ASSESSING THE INFLUENCE OF COMMUNITY HEALTH WORKERS ON UPTAKE OF MATERNAL HEALTH SERVICES IN MUSANZE DISTRICT, NORTHERN PROVINCE, RWANDA

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DECLARATION AND APPROVAL

Declaration by student

This thesis is my original work and has not been presented for a degree in any other University or for any award anywhere.

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DEDICATION

I dedicated this work to my mother and family for their prayer and moral support. More so to my lovely wife, children, brothers, sisters for their love and inspiration.

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ABSTRACT

Background: Community-based initiatives are a worldwide policy that guarantees that key health services are available and accessible closer to the community. CHWs are an important element of healthcare services in Rwanda. Community health workers integrate individuals of their communities to provide preventive, habitual, and emergency maternity healthcare requirements. The aim of this research was to assess the influence of community health workers ' on the uptake of maternal health services in Musanze District. **Methods:** The study design used was an analytical cross-sectional study design utilizing both quantitative and qualitative methods. This research was cross-sectional because it examined the exposure and outcome at a time. In this study, a simple random sample approach was employed to choose 208 CHWs and 16 CHWs' supervisors were interviewed for qualitative data (KII). The statistical tool for social sciences (SPSS) Version 26, was used to examine the data. Categorical variables were summarized with descriptive statistics for frequencies and percentages. Bivariate analysis with the Chi-square test of independence was used to check the association between both dependent and independent variables. Ordinal logistic regression was used as the most suitable inferential statistic because the predictor variables and the dependent were ordinal variables. Qualitative data were analyzed by NVIVO version 10. CHWs 208 participated in the study and all were female. **Results**: This study found that the uptake of maternal health services was regarded as very high. Among those services, deliveries at the Health Facility were at 73.6%, Antenatal care at 65.9%, Family planning at 54.3%, and the rate of Postnatal care was at 45.7%. The results also showed that Sending red Alert SMS by CHWs for pregnant mothers' emergencies by CHWs towards maternal health services with chi-square test result $p^* = .001$. CHWs' enrolment of girls and ladies of reproductive were significant with $p^* = .011$. CHWs' follow-up to the pregnant has improved maternal health services with chi-square $p^* = .001$). Health education has improved maternal health services where chi-square test was significant with $p^* = .014$. This study assessed the influence of sociodemographic factors on uptake of maternal health services, level of education with $p^* < .001$, and working experience $p^* = .005$ were associated with uptake of maternal health services. 85.1% of CHWs were knowledgeable on the warning signs of an emergency among pregnant mothers, and 89.4% reported that they would act based on these warning signs. CHWs had necessary training to provide care to pregnant mothers with $p^* = .001$.Skills that CHWs have on administration of misoprostol to prevent post-partum hemorrhage was significant with $p^* < .001$. Factors that influenced uptake of maternal health services were CHW's regular supervision with $p^* = .001$, provision of transportation $p^* = .001$, regular refresher training $p^* = .002$, and motivation/incentives $p^* = .001$, as they were associated with the performance of CHWs towards uptake of Maternal Health care services. The research recommends improvement of maternal health services through access to contraception, antenatal care, and postnatal care, with particularly scale-up key motherly health services, regular training and supervision for CHWs, governmental support in terms of motivations of CHWs.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANC:	Antenatal care
APA:	American Psychological Association.
BCC:	Behavior Change Communication
CHD:	Community Health Desk
CHIS:	Community Health Information System
CHWs:	Community Health Workers
D.H.:	District Hospital
DHS:	Demographic Health Survey
F.P.:	Family Planning
H.C.:	Health Center
HMIS:	Health Management Information System
LHWP:	The Lady Health Workers Program
MH:	Maternal Health
MKU:	Mount Kenya University
PNC:	Postnatal care
RDHS:	Rwanda Demographic Health System
SDGs:	Sustainable Development Goals

CHAPTER ONE
INTRODUCTION

This chapter covers the background of the study, the problem statement, the objectives of the study, the significance of the study, justification of the study, the limitations of the study, delimitation of the study and the scope of the study.

1.0. Background Information

One of the most urgent global health problems is maternal health, particularly in low- and middle-income countries, where 99% of all maternal deaths occur, the majority of maternal deaths can be avoided and the maternal mortality ratio in Rwanda significantly fell from 1020 in 2000 to 290 in 2015 as a result of initiatives to improve women's access to professional birth attendants (Binagwaho, et al., 2019).

Every year, 140 million women give birth throughout the world while much is known about the clinical treatment of labor and delivery, less attention is paid to what has been accomplished to make mother feel safety, content, and positive regarding the ability or performance beyond of medical interventions (WHO, 2018).

Community Health workers play an essential role particular in low and middle income country that guarantees key health services are available and accessible to the community members. World Health Organization established a community-based initiative programs and uses community volunteers to provide health care to their people (Lauren Crigler,2014; Abraham,A.et al.,2019).

The goal of the Rwanda Community Health Program, which was established in 1995, was to increase the uptake of essential maternal health treatments by educating expectant

mothers, encouraging healthy behavior, and maintaining links to services and more than 15,000 CHWs working at the community provide the line of service. The CHWs are volunteers chosen by community members rather than licensed healthcare providers through the health structure, CHWs receive management and training (NISR & MoH, 2015).

The tasks of CHWs include expectant women, establishing guidelines for monitoring both throughout and after pregnancy, and make sure births take place in medical centers and are performed by competent medical personnel ,CHWs performs one or many duties linked to the delivery of healthcare and received relevant training and supervision which help them to handle and treat cases that are not complicated and refer severe and complicated cases to a near hospital ((Mwizerwa,F.2018; GATWAZA, M. H. 2016).

Community health workers are connected with health facilities that provide health education and ,supportive leadership ,and equipment are unpaid household workers who make home visits to mothers during pregnancy up to labor and delivery, several health organizations around the world use CHWs for basic medical treatment (Mbogori, T. 2016).

The need for CHWs has expanded due to a global lack of healthcare workers, the shortage was in 57 countries, which include Sub-Saharan Africa, Bangladesh, Indian, Indonesia and Rwanda. Rwanda as a member of these countries, has primarily adopted community health workers and considered their role to achieve the optimum in different health indicators(Hardee, Karen, et al.,2014; Wilford et.al,2018).

The Rwandan government acknowledges that primary health care access is a multi-sectoral challenge that needs synergistic collaboration across all sectors to provide a comprehensive

community health package that includes preventative and curative treatments with full community engagement (Mugeni,2014;WHO,2018).

Since 1995, Rwanda's Ministry of Health reported over 120,000 CHWs have been trained among them, 60,000 have indeed been devolved to the cell and village in 30 Districts of Rwanda, the World Health organization strategized that accessible health-related organizations engage with CHWs to provide access to high-quality care in resource-constrained locations ((Beatrice,U.,2016 ;WHO,2020).

Therefore, Rwanda has been engaging and educating community health volunteers across the communities to mobilize and contribute to the positive maternal health and supports the development of community -based primary health care that was laid out initially in the World Organization's Declaration of Alma Ata

1.1. Statement of the Problem

Community health Workers, particularly in the middle and low classes nations, have been highlighted as essential contributors in health promotion programs around the world, their efforts help to advance community-based primary healthcare, as declared in Alma Ata Declaration (WHO,1978).

The CHWs performances is evaluated on a regular basis by analyzing data entered into the system, given the challenges that African countries face to the renewed role for CHWs is both relevant and urgent due to the government or environmental disaster, organizational modifications, policy initiatives, Aids, and a loss of professional skills (Glenton, C.,2021).

In Asia , the study conducted showed that Pakistan's Lady Health Workers Program (LHWP) is among the succeeded CHWs initiatives through health promotion of pregnant mothers and providing health services to pregnant mothers in the community of

disadvantaged and underserved people on family planning services, prenatal care, and the utilization of experienced health personnel ,maternal deaths rates in LHWP-affected areas are higher than the national average 60 percent of the country (Hasan, S. T.,2019).

