



**ASSESSING FACTORS AFFECTING CONTRACEPTIVE SELF-INJECTION (SI)  
UPTAKE AMONG WOMEN IN UGANDA**

**BY**

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## DECLARATION

I, Ndagire Berna, hereby declare that this dissertation titled "*Assessing the factors affecting contraceptive self-injection (SI) uptake among women in Uganda*" is the result of my independent research work and has been prepared solely by me under the guidance of my supervisors.

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## **DEDICATION**

This research work is dedicated to my mother, Miss Kabakoyo Lucy, who has been my unwavering source of love, support, and encouragement throughout this academic journey, and to my children, Jayden Reynolds Mawanda and Jaylah Worthy Nkiinzi. Your belief in my abilities, endless patience, and sacrifices has been the foundation upon which I have built my success.

May the Almighty God richly bless and reward you.

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

|          |                                                   |
|----------|---------------------------------------------------|
| DMPA IM: | Depot Medroxyprogesterone Acetate Intramuscular   |
| DMPA SC: | Depot Medroxyprogesterone Acetate Subcutaneous    |
| FP:      | Family Planning                                   |
| GoU:     | Government of Uganda                              |
| NDA:     | National Drug Authority                           |
| CFA:     | Confirmatory Factor Analysis                      |
| SI:      | Self-injection                                    |
| WHO:     | World Health Organization                         |
| PSIU:    | Population Services International Uganda          |
| DISC:    | Delivering Innovation in Self-Care                |
| IRB:     | Institutional Review Board.                       |
| UNCST:   | Uganda National Council of Science and Technology |
| OR:      | Odds Ratio                                        |

## ABSTRACT

Depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection is a self-care family planning intervention that improves women's autonomy and access to contraception. However, evidence on factors influencing its uptake in Uganda remains limited. This study assessed the predictors of DMPA-SC self-injection uptake among women of reproductive age in Uganda.

A cross-sectional analytical study was conducted using secondary data from 243 women who received DMPA-SC self-injection training through a Population Services International Uganda (PSIU) programme between May and June 2023. Descriptive statistics summarized participant characteristics, while Fisher's Exact Test assessed bivariate associations between selected predictors and DMPA-SC self-injection uptake. Variables significant at the bivariate level were included in an adjusted Firth penalized logistic regression model to identify independent predictors of uptake. A bootstrap sensitivity analysis with 5,000 resamples was performed to assess the robustness of the model estimates.

Overall, 97.1% of the women adopted DMPA-SC self-injection. At the bivariate level, knowledge, confidence, awareness of side effects, and training/support were significantly associated with uptake. In the adjusted Firth regression model, awareness of side effects was the only independent predictor of uptake (adjusted OR = 104.30,  $p = 0.002$ ). Bootstrap analysis demonstrated that this association remained stable across repeated resampling, supporting the robustness of the findings.

The study concludes that awareness of side effects plays a critical role in promoting DMPA-SC self-injection uptake among trained women. Strengthening counselling on potential side effects and their management should therefore be prioritized within family planning programmes to promote informed decision-making and improve uptake. Future studies should use larger and more representative samples to validate these findings and assess determinants of continued self-injection use.

## CHAPTER ONE: INTRODUCTION

### 1.1 Background to the study

Family planning is one of the most effective public health interventions for improving maternal and child health, reducing unintended pregnancies, and advancing women's reproductive autonomy. According to the World Health Organization (WHO), increased access to modern contraceptive methods contributes substantially to reductions in maternal mortality, unsafe abortions, and unmet need for family planning. Injectable contraceptives are among the most commonly used modern contraceptive methods worldwide, accounting for approximately 6% of contraceptive use among women of reproductive age (United Nations, 2023). To expand access to contraception and promote self-care interventions, the World Health Organization recommends depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection, following appropriate training, as a safe, effective, and client-centered family planning option (WHO, 2021).

Depot medroxyprogesterone acetate subcutaneous (DMPA-SC), commonly delivered via the Uniject™ presentation marketed as Sayana® Press, is a progestin-only injectable contraceptive administered every 3 months (Prabhakaran et al., 2021). Unlike conventional provider-administered injectable contraception, DMPA-SC self-injection enables women to administer the contraceptive themselves after appropriate training, offering greater convenience, privacy, and autonomy while reducing dependence on repeated facility visits (Prabhakaran et al., 2021). Consequently, DMPA-SC has become an important self-care intervention aimed at expanding equitable access to family planning services, particularly in low- and middle-income countries where health system constraints may limit access to facility-based care.

Globally, the adoption of DMPA-SC self-injection has steadily increased since its introduction into national family planning programmes. Multi-country implementation studies have shown that approximately 29% of DMPA-SC doses were provided to women who had not previously used modern contraception, demonstrating the method's potential to expand contraceptive coverage among underserved populations (Staveteig et al., 2020). Similar experiences have been reported across several countries where self-injection has been integrated into routine reproductive health services, with studies consistently demonstrating high client satisfaction, improved continuation of contraceptive use, and increased reproductive autonomy (Cover et al., 2017; PATH, 2018; WHO, 2021).

Within Sub-Saharan Africa, DMPA-SC self-injection has demonstrated high feasibility, acceptability, and effectiveness. In Senegal, over 87% of trained women successfully self-administered DMPA-SC and more than 93% expressed willingness to continue self-injection following training (Cover et al., 2017; Cover et al., 2018). Similarly, studies in Malawi reported significantly higher continuation rates among women who self-injected compared with those receiving provider-administered injections, with both providers and clients citing reduced travel time, lower opportunity costs, and greater convenience as important advantages (Stout et al., 2018). These findings have informed wider implementation across several African countries while emphasizing the importance of sustained training, commodity availability, and supportive health systems to ensure successful scale-up (PATH, 2018).

Countries in East Africa, including Tanzania, Rwanda, and Ethiopia, have similarly incorporated DMPA-SC self-injection into national family planning programmes to improve contraceptive access, particularly among women living in rural and underserved communities (Tadesse et al., 2020; Rwandan Ministry of Health, 2022). These initiatives have focused on strengthening provider training, community-based distribution, and client empowerment to improve contraceptive choice and accessibility.

Uganda has been one of the earliest adopters of DMPA-SC self-injection in Sub-Saharan Africa. A feasibility study conducted during the initial introduction of the method reported that approximately 98% of trained women intended to continue self-injecting following provider training (PATH, 2016). Subsequently, a randomized controlled trial demonstrated significantly higher continuation among women who self-injected (81%) compared with women receiving provider-administered injections (65%) over a twelve-month follow-up period (PATH, 2018). Furthermore, the 2020 Uganda Demographic and Health Survey reported that approximately 20% of women using modern contraceptive methods relied on DMPA-SC, reflecting its increasing contribution to Uganda's contraceptive method mix (UBOS, 2022). Collectively, these findings suggest that DMPA-SC self-injection is an acceptable and promising approach for expanding contraceptive access in Uganda.

Despite these encouraging findings, evidence also indicates that successful uptake of DMPA-SC self-injection depends on multiple interacting factors beyond the availability of the contraceptive itself. Andersen's Behavioral Model of Health Services Use provides a useful theoretical framework for understanding health service utilization by categorizing determinants into predisposing, enabling, and need-related (psychosocial) factors. This

framework has been widely applied in studies examining healthcare utilization because it recognizes that individuals' health behaviours are influenced not only by service availability but also by their personal characteristics, resources, and perceived readiness to utilize available services.

Predisposing factors such as age, education, parity, and marital status have consistently been associated with contraceptive decision-making and women's ability to understand and adopt self-injection practices. Younger women and those with higher educational attainment may be more receptive to learning self-injection techniques, whereas social and cultural norms associated with marital status and parity may also influence contraceptive choices. Enabling factors, including household income, distance to health facilities, provider support, availability of DMPA-SC commodities, and opportunities for training, determine women's ability to access and sustain self-injection services. Studies conducted in Uganda and Senegal have shown that women value self-injection because it reduces transport costs, minimizes waiting time at health facilities, and increases privacy and autonomy in reproductive health decision-making (Burke et al., 2018; Keith et al., 2021; Staveteig et al., 2020).

In addition to socio-demographic and access-related characteristics, increasing attention has been directed toward psychosocial factors that influence women's readiness to adopt self-injection. Women's knowledge of DMPA-SC, confidence in correctly administering the injection, and awareness of potential side effects may collectively shape their willingness and ability to self-inject. These factors are conceptually related and represent different dimensions of psychological readiness rather than isolated characteristics. At the same time, concerns regarding incorrect injection technique, injection-site reactions, storage conditions, disposal of used devices, fear of making mistakes, and concerns about side effects may discourage uptake among some women despite the method's demonstrated effectiveness (Cover et al., 2017; Burke et al., 2018; Keith et al., 2021; Burke et al., 2020).

Although implementation studies conducted in Uganda have consistently demonstrated high acceptability, feasibility, and continuation of DMPA-SC self-injection following structured provider training, these studies were largely conducted within pilot or programme implementation settings. Consequently, they provide limited evidence regarding the determinants of actual uptake of self-injection under routine family planning service delivery. Furthermore, while previous studies have examined individual socio-demographic, access-related, or behavioural factors, relatively few have investigated how these factors jointly

influence women's readiness for self-injection and subsequent uptake. Understanding these relationships is important for identifying women who may require additional support during self-injection training and for informing strategies aimed at improving equitable access to self-care family planning interventions.

Guided by Andersen's Behavioral Model of Health Services Use, this study examined factors associated with DMPA-SC self-injection uptake among women in Uganda, considering the roles of predisposing characteristics, enabling factors, and individual-level factors related to women's knowledge, confidence, and awareness of potential side effects. The theoretical framework informed the study's conceptual framework, selection of explanatory variables, and analytical approach. The study therefore assessed the independent associations between these factors and DMPA-SC self-injection uptake using bivariate analysis and Firth penalized logistic regression.

## **1.2 Statement of the Problem**

Depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection has emerged as an important self-care intervention for expanding access to family planning by enabling women to administer injectable contraception independently following appropriate training. In Uganda, the Ministry of Health has integrated DMPA-SC into the national family planning programme through provider training, task shifting, community-based distribution, and integration of family planning services into routine healthcare (Ministry of Health, 2020). Pilot and implementation studies have reported high acceptability of DMPA-SC self-injection, with approximately 98% of trained women expressing willingness to continue self-injecting and higher continuation rates observed among self-injectors compared with provider-administered users (PATH, 2016; PATH, 2018).

Despite these encouraging findings, uptake of DMPA-SC self-injection under routine service delivery remains inconsistent. Although overall modern contraceptive use has increased gradually in Uganda, the proportion of women using injectable contraceptives has not increased at the same pace despite the introduction and scale-up of DMPA-SC (UBOS, 2018; UBOS, 2022). This suggests that the availability of DMPA-SC alone may not be sufficient to ensure its uptake and that women who are eligible for self-injection may differ in their willingness or readiness to adopt the method.

