FACTORS ASSOCIATED WITH THE PREVALENCE OF CONTRACEPTIVE USE AMONG WOMEN OF REPRODUCTIVE AGE IN RWANDA: A CROSS-SECTIONAL STUDY USING DEMOGRAPHIC AND HEALTH SURVEY RWANDA 2010

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MASTER THESIS

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ABSTRACT

Background: The Rwandan government has set family planning (FP) as one of the goals and strategies to improve the health of the population. However, unmet needs for modern contraceptive methods are still a problem, as is the variance of modern contraceptive use among the five regions of Rwanda.

Aim: This study aimed at assessing key factors that contribute to the variance of modern contraceptive use between five regions of Rwanda.

Methods: This study was a secondary analysis of the Rwanda Demographic health survey, 2010. A total of 492 clusters (urban/rural), composed by 12,792 households were selected in the survey; 13,790 women of reproductive age were systematically selected from selected households and interviewed about maternal and reproductive health issues. 6834 married women or living with their partners at the time of the survey were selected for this study.

Results: Socio-economic and demographic characteristics of women, access to family planning (FP) information and women’s empowerment were associated with the variance of modern contraceptive use between the regions. Women’s empowerment was positively associated with modern contraceptive use in all regions. Access to information was associated with modern contraceptive use in all regions except in the North region (AOR: 1.24, 95%CI: 0.8-1.92).

Conclusion: This study highlights that the variance of modern contraceptive use may due to the way in which FP factors are associated with modern contraceptive use vary between regions and how different FP factors occur among regions. Further researches are needed to investigate potential factors on supply side that influence such variance.
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ABBRÉVIATIONS
AOR: Adjusted Odd Ratio
COR: Crude Odd Ratio
FP: Family planning
HH: Household
ICPD: International Conference on Population and Development
IEC: Information, Education and communication
MOH: Ministry of Health
NISR: National Institute of Statistics of Rwanda
ONAPO: National office for population
OR: odds ratio
RDHS: Rwanda Demographic and Health Survey
WHO: World Health organization
1. INTRODUCTION AND BACKGROUND
1.1 BACKGROUND

Globally, about 225 million women are not using any method of contraception but at the same time do not want to get pregnant. According to WHO, such women who do not want to get pregnant but do not use any method of contraception to limit or delay their pregnancies have an unmet need for contraception (1). Nearly 80 million of unintended pregnancies occur every year as a consequence of unmet needs for contraception. Those unintended pregnancies cause millions of deaths and injuries to women due to pregnancy related complications or unsafe abortions (2). In addition, millions of new-borns die in their first month every year as a result of unintended pregnancies (3).

It has been revealed that most of unintended pregnancies are in the poorest countries in the world, where 75% of women with unmet needs for contraception are from low and middle income countries, mainly Africa (2). Unintended pregnancies are more likely present in less educated women, less wealthy, those who live in rural areas when compared to educated women, those from rich families, and those from urban areas (1). Even though the increase of modern contraceptive use has been notable during the past decade, the use of modern contraceptive methods has been identified to be low in Sub-Saharan Africa, where only two women in ten use contraceptive methods for preventing pregnancy or spacing their children (4). During the 1994 International Conference on Population and Development (ICPD), nations recognized the importance of family planning and decided to eliminate unmet needs for contraceptives, but until now that goal is yet to be achieved (2).

1.1.1 Family planning and contraceptive methods

Family planning: according to WHO, FP allows people to attain their desired number of children and determine the spacing of pregnancies. It is achieved through use of contraceptive methods and the treatment of infertility (5). Thanks to technology, over the last three decades, women and men are able to plan their childbearing, deciding if and when to have their children using modern contraceptive methods (6).
Contraceptive methods, also called birth controls, are methods used to prevent pregnancy by interfering with the normal process of ovulation, fertilization, and implantation. These methods can be categorized into modern and traditional methods. Modern contraceptive methods include female and male sterilization, intrauterine devices (IUDs), hormonal methods (oral pills, injectables, hormone-releasing implants, skin patches and vaginal rings), condoms and vaginal barrier methods (diaphragm, cervical cap and spermicidal foams, jellies, creams and sponges) (7). Traditional contraceptive methods include withdrawal (coitus interruptus), abstinence from sex and lactation amenorrhea (which consists of women breastfeeding their babies exclusively during a period of six months postpartum) (1). Traditional methods tend to be less effective compared to modern contraceptive methods which leads to unintended pregnancies or other health problems in women relying wholly on traditional methods for limiting or spacing their pregnancies (8).

1.1.2 Importance of family planning

FP has been marked as an important tool in improving the lives of women and infants; FP has been proven to have the capacity of reducing maternal mortality by 32% by allowing women to delay motherhood, space births, avoid unintended pregnancies and abortions, and limit the number of their children when they have reached their desired family size (5,6). It can also prevent infant mortality by about 10%, by allowing couples to space their pregnancies by at least two years apart through the use of contraceptive methods (9). The birth spacing gives more time for breastfeeding which improve the health of infants and also give time to women to recover physically and nutritionally after delivery (6). As HIV is one of the maternal and child mortality causes, contraceptive methods could have an important effect in preventing HIV positive women from having unintended pregnancies and help to reduce infant mortality that arises from mother-to-child transmission (10).

Not only do FP programs contribute to reducing maternal and infant mortality rates, but they have also been proven to contribute to reduce poverty and improved economic security for families, households, communities through larger incomes, greater accumulation of wealth, and higher levels of education; by allowing government and families to reduce the amount of money spent on maternal and infant mortality and morbidity (11). It also allows families to have a
number of children they are able to provide a quality life for in terms of health, nutrition, and education. Finally, FP programs give women time to participate in the labour market which will increase the household income (12).

1.1.3 Rational cause of the setting

Rwanda has the highest population density in sub-Saharan Africa with total population of more than 10 million (2012) on a land of 26,388 square kilometres (13). The relationship between excess population growth of a country and poverty has been revealed in many studies from different countries (11). Thus, the effect of this growing population on the country’s economy and living condition of the population has been recognized by the Rwandan government and therefore, FP program has been a priority to the ministry of health of Rwanda and one of the goals and strategies to improve health of the Rwandan population, reduce poverty, and develop the country in Rwandan 2020 vision plan (14). Dr Ntawukurirayo, a former minister of health in Rwanda, declared in the Rwandan parliament that "family planning is a key tool for developing the quality of our population, improving the health of mothers and children, and to address the poverty challenges that we face." Thus, FP program initiatives have been introduced and have made a dramatic increase in FP services use and as a result, total fertility in Rwanda has reduced from 6.1 in 2005 to 4.2 in 2015 and the prevalence of use of modern contraceptive methods has increased from 6% in 2000 to 48% in 2015 (12). Even though the prevalence of contraceptive methods use has increased in Rwanda unmet needs for modern contraceptive methods among women of reproductive age is still high.