A study looked at the importance of community health workers in providing Maternity and Neonatal Health care in Bangladesh and India in South Asia, as well as Kenya, Malawi, and Nigeria(sub-Saharan Africa) demonstrated that a global scarcity of health professionals continues to pose a danger to the achievement of the wellness, sustainability, objectives as well as the International Covenant Healthcare Benefits, with a focus on Maternity and Infant health (Olaniran, Abimbola, et al., 2019).

The rate of maternal mortality in Rwanda dropped by 78% between 1990 (1300/10,000 live births), Aiming to reduce maternal death to 168/100,000 live births by 2020 and 126/100,000 live births by 2024, Rwanda's Vision 2020 and related health division changes and policies had a maternal mortality rate of 210 per 100,000 live births in 2016. In Rwanda MMR is associated with low literacy rates in women and underuse of family planning, prenatal, and delivery services with the program of maternal health and preventing premature, Rwanda has been making investments in health initiatives for dropping maternal mortality, particularly regarding community health (Republic of Rwanda ,2015).

To promote women's health in Rwanda and contribute to the United Nations Sustainable Development Goal of reducing worldwide maternal deaths to the less than 70 per 100,000 live births by 2030, the ratio requires both the improvement of existing policies and the development of new initiatives**,** and Government has also distributed the number of CHWs equitably to all communities and their capacity was built to provide quality services to

expectant mothers, moms in postpartum, as well as the children ((Mwizerwa ,2018**)** Therefore, the maternal health poses a barrier to the realization of SDGs in 2030 in the health-care sector compared with the effort provided by CHWs, this study came up with assessing the influence of Community health workers role on uptake of maternal health services in Musanze District, Northern Province, Rwanda

1.2. Purpose of the study

This research provided in-depth information on influence of CHWs' role on uptake of maternal health services in Musanze District and identified variables that influence CHWs' performance on their daily activities that have a valuable contribution to the community and policymakers, the academic community, service providers, among others.

1.3. Objectives of the study

1.3.1. Broad Objective

To assess the influence of Community health workers on the uptake of maternal health services in Musanze District, Northern province, Rwanda.

1.3.2. Specific Objectives

1. To examine social demographic factors of CHWs that influence uptake of maternal health services in Musanze District ,Northern province, Rwanda.
2. To establish the influence of community health workers roles on uptake of maternal health services in Musanze District ,Northern province, Rwanda.
3. To determine the necessary CHW's knowledge associated with uptake of maternal health services in Musanze District Northern province ,Rwanda.
4. To examine factors associated with performance of CHWs towards maternal health services in Musanze District Northern, Rwanda.

1.3.3. Research questions

1. What are social demographic factors of CHWs influencing uptake of maternal health services in Musanze District, Northern province ,Rwanda?
2. What is the influence of community health workers roles on uptake of maternal health services in Musanze District Northern province, Rwanda?
3. What is the necessary CHW's knowledge associated with uptake of maternal health service in Musanze District Northern province ,Rwanda?
4. What factors are associated with performance of CHWs towards maternal health services in Musanze District,Northern province Rwanda?

1.4. Justification of the study

Musanze District, was the one pilot district among 30 in the country where CHWs have been received from further training in several health packages and they have improved maternal health which was a challenge in this area. This is true regardless of the fact that interventions with the capacity to lower death rates, such involving CHWs in addressing mortality rate, are known to exist. According to the literature study, the precise functions that CHWs play in lowering the mortality rate have not been well recorded and explored. Research carried out by Ngabo, F., et al.2012, was concentrated on creating and putting into operation a cutting-edge SMS-based alert system (RapidSMS-MCH) to track pregnancies and lower maternal and infant deaths in Rwanda.

The studies done, in northern province on supporting equal access to maternal health care at the community level found that community health workers (CHWs) need equipment and incentives toward maternal health services (Tuyisenge ,G.et al.,2019)

The lack of involvement of community health workers the pregnancies of the women were complicated by severe bleeding, infections, unsafe abortion, hypertensive disorders (pre- and eclampsia), and medical complications like cardiac disease, diabetes, or HIV/AIDS that complicated or made pregnancy more complicated, as well as fistula from unassisted childbirth. However, Maternal health is still a challenging to the achievement of SDGs by 2030 in the health-care sector compared to the effort provided by CHWs ,the current study was assessed the influence of CHWs role on uptake of maternal health services in Musanze district.

1.5. Significance of the study

The results from this research are helpful to the policy Makers, particularly to the government, Community Health Desk, NGOs, and Musanze District as a case study to know the challenges facing community health workers based on the program's effective execution. The study included ideas and recommendations that can be used to increase awareness to CHWs and their roles in enhancing maternal health services. It can assist to identifying the obstacles that arise during the implementation of health policies and define priorities and determine the funding necessary for certain actions to set baselines then track changes as a result of interventions and advocacy as service providers. This will result in a decrease in maternal death rates, assuring the achievement of the goal of SDGs 2030 and improve the quality of service provided by CHWs. Last, the results of the research will be the basis for research on community health studies.

1.6. Limitations of the Study.

1. The research focused only in one district; moreover, it was not easy to generalize the results to other districts.

2. It was difficult to determine a causal relationship because the study design used.

1.7. Delimitation

The researcher employed a high targeted sample to decrease information bias and maximized reliability. The study was delimited to 208 CHWs in charge of maternal health of Musanze District and therefore the findings of the study are only applicable within the designated geographical area. Secondly, the study examined the influence of CHWs on uptake of maternal health services and therefore other roles of CHWs like treatment of malaria were not covered in the study.

1.8. Assumption of the study

The assumption of this study was that the participants honestly responded to the questions because confidentiality and anonymity were ensured.

1.9. Operational definition of key words.

Community health workers: Are men and women who volunteer from their communities to assist the established health professionals in providing improved health care. This individual is not a professional, but he or she has been trained to provide necessary health service

Maternal health: Is known as the mother's health throughout maternity, birth and the postnatal period.

Influence: Is the capacity of CHWs to influence positively on mothers' health services at village.

Primary health care: it is the first line of interaction for people, families, and villages delivering home healthcare and workplaces as feasible, it's the start of a long-term health-care plan.

Antenatal care

Antenatal also known as prenatal care, is a form of preventative medicine, which aim is to offer routine check-ups so that medical professionals can treat and prevent any potential health issues that can arise during pregnancy, as well as to encourage healthy living for the mother.

Postnatal care

PNC refers to the service provided to a woman immediately following delivery and during the first 42 days after birth for the mother, this represents the beginning of a new period of the family situation, even while the postnatal stage is straightforward for the majority of women.

Family planning

Family planning services are described as "health education, holistic health, or cultural acts that empower anyone, including minors, to voluntarily define the number or interval of future kids and to choose the methods by which this can be achieved."

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The section explores different published articles based on the current study and draws academic expertise to understand the concept of CHWs and their community contributions to enable the researcher to draw valid conclusion on the variables under study.

Researcher tries to highlight the important themes and concepts that underpin the influence of CHWs on uptake of maternal Health services and factors associated with their performance. This chapter covers the literature on study objectives, study gaps, and a theoretical framework

2.1. Theoretical Literature review

2.1.1. Maternal Health in Rwanda

Rwanda turned into listed as the country with the very best every year rate of maternal mortality reduction, at 9%, according to the assessment done from 2012 to 2015 (World Health Organization 2014). Other maternal indices, inclusive of the deliveries in health facilities, the mothers delivered by healthcare professionals, and overall reproduction rate, have all progressed significantly.

For example, the proportion of deliveries in health facilities through a qualified healthcare personnel increased from 69 to 91percentage in 2010 and 2015 respectively; however, the difference among the preferred fertility rate and the overall fertility rate dropped from 1.5 to1.1childrenconsistent with lady in 2010 and 2015 respectively (NISR et al., 2015).

The study conducted in Kenya on maternal health , reported that delayed motherhood, family planning, effective use of healthcare services, postnatal care and immunization are among the factors that reduce the mortality rate among mothers and children (Nzioki, J. M., et al.,2015)

Though Rwanda has succeeded in these areas, it still lagging behind in some health indicators, according to 2014-15 DHS, the use of modern family planning is still low among married couples where in 2010; it was 45% and 48% in 2014-15,in this survey, married women were still having unmet family planning services at 21% in 2010 and reduced in 2014-14 to 19% (NISR et al., 2015; NISR et al., 2012).