Previous studies have identified several factors that may influence uptake of DMPA-SC self-injection, including socio-demographic characteristics, access to services, convenience, privacy, provider support, knowledge of the method, confidence in self-injecting, and awareness of potential side effects (Burke et al., 2018; PATH, 2018; Keith et al., 2021). However, much of the existing evidence has focused on feasibility, acceptability, and continuation following structured provider training rather than on the determinants of actual uptake under routine family planning service delivery in Uganda. Consequently, there remains limited evidence on the relative contribution of predisposing, enabling, and psychosocial factors to women's uptake of DMPA-SC self-injection in routine practice.

Furthermore, previous studies have identified several factors associated with DMPA-SC self-injection uptake, including women's knowledge of the method, confidence in self-injection, awareness of potential side effects, access to health services, and socio-demographic characteristics. However, the relative contribution of these factors to self-injection uptake remains insufficiently understood, particularly in the Ugandan context. In addition, evidence is limited on the independent predictors of DMPA-SC self-injection uptake among women who have received self-injection training. This is particularly important given the potential for highly imbalanced outcomes, where conventional logistic regression methods may produce biased estimates or encounter separation.

Addressing these knowledge and methodological gaps is important for informing evidence-based family planning programmes. A better understanding of the socio-demographic, enabling, and individual-level factors associated with DMPA-SC self-injection uptake can guide the design of targeted interventions, strengthen counselling and training approaches, and support policies aimed at expanding equitable access to and uptake of DMPA-SC self-injection in Uganda. Evidence on the factors that independently predict uptake can also help programme planners identify modifiable areas for intervention and strengthen the implementation of self-injection within Uganda's broader family planning and self-care strategies.

### **1.3 General Objective**

To assess the determinants of DMPA-SC self-injection uptake among women in Uganda.



### **1.3.1 Specific Objectives**

- i. To determine the influence of socio-demographic factors (age, education level, marital status, residence, parity, income level) on DMPA-SC self-injection uptake.
- ii. To examine the influence of confidence, knowledge, and side-effect awareness on DMPA-SC self-injection uptake.
- iii. To assess how healthcare system factors (training and support, distance to health facility) influence DMPA-SC self-injection Uptake.

### **1.4 Research Hypotheses**

H<sub>01</sub>: Predisposing factors (age, education level, marital status, residence, and parity) have no statistically significant influence on the uptake of DMPA-SC self-injection among women in Uganda.

H<sub>02</sub>: Enabling factors (training & support and distance to the health facility) have no statistically significant influence on the uptake of DMPA-SC self-injection among women in Uganda.

H<sub>03</sub>: Individual-level factors (knowledge of DMPA-SC self-injection, confidence in self-injection, and awareness of side effects) have no statistically significant influence on the uptake of DMPA-SC self-injection among women in Uganda.

### **1.5 Significance of the study**

Although DMPA-SC self-injection has considerable potential to improve women's access to contraception and strengthen contraceptive self-care, evidence on factors associated with its uptake under routine programme conditions in Uganda remains limited. In particular, there is a need for further evidence on the relative contribution of socio-demographic, healthcare access, programme-related, and individual-level factors to DMPA-SC self-injection uptake. This study contributes to addressing this evidence gap by examining factors associated with uptake among women who received DMPA-SC self-injection training.

The findings of this study may inform policymakers and programme managers within the Ministry of Health and other reproductive health stakeholders in the design and implementation of strategies aimed at expanding DMPA-SC self-injection in Uganda. Specifically, the findings may inform the strengthening of counselling and health education,

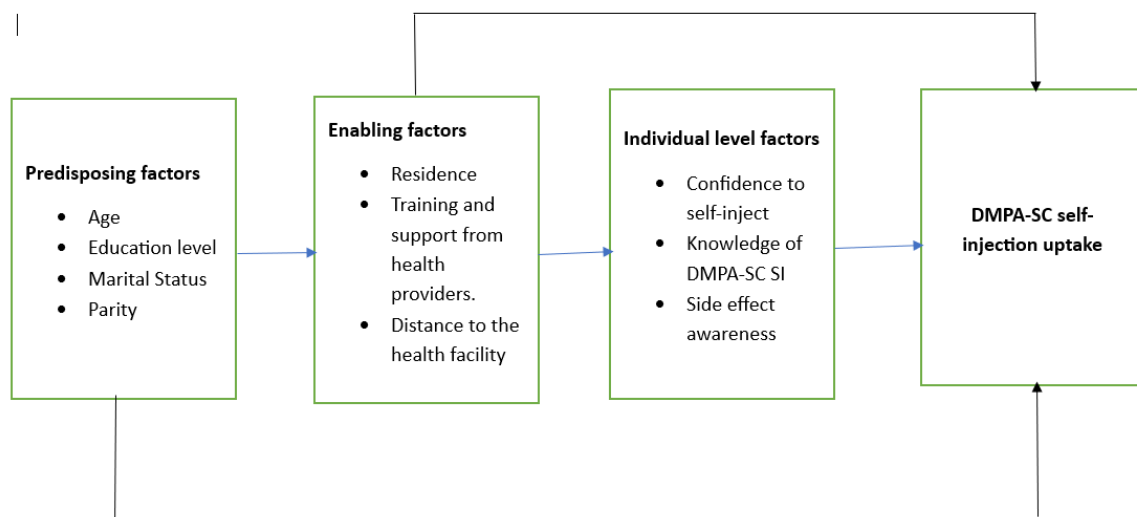
provider training, community-based sensitization, and other programme strategies that address modifiable barriers to self-injection uptake.

The study may also contribute to the evidence base for Uganda's family planning and self-care programmes by identifying factors that are independently associated with DMPA-SC self-injection uptake. This evidence can support the development of interventions that promote informed contraceptive decision-making and improve access to self-injection services among women of reproductive age.

Finally, the findings may serve as a reference for researchers conducting further studies on contraceptive uptake and self-care interventions in Uganda and other low- and middle-income countries. The study also highlights the importance of appropriate statistical approaches for analysing highly imbalanced outcomes, particularly in settings where the number of women who do not adopt a contraceptive method is relatively small.

## 1.6 Conceptual Framework for DMPA-SC SI uptake among women in Uganda.

Figure 1.1: Conceptual framework for DMPA-SC self-injection uptake



*Adapted from Andersen's behavioral model of health services utilization (Andersen, 1995)*

The conceptual framework for this study was adapted from Andersen's Behavioral Model of Health Services Utilization (Andersen, 1995), which proposes that health service utilization is influenced by three broad categories of determinants: predisposing factors, enabling factors, and need factors. The model suggests that an individual's use of health services is shaped by

characteristics that predispose them to seek care, resources and conditions that enable or constrain access to services, and their perceived or evaluated need for the service.

In the context of this study, predisposing factors include socio-demographic characteristics that may influence women's likelihood of self-injecting DMPA-SC. These factors include age, education level, marital status, and parity.

Enabling factors refer to resources and contextual or health-system conditions that may facilitate or constrain access to and uptake of DMPA-SC self-injection. In this study, these include residence, household income, training and support received from healthcare providers, and physical access to health services as measured by distance to the nearest health facility.

Individual-level factors related to women's understanding and perceived ability to use DMPA-SC self-injection were also considered. These included knowledge of DMPA-SC self-injection, confidence in performing self-injection, and awareness of potential side effects. Each factor was examined as an independent explanatory variable in relation to DMPA-SC self-injection uptake.

The dependent variable in the conceptual framework is DMPA-SC self-injection uptake, defined as whether an eligible woman adopted self-injection following training. The framework hypothesizes that predisposing characteristics, enabling factors, and individual-level factors are associated with the likelihood of DMPA-SC self-injection uptake among women in Uganda.

The conceptual framework therefore guided the selection and categorization of explanatory variables and informed the statistical analysis of factors associated with DMPA-SC self-injection uptake.

## **1.7 Structure of the Report**

This report is organized into five chapters. Chapter One introduces the study by presenting the background, statement of the problem, research objectives, hypothesis, significance, justification, and conceptual framework. Chapter Two provides a comprehensive review of the literature on factors influencing the utilization of DMPA-SC self-injection. Chapter Three details the research methodology, including the data sources, study population, study

variables, data analysis procedures, and ethical considerations. Chapter Four presents and discusses the study findings at univariate, bivariate, and multivariate levels. Finally, Chapter Five summarizes the key findings, draws conclusions, and provides recommendations for practice, policy, and future research, along with suggestions for further investigation.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.0 Introduction**

This chapter reviews the theoretical and empirical literature relevant to the uptake of depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection among women. The review is guided by Andersen's Behavioral Model of Health Services Use, which posits that health service utilization is influenced by predisposing, enabling, and individual-related (psychosocial) factors. The chapter first presents the theoretical foundation underpinning the study before reviewing empirical evidence on DMPA-SC self-injection uptake and its determinants. The literature is organized according to the study objectives and conceptual framework, focusing on predisposing factors, enabling factors, and psychosocial readiness. The chapter concludes by highlighting methodological and empirical gaps that informed the current study.

### **2.1 Theoretical Review**

#### **2.1.1 Andersen's Behavioral Model of Health Services Use**

The present study is guided by Andersen's Behavioral Model of Health Services Use, originally developed by Andersen (1968) and subsequently refined over several decades to explain the factors influencing individuals' utilization of health services (Andersen, 1995). The model proposes that health service utilization is not determined solely by the availability of healthcare services but results from the interaction of three broad categories of determinants: predisposing factors, enabling factors, and need factors.

Predisposing factors refer to the socio-demographic characteristics that influence an individual's inclination to use health services before a health need arises. These characteristics include age, educational attainment, marital status, parity, and other social attributes that shape health beliefs, knowledge, and health-seeking behaviours. Although these characteristics do not directly determine utilization, they influence how individuals perceive healthcare options and make decisions regarding service use.

Enabling factors represent the resources and conditions that facilitate or hinder access to healthcare services. These include both personal and community resources such as income, health insurance, availability of healthcare providers, provider support, geographical accessibility, and distance to health facilities. Even when individuals are willing to utilize health services, the absence of enabling resources may prevent actual utilization.

Need factors describe an individual's perceived or evaluated need for healthcare. In the original Andersen model, need primarily referred to perceived illness or professionally evaluated health status. However, subsequent adaptations of the model have recognized the importance of psychosocial factors, particularly in preventive health behaviours such as contraceptive utilization. In the context of DMPA-SC self-injection, readiness for self-injection represents an individual's psychological preparedness to adopt and correctly use the method. Readiness encompasses multiple interrelated dimensions, including knowledge of the contraceptive method, confidence in performing self-injection correctly, and awareness of potential side effects. These dimensions collectively influence whether women translate access to DMPA-SC into actual uptake.