1.1.4 Family planning in Rwanda

Even though the problem is not new, Rwanda is still facing the challenge of high population density. The Rwandan government had started taking FP into consideration as a key to reduce the rapid growth of its population in 1981. Thus, the National Office for population (ONAPO) was created and its main focus was to improve access and promotion of FP services (15). This effort was weakened by the genocide in 1994, which destroyed the health infrastructures, many trained health workers died, and the economy of the country dropped massively. After genocide the total fertility rate increased. The increase in birth was due to the lack of FP services availability in many health facilities and also to the fact that people wanted to replace their
family members who died; to bring new life to their families and to the country in general (16). This increase in fertility has been recognized after the Rwanda National census in 2000 (17).

After the findings from 2000 national census, the Rwandan health ministry heavily invested in FP as a mean to reduce high population density and to reduce maternal and child mortality. FP resources were expended all over the country in order to allow women who want to prevent or delay their pregnancies have access to appropriate services (18). After recognition of needs of broader access to health services at the village level, 30,000 CHWs including one male and one female (“binomes”) in every village, were trained by MOH in FP provision in 2010 trained in providing FP information and some methods of contraceptive methods (19).

During that time, the target was to increase modern contraceptive use prevalence rate from 4% to 15% by 2010. This target was meant to be met through actions like:

- Improving awareness of women and men about FP services and access through social communication and mobilization, involving administrative authorities and religious leaders in FP mobilization,
- Improving FP health providers’ skills, by training them
- Increase availability and sustainability of FP services in all health facilities and monitor all FP activities in health centres at all levels (20)

According to RDHS 2010, the contraceptive prevalence rate increased to 45% with 19% of unmet need among married women (14). The incredible increase of modern contraceptive methods use in Rwanda has been mostly attributed to the political will and commitment of Rwandan government to improve health of Rwandan population, especially through the ministry of health. This has facilitated mobilization of financial and technical resources, as well as health system strengthening focused on training health professionals, task shifting by training community health workers and performance-based incentives which have increased access and quality of health services (18).

The RDHS (2010) has revealed the variance of prevalence rate of contraceptive use between the provinces in Rwanda. Compared to other provinces in Rwanda, the Western province has the lowest modern contraceptive use prevalence according to 2010 DHS report. The prevalence is
35% in Western province compared to 52%, 48%, 46% for Northern, Southern, and Eastern provinces respectively and 48% for the capital city of Kigali (21). In addition, Muhoza (13), in his study also showed that from 2005 to 2010, the prevalence of modern contraceptive methods use has increased more in rural areas compared to urban areas. The purpose of this study is thus to assess the use of modern contraceptive methods among women who are married or living with their partners across regions and to evaluate factors that are associated to the variance of the use of modern contraceptive methods between regions in Rwanda.

1.2 Literature review
1.2.1 Factors Affecting Family Planning

It has been shown that FP adherence and more specifically, the use of modern contraceptive methods in any country, is influenced by both supply and demand sides (14). The demand of modern contraceptives can be influenced by several factors such as the knowledge of the woman about FP, cultural or religious perceptions about contraceptive use as well as the ability to access health services. Supply side also plays a big role when it comes to availability of types of contraceptive methods, provision of a trusting interaction between patient and health provider, knowledgeable explanation of types of modern contraceptive methods available (to enhance an informed choice). All these factors on the health system side may reinforce if a woman will get the appropriate contraceptive method (22).

Studies exploring determinants of modern contraceptive use, have revealed association between family planning use in developing countries and socio-economic and demographic characteristics of women:

*Education level*

Studies have shown that education level of women is one of FP predictors, where high level of education is positively associated with use of modern contraceptive (12,17,20). Educated women are more aware of methods of contraception and their benefits, which is to reduce the risk of unwanted pregnancies. Also educated women tend more to enter the labour market, thus, women in labour market tend to have only as much children that they can take care of while following their professional careers (23). One study in Ghana found that the odds of using contraceptive
methods were higher in women with high education compared to women with primary or no education (24).

**Rural/urban residence**

Studies have shown that rural-urban differences in contraceptive adaptation are the highest in Sub Saharan Africa. In some areas the rate is more than twice as high as among urban than among rural (25). This difference can be attributed to more exposure of urban women to information leading to access to health facilities in terms of good infrastructure and availability of FP services (8,17). One study in Ghana showed that distance to health facilities also influences the use of modern contraceptives where women living more than 2km away from the nearest health centre that provides modern contraceptives were less likely to use contraceptives. In developing countries rural women have difficulties of accessing health facilities compared to women in urban areas due to long distance between the nearest health facility and home (26).

**Household wealth**

Also contraceptive use has been associated with the wealth of households. In a study conducted in Newly Independent States, women from rich families were more likely to use modern contraceptive use compared to women from poor communities (27).

**Exposure to family planning messages.**

Studies from Kenya and Nigeria showed, that exposure of women to family-planning-messages have improved their attitude towards modern contraceptive methods, also improved their knowledge about where to find the contraceptives, the importance of FP on their health, their families’ their economy and their countries’ economy in general (28). Thus, women who got information about FP either from a FP workers visit or from a health professionals are more likely to use modern contraceptives, compared to those, who didn’t get any FP information (24). Access to FP information may alleviate many barriers to use of modern contraceptive methods like: lack of knowledge about risks of pregnancy, fear of side effects of contraceptives, husband and religion opposition and lack of knowledge of how to access FP services (6).

**Women’s empowerment**
Women’s empowerment is also one of the key factors that influence modern contraceptive use. Women’s empowerment involves the ability of women to make decisions in many life aspects like economic, socio-cultural, familial and interpersonal, and legal dimensions (29). Studies have shown a positive association between contraceptive use and the empowerment of women (30). In one study from Nigeria (31), suggested that women who have a say in household decision-making are more likely to be able to control their fertility compared to women who don’t have a say in their homes. In order to enforce women’s empowerment, the Rwandan government has focused on promoting education and employment of girls, which helps them to know what is happening outside in the society and allow them to have access to income and power, in decision making about their health and other life aspects and improve their living standards (23). It has been shown, that there is an association between the lack of understanding and lack of knowledge about modern contraceptive methods among men in some cultures and most of the time, men are the ones in charge of decision making in their houses. This attitude of men towards modern contraceptive methods and male-dominance at home, has been associated to low contraceptive use by many research (32).

Other studies have also shown different barriers to modern contraceptive use which are; lack of discussion between partners about use of contraception, fear of side effects, the believes that some women may have that they are not likely to get pregnant because of their age or relying on counting days of their menstruation, inconsistent use of modern contraceptive either because of women having problem with the first method used or financial barriers and availability of FP services at the nearest health facilities (1,13).