The research conducted on role of community health workers on maternal health care reported that only 40% of mothers received four or more antenatal visits and postnatal care respectively in 2014-15 (Rwabufigiri et al., 2016).

After the genocide, Rwanda struggled with a severe shortage of health workers, an inadequate health infrastructure, and high rates of maternal mortality. Through a number of corresponding initiatives, the government gave maternal health a high priority as a means of rebuilding fundamental systems and services: Strong community support, a community-based health insurance program, advancements in health workers and infrastructure, and system strengthening through the use of current data collection tools (Paul, 2015).

To encourage greater community involvement and provide 45,000 community health professionals with the necessary training to deliver primary healthcare in villages, the government decentralized the health unit. These individuals, who are chosen by their community, connect people to health services, especially in remote or difficult-to-reach locations, and administer basic health care in the community level (Paul, 2015)

2.1.1.1.Family planning as crucial for long-term success in maternal health in Rwanda.

The success story in maternal health also tells of increased access to family planning, in Rwanda, the prevalence of modern contraceptives increased from 4 to 45 percent in just ten years. According to research, family planning can save up to one in three maternal deaths by enabling women to postpone motherhood, spacing out births, prevent unwanted pregnancies, and stop having children once they have reached their ideal number of children (Paul, 2015)

Rwanda's average fertility rate increased from 6.2 to 3.8 children per woman from 1992 to 2015; the advances attribute greatly to community health workers, condoms, medications, injectables, and cycle beads can all be made available. The effort to give the community-based insurance program a successful public awareness initiative, facilitated by an approach of fees established on the people that are not able to receive prenatal care and delivery in healthcare centers, has been connected to the rapidly improving uptake of maternal health services (Paul, 2015)

2.1.2. Improving Maternal Health in Rwanda

Rwanda, like other Sub-Saharan African countries, is making progress in maternal health, and the Ministry of Health's primary objective is to deliver and consistently enhance the health care of the Rwandan people by providing preventive, curative, and rehabilitation services health care, thus also making a contribution to the population's overall well-being.

The government of Rwanda works together to achieve an integrated and social development process, which has resulted in success in the health sector, Rwanda has been

on a rapid target to accomplish huge health achievements for its whole population in recent years.

The combination of health care service, the enhancement of health quality, and the achievement of reliable revenue sources will be essential themes as the Ministry of Health continue to develop new ways to meet and achieve its mandated health status goals (GoR/PRSP, 2010 &RHIMS, 2012).

In the aftermath of the Tutsi genocide in 1994, Rwanda's government decided to expand present community-based activities with the objective of deploying CHWs to supplement the health-care workforce's insufficient capacity, particularly for maternity health services and health care facilities to empower community health workers (Condo,2014).

The Government of Rwanda continued promoting in key maternal wellness solutions to reduce deaths of mothers, as well as contraception, accessibility to various services related to reproductive health, skilled care for the period of pregnancy (including emergency obstetric care), postpartum care, and even post-abortion care, with a particular focus on scaling up key maternal health interventions from 2005 to 2016 (Sayinzoga F & Bijlmakers L, 2016).

Community health workers of Musanze district contributed on improvement of maternal health services in various indicators such as antenatal care attendance, family planning, postnatal care visit and assisted deliveries at health facilities (Musanze HMIS,2021).

The following chart illustrates the state of maternal health in Musanze district after these improvements:

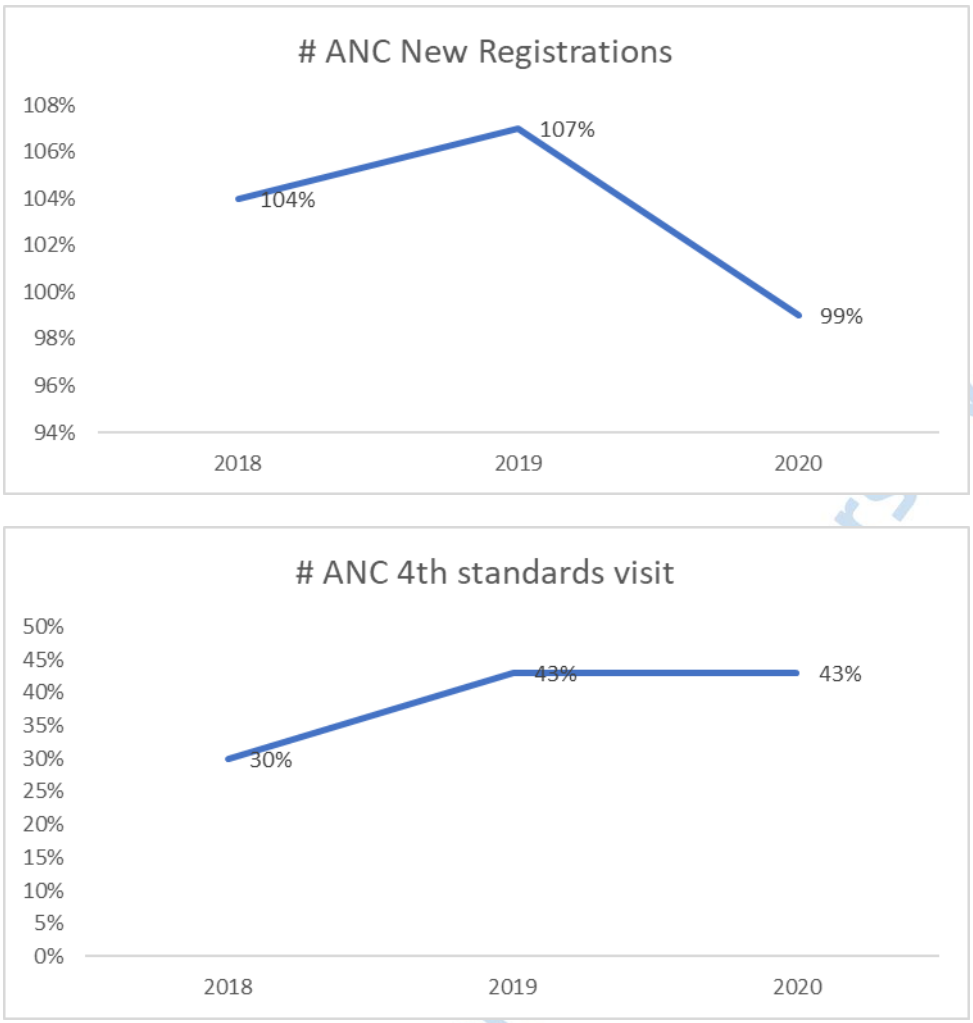


Figure 1: Antenatal care attendance in Musanze District

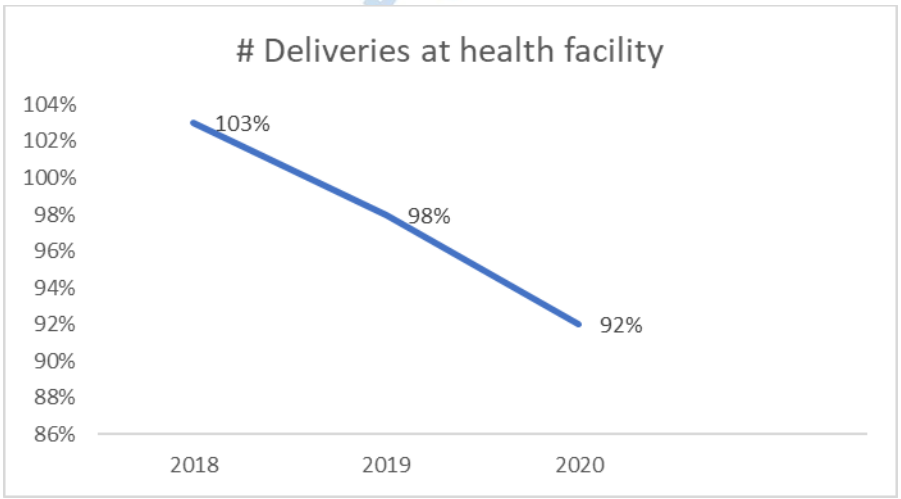


Figure 2: Assisted deliveries at health Facility in Musanze District

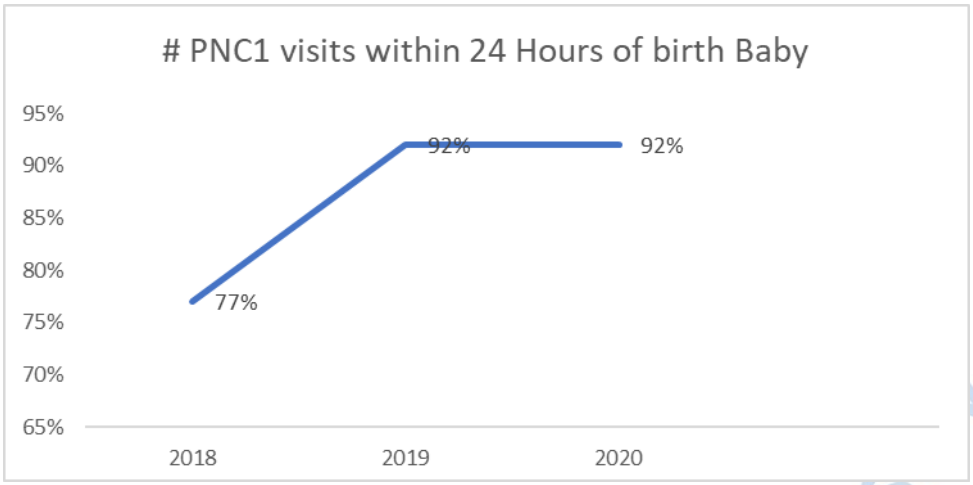


Figure 3:Postnatal care visit in Musanze District

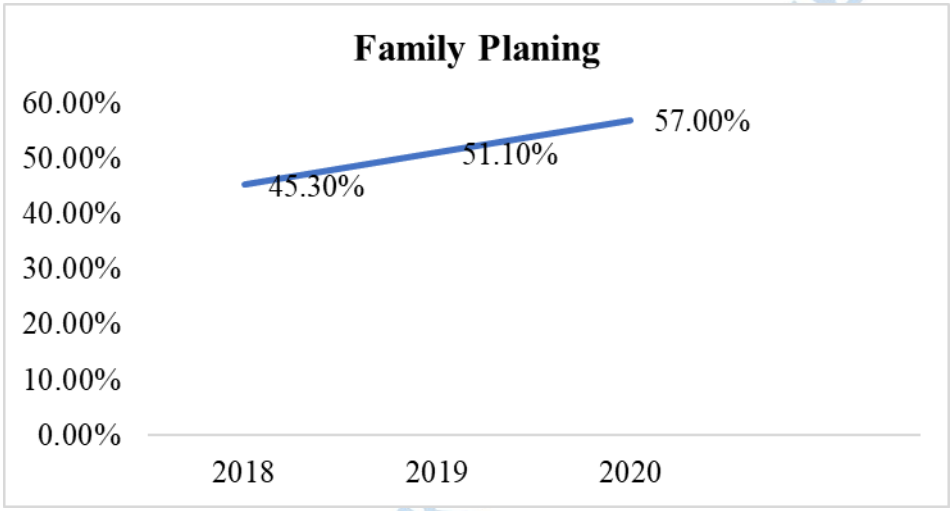


Figure 4: **Family planning in Musanze District**

2.1.3. Community Health Workers

Community health workers are most common category of community-based professionals, and they include members of the top management team or local nonprofit people, throughout addition to normal health workers, there's far more trained leaders including community support, help for tuberculosis treatment in the village, malnutrition of children less than five years, caregivers, HIV/AIDS communication (Roger, M.,2020).

Community health workers are community persons who have been selected by individuals of the society or organizations that can provide basic health care to neighborhoods, they are also known as village health workers, health workers assistance advocates, but also lay health advisers (Ministry of Health ,2013).

2.1.3.1. Community-based programs for improving maternal health

In response to the 1994 genocide against the Tutsi, the government of Rwanda began to expand community-based initiatives with the aim of utilizing CHWs to supplement the inadequate capabilities of health employees, especially for the provision of maternity care. The national community health program was established in 1995, and in 2007 the Ministry of Health began reforming its policies. In 2014, Condo reported a CHW, known as a 'Mobilizer of community for maternal health', is called the woman in charge of maternal health with tasks of intervening in basic care for the period of during and after pregnancy, CHWs are linked to health facilities which give training, helpful management, commodities an provide training, helpful management, supplies, and equipment (Bucagu, 2016).

2.1.3.2. CHWs' Performance in enhancing maternal health in Rwanda

Since 2007, a nationwide reorganization has been in place with the aim of improving the contribution of CHWs in enhancing Rwandans' ability to access maternity medical care. The fundamental focus for Rwanda is the CHW agenda, which serves as a link among the community and the primary health care structure and communities. The primary barrier has been the national health system's insufficient capacity to provide CHWs with the

competencies and abilities necessary for the efficient implementation of crucial measures for maternal health and to guarantee their sustainability (Bucagu, 2016).

2.2. Empirical literature

Assessment of the influence of Community health workers on the uptake of maternal health services offers the chance to develop, put into practice, and reinforce various techniques with the goal of promoting maternal health care through community health workers.

2.2. Community Health Workers' Social demographic factors and uptake of maternal health services

A research carried out in Rwanda, has demonstrated that individual aspects of Community health workers such as age, gender, marital status, working experience as a community health worker may influence how health services are perceived and delivered(Rwanda Ministry of Health,2018).

The criteria for selecting CHWs vary depending on the Ministry of Health in each country; however, the baseline requirements for selecting CHWs through partners in health are that they must be an adult, normally over the age of 18, have reading skills, and be able to adequately read prescription drug packets, fill out simple forms, and take notes all through routine practice sessions(Condo, J.et.al. ,2014)

The majority (94%) of participants in a research on job satisfaction and motivation among CHWs in Tanzania's Morogoro Region reported that agriculture was their primary source of income and that their median family income was 50,000 TZS (US$ 29) per month (Mpembeni et al, 2015).

Community health workers should be mature enough to be allowed to provide maternal health services the CHWs who have more experience in services are more respected and trustfully in the community than those who are still single (Gatwaza,2016) . The majority of respondents (76.9%) in the study on the effectiveness of Community health volunteers in Kenya found that marital status, 31 (14%) people have been either widowed or separated, while 71 (32%) were single and 123 (55%) were married (Mulingwa, 2014).

Many programs require a certain level of literacy but in Rwanda, the CHWs must complete primary school and be capable to write and read as criteria to be selected as CHWs, training benefits enabled them to follow the CHWs' advice both during pregnancy and after birth (Mulingwa, 2014).

They should be living in the neighborhood with the clients so the people want to feel contented discussing the issues; then allows the CHWs to gain direct knowledge related to the challenges faced on a daily basic health care provided to the clients, additionally, CHWs work concentrates not just because of improving health and also promoting equality then cooperation only within society, by assisting people and families who are involved (GATWAZA, M. H.,2016).

The study conducted on sociodemographic factors (Age, Gender, Education, working experience of community health workers all are vital factors to improve the performance of community health workers where age cohort 40-50 had the highest results of home visits mothers (Crispin,.et al., 2012; Mwanaisha, 2015) .

Concerning CHW's experience, it was found in this study that highly experienced Community health workers had a very high performance as compared to less experienced

community health workers ,this was reported in the research conducted in in Kenya by (Crispin, et al. 2012).

This association was also in agreement with the study done in Nigeria, these findings showed that the most Community health workers (CHWs) are effective at their professions because of their work experience (Javanparast, S.et al., 2018).