The Andersen Behavioral Model has been widely applied in studies of healthcare utilization, including maternal health services, preventive healthcare, immunization, HIV care, and family planning. Its strength lies in providing a comprehensive framework that recognizes healthcare utilization as the product of interacting individual, social, and health system factors rather than isolated determinants. Consequently, the model is particularly suitable for understanding DMPA-SC self-injection uptake because adopting self-injection requires not only access to the contraceptive method but also individual preparedness and supportive health system conditions.

Guided by this framework, the present study categorizes age, education level, marital status, and parity as predisposing factors; residence, income, distance to health facilities, and provider training and support as enabling factors; and knowledge of DMPA-SC self-injection, confidence in self-injection, and awareness of potential side effects as individual-level factors. These factors were considered potential determinants of DMPA-SC self-injection uptake and informed the selection of study variables and the subsequent statistical analysis. The framework guided the examination of both bivariate associations and independent predictors of DMPA-SC self-injection uptake using Fisher's Exact Test and Firth penalized logistic regression.

## **2.2 Empirical Literature Review**

### **2.2.1 Uptake of DMPA-SC Self-Injection**

Depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection has emerged as one of the most promising self-care interventions for expanding access to modern contraception, particularly in low- and middle-income countries where access to healthcare

facilities may be limited. Unlike provider-administered injectable contraception, DMPA-SC self-injection allows women to administer the contraceptive independently following appropriate training, thereby reducing dependence on healthcare providers while improving convenience, privacy, and autonomy (Prabhakaran et al., 2021).

Evidence from several countries consistently demonstrates that DMPA-SC self-injection is safe, acceptable, and effective. A systematic review by Cover et al. (2019) found that women who self-injected DMPA-SC achieved contraceptive effectiveness comparable to provider-administered injections while experiencing significantly higher continuation rates. The review concluded that self-injection enhances women's autonomy without compromising safety, making it a viable strategy for improving access to family planning services.

Implementation studies conducted across Sub-Saharan Africa have similarly demonstrated high levels of acceptability and competence following training. In Senegal, Cover et al. (2017) reported that approximately 87% of women successfully self-injected three months after receiving training, while more than 93% expressed willingness to continue self-injection. Likewise, a randomized controlled trial conducted in Malawi found significantly higher continuation among women who self-injected compared with those receiving provider-administered injections over a twelve-month follow-up period (Cover et al., 2018). Participants cited convenience, reduced travel costs, privacy, and greater control over contraceptive use as major advantages of self-injection.

Uganda has also demonstrated encouraging results following the introduction of DMPA-SC self-injection. A feasibility study conducted during the early implementation of the programme reported that nearly all women trained in self-injection intended to continue using the method (PATH, 2016). Subsequently, a randomized controlled trial found that continuation rates among women who self-injected were substantially higher than among women receiving provider-administered injections (PATH, 2018). These findings demonstrate that DMPA-SC self-injection is both feasible and highly acceptable within the Ugandan context.

Despite these positive findings, existing evidence has largely been generated from pilot programmes, implementation projects, or controlled research settings where women receive structured training, regular follow-up, and continuous support from healthcare providers. Such environments may not accurately reflect routine family planning service delivery, where provider support, commodity availability, and client follow-up may be less intensive.

Consequently, findings from implementation studies may overestimate uptake under routine programme conditions.

Furthermore, much of the existing literature has concentrated on evaluating the feasibility, acceptability, safety, and continuation of DMPA-SC self-injection rather than identifying the determinants of uptake among women receiving routine family planning services. Although studies have acknowledged that factors such as age, education, access to services, provider support, knowledge, confidence, and concerns about side effects may influence women's decisions to self-inject, relatively few have examined the combined influence of these factors within a comprehensive theoretical framework such as Andersen's Behavioral Model.

An additional limitation of previous studies is that psychosocial characteristics—including knowledge, confidence, and awareness of side effects—have generally been examined as separate variables. Because these characteristics are conceptually related and collectively represent women's psychological readiness for self-injection, analysing them independently may not fully capture the underlying construct influencing uptake. Few studies have therefore applied latent variable approaches such as Confirmatory Factor Analysis (CFA) to validate readiness for self-injection before examining its association with uptake. This represents an important methodological gap in the existing literature.

Overall, the reviewed literature demonstrates that DMPA-SC self-injection is a safe, acceptable, and effective contraceptive option with the potential to improve contraceptive continuation and reproductive autonomy. However, important gaps remain regarding the determinants of uptake under routine service delivery, particularly within the Ugandan context. In addition, there is limited application of robust latent variable methods to measure psychosocial readiness for self-injection. Addressing these empirical and methodological gaps formed the basis for the present study.

### **2.2.2 Predisposing Factors Associated with DMPA-SC Self-Injection Uptake**

According to Andersen's Behavioral Model, predisposing factors are socio-demographic characteristics that influence an individual's inclination to utilize healthcare services before the actual need for care arises (Andersen, 1995). Although these characteristics do not directly determine health service utilization, they shape individuals' health beliefs, knowledge, attitudes, and decision-making processes. In the context of DMPA-SC self-injection, predisposing factors such as age, education, marital status, and parity may influence women's willingness to adopt self-injection by affecting their understanding of the method,



confidence in self-care, reproductive intentions, and previous experiences with family planning. The empirical evidence regarding these factors is discussed below.

### **Age and DMPA-SC Self-Injection Uptake**

Age has consistently been identified as an important determinant of contraceptive behaviour, although its relationship with DMPA-SC self-injection remains inconsistent across settings. Younger women are generally considered more receptive to innovations in reproductive health because they tend to have greater exposure to health information, higher levels of health literacy, and greater familiarity with self-care interventions. Conversely, older women often possess greater reproductive experience and may demonstrate higher confidence in managing contraceptive methods independently.

Evidence from Uganda and other sub-Saharan African countries suggests that younger women are more likely to adopt DMPA-SC self-injection following appropriate training. Burke et al. (2018) reported that younger women appreciated the convenience, privacy, and flexibility offered by self-injection, particularly because it reduced frequent visits to health facilities. Similarly, Cover et al. (2017) observed high levels of competence among younger women participating in self-injection programmes in Senegal, indicating that age alone does not constitute a barrier to successful self-administration when adequate training is provided.

However, findings from other studies have been less consistent. Research conducted in Malawi reported no statistically significant association between age and successful continuation of DMPA-SC self-injection after controlling for provider support and training quality (Cover et al., 2018). These findings suggest that the influence of age may be mediated by enabling factors, particularly access to comprehensive counselling and provider support, rather than chronological age itself.

The inconsistency in previous findings indicates that age should not be viewed as an isolated determinant of self-injection uptake. Rather, its influence is likely to operate through differences in reproductive experience, exposure to health information, and interactions with health services. Consequently, examining the effect of age alongside other socio-demographic and psychosocial characteristics provides a more comprehensive understanding of women's decisions regarding DMPA-SC self-injection.

## **Education Level and DMPA-SC Self-Injection Uptake**

Educational attainment has long been recognised as an important predictor of health-seeking behaviour and contraceptive utilization. Higher levels of education are generally associated with improved health literacy, greater ability to understand medical instructions, increased autonomy in healthcare decision-making, and greater confidence in adopting new health technologies. Within Andersen's Behavioral Model, education represents a predisposing characteristic that shapes an individual's capacity to acquire and process health information.

Several studies have reported positive associations between educational attainment and contraceptive utilization. Women with secondary or tertiary education are generally more likely to adopt modern contraceptive methods because they better understand their effectiveness, side effects, and correct use (Prata et al., 2019). Similar findings have been reported in Uganda, where educated women demonstrate greater awareness of family planning options and are more likely to seek reproductive health services (UBOS, 2022).

With respect to DMPA-SC self-injection, education may facilitate women's understanding of injection procedures and improve their confidence in administering the method correctly. However, evidence from implementation studies suggests that self-injection can be successfully adopted across different educational levels, provided that women receive standardized provider training. Cover et al. (2017) found that women with limited formal education were able to demonstrate high levels of competency following structured practical demonstrations, suggesting that appropriate counselling may compensate for differences in educational attainment.

These findings imply that although education may facilitate the adoption of self-injection by improving health literacy, it is unlikely to operate independently of provider training and psychosocial readiness. Therefore, education should be considered alongside other predisposing, enabling, and psychosocial factors when examining determinants of DMPA-SC self-injection uptake.

## **Marital Status and DMPA-SC Self-Injection Uptake**

Marital status has frequently been associated with contraceptive decision-making because reproductive intentions, partner support, and household dynamics differ between married and unmarried women. Married women may experience greater motivation to space or limit births, but may also encounter partner influence regarding contraceptive choices. Conversely,

unmarried women may value contraceptive methods that offer greater privacy and confidentiality.

Studies conducted across sub-Saharan Africa suggest that DMPA-SC self-injection is particularly valued because it allows women to manage contraception privately without frequent contact with healthcare facilities (Keith et al., 2021). Privacy has been identified as an important consideration among women concerned about partner disapproval or community stigma associated with contraceptive use. Consequently, self-injection may be attractive to both married and unmarried women for different reasons.

Nevertheless, empirical findings regarding marital status remain inconsistent. Some studies report higher uptake among married women because of greater contraceptive need and more regular interaction with maternal health services, whereas others find no statistically significant differences after controlling for education, age, and access to healthcare services (Burke et al., 2018). These inconsistencies suggest that marital status may interact with broader socio-cultural and health system factors rather than exerting an independent influence on self-injection uptake.

### **Parity and DMPA-SC Self-Injection Uptake**

Parity, defined as the number of children previously born to a woman, reflects reproductive experience and often influences contraceptive decision-making. Women with higher parity generally have greater motivation to space or limit subsequent pregnancies and may therefore demonstrate increased interest in effective long-acting or injectable contraceptive methods.

Previous studies have shown that women with previous experience using injectable contraception are generally more comfortable transitioning to DMPA-SC self-injection because they are already familiar with the method and its side effects (PATH, 2018). Conversely, first-time contraceptive users may require more comprehensive counselling before adopting self-injection due to concerns regarding injection technique and potential adverse effects.

However, evidence regarding parity remains mixed. While some studies report higher uptake among multiparous women, others suggest that parity becomes less important once women receive adequate counselling and provider support. These findings indicate that reproductive experience alone may not determine uptake but instead interacts with women's knowledge, confidence, and access to quality family planning services.

### **2.2.3 Enabling Factors Associated with DMPA-SC Self-Injection Uptake**

According to Andersen's Behavioral Model, enabling factors are the logistical, financial, and structural resources that facilitate or impede an individual's ability to utilize healthcare services (Andersen, 1995). Unlike predisposing factors, which influence an individual's inclination to seek care, enabling factors determine whether healthcare services are practically accessible once the decision to seek care has been made. In the context of DMPA-SC self-injection, enabling factors include geographical accessibility, provider support, availability of training, and characteristics of the healthcare system that influence women's ability to initiate and continue self-injection. This section reviews evidence relating to residence, distance to health facilities, and provider training and support.