A conceptual framework was made based on previous literature reviews about factors associated to use of modern contraceptive methods as shown in Figure 1. In this conceptual framework access to FP information and services and women’s empowerment are directly related to modern contraceptive use, but those factors are also influenced by other women’s background characteristics like socio-economic characteristics and age of women and all of these factors and their associations and their effect to modern contraceptive use, may also depend on the region in which women are coming from.
**Socio-economic factors**
- Educational level
- Wealth index
- Place of residence

**Demographic factors**
- Age of women

**Access to family planning information**
- Heard FP from media
- Visited by a FP worker
- Visited a HF & told about FP
  - Women's empowerment
  - Decision making on FP
  - Decision making on women’s health
  - Decision making on HH purchase
  - Decision making on HH income
  - Decision making on family visits

**Use of modern contraceptive**

Figure 1: Conceptual framework.
1.3 Research question
1.3.1 Hypothesis
Regional variance of modern contraceptive use is influenced by women’s socioeconomic characteristics, age of women, access to FP information and women’s empowerment.

This study is intended to answer the following questions:

What are factors associated with modern contraceptive use among married women/women living with their partners in Rwanda?

What are the factors contributing to regional disparities in modern contraceptive use among married women and women living with their partners in Rwanda?

1.1.1 Aim
The main aim of this study is to investigate factors that are associated with variance in modern contraceptive use between regions in Rwanda. This was done by analysing the association of use of modern contraceptive methods across regions with explanatory variables.

1.1.2 Specific objectives
To identify (socio-economic, demographic, access to FP information and women’s empowerment) factors that influence the variance of modern contraceptive use between regions in Rwanda

To provide policy recommendations that can be used by government to avert this problem.

1.1.3 Study significance
Study results are of importance as they will contribute to the growing literature on family planning both in the regions and the country and they may also be a hint for Rwandan policy makers on what should be done to improve modern contraceptive use in Rwanda depending on factors that affect use of modern contraceptive methods and on what is needed in each region.
2. METHOD

2.1 Study design

This was a cross-sectional study using secondary data from Rwanda Demographic Health Surveys 2010, which is a national representative survey.

2.2 Country context

Rwanda is a landlocked country of 26,388 square kilometres, situated in the east-central Africa and usually called “Land of Thousand Hills” because of its mountainous land. Rwanda is boarded in the north by Uganda, South by Burundi, east by Tanzania and West by Democratic Republic of the Congo. It is divided into four geographic provinces Northern, Southern, Western and Eastern and the capital city of Kigali. Provinces are also subdivided into 30 districts, 416 sectors, 2,148 cells, and 14,837 villages (Imidugudu).

Rwanda is a low income country with Gross Domestic Product (GDP) per capita (current) of US$ 695.7 in 2014 according to world bank (33). According to Rwanda demographics profile, Rwandan population was estimated to be 12,337,138 people and total fertility rate of 4 children per woman in 2012. The majority of the Rwandan population lives in rural areas with only 19% of the population who are living in urban areas. It has a young population with 42.1% of Rwandan population are people under 15 years of age (34).

In 2000 Rwandan government created a development plan called “vision 2020” with an ambition to become a middle income country in 2020. In that plan, health was recognized as a pillar to development and number one target was to give appropriate health care and to reach every part of the country. In order to meet its target, Rwandan health system has been decentralized and good partnership between public and private health institutions and coordination between different actors have been stressed on (35). Due to insufficient professional health workers especially in the remote areas, the ministry of health trained community health workers who bring healthcare into people's homes and reach those who if not might not receive care (36). As one of results of vision 2020, maternal and child mortality reduced; RDHS 2010 results revealed that maternal mortality was 476/ 100,000 and infant mortality was 48.6/1000 from the national census 2012.
2.2.1 MAP OF RWANDA

![Map of Rwanda showing five provinces and bordering countries](image)

**Figure 2**: Five provinces and bordering countries of Rwanda. Sourced from Rwanda Demographic Health Survey, 2010 (21).

2.3 Study population

All women of reproductive age (15-49 years old) were eligible to participate in Rwanda Demographic and Health survey 2010 (21). From 13,671 women who completed interviews, we only subset the study sample to married women and women who live with their partners and we left with a sample of 6834 participants.
2.4 Sample design and implementation

The 2010 RDHS was a two stage-cluster sampling. RDHS was designed to produce representative estimates of demographic and health indicators for the whole country, urban and rural. Thus, in order to have a national representative sample, 492 clusters (Villages) were selected in the first stage of sampling from urban/rural from all provinces (North, South, West, and East) and the city of Kigali. A fixed number of 26 households were selected from each of the selected villages in the second stage of sampling. 12,792 households were systematically selected from a mapping and listing of all household existing in the selected villages and 12,540 households completed the Household Questionnaire (21). Participants, who lived or had spent the night preceding the survey in selected households and were of reproductive age, were eligible for the survey. A nationally representative sample of 13,671 women, age 15–49 from 12,540 surveyed households, and 6,329 men, age 15–59 from half of these households, were interviewed. Of all 13,790 women aged 15–49 years old in the selected households, 13,671 completed interviews giving 99.1% of response rate (21).

The DHS questionnaire is divided into three structural questionnaires; one for household, another for women and the last for men. The one for women, they collected information on background characteristics, reproductive history, childhood mortality, knowledge and use family planning methods, fertility preferences, antenatal, delivery and postnatal care, female empowerment and a host of other health issues relating to specific diseases and disease-prevention programs/interventions (21).

2.5 Data collection

The National Institute of Statistics of Rwanda (NISR) and the Ministry of Health (MoH) carried out the survey with technical assistance from ICF International. The NISR recruited and trained 105 field workers. The training started from August 16 to September 14, 2010, and it consisted of teaching field workers about interviewing techniques and fieldwork procedures, a detailed review items on the questionnaires followed by a test and role play in the class. Questionnaires were translated from French and English into Kinyarwanda which is the national language. Field work including data collection started from September 26, 2010 to March, 10, 2011 and NISR team and ICF international supervised the fieldwork through regular visits to review data.
collectors’ work and monitor quality data. Questionnaires and blood sample were regularly referred to NISR headquarters (21).

2.6 Data Processing
Data entry was done by a team of 15 data processing personnel who were trained about the process. Data entry started one month after field work was launched, on November 1, 2010. In order to minimize keying error and data editing, data entry involved of 100% double entry. CSPro, a program developed together by the United States Census Bureau, the ORC Macro MEASURE DHS+program, and Serpro S.A. was used in data entry. Data cleaning and finalization was completed on May 27, 2011 (21).

2.7 Measurements
2.7.1 Outcome variable
Outcome variable in this study was the current use of modern contraceptive methods among women of reproductive age (15-49 years old) in Rwanda. Contraceptive prevalence is a measure of current use of contraceptive methods by women of childbearing age (21). In our study we only focused on modern contraceptive methods.