They stated to have expertise in providing MHC services like counselling women on the value of completing pregnancy appointments, escorting mothers to deliver at HF as well as maternity hospitals, referral services, health education, women's health, and access to contraception (Tulenko *et al.,* 2013).

The performance of individuals who had worked for more than 10 years was reported to be above average, demonstrating that community people prefer receiving curative care from skilled healthcare professionals over preventive services from CHWs, who lack training in healthcare (Crispin, et al., 2012;Murura, (2015).

2.3. Influence of community health workers roles on uptake of maternal health services

Community Health workers was founded in 1995 with the goal of improving consumption of vital mother and clinical services for children by trained expectant mothers, encouraged health behavior, and providing follow-up to the pregnant mothers during and after birth and referrals to other services (Bucagu,2016).

Over 45 000 Community Health Workers (CHW) working in villages provide the first line of service delivery, which includes the tasks of CHWs-MH place a special emphasis on maternal health, accompanying expectant mothers throughout their pregnancy, promoting

family planning at community level ,encourage mother to delivery at health facilities and to respect Postnatal care visit (The National Health Policy prohibits serving women to give birth at home and recommends the administration of misoprostol for postpartum hemorrhage (Beatrice, U. ,2016).

CHWs make up a high-performing healthcare system that intervene in different integral health indicators, they are 4 CHWs per village they improve the availability of prenatal care, hospital deliveries, and postpartum care, family planning, delivering misoprostol to expectant mothers in anticipation of self-administration postnatal period when they give birth unexpected at community, then scheduling inappropriate postnatal home care to detect worming symptoms and refer them to the hospital if necessary. Moreover, CHWs-MH sent alert messages to the health facility, allowing pregnant women to be referred quickly (Beatrice, 2016).

Since the year 2005 and 2008, the government of Rwanda sought to improve standing community-based interventions by utilizing CHWs to curtail shortage of health personnel, this was in solution to a health staff scarcity between 2005 and 2008 due to displacement and death of healthcare providers in the post-genocide period and Rwanda commenced new community health system reform in 2007 (Bucagu et al. 2016).

The health system in the country has recognized that importance of women in obtaining better health in general, as well as maternity and child health in particular, MH-CHWs in their village area are mothers in this regard and women's continued involvement in the implementation of health initiatives in their communities, particularly in the areas of safe

delivery and reproductive health, has achieved major improvements on mother's well-being (Condo et al. 2014).

2.3.1 Goals of Rapid SMS-MCH system

The Rapid SMS-MCH system was created to give community health workers and the other health system (ambulance, health facility personnel, District Hospital, and Central level) a mobile platform for efficient and genuine two-way action interaction.

The system's major goal is to increase newborn, Rapid SMS also includes a system or keeping a record of clinical information for pregnancy and delivery (Ngabo et al.,2012).

Ministry of health promote male's engagement in maternity and general family cohesion in order to reduce preventable care obstacles, MH-CHWs communicate with mothers by visiting them in their home and also in community meetings ,they have tasks to visit each household in the village least once every month for home visits, or they receive women in their homes who require maternal health care and offer to them with appropriate health information at community gatherings in villages (Tuyisenge,G., et al., 2019).

Community health professionals provide health promotion services, include diagnosing, preventive, referrals, report and although the Community Health Development Strategy recognizes the need for CHWs in Rwanda to be properly trained, papers defining the time, format, and content material of general education are hard to come through it (Mugeni,2017; Brenner, J. ,2017).

Moreover, detailed data on Community health workers training for particular applications inclusive of maternity health services (MNH), Rapid SMS, community-based F.P., and

community-based IMCI is available and the effectiveness of CHWs was evaluated on a regular basis through analyzing data submitted into the system.

2.4. Community health workers' knowledge associated with uptake of maternal health services

The training given to the CHWs help them to have overview on maternal health packages such as: prenatal warning symptoms, vaginal bleeding, temperature, edema, convulsions, severe headache, lower abdomen discomfort, loss of consciousness, and losing weight.

The CHWs are community members who have been voted through their peers rather than qualified health professionals, they are mentored by the health system. As previously stated, the four CHWs in each community, who have tasks and responsibilities that are well defined.

All references to CHWs in this work was focused on CHWs in charge of maternal health recognizing a pregnant woman, performing follow-ups before, throughout, and after pregnancy, as well as assisting births in hospitals and by professionals are all examples of CHWs efforts in the community (Rwanda Ministry of Health,2018).

Community health workers are crucial in delivering primary care in the local community, they are health-care professionals who have been trained and monitored by health center, where each health center has one supervisor in charge of Community health workers, he is the one who has the tasks of coordinating all activities done by CHWs with health center staff, the involvement of CHWs differs and is completely reliant on the field employees

work in (social care, health), the services they offer customers (heath education, medical services (Gatwaza,2016).

CHWs in charge of maternal service should know all woman with age of reproduction and total pregnant woman in the village even those who are completed ANC and deliveries attendance and follow them outreach vaccination Mwizerwa, (2018).

2.5. Factors associated with performance of CHWs towards maternal health services

The group of experts performed a research on community health promotion in America focused on cartography the direction of community health promotion which connected with successful case management by community health volunteers to their degree of education, transportation, enough incentives, appropriate supervision, and availability of drugs and instructional resources (Navarro et al.,2007; Condo, J.et.al. ,2014).

In a research carried out in Uganda on enhancing CHWs program has demonstrated that improved supervision of Community health workers enhances their performance in their daily activities like health education and household visiting (Musoke, et al., 2019).

Research conducted in Rwanda by Gatwaza 2016,reported that about 60.8% of CHWs confirmed transportation is the barrier to their daily activities and the study done on implications of remuneration and motivation and concentration of CHWs, where giving more incentives and motivation to CHWs increases their focus from other part-time works to their work as CHWs in delivering health services to the community members at the community level (Debra,2015).

According to a qualitative research on Rwanda's developing community health worker system, CHW effectiveness is still limited by irregular training and insufficient monitoring

(Condo et al., 2014). Another study done, found that training covering the scope of CHWs found to increase the performance of CHWs in delivering health services (Musoke, et al., 2019) In Rwanda, the Ministry of Health gives cash through cooperatives to community health workers who meet significant health variables, CHWs are grouped into cooperatives that assemble once a monthly only at health facility in each sector and majority of performance-based financing awards (70 percentage invested in revenue businesses chosen by a group of people, the remaining 30% is paid to Community member's account in the form of cash bonuses of around US$0.73 per month each CHWs **(**Mugeni, 2014).

Maternal health services provided by community health workers is linked with health system established by Ministry of health ,flow of information top to bottom and feedback, the figure below, demonstrates channel of communication from Ministry of health to the village (community level and vice versa) Beatrice ,U.,2016.