#### **Residence and DMPA-SC Self-Injection Uptake**

Place of residence has frequently been examined as a determinant of contraceptive utilization because urban and rural populations often experience different levels of access to healthcare services, health information, and family planning commodities. Women residing in urban settings generally benefit from greater proximity to health facilities, better availability of trained providers, and increased exposure to health promotion campaigns. Conversely, women in rural areas often encounter longer travel distances, limited healthcare infrastructure, and shortages of trained health workers, which may reduce access to contraceptive services.

Several studies have reported higher utilization of modern contraceptive methods among urban women compared with their rural counterparts (United Nations, 2023; UBOS, 2022). However, evidence specifically relating to DMPA-SC self-injection suggests that residence alone may not adequately explain uptake. Because self-injection reduces the frequency of clinic visits after initial training, it has the potential to minimize geographical disparities in contraceptive access. Studies conducted in Uganda and Malawi demonstrated that women from both rural and urban settings were able to competently self-inject following standardized provider training, suggesting that differences in uptake may be more strongly influenced by service delivery factors than by residence itself (PATH, 2018; Cover et al., 2018).

Furthermore, implementation programmes have demonstrated that community-based distribution and outreach services substantially improve access among rural women by bringing training and contraceptive services closer to communities (Keith et al., 2021). These

findings indicate that although residence may influence initial access to family planning services, its effect may be substantially reduced when enabling interventions such as community outreach and provider support are available.

Overall, the evidence suggests that residence functions primarily as a contextual factor reflecting differences in healthcare accessibility rather than acting as an independent determinant of DMPA-SC self-injection uptake. Consequently, its influence should be interpreted alongside other enabling factors that directly affect access to services.

### **Distance to Health Facilities and DMPA-SC Self-Injection Uptake**

Distance to health facilities is widely recognized as one of the most important enabling factors influencing healthcare utilization, particularly in low- and middle-income countries where transportation costs and travel time often limit access to services. Within Andersen's Behavioral Model, geographical accessibility represents a critical enabling resource because individuals may be unable to utilize healthcare services despite having favourable attitudes toward care.

One of the principal advantages of DMPA-SC self-injection is its ability to reduce dependence on frequent facility visits. Women who complete provider training can administer subsequent injections independently at home, thereby minimizing transport costs, reducing waiting times, and decreasing opportunity costs associated with clinic attendance (Prabhakaran et al., 2021). These characteristics make DMPA-SC self-injection particularly attractive for women residing in remote or underserved areas.

Evidence from Uganda indicates that women frequently cite reduced travel time and transport costs as major reasons for preferring self-injection over provider-administered contraceptives (Burke et al., 2018). Similar findings have been reported in Senegal and Malawi, where women perceived self-injection as a convenient alternative that enabled continued contraceptive use without repeated facility visits (Cover et al., 2017; Cover et al., 2018). These findings suggest that DMPA-SC self-injection may reduce geographical barriers that have traditionally limited contraceptive continuation.

However, the relationship between distance and uptake remains complex. Initial adoption of self-injection still requires attendance at a health facility for counselling, competency assessment, and supervised practice. Consequently, women living far from facilities may experience challenges accessing initial training despite benefiting from reduced follow-up

visits thereafter. This suggests that distance may influence different stages of self-injection differently, serving as both a barrier to initiation and a motivator for continued use once training has been completed.

Although numerous studies acknowledge the importance of geographical accessibility, relatively few have quantified its independent contribution after accounting for psychosocial readiness and other socio-demographic characteristics. This represents an important gap addressed in the present study.

### **Training and Provider Support**

Provider training and supportive supervision are central components of successful DMPA-SC self-injection programmes. Unlike conventional provider-administered contraception, self-injection requires women to acquire practical skills related to injection technique, dose scheduling, storage of supplies, and safe disposal of used injection devices. Consequently, the quality of counselling and practical demonstrations provided by healthcare workers plays a critical role in building women's competence and confidence.

Evidence from implementation studies consistently demonstrates that comprehensive training substantially improves women's ability to self-inject correctly. In Senegal, Cover et al. (2017) reported that most women were able to perform self-injection following structured demonstrations and supervised practice sessions competently. Similarly, studies conducted in Malawi and Uganda found high levels of competency and continued use among women receiving standardized training delivered by skilled healthcare providers (PATH, 2018; Cover et al., 2018).

Provider support extends beyond the initial training session. Follow-up counselling, reminder systems, opportunities to ask questions, and continued availability of healthcare workers contribute to sustained self-injection by reinforcing women's confidence and addressing concerns regarding side effects or injection technique (Keith et al., 2021). Such supportive interactions strengthen women's self-efficacy and reduce anxiety associated with adopting a new contraceptive method.

Nevertheless, implementation challenges remain. In many resource-constrained settings, shortages of trained providers, inconsistent availability of DMPA-SC commodities, and limited opportunities for refresher training may compromise programme effectiveness. Variability in provider competence may also contribute to inconsistent counselling messages,

potentially influencing women's confidence and willingness to adopt self-injection. These findings highlight the importance of strengthening health system capacity alongside efforts to promote individual behaviour change.

#### **2.2.4 Individual-level factors and DMPA-SC Self-Injection Uptake**

Within Andersen's Behavioral Model of Health Services Utilization, individual characteristics and perceptions may influence decisions to use health services (Andersen, 1995). In the context of contraceptive self-care, women's understanding of a method, confidence in their ability to use it, and awareness of potential side effects may influence their decision to adopt and continue using DMPA-SC self-injection. Unlike socio-demographic characteristics, these individual-level factors may be modifiable through appropriate counselling, training, and health education.

For DMPA-SC self-injection, knowledge, confidence, and awareness of potential side effects represent distinct but potentially related aspects of women's experiences with the method. Examining these factors individually may provide insight into specific areas that can be addressed through family planning programmes and self-injection training.

#### **Knowledge and DMPA-SC Self-Injection Uptake**

Knowledge is an important component of informed contraceptive decision-making. Women who understand how DMPA-SC self-injection works, its effectiveness, injection schedule, administration procedure, and potential side effects may be better prepared to make informed decisions about adopting the method. Adequate knowledge may also help women distinguish expected side effects from symptoms requiring medical attention, thereby reducing uncertainty and anxiety associated with self-injection.

Several studies have demonstrated associations between contraceptive knowledge and the uptake of modern family planning methods. Women with greater knowledge are generally more likely to initiate contraception and make informed choices about contraceptive methods (Prata et al., 2019). Similarly, studies evaluating DMPA-SC self-injection have reported that comprehensive counselling and practical demonstrations can improve women's understanding of the method and increase their willingness to self-inject (Cover et al., 2017; PATH, 2018).

However, knowledge alone may not be sufficient to result in adoption of self-injection. A woman may understand the procedure but remain hesitant to inject herself because of fear of needles, uncertainty about the correct technique, or concerns about making mistakes. This

suggests that knowledge should be considered alongside other individual and programme-related factors that may influence women's decisions to adopt self-injection.

### **Confidence and DMPA-SC Self-Injection Uptake**

Confidence, often described as self-efficacy, refers to an individual's belief in their ability to successfully perform a particular behaviour. In the context of DMPA-SC self-injection, confidence reflects a woman's perceived ability to correctly administer the injection and manage the method independently.

Evidence suggests that confidence is an important factor in self-injection adoption and continuation. Women who report greater confidence following provider training may be more likely to initiate self-injection, perform subsequent injections correctly, and continue using the method over time (Cover et al., 2018). Studies conducted in Uganda have similarly emphasized the importance of practical demonstrations and supervised practice in helping women develop the skills and confidence required for independent self-injection (PATH, 2018).

Confidence may be strengthened through hands-on training, provider encouragement, and opportunities for supervised practice. Consequently, DMPA-SC self-injection programmes that combine information provision with practical skills development may be better positioned to support women's adoption of the method. These findings highlight the importance of examining confidence as an individual-level factor associated with self-injection uptake.

### **Awareness of Side Effects and DMPA-SC Self-Injection Uptake**

Awareness of potential side effects is another important consideration in contraceptive decision-making. Women considering DMPA-SC self-injection may seek information about possible side effects, their expected duration, and appropriate actions if they occur. Accurate and comprehensive counselling can help women distinguish between common and manageable side effects and symptoms that require further medical assessment.

Research across different contraceptive methods has shown that concerns about side effects can contribute to discontinuation and method switching (Burke et al., 2018). Conversely, appropriate counselling and accurate information may help women anticipate and manage expected side effects, thereby supporting informed contraceptive decision-making.



The relationship between awareness of side effects and contraceptive uptake may, however, be complex. Information about potential side effects may reassure women by preparing them for expected experiences, but it may also increase concerns among women who perceive the potential risks as unacceptable. The quality and content of counselling are therefore important in determining how information about side effects influences contraceptive decisions.

For DMPA-SC self-injection, examining awareness of side effects is particularly relevant because women are required to manage the method with greater independence. Adequate information may increase women's preparedness to make informed decisions and manage expected experiences following self-injection.

### **2.2.5 Methodological Approaches Used in Previous Studies**

The choice of analytical methods plays an important role in determining the validity and reliability of evidence generated from studies examining contraceptive utilization. Appropriate statistical techniques should reflect both the research questions and the characteristics of the study population and outcome variable.

Studies examining DMPA-SC self-injection have employed a range of quantitative methods, including descriptive statistics, bivariate analyses, and multivariable regression models. However, methodological differences across studies may contribute to variations in reported findings regarding the factors associated with self-injection uptake.

Many studies have adopted cross-sectional or quasi-experimental designs and have used descriptive statistics to summarize participant characteristics and estimate DMPA-SC self-injection uptake (Cover et al., 2017; Burke et al., 2018). Bivariate techniques, including Chi-square tests and t-tests, have also been used to examine associations between socio-demographic characteristics and contraceptive uptake. Although these approaches provide useful preliminary evidence, they do not account for the simultaneous influence of multiple explanatory variables and therefore cannot identify independent predictors.

To address this limitation, several studies have used multivariable logistic regression to examine independent predictors of DMPA-SC self-injection uptake (Keith et al., 2021; Prata et al., 2019). Logistic regression is appropriate when the outcome is binary, such as whether or not a woman adopts self-injection. The method allows researchers to estimate adjusted odds ratios while accounting for the influence of multiple explanatory variables.

However, conventional maximum likelihood logistic regression may produce biased or unstable estimates when outcome categories are highly imbalanced or when complete or quasi-complete separation occurs. In such circumstances, regression coefficients may become excessively large, confidence intervals may be very wide, or model convergence may fail (Heinze & Schemper, 2002). These challenges are particularly relevant in studies of contraceptive uptake where adoption rates may be very high and the number of non-users may be small.

Firth penalized logistic regression provides an alternative approach for addressing small-sample bias and separation in binary outcome models. By applying a penalized likelihood approach, Firth regression can produce more reliable parameter estimates under conditions where conventional logistic regression may be unstable or fail to converge (Heinze & Schemper, 2002). The method is therefore particularly relevant to studies with rare outcome categories or sparse data.