This variable was obtained from women’s questionnaire in the contraception section, where women were asked if they are currently doing anything or using any methods to delay or prevent pregnancy. As for this study our outcome of interest is use of modern contraceptive methods, modern contraceptive methods were recoded as “yes” and any other methods were recoded “no”. In this study the use of traditional contraceptive methods was considered similar to not using any methods to prevent unintended pregnancies.

2.7.2 Explanatory variables
Explanatory variables for this study were selected depending on previous literature reviews on determinants of contraceptive methods use:
As previous studies on factors of FP use in Rwanda and DHS reports showed that, there is a difference in contraceptive methods use among regions (North, South, West and East) and Kigali city; We planned to assess if the current use of modern contraceptives among married women and women living with partners is associated with socioeconomic and demographic factors, access to FP information and services and to women’s empowerment.

2.7.2.1 Socioc-economic factors

1. MARITAL STATUS

In this study, current marital status of respondent was included in the analysis, where married women and women living with partners were our groups of interest. According to RDHS 2010, married women in Rwanda are those who are legally bounded together with their partners, while living with partner referred to couples cohabiting in informal unions. This variable had two categories: married women and women living with their partners (reference category).

2. WEALTH INDEX QUINTILES

The wealth index was developed on Principal Component analysis of data on population ownership of goods. Data for household goods were obtained through questions on ownership of durable goods (television, radio, car, mobile telephone, etc.) and questions about certain housing characteristics (access to electricity, source of drinking water, type of toilet facilities, type of flooring material, number of rooms used for sleeping, and type of cooking fuel). Thus, from that analysis, population was grouped into five wealth quintiles: poorest (reference category), poorer, middle, richer and richest.

3. EDUCATION LEVEL OF WOMEN

Women were asked their highest level of education during the survey. Depending on respondents’ answers, this variable ended up being sub-divided into three groups: no education (reference category), primary, secondary and high. In this study secondary and high groups were merged into one group “secondary or high”

4. PLACE OF RESIDENCE

This was the place of residence of women by the time of the survey. This variable has two categories: rural (reference category) and urban.
2.6.2.2. Demographic factors (Age)

In DHS, women were asked about the current age at the time of the survey, and from DHS data age were grouped in following groups: 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. In this study those were merged into three following groups: 15-24 years old identified as young women, 24-34 age group as the “mid aged women” and 35-49 group coded as “older women”.

2.6.2.3. Women’s empowerment

This variable in the current study focused mainly on with agency and control over decision-making and choices by women. In DHS questionnaires, information on different aspect of decision-making are collected and in this study women’s empowerment of a participant was defined by the sum score she got from these topics on decision making: decision-making on family planning use, decision on household income, decision making on household purchase, decision making of family visits and decision making on respondent’s health. The respondent could choose one of the following answers: mainly respondent, mainly husband, partner, joint decision or other. For every answer where the woman was involved in decision-making (mainly respondent or joint decision), she got the score of 1 and when she was not involved in the decision-making, she got the score of 0. Sum scores and a mean of sum scores (2.90) were calculated to put women in category of empowerment, women who got a sum score of 0 out of the five questions was described as “not empowered”, those who got a sum score 1:2 were described as “somehow empowered” and 3:5 sum score was in “fully empowered” category.

2.6.2.4. Exposure to family planning information

This variable in the analysis was created using questions in the DHS that strongly focused on activities of the national family planning programs especially the information, education and communication (IEC) component. Women were asked whether they have heard family planning on radio last few months, heard family planning on television last few months, and heard family planning in newspaper/magazine, and from this questions one variable was made, “FP information through media”. If the respondent had never heard or listened FP from those three sources of information, she identified as “not informed through media” if she got 1:3 score she was identified as “informed through media”. To make the final variable of “access to FP information”, we combined whether the respondent had heard FP information through media
with whether they had been visited by an FP worker in the last 12 month or if they had visited a health facility in the last 12 months and been told about FP. Subsequently, participants were categorized in “No” access to FP information if they got 0 as a sum score from the three questions or as “Yes” if they got 1, 2 or 3.

3. ANALYSIS
Data used in this study were downloaded from DHS measure website in SPSS version and were imported to R commander software version 3.2.2. Using DHS record manual and Map file, codes representing variables were identified. A subset of variables needed for this analysis was created where unneeded variables were cleaned from the dataset and remained with variables of interest. The dataset was only limited to married women and women living with their partners. Variables were recoded and sum scores of some variables were calculated and then after those variables were categorized according to their sum scores.

3.1 Descriptive analysis
Frequency distribution analysis was also conducted for describing the distribution of women by their background characteristics or explanatory variables. Pearson’s Chi-square test analysis was performed to assess the frequency of modern contraceptive use by explanatory variables. Absolute and relative frequencies were used to describe distribution of women by explanatory variables.

3.2 Inferential analysis
As the outcome variable was binary, generalized linear models (GLM) with logit link function were used to assess the significance and association between outcome variable and independent variables. First, bivariate logistic regression analysis was performed to assess the association of outcome variable with each explanatory variable (crude odd ratio). After a multiple logistic regression analysis (Adjusted odd ratio) was performed to assess how explanatory variables’ association with the outcome variables changes from the crude analysis when all explanatory variables were included in models. Stratified analyses by region were also performed to assess the significant association of explanatory variables in relation to the outcome variable in each
region, and to assess how explanatory variables contribute to variance of outcome between regions.

Odd ratios were used to estimate the association between use of modern contraceptive and independent variables. The 95% of confidence interval has been considered.

3.3 Missing values
Access to FP information variable had some missing values; in “have heard of FP on television” variable there were six missing values, in “have been visited by a FP worker” there were also six missing values and the “have visited HF” there were three missing values. In total, there were fifteen missing values for access to FP information variable. For this variable, we combine those missing values as “No” access to FP information and this couldn’t introduce any bias because of their small number.

On the women’s empowerment category, decision on contraceptive methods use had 694 “no applicable values due to the fact that the respondent was not using any methods of contraception at the time of survey and there was no answer to who decide on the use of contraception. These no applicable values were given a score of “0” meaning that the women had no power to decide on use of modern contraceptive methods. This could have introduced bias in results as those women might not use modern contraceptive because they chose not to use them due to their believes or other factors.

3.4 Bias
In order to avoid information bias; we only focus on married women and women living with their partners because sexuality topic among unmarried women in Rwanda is sensitive topic. Due to missing values and their handling, some bias may have been introduced but multiple logistic regression analysis was done and crude and adjusted odd ratios were compared to assess any potential confounding.

4. Ethical consideration
RDHS 2010 was implemented by the National Institute of Statistics of Rwanda (NISR) and the Ministry of Health (MoH), in collaboration with the worldwide Demographic and Health
Surveys Program (21). The goal of the research was explained to participants by fieldworkers in their houses. An informed consent was obtained from the respondent at the beginning of every interview for the individual questionnaire and individual information was kept anonymous. At the beginning of domestic violence section, an additional statement was added informing respondent that subsequent questions may be sensitive and reassuring confidentiality of their response (21).