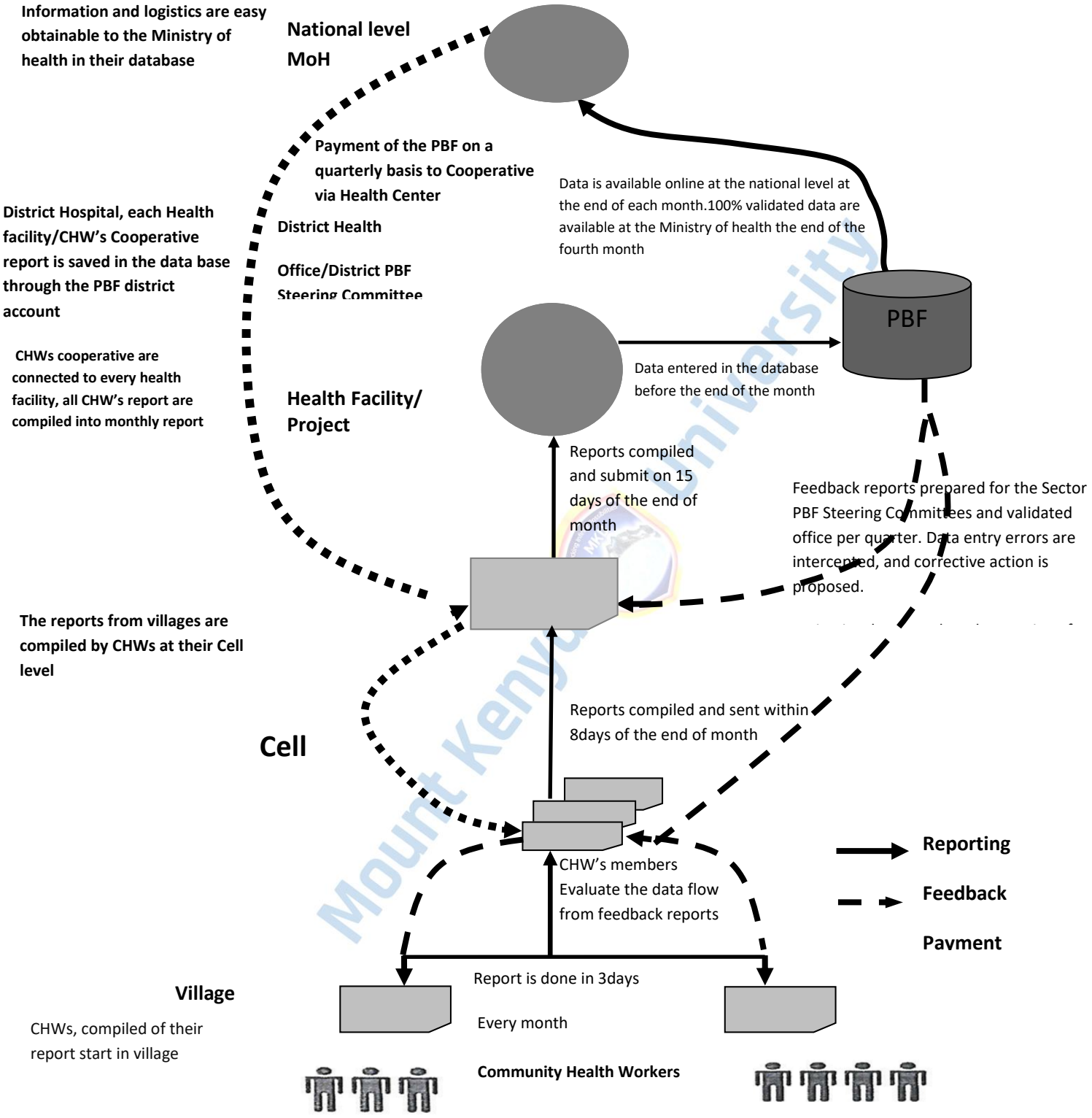


Figure 5**:Data Flow Chart for the Community Health Information System**

CHWs meetings are scheduled for three days just at end of every month to put together their file and submitted them to the cell level then the Cell organize this information within five days and forwarded to the Health Center.

At each level the reports are compiled and sent to the next level. All reports are organized in one concise monthly report at the CHWs Cooperatives, with the help from their Health Center through their cooperatives, and delivered to the district level within 5 days.

These reports are recorded in the District PBF database account then sent to the Ministry of health record and it is confirmed just at the end of every mouth.

2.6. Critical of literature review and Research Gap

According to the literature from Sub-Saharan Africa which includes Rwanda has indicated that there are no particular indicators to indicate how maternal health (of mother and new-born) has improved for the last ten years, despite recognition of the severity of maternal death in the globalized world and the significance of these mortality in a nation's capacity to achieve the SDGs set objectives 2030. This is true despite the fact that interventions with the ability to decrease death rates, such as engaging CHWs in addressing mortality rate, are known to exist.

The role and responsibilities that CHWs play in decreasing death rates have not been effectively researched by the literature reviewed specifically in Musanze district which was a pilot district among others to have more CHWs trained in different heath packages.

Brazilian, Indian, Nepalese, and American governments have invested in CHWs in an effort to improve maternal health, but there is no literature on the Rwandan context and it among the countries in Africa which has been improved maternal health care through

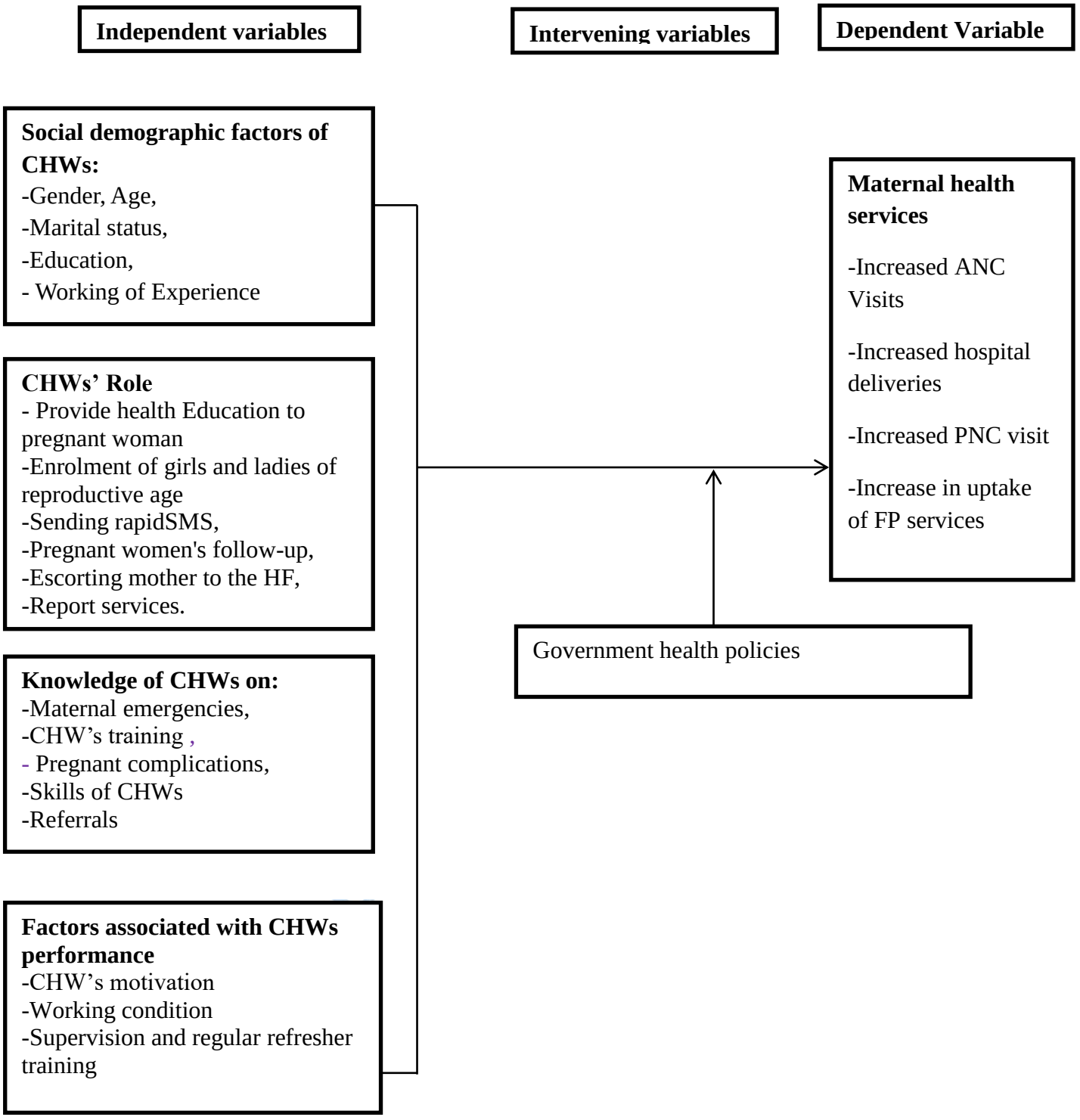
CHWs interventions and the majority of initiatives developed have been focused on goal suggestions (UNICEF and WHO).

Therefore, the maternal health poses a barrier to attaining the SDGs by 2030 in the health-worldwide sector compared with the effort provided by CHWs. Moreover, the researcher believes that better health care service delivery by CHWs provides a more successful program on maternal health.