In addition to selecting appropriate regression methods, assessing the robustness of model estimates is important, particularly when sample sizes are relatively small. Bootstrap resampling provides a useful approach for evaluating the stability of statistical estimates by repeatedly drawing samples with replacement from the original dataset. Comparing bootstrap estimates with the original model estimates can provide evidence regarding the consistency and robustness of the observed associations.

The present study therefore employed Fisher's Exact Test for bivariate analysis because of the sparse outcome distribution and used Firth penalized logistic regression to identify independent predictors of DMPA-SC self-injection uptake. Bootstrap resampling was subsequently used to assess the robustness of the final model estimates.

### **2.3 Summary of Literature and Research Gaps**

The reviewed literature demonstrates that DMPA-SC self-injection is an acceptable and potentially effective contraceptive option that can improve women's access to family planning services and increase autonomy in contraceptive decision-making. Studies conducted in Uganda and other low- and middle-income countries have generally reported high levels of acceptability and uptake following appropriate provider training and counselling, highlighting the potential of self-injection as an important component of contraceptive self-care.

The literature further suggests that DMPA-SC self-injection uptake may be associated with a combination of predisposing, enabling, and individual-level factors. Predisposing characteristics such as age, education, marital status, and parity have been examined in relation to contraceptive utilization, although findings have varied across settings. Enabling factors, including geographical access, provider support, and training, may facilitate uptake by reducing barriers to service access and improving women's ability to use the method. Individual-level factors, particularly knowledge, confidence, and awareness of potential side effects, may also influence women's decisions to adopt self-injection.

Despite these advances, several gaps remain. First, relatively few studies have examined factors associated with DMPA-SC self-injection uptake under routine service delivery conditions in Uganda. Much of the available evidence has been generated through pilot projects or specific implementation programmes, limiting the extent to which findings can be generalized to routine family planning services.

Second, existing studies have reported inconsistent findings regarding the contribution of socio-demographic and enabling factors to self-injection uptake. This highlights the importance of examining these factors within the specific context of Uganda and among women receiving DMPA-SC self-injection training.

Third, although knowledge, confidence, and awareness of side effects have been identified as potentially important factors, limited evidence exists on their independent associations with DMPA-SC self-injection uptake among women in Uganda. Understanding the contribution of these individual-level factors may help identify modifiable areas for intervention through counselling, health education, and provider training.

Finally, methodological challenges may arise when analysing DMPA-SC self-injection uptake because adoption rates can be very high, resulting in a small number of non-users and sparse outcome categories. The use of conventional logistic regression in such circumstances may result in biased estimates or separation. There is therefore a need for analytical approaches that account for sparse data and small-sample bias while also assessing the robustness of model estimates.

The present study addresses these gaps by examining socio-demographic, enabling, programme-related, and individual-level factors associated with DMPA-SC self-injection uptake among women in Uganda. The study uses Fisher's Exact Test to assess bivariate associations, Firth penalized logistic regression to identify independent predictors under

conditions of sparse outcome data, and bootstrap resampling to assess the robustness of the final model estimates. The findings are expected to contribute to the evidence base for strengthening DMPA-SC self-injection programmes and informing policies and interventions aimed at expanding access to client-centred contraceptive self-care in Uganda.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0 Introduction**

This chapter describes the methodology used to investigate the determinants of Depot Medroxyprogesterone Acetate Subcutaneous (DMPA-SC) self-injection uptake among women in Uganda. It presents the study design, study setting, data source, study sample, study variables, statistical analysis, model diagnostics, ethical considerations, and study limitations. The analytical framework was informed by Andersen's Behavioral Model of Health Service Utilization and employed Confirmatory Factor Analysis (CFA) to construct a latent readiness score, followed by Firth penalized logistic regression to identify predictors of DMPA-SC self-injection uptake. In addition, bootstrap validation was performed to assess the robustness and stability of the regression estimates given the relatively small sample size.

### **3.1 Study design and data source**

This study employed a quantitative cross-sectional analytical design using secondary data obtained from Population Services International (PSI) Uganda between May and June 2023 as part of the Delivering Innovation in Self-Care (DISC) project. The original study aimed to evaluate women's experiences with family planning services and assess awareness and uptake of DMPA-SC self-injection following provider training. A cross-sectional analytical design was appropriate because the objective was to examine associations between DMPA-SC self-injection uptake and selected predisposing, enabling, and psychosocial factors measured at a single point in time.

The present study utilized the baseline client exit interview dataset generated from the DISC project. Only variables relevant to the objectives of the present study were extracted for analysis, including socio-demographic characteristics, psychosocial indicators, accessibility variables, and DMPA-SC self-injection uptake.

The study was guided by Andersen's Behavioral Model of Health Service Utilization, which posits that health service utilization is influenced by predisposing characteristics, enabling resources, and need or psychosocial factors. In line with this framework, the present study examined socio-demographic characteristics, health service accessibility, and psychosocial readiness for self-injection as determinants of DMPA-SC self-injection uptake.

### **3.2 Study area**

The study utilized secondary data collected from three purposively selected health facilities located in Wakiso, Jinja, and Kyenjojo districts of Uganda. The facilities included Wakiso Health Centre IV in Wakiso Town Council (Central Uganda), Walukuba Health Centre IV in Jinja City (Eastern Uganda), and Kyenjojo Hospital in Kyenjojo Town Council (Western Uganda). These facilities were selected by Population Services International (PSI) Uganda as sentinel sites for implementation of the Delivering Innovation in Self-Care (DISC) project because they represented areas targeted for DMPA-SC demand-generation activities and had established family planning service delivery systems.

The three districts differ geographically and socio-demographically, thereby providing representation of urban, peri-urban, and rural populations. Wakiso Town Council is characterized by a high concentration of public and private health facilities serving a rapidly growing peri-urban population. Walukuba Health Centre IV serves communities within Jinja City and surrounding urban settlements, while Kyenjojo Hospital serves predominantly rural populations in Western Uganda. Collectively, these facilities provided an appropriate setting for evaluating uptake of DMPA-SC self-injection among women accessing routine family planning services.

The source population comprised women of reproductive age (18–49 years) attending selected health facilities to receive family planning services during the original PSI Uganda study. Women were recruited immediately after receiving contraceptive services through client exit interviews conducted at the participating health facilities.

Eligible participants were women who: self-identified as female; were aged between 18 and 49 years; attended one of the selected health facilities seeking family planning services, including counselling or contraceptive provision; spoke English, Luganda, Lusoga, Rutooro; and voluntarily provided informed consent to participate.

### **3.3 Study sample**

The present secondary analysis was restricted to women who had received DMPA-SC self-injection training and for whom complete information was available on the study outcome and explanatory variables.

Although the original DISC project recruited women seeking modern contraceptive services through client exit interviews, the present study included only records relevant to the study

objectives. Records with missing information on the outcome variable or key explanatory variables were excluded from the analysis.

The final analytical dataset consisted of 243 women, all of whom met the eligibility criteria for the present analysis.

Because this study utilized secondary data, information on the total number of women initially recruited into the original study and the number lost to follow-up was not available to the researcher. Consequently, the extent of loss to follow-up could not be assessed in the present study.

### **3.4 Sampling procedure**

The original DISC study employed a convenience sampling approach. Following receipt of family planning services, trained research assistants approached all eligible women exiting the selected clinics and screened them for participation using a standardized screening tool. Women meeting the eligibility criteria were invited to participate in the client exit interview after providing written informed consent.

Interviews were conducted in a private location within the health facility to ensure confidentiality. Information collected included socio-demographic characteristics, reproductive history, contraceptive experience, awareness of DMPA-SC, confidence in self-injection, knowledge of the method, awareness of side effects, and uptake of DMPA-SC self-injection. Data collection was conducted over approximately four to six weeks, depending on client volume at each facility.

### **3.5 Study variables**

#### **3.5.1 Outcome variable**

The dependent variable was uptake of DMPA-SC self-injection, measured as a binary outcome.

$$Y_i = \begin{cases} 1, & \text{if woman } i \text{ reported self-injecting DMPA-SC} \\ 0, & \text{Did not self-inject} \end{cases}$$

The variable represented actual adoption of DMPA-SC self-injection following training and served as the primary outcome for both descriptive and inferential analyses.

### **3.5.2 Independent variables**

The independent variables were selected based on Andersen's Behavioral Model of Health Services Use and the study objectives. They comprised predisposing and enabling factors, as well as psychosocial factors related to readiness for DMPA-SC self-injection.

Predisposing factors included age, education level, marital status, income level, and parity. These characteristics represent individual attributes that may influence women's propensity to adopt DMPA-SC self-injection.

Enabling factors included residence, distance to the nearest health facility, and training and provider support. These variables represent the contextual and health-system conditions that may facilitate or constrain access to and adoption of self-injection.

Individual-related factors included knowledge of DMPA-SC self-injection, confidence in performing self-injection, and awareness of potential side effects. These variables were initially assessed individually in the bivariate analysis. Variables demonstrating statistically significant associations with DMPA-SC self-injection uptake in Fisher's Exact Tests were subsequently considered for inclusion in the Firth penalized logistic regression model, in accordance with the study's analytical strategy.

The selection and classification of independent variables were guided by the study objectives, the conceptual framework, and their relevance to DMPA-SC self-injection uptake.



Table 3.1: Variable measurements in this study

| Variables                                                 | Description                                                                        | Coding                                                                                                                                | Data type |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------|
| DMPA SC Self-inject (Y)                                   | Did you self-inject, meaning you administered DMPA-SC outside of a facility?       | 0. No<br>1. Yes                                                                                                                       | Binary    |
| Age (X <sub>1</sub> )                                     | Age of respondents in complete years                                               |                                                                                                                                       | integer   |
| Education level (X <sub>2</sub> )                         | Highest level of school attended by the respondent                                 | 1. No Formal Education<br>2. Primary<br>3. Secondary<br>4. Tertiary                                                                   | Ordinal   |
| Marital Status(X <sub>3</sub> )                           | Are you currently married or living together with a man as if married?             | 1. Married<br>2. Unmarried                                                                                                            | Binary    |
| Income status (X <sub>4</sub> )                           |                                                                                    | 1. High (living on > UGX 38,000/day)<br>2. Middle (living on > UGX 3,800 and < UGX 38,000/day)<br>3. Low (living on < UGX 3,800/day). | Ordinal   |
| Number of times given birth (X <sub>5</sub> )             | How many times have you given birth?                                               |                                                                                                                                       | Integer   |
| Place of Residence (X <sub>6</sub> )                      |                                                                                    | 1. Urban<br>2. Rural                                                                                                                  | Binary    |
| Distance to the health facility (X <sub>7</sub> )         |                                                                                    | 1. 0–5 km<br>2. 6–10 km<br>3. >10 km                                                                                                  | Nominal   |
| Training and support for self-injection (X <sub>8</sub> ) | Did the provider offer to teach you how to self-inject during your previous visit? | 0. No<br>1. Yes                                                                                                                       | Binary    |
| Confidence with DMPA-SC SI (X <sub>9</sub> )              | How Confident are you with DMPA-SC SI?                                             | 0. Not confident<br>1. Confident                                                                                                      | Binary    |
| Knowledge of DMPA-SC SI (X <sub>10</sub> )                | How knowledgeable are you about DMPA-SC SI?                                        | 1. Low<br>2. Medium<br>3. High                                                                                                        | Nominal   |

|                                              |                                                               |                 |        |
|----------------------------------------------|---------------------------------------------------------------|-----------------|--------|
|                                              |                                                               |                 |        |
| Awareness of Side Effects (X <sub>11</sub> ) | Are you aware of the side effects associated with DMPA-SC SI? | 1. No<br>2. Yes | Binary |

### 3.6 Statistical analysis

Statistical analyses were conducted using R Statistical Software (Version 4.5.x; R Foundation for Statistical Computing, Vienna, Austria). Data management and cleaning were performed using the tidyverse package, Firth penalized logistic regression was conducted using the logistf package, and bootstrap validation was performed using the boot package. Statistical analysis was conducted in four stages: descriptive analysis, bivariate analysis, multivariable analysis, and model validation.