As DHS data consists of secondary data of population study-based released for public use, formal ethical clearance was not required for the current study. The dataset applied was downloaded from the MEASURE (Monitoring and Evaluation to Assess and Use Results) DHS website. The dataset was publically published on MEASURE DHS website after approval from the host country and data were provided with participants’ identification removed.

5. RESULTS

![Flow chart of participants]

**Figure 3: Flow chart of participants**
5.1 Descriptive analysis

From RDHS 2010, a subset of 6834 married women or women living with partners was analysed. The distribution of women by their background characteristics is shown in Figure 4. According to their place of residence, the majority of participants (85%) were from rural area, more than half of the population (69%) had a primary education, 11.4% had secondary or high education and the rest which was 19% were not educated. Most women in a union in Rwanda (47%) were in the mid age group while 38% were older women and 15% were young women. The majority of participants (25%) are from South province compared 24% from East, 23% from West and 16% from North. Low number of women (12%) was from Kigali city which is consistent with the fact that Kigali city has the lowest population as pointed out by NISR. In this study sample 70% of women were married and 30% were living with their partners.
Figure 4: Distribution of married women or women living with their partners aged 15-49 years old by their background characteristics in the 2010 RDHS.
Figure 5: Percentage distribution of women by women’s empowerment (left) and exposure to FP information factor (right).

Error! Reference source not found. shows that women’s empowerment is also another factor that can have an impact on the use of modern contraception depending on how a woman is able to make decision and choice in her home or in the society. The majority of women in Rwanda are able to access information about FP. In this study 85% were exposed to FP information compared to 15% who did not have any information about FP. 72% of the population are considered empowered.
Figure 6: Percentage distribution of married women or women living with their partners aged 15-49 years old by the current use of modern contraceptive methods
As it is shown in Figure 6, there was a significant disparity in modern contraceptive use by women's background characteristics except for place of residence where living in rural or urban area was not associated significantly with the use of modern contraceptive methods (p>0.05). Married women used modern contraceptive more compared to women who are not married to their partners (47.4% vs 41.4%). Women who were more exposed to FP information were using modern contraceptive methods more compared to those who were not exposed (48% vs 33%). Also women who were not empowered were less likely to use modern contraceptive (3%) compared to women who were somehow empowered or those fully empowered (39% and 51% respectively). More than half of women with secondary or high education (52%) were using modern contraceptive methods while among women who were not educated 37% were using modern contraceptive methods. When classifying use of modern contraceptive methods by age of women, 50% of women in the mid age group were using contraception compared to 42% of young women and 41% of older women.

5.2 Bivariate and multiple logistic regression analysis

Table 1 shows bivariate and multiple logistic regression analysis performed to assess the association between explanatory variables and outcome variable at the national level.

**Table 1: Bivariate and multiple logistic regression analysis of modern contraceptive use as an outcome and its explanatory variables**

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Crude OR, 95%(CI)*</th>
<th>Adjusted OR, 95%(CI)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPOSURE TO FP INFORMATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access FP info[T.no]</td>
<td>REFERENCE</td>
<td>1</td>
</tr>
<tr>
<td>Access FP info[T. yes]</td>
<td>1.89 (1.64 - 2.18)**</td>
<td>1.70 (1.48 - 1.99)**</td>
</tr>
<tr>
<td>EMPOWERMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fully empowered</td>
<td>REFERENCE</td>
<td>1</td>
</tr>
<tr>
<td>Somehow empowered</td>
<td>0.60 (0.53 - 0.68)**</td>
<td>0.62 (0.55 - 0.70)**</td>
</tr>
<tr>
<td>Not empowered</td>
<td>0.03 (0.01 - 0.05)**</td>
<td>0.03 (0.01 - 0.05)**</td>
</tr>
</tbody>
</table>
## PLACE OF RESIDENCE

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>Rural</th>
<th>Urban</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.09 (0.96 - 1.25)</td>
<td>0.89 (0.72 - 1.09)</td>
</tr>
</tbody>
</table>

## MARITAL STATUS

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>Living with partner</th>
<th>Married</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.27 (1.15 - 1.41)**</td>
</tr>
</tbody>
</table>

## AGE CATEGORY

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>Young women</th>
<th>Mid.</th>
<th>Older</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.42 (1.24 - 1.64)**</td>
<td>1.32 (1.36 - 1.53)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.98 (0.84 - 1.13)</td>
<td>0.89 (0.76 - 1.04)</td>
</tr>
</tbody>
</table>

## EDUCATION LEVEL

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>No education</th>
<th>Primary</th>
<th>Secondary or higher</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.46 (1.29 - 1.66)**</td>
<td>1.80 (1.50 - 2.15)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.18 (1.03 - 1.36)**</td>
<td>1.31 (1.06 - 1.62)**</td>
</tr>
</tbody>
</table>

## HOUSEHOLD WEALTH INDEX

<table>
<thead>
<tr>
<th></th>
<th>Reference</th>
<th>Poorest</th>
<th>Poorer</th>
<th>Middle</th>
<th>Richer</th>
<th>Richest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.11 (0.95 - 1.30)</td>
<td>1.40 (1.20 - 1.63)**</td>
<td>1.51 (1.29 - 1.76)**</td>
<td>1.54 (1.33 - 1.80)**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.05 (0.89 - 1.23)</td>
<td>1.27 (1.08 - 1.50)**</td>
<td>1.28 (1.08 - 1.51)**</td>
<td>1.25 (1.03 - 1.52)**</td>
</tr>
</tbody>
</table>

*** Significance of the association between independent and dependent variables

*All explanatory variables were included in the adjusted models.*
5.2.1 Access to FP information
Access to FP information was an independent predictor of modern contraceptive use. This association retains its significance in both crude and adjusted analysis (COR: 1.89, 95%CI: 1.64 - 2.18) and (AOR: 1.70, 95%CI: 1.48 - 1.99). Women who were exposed to FP information were more likely to use modern contraceptive methods compared to those who were not exposed to FP information.

5.2.2 Women’s empowerment
Women’s empowerment was associated with modern contraceptive use in both bivariate logistic regression and multiple logistic analyses when adjusted for other explanatory variables. Women who were not empowered were less likely to use modern contraceptive methods compared to women who were fully empowered (AOR: 0.03, 95%CI: 0.01 - 0.05). (see Table 1)

5.2.3 Place of residence
Place of residence was not significantly associated with modern contraceptive use. In crude analysis the odds ratio showed that women in urban areas were more likely to use modern contraceptive methods (COR: 1.09, 95%CI: 0.96 - 1.25) compared to women from rural areas but when adjusted for other explanatory variables, the odds ratio revealed that women in urban areas were less likely to use modern contraceptive methods (AOR: 0.89, 95%CI: 0.72 - 1.09) compared to women from rural areas which means that this association were influenced by other factors. (See Table 1)

5.2.4 Marital status
Marital status was also a significant predictor of modern contraceptive use in crude analysis. Women who were married were more likely to adhere to the use of modern contraceptive methods (COR: 1.27, 95%CI: 1.15 - 1.41) compared to women who were living with their partners. This association lost it significance when adjusted for other explanatory variables (AOR: 1.07, 95%CI: 0.93 - 1.17). (See Table 1)
5.2.5 Age category
Women in their mid-age (24-34) were more likely to use modern contraceptive methods compared to other young women in planning the size of their families. This association was consistently significant in both crude and adjusted (COR: 1.42, 95%CI: 1.24 -1.64) and (AOR: 1.32, 95%CI: 1.36 - 1.53) (See Table 1).