2.7. Theoretical framework

The current research focused on evaluation approach that focuses on assessing the quality of health care and evaluating them, this examines function of knowledge (as it is produced, created, and maintained) in the selection and implementation of health policies, which may have an effect on citizen-valued health outcomes (Weiss, 2013).

Community health volunteers known as important contributors on maternal health outcomes given that as well as they activities are well implemented ,CHWs help to promote health services such us to increase deliveries at health facility, providing family planning and antenatal care which offers regular checkups to take care of and prevent potential health problems in pregnant women, as well as post-natal care-specified to the mother immediately after delivery and for the first 42 days ,they help identify warning signs and decrease the recommended outcomes for the mother.,. Following the same logic, the paradigm attempts to trace the causation line among a variety of aspects for which members participate in order to ensure that the CHWS role is functioning appropriately.



2.8. Conceptual framework

Figure 6: Relationship between Independent and dependent variables.

In this research, the independent variables include the roles that CHWs perform in providing health care in Musanze District.

These factors include CHWs' actions of providing women with health information, mobilization, Pregnant mother's follow-up, Maternal emergencies, referrals including refresher training and motivation for CHWs, it is presumed that the three predictors have effect on improvement of maternal health in Musanze district.

It is significant to highlight that community health workers in charge of mother and child health are not charged with diagnosing or treating patients; rather, they are responsible for assisting clients and the greater community in getting access to healthcare services.

The dependent variable is indicated by improvements in maternal health , the indicator involves establishing increased ANC Visits, increased hospital deliveries, Increase PNC visits and increase in uptake of FP services. The level at which the respondents (CHWs and supervisors) was supportive towards improving their maternal health were the main parameter for this research.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter focuses on the research design used in carrying out the study, study area and they include the target population of the study, study population ,and the sample size, reliability and validity of research instruments ,sampling procedures and techniques, method for collecting quantitative and qualitative data and analysis and Presentation of quantitative and qualitative data

3.1. Study design

This was a cross-sectional study utilized quantitative and qualitative methods. The study examined the influence of Community health workers on uptake of Maternal health services in Musanze District, Northern province. This study was cross-sectional because it examined the exposure and outcome at a time.

3.2. Research area

Research was carried out in Musanze District. The district has 15 Sectors, 68 cells and 432 villages. It has 16 health centers and 432 community in charge of maternal health. According to Rwanda's National Institute of Statistics (NISR, 2016), Musanze District has a population of 424,572 people and is densely populated of 530, 4 per km^2.

The study was done in this district because it is one among the district started with many packages through community health workers where there was a chance to get CHWs experienced in their work.

3.3.Target Population

The target population was 432 CHWs in charge of maternal and new born health from 16 health facilities of Musanze District in Northern province.

3.4.Study population

The participants in this research were CHWs and their supervisors appointed at health facilities levels in Musanze District.

3.4.1. Inclusion criteria

1. The research included only the CHWs-MH, who had resided in research area for at minimum 6moths.
2. CHWs who consented to take part in the study
3. CHWs aged 18 year and above

3.4.2. Exclusion criteria

1. The research excludes CHWs called "Binome" and counselors or health care professionals are not considered.

3.5. Determining the sample size

The researcher utilized the formula of Cochran (1977) to calculate the sample size, that proposes the random sample is obtained by multiplying the average population by the number of people in the sample, a square of the confidence level **(**Martin, 2005**).** Which is to state

$$n = \frac{N}{1+(N.e^2)}$$

Where;

n is the sample size

N represents the total population, in this case, total number of CHWs in Musanze District= 432

e indicates the level of confidence (0.05).

$$n=\frac{432}{1+(432)(0.05^2)}=207.69230\approx 208$$

So, the estimated sample size was 208 CHWs then for qualitative data, community health supervisor's all were interviewed in16 Health facilities of Musanze district.

3.6. Sampling procedures and techniques

A simple random sampling procedure was utilized to choose 208 CHWs from 432 CHWs in charge of maternal health of Musanze District. The number of CHWs was proportionally distributed to 16 health facilities (Musanze district, 2021)

The table below shows how CHWs were proportionally distributed to 16 Health facilities.

Table 3. 1: The table below shows the distribution of CHWs to the Health facilities.

Health Center's Name	**Number of CHWs per Health facility.**	**Representative sample proportional to sample size**	**Rounded Sample size**
Kimonyi	13	6.2	6
Musanze	18	8.6	7
Busogo	25	12.03	12
Gataraga	16	7.7	8
Kinigi	23	11.07	11
Kabere	25	12.03	12
Nyange	32	15.4	14
Bisate	29	13.9	14
Karwasa	30	14.4	14
Gasiza	27	13	13
Muhoza	49	23.5	24
Nyakinama	51	24.5	25
Rwaza	32	15.4	15
Gashaki	22	10.5	11
Murandi	18	8.6	9
Shingiro	22	10.5	11
TOTAL=16	**432**	**207.33**	**208**

3.7. Method for collecting quantitative data

A questionnaire with both open-ended and closed-ended questions was used to gather quantitative data. The questionnaire had four sections, A, B, C, and D. Section A detailed on socio-demographic characteristics of CHWs. Section B covered the influence of CHWs roles on uptake of maternal health services. Section C included necessary CHW's knowledge associated with uptake of maternal health services. Additionally, section D based on the factors associated with the performance of CHWs.

3.8. Method for collecting qualitative data

Qualitative data were collected using key informants interview (KII) with community health supervisors. The data were collected using a conversation guide with pre-prepared questions, the guide extracted information from the participants. The information was recorded using an audio recorder.

3.9. Validity and reliability

To be sure that the instruments are reliable, researcher pre-tested the questionnaires with 10% of sample,therefore, in Musanze District, the tool's pre-testing involved 21 respondents. Data were then loaded into SPSS version 26 to determine the internal consistency and the alpha coefficient was observed to be 0.7 indicating that the instrument was reliable and consistent.

The questionnaire was adjusted using the pre-testing results to make it easier for CHWs to understand by inserting, removing, and mixing sections in some factors.

3.10. Analysis and Presentation of Quantitative Data.

The statistical tool for social sciences (SPSS) Version 26 was utilized to analyze quantitative data. Descriptive statistics were utilized to summarize categorical variables using frequencies and percentages. The link between the dependent and independent variables was examined using a bivariate analysis as well as a Chi-square test of independence. The parameters with a significant association with the dependent variable were then modeled using ordinal logistic regression to develop a prediction model. This was done with a 95% confidence interval. Ordinal logistic regression was the most suitable inferential statistic as the dependent variable was ordinal. This statistic established further associations for the indicators which were significant in bivariate analysis. Text, tables, and graphics were used to present the results.

3.11. Qualitative Data analysis

In this study, qualitative data were analysed by NVIVO version 10. Data was recorded using an audio recorder, were then converted to text for analysis. Transcripts have been uploaded to NVIVO. Similar patterns were identified, and themes were generated.

3.12. Ethical Consideration

The MKU Institutional Research Ethics and Review Committee (IREC) provided ethical approval for this study. The permission to perform the research was sought from Musanze district after presenting an official authorization letter from MKU. Following receiving written permission, the investigator went to the health facilities to consent the participants to participate.

The participation was voluntary, and anonymity was guaranteed to the respondents by excluding any information that can directly identify the participants. Written consent was sought from participants before participation and Participating was purely optional. There weren't sanctions regarding their participation, and responses given.

They were permitted to leave the study at any moment and there were no consequences regarding their withdrawal. Respondents were given the assurance that their answers would be only used anonymously and for these sole academic purposes. The respondents got time to read data collection tools and asked anything they didn't understand.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.0. Introduction

This chapter presents the findings and discussion. The way the results were presented and their interpretations. The results discussed here were from the data collected through the use of questionnaires and interviews responded by the study participants.

4.1. Uptake of Maternal Health Services.

This study recruited 208 CHWs from 16 health facilities of Musanze district and all the participants were female, 100%. Four indicators were assessed to determine the level of uptake of maternal health care. These were the number of mothers completing antenatal care visits, number of mothers giving birth at healthcare centers, postnatal care attendance, and rate of Family Planning uptake among mothers.