#### 3.6.1 Descriptive analysis

Descriptive statistics were generated to summarize participant characteristics. Categorical variables were summarized using frequencies and percentages. Continuous variables were summarized using means and standard deviations or medians and interquartile ranges where appropriate.

#### 3.6.2 Bivariate analysis

Associations between DMPA-SC self-injection uptake and each explanatory variable were assessed using Fisher's Exact Test. Fisher's Exact Test was selected because only seven women did not adopt self-injection, resulting in sparse contingency tables that violated the assumptions of Pearson's Chi-square test. Variables that were statistically significant at the bivariate level ( $p < 0.05$ ) were considered for inclusion in the multivariable model.

#### 3.6.3 Firth Penalized Logistic Regression

Variables that were statistically significant in the bivariate analysis were entered into a Firth penalized logistic regression model to identify independent predictors of DMPA-SC self-injection uptake.

Firth penalized logistic regression was selected because the outcome variable exhibited severe class imbalance, with only seven women classified as non-users of DMPA-SC self-injection. Under such conditions, conventional maximum likelihood logistic regression may produce biased parameter estimates or fail because of complete or quasi-complete separation.

Firth's penalized likelihood approach reduces small-sample bias and provides more reliable parameter estimates under sparse-data conditions.

The model is expressed as

$$\log \left( \frac{P(Y_i = 1)}{1 - P(Y_i = 1)} \right) = \beta_0 + \sum_{j=1}^k \beta_j X_{ij}$$

where:

- $Y_i$  represents DMPA-SC self-injection uptake;
- $X_{ij}$  represents the explanatory variables; and
- $\beta_j$  represents the regression coefficients.

Adjusted odds ratios (AORs), 95% profile penalized likelihood confidence intervals, and p-values were reported. Statistical significance was assessed at the 5% level.

### 3.6.4 Bootstrap Validation of the Final Model

To evaluate the robustness of the final Firth logistic regression model, a non-parametric bootstrap validation procedure was conducted. Bootstrapping is a resampling technique that repeatedly draws samples with replacement from the original dataset to approximate the sampling distribution of model estimates. This approach is particularly useful when sample sizes are relatively small because it does not rely on large-sample assumptions.

A total of 5,000 bootstrap replications were generated. For each bootstrap sample, the final Firth logistic regression model was re-estimated using the same predictor variables included in the primary analysis.

The following statistics were computed for each predictor: bootstrap mean coefficient; bootstrap mean odds ratio; bootstrap bias; bootstrap standard error; bootstrap 95% confidence interval.

Bootstrap estimates were compared with the original regression estimates to assess model robustness. Predictors whose bootstrap estimates remained close to the original estimates with minimal bias and comparable confidence intervals were considered stable.

### **3.7 Model assessment and validation**

Several diagnostic procedures were undertaken to evaluate the adequacy and robustness of the final model.

#### **3.7.1 Assessment of Sparse Data**

Cross-tabulations of predictor variables against DMPA-SC self-injection uptake were examined to identify sparse cells and potential separation. The observed rarity of the outcome justified the use of Firth penalized logistic regression instead of conventional logistic regression.

#### **3.7.2 Overall Model Performance**

The overall significance of the fitted model was evaluated using the penalized likelihood ratio test.

#### **3.7.3 Bootstrap Model Validation**

The stability of the regression estimates was assessed through non-parametric bootstrap validation using 5,000 resamples. Bootstrap estimates were compared with the original regression estimates to evaluate the robustness of the model.

#### **3.7.4 Data Screening**

Before analysis, the dataset was examined for missing values, data entry inconsistencies, and sparse response categories. Continuous variables were assessed graphically using histograms and boxplots to identify potential outliers, while categorical variables were reviewed for sparse categories that could affect model estimation.

### **3.8 Ethical Considerations**

The study received ethical approval from Population Services International (PSI) Uganda and the Uganda National Council for Science and Technology (UNCST). Only anonymized secondary data were analysed. No participant identifiers were available to the researcher, thereby minimizing risks to confidentiality and privacy.

### **3.9 Study Limitations**

The study had several methodological limitations.

First, the cross-sectional nature of the secondary dataset limited causal inference. Consequently, observed relationships should be interpreted as associations rather than cause-and-effect relationships.

Second, the study relied on secondary data, restricting the researcher to variables collected in the original survey. Important psychosocial or behavioural variables not included in the original questionnaire could not be incorporated into the analysis.

Third, the relatively small analytical sample may have reduced statistical power for detecting weaker associations. To address this limitation, Firth penalized logistic regression and non-parametric bootstrap validation were employed to improve the robustness and stability of the estimated effects.

Fourth, the study outcome was highly imbalanced, with only seven participants not adopting DMPA-SC self-injection. Although Firth penalized logistic regression and bootstrap validation were employed to minimise small-sample bias and improve estimate stability, some parameter estimates remained imprecise, as reflected by relatively wide confidence intervals. Consequently, the magnitude of the observed associations should be interpreted with caution.

Finally, because secondary data were used, information on the total number of women initially recruited and those subsequently lost to follow-up was not available. Consequently, it was not possible to assess the extent of attrition or determine whether women lost to follow-up differed systematically from those included in the final analytical dataset. This may have introduced selection bias and should be considered when interpreting the findings.

## **CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS**

### **4.0 Introduction**

This chapter presents the findings of the study examining factors associated with DMPA-SC self-injection (SI) uptake among women of reproductive age in Uganda. The analysis was conducted using secondary data from a DMPA-SC self-injection programme implemented by Population Services International Uganda (PSI Uganda). Findings are presented in four sections: descriptive characteristics of study participants, bivariate analysis using Fisher's Exact Test, multivariable analysis using Firth penalized logistic regression, and bootstrap validation of the final model.

### **4.1 Sample Demographics**

A total of 243 women who received DMPA-SC self-injection training were included in the analysis. Overall, participants were predominantly older women, multiparous, married, and residing in rural areas.

The majority of participants were aged 35 years and above (57.6%), followed by those aged 25–34 years (32.5%), while women aged 18–24 years constituted the smallest proportion (9.9%). Most participants had four or more children (84.8%), whereas 15.2% had fewer than four children.

Regarding marital status, the majority of respondents were married (86.0%), while 14.0% were unmarried. Primary education was the most common education category (41.6%), followed by tertiary education (25.9%), no formal education (23.0%), and secondary education (9.5%).

Nearly half of the participants reported low monthly income (45.3%), while 38.7% were classified as having middle income and 16.0% as high income. Most participants lived in rural areas (72.4%), compared with 27.6% residing in urban areas.

In relation to geographic access, 37.5% of participants lived more than 10 km from the nearest health facility, 32.5% lived within 0–5 km, and 30.0% lived 6–10 km away.

Most participants reported awareness of DMPA-SC side effects (96.3%). Confidence in self-injection was also high, with 88.9% reporting confidence compared with 11.1% who were not confident. Knowledge of DMPA-SC self-injection was generally high, with 77.8% demonstrating high knowledge, 15.2% moderate knowledge, and 7.0% low knowledge.

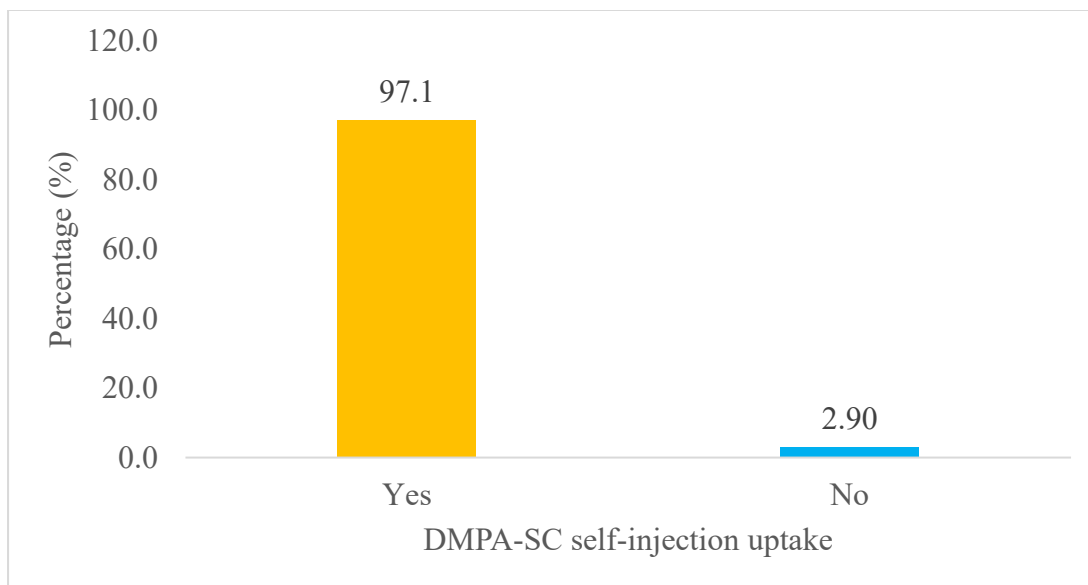
**Table 4.1: Characteristics of the Respondents**

| Characteristics             | n   | %     |
|-----------------------------|-----|-------|
| Age                         |     |       |
| 18-24                       | 24  | 9.9   |
| 25-34                       | 79  | 32.5  |
| 35+                         | 140 | 57.6  |
| Parity                      |     |       |
| 0-3                         | 37  | 15.2  |
| 4+                          | 206 | 84.8  |
| Marital status              |     |       |
| Married                     | 209 | 86.0  |
| Unmarried                   | 34  | 14.0  |
| Education level             |     |       |
| No Formal Education         | 56  | 23.0  |
| Primary                     | 101 | 41.6  |
| Secondary                   | 23  | 9.5   |
| Tertiary                    | 63  | 25.9  |
| Monthly Income              |     |       |
| Low (<3,800 UGX)            | 110 | 45.3  |
| Middle (3,800–38,000 UGX)   | 94  | 38.7  |
| High (>38,000 UGX)          | 39  | 16.0  |
| Residence                   |     |       |
| Rural                       | 176 | 72.4  |
| Urban                       | 67  | 27.6  |
| Distance to health facility |     |       |
| 0-5 km                      | 79  | 32.5  |
| 6-10 km                     | 73  | 30.0  |
| >10 km                      | 91  | 37.5  |
| Awareness of side effects   |     |       |
| No                          | 9   | 3.7   |
| Yes                         | 234 | 96.3  |
| Confidence level            |     |       |
| Confident                   | 216 | 88.89 |
| Not Confident               | 27  | 11.11 |
| Knowledge level             |     |       |
| High                        | 189 | 77.8  |
| Medium                      | 37  | 15.2  |
| Low                         | 17  | 7.0   |

## **4.2 Uptake of DMPA-SC self-injection**

The bar chart illustrates the uptake of DMPA-SC self-injection (SI) among the study participants. Out of the 243 women surveyed, 97.1% (n = 236) reported that they had self-injected DMPA-SC, while only 2.9% (n = 7) indicated that they had not.