5.2.6 Educational level
Education level of women was also another independent factor associated with modern contraceptive use in both crude and adjusted analysis (COR: 1.80, 95%CI: 1.50 - 2.15) and (AOR: 1.31, 95%CI: 1.06 - 1.62). Women with secondary or high education were more likely to use modern contraceptive methods compared to women with no education. (See table 3)

5.2.7 Household wealth index
Household index was also associated with modern contraceptive use. In the crude analysis women from richest households were more likely to use modern contraceptive methods compared (COR: 1.54, 95%CI: 1.33 - 1.80) to women from poorest households. When household wealth index is adjusted for other explanatory variables women from richer households are more likely to use modern contraceptive methods at 28% (AOR: 1.28, 95%CI: 1.08 - 1.51) more than poorest women compared to richest women who use modern contraceptive methods at 25% (AOR: 1.25, 95%CI: 1.03 - 1.52) more than poorest women. The association may be by other explanatory variables. (See Table 1)

5.3 Stratification analysis
As it is shown in Figure 7, women in North province are more exposed to FP information (90.9%) compared to women from other regions and women from Kigali city and south province are less informed (83.8% and 83.2% respectively) about FP program compared to other provinces. In women’s empowerment category, Western province has the biggest number of women who are not empowered compared to other regions. In Kigali city, the majority of its population (79.9%), were women who were empowered. Women in Kigali city are more educated with 42.5% who had secondary or high education while women in the West region were the least educated women with 26% of not educated women compared to 7% not educated
women in Kigali city and 21% in North province. Compared to other regions, North province has most women who are married to their partners (79%). According to household wealth index, more than half of the population in South and West province live in poor household with 54.6% and 50% respectively. (See Figure 7).

![Figure 7: Percentage distribution of married women or women living with their partner per region. All women are aged between 15 to 49 years.](image)

Table 2 (in Annex), shows sub-group analysis by regions where bivariate and multiple logistic analysis were performed to assess factors that are associated with the use of modern contraceptive methods by regions.

5.3.1 West

In Western region, modern contraceptive use was positively associated with access to FP information, women’s empowerment and education level of women. Women who had had access
to information were twice more likely to use modern contraceptive methods (AOR: 2.02, 95%CI: 1.46 – 2.83) compared to women who had no access to FP information. Women with secondary or high education level in the western region were more likely to use modern contraceptive methods (AOR: 1.82, 95%CI: 1.16 - 2.87) compared to women with no education. Women who were not empowered were 95% less likely to use modern contraceptive methods compared to women who were empowered. Even though Age was not significantly associated with use of modern contraceptive methods, women in mid age group were more likely to use contraceptive methods compared to young women. (see Table 2)

5.3.2 North region
In North region use of modern contraceptive methods was positively associated with women’s education level and women’s empowerment. Women with secondary or high education were more likely to use modern contraceptive methods (AOR: 2.05, 95%CI: 1.07 – 4.10) compared to those who are not educated. Women who were not empowered were 99% less likely to use modern contraceptive methods. Age of women were associated with use of modern contraceptive methods in the crude analysis where women in mid age category were more likely to use modern contraceptive (COR: 1.49, 95%CI: 1.06 - 2.11) compared to young women. This association disappeared in adjusted analysis, when age of women was adjusted for women’s empowerment, women’s education, marital status, access to FP information, place of residence and household wealth (AOR:1.26, 95%CI: 0.87 - 1.83). In bivariate analysis, married women were more likely to use modern contraceptive methods (COR: 1.5495%CI: 1.15 - 2.07) compared to women living with their partners however in multiple regression analysis the association was no significant (AOR: 1.35, 95%CI: 0.98 - 1.87) (see Table 2)

5.3.3 Kigali City
In Kigali city, factors that were associated with modern contraceptive methods were access to FP information, women’s empowerment and marital status. Married women were less likely to use modern contraceptive methods (AOR: 0.64, 95%CI: 0.47 – 0.86) compared to women living with their partners. Also women who were exposed to FP information were more likely to use modern contraceptive methods (AOR: 1.79, 95%CI: 1.21 – 2.67) compare to those who were not exposed to information. Women, who were not empowered, were 94% less to use modern
contraceptive methods compared to women who were empowered. Even though education level of women were not significantly associated with modern contraceptive use, its odds ratio showed that women with secondary or high education were more likely to use modern contraceptive (AOR: 1.20, 95% CI: 0.65 - 2.23) compared to women with no education.

5.3.4 East
In East, modern contraceptive use was significantly associated with; access to FP information, women’s empowerment, age of women, and marital status. Married women in eastern region were more likely to use modern contraceptive methods (AOR: 1.36, 95% CI: 1.09 – 1.72) compared to women who were living with their partners. Women in the mid. age category were using modern contraceptive methods more, compared to young women (AOR: 1.49, 95% CI: 1.10 – 2.02). Women who had access to FP information were more likely to use modern contraceptive methods compared to other women who didn’t have access to FP information (AOR: 1.52, 95% CI: 1.13 -2.05). Women not empowered were 98% less likely to use modern contraceptive compared to women who were fully empowered. Women education level status was significantly associated with modern contraceptive use in the crude analysis where women with secondary or high education were more likely to use modern contraceptive methods (COR: 1.57, 95% CI: 1.03 -2.38) compared to women with no education and the association disappeared (AOR: 1.05, 95% CI: 0.66 - 1.68) when adjusted for access to FP information, women’s empowerment, place of residence and marital, wealth index and age of women.

5.3.5 South
In southern region, modern contraceptive use was associated with access to FP information, women’s empowerment, age of women, and household wealth index. Women with access to information were also more likely to use modern contraceptive methods (AOR: 1.83, 95% CI: 1.38 – 2.48) compared to women without FP information. Women in mid age category were 62% more likely to use modern contraceptive methods compared with young women. Women from richer households tend to use modern contraceptive methods (AOR: 1.72, 95% CI: 1.25 – 2.38) compared to women from poorest households. Education level of women were significantly associated with modern contraceptive use in crude analysis but this association lost its significance (COR: 1.91, 95% CI: 1.26 - 2.94) and (AOR: 1.30, 95% CI: 0.80 - 2.11) when
adjusted for access to FP information, women’s empowerment, age of women, household wealth, marital status and place of residence. The same change occurs on marital status where being married were positively associated with modern contraceptive use in bivariate logistic regression but when adjusted for access to FP information, women’s empowerment, education level of women, wealth and place of residence, marital status was no longer significantly associated with modern contraceptive use in southern region.

6. DISCUSSION
6.1 Key findings
The study investigated factors which contributed to disparities in use of modern contraceptive methods by married women or women living with their partners aged 15 to 49 years old in five regions in Rwanda. A sample of 6834 women selected randomly from urban and rural from all regions was used in this analysis. Our hypothesis was that socio-economic factors, women’s empowerment and access to FP information could contribute to the variance of use of modern contraceptives among regions. Frequency distribution analysis was done to assess distribution of women according to the explanatory variables in their regions. Bivariate and multiple logistic regression analysis were used to assess which explanatory variables were associated with the outcome variable (modern contraceptive use).

Results of this study highlight the difference in occurrence of factors associated with modern contraceptive among five regions in Rwanda. For example, there were many uneducated women in west province (26%) compared to other regions with women in Kigali city being the most educated and empowered. In stratification analysis by region, results showed also that, the associations of those factors (socio-economic factors, demographic factors, women’s empowerment and access to FP information) with modern contraceptive use vary by region.

Factors found to be positively associated to use of modern contraceptive methods in Rwanda were women’s empowerment, women’s education level, and access to FP information, age of women and wealth index. The more women are educated, empowered and informed about FP, the more they use modern contraceptives to space and limiting their pregnancies.
6.2 Study in relation to the conceptual framework

As it was shown in the results of this analysis, socio-economic and demographic characteristic, women’s empowerment and access to FP information were associated to modern contraceptive use in Rwanda. Disparities of modern contraceptive use among regions may firstly be explained by the difference of socio-economic and demographic factors that may exist among regions, which can contribute to the difference of women’s status and ability of making choice and decision in their lives, and also contribute to the difference to access of health information and services. In summary, this difference may be related to socio-economic development difference among regions.

In this study women from Kigali city were more educated compared to other women and there were also many empowered women in Kigali compared to other regions. The great number of educated people in Kigali city may be due to the fact that, schools are available in Kigali, and that many educated people migrate to Kigali in search of well paid jobs, particularly white collar jobs which are higher in cities (37). The association between education level of women and women’s empowerment from this study is consistent with Mahmud et all in their study about factors of women’s empowerment (38), they have shown that education level of women was positively associated with women’s empowerment. Therefore, the more women in a region are educated, they are more likely to have a say in the household decision-making and are more likely able to decide freely the number of children and plan when to have children by using modern contraceptive Methods.

Even though, living in rural or urban was not significantly associated with the use of modern contraceptive methods, there was a slight difference in use of modern contraceptive use between urban women and rural women. Urban areas are more developed compared to rural areas; women in urban areas are more educated, more informed about health and more empowered in making choices in their houses compared to women from rural. Moreover, with infrastructure development in urban areas, women in urban have good education and they have the knowledge about contraceptive methods and their importance and with the education and the knowledge they are more empowered to make decision alone or with their partners if and when to have their
children. Urban women are able to easily access the health facilities as the roads and transport in urban areas, while in rural areas women walk long distance to reach health facilities. The bad-quality infrastructure in rural may also lead to the shortage of modern contraceptive methods, either by the fact that the transport of these methods take long time to reach the area or by lack of appropriate material to keep in the medicines. Additionally, an imbalance distribution of health professionals in developing countries, where most of those health professionals are concentrated in urban areas while in rural areas there is a shortage(39). This inequality of health professionals may also affect the quality of health services in rural areas which will lead to less prevalence of modern contraceptive use in rural areas.

The huge gap seen between urban and rural in modern contraceptive use that has been consistent in many studies from other countries, is almost eliminated in Rwanda by different factors (14). This may be related to the shortage of health workers in rural areas has been resolved by task shifting where community health workers were trained to inform people about use of modern contraceptive methods and to provide some contraceptive methods while visiting women at their homes and being intermediate between health system and the patients (40). Thus with community health workers the problem of distance to health facilities, information about FP and health service provision were resolved.

Also as women from rich households are more likely to use contraceptive methods because these women are more exposed to education and exposed to access the income resources either from their work or from their families which will allow them to accessibility of health services. In this study more than half of the population in the western region was from poor families which can also explain the low prevalence of modern contraceptive use in this region. Women from poor families are less educated, less exposed to information and health facilities and more importantly less empowered (38).

### 6.3 Implications of the study

**Regional level**

Our results showed that education level and empowerment of women was an important factor of modern contraceptive use independently of marital status, place of residence, household wealth
and age of the woman in North province which has the highest prevalence in use of modern contraceptive methods. High prevalence of use of modern contraceptive methods in North region was not associated significantly with access to FP information, this may imply that, FP information alone is not enough without availability and affordability of FP services in the region, how women feel about health facility environment and the quality of services provided which are also other important factors that can play role in use of modern contraceptive methods.

Kigali city had many women with secondary or high education compared to other region and it was also the region that had many empowered women. Furthermore, in Kigali city, women living with their partners were more likely to use modern contraceptive methods compared to women who were married. Thus, this may suggest that educated and empowered women in Kigali living in cohabitation relationships who are unsure of the stability of the relationship prefer not to have kids and use modern contraceptive methods to prevent them from getting pregnant. On the other side women who are legally married are prone to have their kids and form their families. Additionally, results also shown that modern contraceptive use was not associated with education level of women; this may be due to that almost all women in Kigali are educated (50% and 42% primary and secondary or high respectively), so the population is almost homogenous, in which it may be difficult to detect any difference based on education level.

Moreover, this can also imply that women in Kigali city don’t need to be educated to know the benefits of modern contraceptive methods and use them as women are informed about FP, and because, there are many health facilities which are easy to reach by good infrastructures (roads, cars), information about FP is easy to get in Kigali city through media and the fact that contraceptive methods are free of charge in Rwanda.

In the western region, important factors associated with modern contraceptive use were access to FP information where women informed about FP were twice more likely to use modern contraceptive methods compared to women who were not informed about FP. Addition to that factors; women’s empowerment and level of education were also important factors of modern contraceptive use in the western region. As it is shown in Figure 7, Western region had most not educated women, not empowered women and less informed about contraceptive methods compared to North province. This may suggest the reason why women in West use modern
contraceptive methods less compared to other regions. Low prevalence of modern contraceptive use in the western region may also be related to lack of accessibility to primary health facilities as Huerta *et al* in her research has found that only 26% of the population in Western region could reach the primary health centre in less than one hour (41).