**Figure 4.1: Percentage of DMPA-SC self-injection**

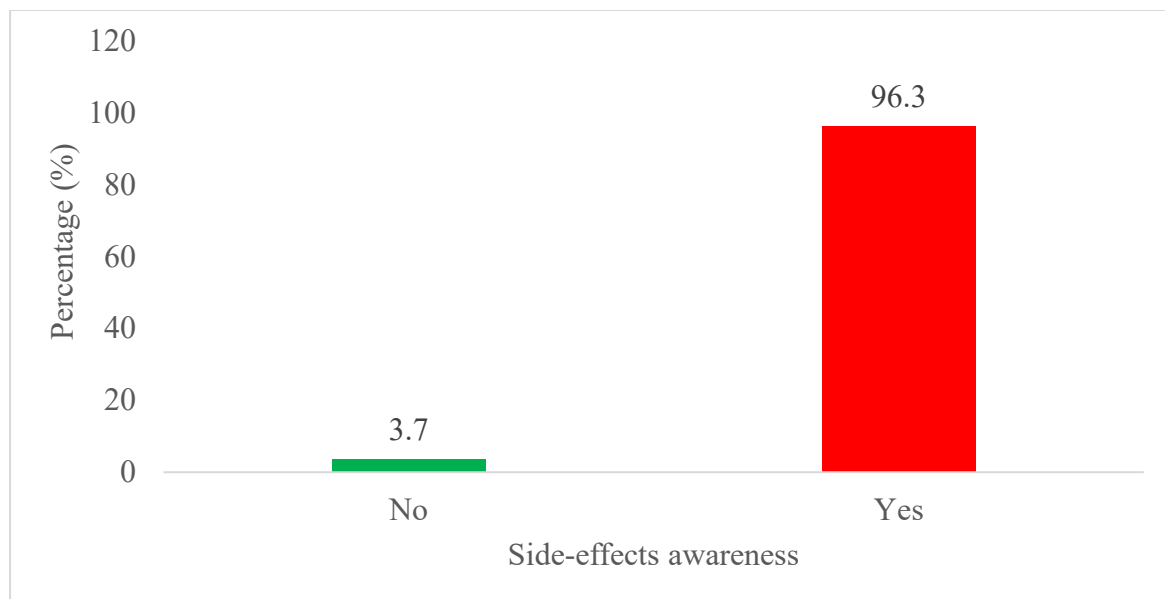


#### **4. 3 DMPA-SC side effect awareness**

Figure 2 presents the distribution of awareness of side effects among participants using DMPA-SC self-injection. The majority of respondents (96.3%,  $n = 234$ ) reported being aware of side effects after use. A small proportion (2.9%,  $n = 7$ ) were not aware of the side effects associated with DMPA-SC SI.



**Figure 4.2: Percentage of women who were aware of DMPA-SC side effects**



#### **4.4 Bivariate Analysis of sociodemographic, socioeconomic, access-related and psychosocial factors associated with uptake of DMPA-SC**

This section discusses the key findings from the bivariate analysis conducted using Fisher's Exact Test. Given the small number of non-users ( $n = 7$ ) and violations of Chi-square assumptions due to sparse categorical data, Fisher's test was deemed the most appropriate.

Table 4.2 presents the bivariate associations between selected sociodemographic, socioeconomic, access-related, and psychosocial characteristics and DMPA-SC self-injection uptake among the 243 women included in the study. Fisher's Exact Test was used to assess associations between each explanatory variable and self-injection uptake because of the highly imbalanced outcome distribution, with only seven women not reporting uptake.

Overall, DMPA-SC self-injection uptake was high across most participant subgroups. Uptake did not differ significantly by marital status ( $p = 0.254$ ), age group ( $p = 1.000$ ), parity ( $p = 0.642$ ), education level ( $p = 0.112$ ), residence ( $p = 0.398$ ), income level ( $p = 0.604$ ), or distance to the nearest health facility ( $p = 0.081$ ).

In contrast, statistically significant associations were observed between DMPA-SC self-injection uptake and knowledge level ( $p < 0.001$ ), awareness of side effects ( $p < 0.001$ ), and confidence in self-injection ( $p < 0.001$ ). Uptake increased with knowledge level, from 76.5% among women with low knowledge to 99.5% among those with high knowledge. Similarly, uptake was higher among women who were aware of potential side effects (100.0%)

compared with those who were not aware (22.2%). Women who were confident in performing self-injection also had higher uptake (100.0%) than those who were not confident (74.1%).

Training and support were also statistically associated with uptake ( $p < 0.001$ ); however, this finding should be interpreted cautiously because 236 of the 243 participants had received training and support, leaving no meaningful comparison group among those who had not. Therefore, the association does not provide sufficient evidence to estimate the independent effect of training and support on self-injection uptake.

**Table 4.2: Bivariate associations between sociodemographic, socioeconomic, access-related, and psychosocial factors and DMPA-SC self-injection uptake among women in Uganda**

| Variable                                       | Category              | Total (N)  | Uptake (n) | Percentage Uptake (%) | Fisher's Exact p-value |
|------------------------------------------------|-----------------------|------------|------------|-----------------------|------------------------|
| Marital status                                 | Married               | 232        | 226        | 97.41                 | 0.254                  |
|                                                | Unmarried             | 11         | 10         | 90.91                 |                        |
| Age group                                      | 18 – 24               | 24         | 24         | 100.00                | 1.000                  |
|                                                | 25 – 34               | 79         | 77         | 97.47                 |                        |
|                                                | 35+                   | 140        | 135        | 96.43                 |                        |
| Parity                                         | None                  | 2          | 2          |                       | 0.642                  |
|                                                | 1 – 3                 | 191        | 186        | 97.38                 |                        |
|                                                | 4 – 6                 | 43         | 41         | 95.35                 |                        |
|                                                | 7+                    | 7          | 7          | 100.00                |                        |
| Education                                      | No                    | 64         | 60         | 93.75                 | 0.112                  |
|                                                | Formal/Primary        |            |            |                       |                        |
|                                                | Secondary (O/A level) | 116        | 113        | 97.41                 |                        |
|                                                | Tertiary +            | 63         | 63         | 100.00                |                        |
| Residence                                      | Urban                 | 67         | 64         | 95.52                 | 0.398                  |
|                                                | Rural                 | 176        | 172        | 97.73                 |                        |
| Income level                                   | Low                   | 84         | 81         | 96.43                 | 0.604                  |
|                                                | Medium                | 102        | 99         | 97.06                 |                        |
|                                                | High                  | 57         | 56         | 98.25                 |                        |
| Distance to health facility                    | 0 – 5 km              | 72         | 69         | 95.83                 | 0.081                  |
|                                                | 6 – 10 km             | 86         | 82         | 95.35                 |                        |
|                                                | >10 km                | 85         | 85         | 100.00                |                        |
| <b>Training and Support for self-injection</b> | <b>0</b>              | <b>7</b>   | <b>0</b>   |                       | <b>&lt;0.001</b>       |
|                                                | <b>1</b>              | <b>236</b> | <b>236</b> | <b>100.00</b>         |                        |
| <b>Knowledge level</b>                         | <b>Low</b>            | <b>17</b>  | <b>13</b>  | <b>76.47</b>          | <b>&lt;0.001</b>       |
|                                                | <b>Medium</b>         | <b>37</b>  | <b>35</b>  | <b>94.60</b>          |                        |
|                                                | <b>High</b>           | <b>189</b> | <b>188</b> | <b>99.47</b>          |                        |
| <b>Side effects awareness</b>                  | <b>Yes</b>            | <b>234</b> | <b>234</b> | <b>100.00</b>         | <b>&lt;0.001</b>       |
|                                                | <b>No</b>             | <b>9</b>   | <b>2</b>   | <b>22.22</b>          |                        |
| <b>Confidence level</b>                        | <b>Confident</b>      | <b>216</b> | <b>216</b> | <b>100.00</b>         | <b>&lt;0.001</b>       |
|                                                | <b>Not confident</b>  | <b>27</b>  | <b>20</b>  | <b>74.07</b>          |                        |

## 4.5 Multivariate Analysis

### 4.5.1 Firth Logistic Regression Analysis

The Firth penalized likelihood method (Firth, 1993) was implemented via the `logistf` package in R (Heinze et al., 2023) to address issues about the presence of separation and rare events bias (King & Zeng, 2001).

Table 4.3: Firth penalized logistic regression model

| Predictor                           | aOR           | 95% CI             | p-value      |
|-------------------------------------|---------------|--------------------|--------------|
| Knowledge (Medium)                  | 3.60          | 0.00–37,250        | 0.757        |
| Knowledge (High)                    | 15.44         | 0.01–5,249         | 0.543        |
| <b>Side effects awareness (Yes)</b> | <b>104.30</b> | <b>5.32–21,271</b> | <b>0.002</b> |
| Confidence                          | 13.63         | 0.45–1,621         | 0.123        |
| Training                            | 0.13          | <0.001–157.90      | 0.672        |

*Note:* Likelihood ratio test  $\chi^2 = 56.97$ ,  $df = 5$ ,  $p < 0.001$ , Wald test  $\chi^2 = 33.76$ ,  $df = 5$ ,  $p < 0.001$ .

Table 4.3 presents the results of the adjusted Firth penalized logistic regression model examining factors associated with DMPA-SC self-injection uptake. The overall model was statistically significant (likelihood ratio test  $\chi^2 = 56.97$ ,  $df = 5$ ,  $p < 0.001$ ), indicating that the included predictors jointly improved the prediction of uptake.

Awareness of side effects was the only predictor significantly associated with DMPA-SC uptake. Participants who reported awareness of side effects had substantially higher odds of uptake compared with those who were not aware (aOR = 104.30, 95% CI: 5.32–21,271.00,  $p = 0.002$ ). Although higher knowledge levels and confidence showed positive associations with uptake, these relationships did not reach statistical significance after adjusting for other variables in the model. Training showed a negative but non-significant association with uptake (aOR = 0.13,  $p = 0.672$ ).