In the East province, education level of women was associated with modern contraceptive use in crude analysis even if when adjusted for other explanatory variables the association disappeared but the odds ratio in adjusted analysis still show that with improve of education of women, the prevalence of modern contraceptive use increases. The same for South region, where in multiple logistic regression analysis, when adjusted for access to information, women’s empowerment, age of women and wealth index, education level of women lost its significant association to modern contraceptive use. Generalized variance inflation factor were performed to detect multi-collinearity between explanatory variables but GVFI were less than four in all analysis, thus there were no confounding variables. This hints that education level of women is important in these regions for use of modern contraceptive use.

The lack of association between place of residence and modern contraceptive use were consistent in all regions and even though there were no association between the two variables, results in three regions showed that women in rural areas were more likely to use modern contraceptive methods compared to women in rural areas for example in West, women in urban areas were 27% less likely to use modern contraceptive methods compared to women from rural areas. This could imply that too many efforts have been put on improving health in rural areas and urban areas may have been ignored which can explain the results of Muhoza *et al*, in their research they found that the prevalence of modern contraceptive use increased more in rural areas from 2005 to 2010. Further investigation into this unusual result would help unearth this correlation.

6.4 Comparison to other studies

The association between women’s empowerment and use of modern contraceptive among married women/living with their partners is consistent with other previous studies in countries with the same context as Rwanda (23,30). In this study, women’s empowerment only focused on decision making of women in the following issues: decision-making on family planning use, decision on household income, decision making on household purchase, decision making of
family visits and decision making on respondent’s health. Women who are free to make decisions on their health and other issues in their homes are confident to share their opinion and make choice over their health and the household issues including limiting or delaying pregnancy.

Also, the education level of women has been revealed to have an influence on women’s use of modern contraceptive methods by other studies (17,18,20,21). Educated women are more informed, confident and also employed which give them access to income resources and are able to make decision in their home or in the community.

Access to information about FP has also been proved by other previous studies (15) to have a contribution to the use of modern contraceptive methods of women. Information from media or from health community workers or health professionals at health facilities or during outreach sessions may improve the knowledge of women about importance of modern contraceptive methods, how to access FP services, and change attitude of women towards modern contraceptive methods which lead to the use of modern methods.

Contrary to many studies (17,31,35), place of residence was not associated with use of modern contraceptive methods. The difference in modern contraceptive use between women from rural areas and those from urban was slightly small (2%). This may be related to the fact that the Rwandan government in its development plan “vision 2020” heath has been a priority as a tool to the country development and ministry of health have put too much effort to reach people, who are in remote areas through outreach sessions, creation of poste clinics near people and introduction of community health workers especially in rural areas who were trained to give health services to people in their homes. Government’s commitment on improving health especially in remote areas can also explain the fact that despite that Kigali city is the capital of Rwanda and has more health facilities, good infrastructures and more health providers compared to all other regions women in this region use modern contraceptive methods less, compared to North region which is less developed compared to the capital city.

In this study, age of women has also been proved to influence the use of modern contraceptive methods. Mostly women in mid age group (25-34years old) were more likely to use modern contraceptive methods compared to young (15-24) or older women group (35-49), this may be
related to the fact that women in their 30s start to think about their family size and how to limit it compare to young women who are just starting their families and still want more children (42). This association was consistent with other studies; for example, one study in Ethiopia found that women aged between 25-34 were twice more likely to use modern contraceptives compared to other age groups (43).

6.5 Strengths and Limitation

One of the strengths of this study is that data for analysis were collected from a nationally representative sample of women in Rwanda, thus the large sample allow the results of this study to be generalized to the general population. Another strength for this study was the use of multiple logistic regression analysis that was good to detect any potential confounding factors.

The first limitation to this study was that the analysis was based on cross-sectional study of secondary data analysis, though the results don’t draw a causal relationship or effect between explanatory variables on modern contraceptive use; only associations can be drawn from this study results. The sample selection used during data collection could have caused loss of useful information while dividing the population into clusters; some information may have been lost within clusters that have not been selected. Also answers to the questionnaires were self-reported, this could have introduced some information bias by women giving answers that they think are acceptable to the society for instance in the section of women talking about who make decisions at home.

Another limitation to this study is the fact that other potential determinants of contraceptive use in a country like number of living children, employment, distance to health facilities were not included in the analysis (32,35).

This analysis only focused on the demand side and not on the supply side of FP services that can also predict the use of contraception in different regions. An analysis of the supply side of FP services can show the quality of services provided, availability of those services and how they differ among different regions. Lack of qualitative analysis on women's perception of contraceptive methods is also another limitation to this study to get a clear explanation on why women use or do not use modern contraceptive methods because factors like cultural, traditional
and religious believes may vary by regions and may be detected in qualitative data. Fear of side effects can also be another barrier to the use of modern contraceptives which can be detected through qualitative data.

6.6 Recommendation

The results from this study have shown that education, women’s empowerment and access to FP information are important factors of use of modern contraceptive methods, so the Rwandan government especially the ministry of health in its department of maternal and reproductive health should put much effort to provide access to information about contraception services and methods especially in the West province as it has the lowest prevalence in contraceptive use. Also more effort is needed on education of women as it has been shown that education is an important factor that can contribute to women’s empowerment, FP awareness, and other socio-economic characteristics which in turn will allow women to knowledgeably make the choice of if and when to have children and how and when using modern contraceptive methods.

As this study has only focused on the demand side of FP services in the analysis, studies that evaluate supply environment and quality of services provision in different regions of Rwanda are needed because even though women are educated and empowered in making decisions, it is not enough when services are not available or are lacking in quality.

In order to better understand the factors that affect regional variance of use of modern contraceptive methods, studies that evaluate contextual factors of modern contraceptive use are also needed in Rwanda, because individual behaviours or choices may also be influenced by the community in which the individual comes from (4).
7. CONCLUSION

The study highlights how socio-economic factors, women’s empowerment and access to FP information are associated with modern contraceptive use in Rwanda. It also highlights the difference between regions by women’s background characteristics, most importantly the results of this study identified how different is the way in which modern contraceptive use is associated with socio-economic factors, women’s empowerment and access to FP information in five regions of Rwanda. This may predict the regional difference in modern contraceptive use. These results have several implications: firstly, more efforts in providing FP information to women, improving education of women and promoting women empowerment are needed in Rwanda. Secondarily, variance of modern contraceptive use between regions, which is influenced by socio-economic factors, access to FP information and women’s empowerment may provide a hint to Rwandan policy makers on what has to be improved in each region and mostly the region with low prevalence has to be number one priority. Thirdly, further research on supply and environment of FP services are needed in order to assess other factors that may contribute to regional variation on modern contraceptive use.
REFERENCES


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34. Rwanda Demographics Profile 2014 [Internet]. [cited 2016 Feb 1]. Available from: http://www.indexmundi.com/rwanda/demographics_profile.html


## ANNEX

Table 2: Logistic regression analysis assessing association between outcome variable and explanatory variables when sample is stratified by region

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**MARITAL STATUS**

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*All explanatory variables were included in the adjusted models*