**Table 4.4: Bootstrap validation of the final Firth penalized logistic regression model (5,000 bootstrap resamples)**

| <b>Predictor</b>                          | <b>Original OR</b> | <b>Bootstrap Mean OR</b> | <b>Bootstrap Bias</b> | <b>Bootstrap SE</b> | <b>Bootstrap 95% CI</b> |
|-------------------------------------------|--------------------|--------------------------|-----------------------|---------------------|-------------------------|
| Knowledge Medium vs Low                   | 3.60               | 2.86                     | -0.74                 | 0.70                | (0.47, 10.82)           |
| Knowledge High vs Low                     | 15.44              | 13.86                    | -1.58                 | 0.67                | (1.93, 45.65)           |
| <b>Side effects Awareness (Yes vs No)</b> | <b>104.30</b>      | <b>97.12</b>             | <b>-7.18</b>          | <b>0.51</b>         | <b>(34.74, 246.08)</b>  |
| Confidence (Confident vs Not Confident)   | 13.63              | 12.55                    | -1.08                 | 0.47                | (5.78, 34.60)           |
| Training (Yes vs No)                      | 0.13               | 0.17                     | 0.04                  | 1.05                | (0.02, 1.07)            |

**Note:** OR = Odds Ratio; SE = Standard Error. Bootstrap validation was based on 5,000 resamples, of which 4,324 converged successfully and were used to estimate the bootstrap statistics.

Table 4.4 presents the bootstrap validation results for the final Firth-penalized logistic regression model, based on 5,000 bootstrap resamples. Overall, the bootstrap mean odds ratios were similar to the original model estimates, indicating that the parameter estimates were generally stable across repeated resampling. Awareness of side effects showed the most robust association with DMPA-SC self-injection uptake, with an original odds ratio of 104.30 and a bootstrap mean odds ratio of 97.12. The bootstrap bias for this predictor was small (-7.18), and the bootstrap 95% confidence interval (34.74–246.08) remained well above one, supporting the stability of the observed positive association. Although knowledge and confidence also showed positive bootstrap mean odds ratios, their corresponding Firth regression p-values were not statistically significant. Training remained negatively associated with uptake, and its bootstrap confidence interval included one, indicating no statistically significant independent association. Overall, the bootstrap analysis supports the robustness of the primary Firth regression findings despite the modest sample size and sparse data.

#### **4.5.2 Discussion of findings and implications**

The final adjusted Firth penalized logistic regression model identified awareness of side effects as the only statistically significant predictor of DMPA-SC self-injection uptake among trained women. Women who reported awareness of potential side effects had significantly higher odds of DMPA-SC self-injection uptake compared with those who did not report awareness (adjusted OR = 104.30, 95% CI: 5.32–2137.00,  $p = 0.002$ ). Given the relatively small sample size and sparse distribution of responses across some categories, the magnitude of the odds ratio should be interpreted cautiously; however, the consistent positive association observed in the bootstrap sensitivity analysis supports the robustness of this finding.

The observed relationship between side-effect awareness and DMPA-SC self-injection uptake is consistent with previous evidence showing that addressing concerns about potential adverse effects is central to contraceptive decision-making and continuation. Concerns about side effects have frequently been reported as a major barrier influencing acceptance and continuation of injectable contraceptive methods, particularly in low- and middle-income settings (Cover et al., 2017; Burke et al., 2018). Women who understand potential side effects and how they can be managed may be better equipped to make informed decisions and maintain confidence in their chosen contraceptive method.

Similarly, studies evaluating DMPA-SC self-injection programs have emphasized the importance of counselling and supportive training in improving women's confidence and acceptance of the method. For example, Cover et al. (2017) demonstrated that structured training and provider support enabled women to successfully adopt self-injection, while Burke et al. (2018) highlighted the role of addressing misconceptions and fears surrounding injectable contraception in improving uptake. The current study extends this evidence by demonstrating that awareness of side effects remains an important factor associated with uptake even among women who had already received training on DMPA-SC self-injection.

The association observed in this study may reflect the role of informed decision-making in contraceptive adoption. Awareness of side effects does not necessarily discourage contraceptive use; rather, when accurate information is provided, it may reduce uncertainty and increase confidence in managing expected reactions. This finding aligns with behavioural theories such as the Health Belief Model, which proposes that perceived barriers and perceived benefits influence health-related behaviours (Rosenstock, 1974). Women who

understand possible side effects and their management may perceive fewer barriers to self-injection and therefore be more willing to adopt the method.

The findings have important implications for DMPA-SC self-injection programming in Uganda. Training interventions should continue to prioritize comprehensive counselling on possible side effects, including what is expected, what is manageable, and when to seek additional care. Programmes should avoid focusing only on the technical skills of injection administration and incorporate communication approaches that address fears, misconceptions, and women's concerns about adverse effects.

Although other assessed factors, including knowledge level, confidence, training status, and sociodemographic characteristics, were not statistically significant predictors in the adjusted model, their inclusion was important for controlling potential confounding and understanding the broader context of DMPA-SC uptake. The absence of significant associations for these factors suggests that among women who had already received DMPA-SC training, individual demographic characteristics may have had less influence on uptake compared with perceptions and understanding of the method itself.

Overall, this study highlights the importance of informed and supportive counselling in promoting DMPA-SC self-injection uptake. Strengthening communication around side effects and their management may enhance acceptance of self-injection and contribute to the successful scale-up of self-administered contraceptive methods in Uganda and similar settings.

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

### **5.0 Introduction**

This chapter presents a summary of the study findings, draws conclusions based on the study objectives, and provides recommendations for policy, practice, and future research. The recommendations are informed by the findings of the adjusted Firth penalized logistic regression analysis and are intended to guide the implementation and scale-up of DMPA-SC self-injection programmes in Uganda.

### **5.1 Summary of findings**

This study examined factors associated with the uptake of depot medroxyprogesterone acetate subcutaneous (DMPA-SC) self-injection among women of reproductive age in Uganda using secondary programme data from 243 women who had received DMPA-SC self-injection training.

Overall, uptake of DMPA-SC self-injection was very high, with 97.1% of trained women reporting adoption of the method. At the bivariate level, awareness of side effects, knowledge of DMPA-SC, confidence in self-injection and receipt of training/support were significantly associated with uptake.

Following adjustment using Firth penalized logistic regression, awareness of side effects remained the only independent predictor of DMPA-SC self-injection uptake. Women who reported awareness of potential side effects had significantly higher odds of adopting DMPA-SC self-injection than women who were not aware. The bootstrap sensitivity analysis demonstrated that this association remained stable across repeated resampling, supporting the robustness of the finding despite the relatively small sample size.

Knowledge, confidence and training/support were positively associated with uptake but did not remain statistically significant after adjustment for other variables.

### **5.2 Conclusions and Implications**

This study concludes that awareness of side effects is an important determinant of DMPA-SC self-injection uptake among women who have received self-injection training in Uganda. Rather than discouraging uptake, awareness of potential side effects appears to facilitate



informed decision-making and increase women's willingness to adopt self-injection when accompanied by appropriate counselling and support.

The findings further suggest that among trained women, sociodemographic characteristics alone may not adequately explain DMPA-SC self-injection uptake. Instead, programme-related factors that improve women's understanding of the method may play a more important role in influencing adoption.

Overall, the study demonstrates that strengthening counselling on side effects and ensuring women receive accurate and comprehensive information before initiating self-injection are likely to improve uptake and support the successful scale-up of self-care family planning interventions in Uganda.

### **5.3 Policy and Programmatic Recommendations.**

#### **5.3.1 Strengthen counselling on side effects during DMPA-SC self-injection training.**

The Ministry of Health should strengthen standardized counselling on potential side effects as part of all DMPA-SC self-injection training packages. Counselling should clearly explain expected side effects, differentiate normal reactions from complications requiring medical attention, and provide practical guidance on managing common concerns. This would enable women to make informed contraceptive choices and reduce misconceptions that may discourage uptake.

#### **5.3.2 Standardize provider training materials.**

The Ministry of Health, district health offices, and implementing partners should review and standardize national DMPA-SC self-injection training curricula to ensure consistent messaging on side effects across all service delivery points. Standardized counselling tools, job aids, and client education materials should be routinely used by health workers and community health workers delivering DMPA-SC services.

### **5.3.3 Strengthen community-based family planning education.]**

Community health workers and Village Health Teams (VHTs) should be supported to conduct community sensitization activities that provide accurate information on DMPA-SC self-injection and address myths and misconceptions regarding side effects. Community-based education can improve awareness before women attend health facilities, thereby increasing informed demand for self-injection services.

### **5.3.4 Integrate side-effect counselling into self-care policies.**

The Ministry of Health should ensure that comprehensive side-effect counselling is incorporated into national self-care and family planning guidelines. As Uganda continues to expand self-care interventions, communication strategies should receive equal emphasis alongside technical training to promote sustained uptake and continuation of DMPA-SC self-injection.

### **5.3.5 Strengthen routine programme monitoring.**

Family planning programmes should routinely monitor indicators related to counselling quality, women's understanding of side effects, and client satisfaction in addition to measuring uptake. Monitoring these indicators will help identify implementation gaps and improve the quality of DMPA-SC self-injection services.

## **5.4 Recommendations for Future Research.**

Future studies should use larger and more geographically representative samples to validate the findings of this study and improve the precision of estimated effects. Longitudinal studies are needed to assess whether awareness of side effects influences not only initial uptake but also continuation of DMPA-SC self-injection over time.

Qualitative studies exploring women's perceptions of side effects, counselling experiences, and decision-making processes would provide valuable insights into the mechanisms underlying uptake. Such studies could help explain why awareness of side effects appears to facilitate rather than discourage adoption of self-injection.

Further research should also evaluate the effectiveness of different counselling approaches, including facility-based counselling, community health worker education, peer support, and digital health interventions, in improving informed uptake of DMPA-SC self-injection.

Finally, implementation research examining the cost-effectiveness of integrating enhanced side-effect counselling into routine family planning services would provide evidence to inform national scale-up strategies.

### **5.5 Final Reflection**

This study contributes to the growing evidence on factors influencing uptake of DMPA-SC self-injection in Uganda. Although uptake among trained women was high, awareness of side effects emerged as the only independent predictor of uptake after adjustment for potential confounders. The findings underscore the importance of providing women with accurate, comprehensive, and supportive counselling that enables informed contraceptive decision-making.

As Uganda continues to expand self-care interventions within its family planning programme, strengthening communication on side effects should be considered an integral component of DMPA-SC self-injection services rather than an optional addition to technical training. By improving the quality of counselling and promoting informed choice, family planning programmes can support sustained uptake of self-injection and contribute to broader national goals of expanding access to safe, acceptable and client-centred reproductive health services.

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