The variables were assessed to establish whether there was any association with the uptake of maternal health services, these variables were determined utilizing a five-point Likert scale in different ways from strongly disagree to strongly agree and from very low to very high. The chi-square test was applied, and Fishers exact test applied when assumption 4 of chi-square was not satisfied and about the internal reliability of these variables had the Cronbach's Alpha value of $\alpha = 0.73.6$. When the four items were combined and analyzed, it revealed that more than three quarters(76.4%) of the participants had observed a Very High uptake of maternal health services then 22.1% of them reported High uptake ,and the rest moderate uptake (1.4%).None of the reported Very Low and Low uptake as it shown in table 4.1.

Table 4. 1.Summary for overall Uptake of Maternal Health Services

Overall Uptake of Maternal Health Services			
		Frequency	Percentage
Valid	Moderate	3	1.4
	High	46	22.1
	Very high	159	76.4
	Total	208	100.0

4.2. Uptake of Maternal Health Services per Indicator

The aim of the research was to establish the individual contribution of the assessed variable to the uptake of maternal health services, the results showed that 73.6% of participants responded that the deliveries in health care facilities had the most improvement after CHWs started to work in the community.

Results showed that 65.9% of the CHWs took part in this research responded that there was a very high increase of mothers completing ANC visits. More than half of the CHWs, 54.3% responded that there was a very high uptake of mothers towards using FP after providing health education. Moreover, 45.7% responded that there was a very high increase in the rate of post-partum mothers' attendance to PNC visits with respect to CHWs' visits.

Table 4. 2. Frequency table showing the uptake of Maternal Health Services per Indicator

Variable	Category	Frequency	Percentage
Mothers completed ANC visits has increased at the health facility after CHWs started to work in the community	Average	4	1.9
	High	67	32.2
	Very high	137	65.9
CHW's record of pregnant mothers has increased deliveries in a health care facility	Moderate	3	1.4
	High	52	25.0
	Very high	153	73.6
The rate of post-partum mothers' attendance to PNC visit with respect to CHWs visit	Very low	2	1.0
	Low	4	1.9
	Moderate	5	2.4
	High	102	49.0
	Very High	95	45.7
The rate of mother's uptake towards using FP after providing health education on FP	Low	1	.5
	Moderate	6	2.9
	High	88	42.3
	Very high	113	54.3

4.3. Socio-demographic Factors of CHWs

This study involved 208 CHWs who responded to various metrics of the research questionnaire. All the participants were female, 100%. Most of the participants (42.3%) were between the ages 41-51 then those who were 50 years and above (34.1%) while few participants(2.9%)were falling in the interval of 20-30 years.

Many CHWs were older maybe because older CHWs are highly trusted by the community in delivering maternal health services as compared to the young ones. The majority, 81.3% had over ten years of experience as a community health worker, and only 8.2% had less than three years of experience in the program, this makes them to have a best performance in providing services related to maternal health in the community.

About 81.3% of participants were married, 17.3% were widows and 1.0% were single, married CHWs are highly trusted by the community members as compared to those who are single and this has an influence in offering community services for maternal health. Three quarter of CHWs participated in the study (75.0%) and only 4.3% attained a university education. This shows that most of the CHWs in Musanze District-Rwanda have a primary level of education. In term of occupation other than being a CHW, almost all of them (98.1%)were farmers and only 0.5% were artisans as presented in table 4.3.

Table 4. 3.Frequency distribution table for social demographic characteristics of CHWs

Social-demographic Characteristics	Category	Frequency	Percentage
Gender	Female	208	100.0
Age category of respondents	Between 20-30	6	2.9
	Between 31-40	43	20.7
	Between 41-51	88	42.3
	51 and above	71	34.1
Level of Education of respondent	None	14	6.7
	Primary	156	75.0
	Ordinary level	23	11.1
	Secondary	5	2.4
	University	10	4.8
Marital Status of CHWs	Single	2	1.0
	Married	169	81.3
	Widow	36	17.3
	Divorced	1	.5
Occupation/profession of respondents	Farmer	204	98.1
	Salaried	1	.5
	Artisan	1	.5
	None	2	1.0
Working experience of CHWs	6 months to 3 years	17	8.2
	From 4-6 years	8	3.8
	From 7- 9 years	14	6.7
	From 10 years and Above	169	81.3

4.3.1. Age category and uptake of maternal health services

Results showed that 66 (75.0%) of CHWs who were aged between 41-50 years, ranked the uptake of maternal health care services as very high with 75%, 52 (73.2%) who were aged 51 years and above rated the uptake as very high with 73.2%, 36(83.7%) , who were aged 31-40 years, ranked the uptake as very high with 83.7% while 5(83.3%), who were aged between 20-30 years, ranked the uptake of maternal health services as very high with 83.3%.

In this study, uptake of maternal health services is independent of CHWs age, Fisher's exact test showed no relationship between the uptake of maternal health care and age of CHWs (X^2 = 5.135 df =6*p**=0.535).

This was not the case in qualitative findings as from interview with CHWs supervisor ; *CHWs who are more than 40 years old and served for a long period as CHWS are more trustful than those who are still young, this has been identified by the big number of pregnant women who received health care services at the community level, additional to this, a portion of CHWs with age more than 70 years old have a problem of vision, unable to visit all pregnant women, and make follow up in their respective village* (KII 9).

These results contradicted with those of research conducted in Busia district-Kenya were age of CHWs was obtained to be correlated with the uptake of maternal Health care as CHW in the age bracket of 40-50 and those with 51 years and above had best performance in increasing the uptake of maternal health service through a home visit (Crispin, N.et al, 2012).

Findings were also not in agreement with ministry of Health report as the older CHWs were being highly trusted and respected and were likely to enhance the uptake of maternal health care in the community (MoH ,2007).

4.3.2. Education level of CHWs on uptake of maternal health services

The most of the participants, 118(75.6%) had completed primary school, rated the uptake as very high with 75.6%, 23(100.0%) who completed the ordinary level, ranked the uptake of maternal health services as very high with 100%, 9(90.0%) who completed university, rated the uptake of maternal health services as very high with 90%, and only 5(100.0%) who have done secondary school ranked the uptake as very high with 100%.

The level of education of CHWs revealed a significant relationship with the uptake of maternal health services (X^2 = 27.330, df =8p*<.001),there was a significant association between the level of education of CHWs and uptake of maternal health services.

This was supported by the interviews with CHWs' supervisor 16 who stated that *"Education and training provided to the CHWs have influenced uptake of maternal health services as the highly educated are more active in training and reporting compared to those with lower education"*(KII 16).

This was same as the findings from a study by (Mulingwa ,2014) where the level of education of CHWs had an effect on the uptake of maternal health services as it assists them to make a follow-up of CHWs advises during pregnancy and after birth.

4.3.3. Occupation of CHWs on uptake of maternal health services

More than three quarter, 155(76.0%) of CHWs who were farmers ranked the uptake of maternal health services as very high with 75.9% while 3(1.5%) ranked it as moderate and all of the rest (100.0%) who were artisan and salaried ranked the uptake as very high 100%.

Fisher's exact test didn't show any significance association between the occupation of CHWs and the uptake of maternal health services in the community where (X^2 = 28.152 df =6 *p**=1.000).

But this was not the case in qualitative findings as the CHWs supervisor reported that; "*The majority of people in Rwanda including our CHWs are farmers so they are combining their daily activities with providing health services in their respective villages, this could probably negatively affect provision of maternal health services in the country as our CHWs would spend most of their time in erring their livelihood rather than focusing in providing maternal health services"* (KII 10).

Quantitative findings from this study were not in agreement with the findings from a research carried out in Tanzania on the motivation and job satisfaction of community health workers in the Morogoro Region, the vast majority (94%) of participants reported that farming was their primary source of income and this decreases their performance in providing maternal health services as CHWs are working as volunteers and are overwhelmed with responsibilities (Mpembeni, et al, 2015)

4.3.4. Marital status of respondents on uptake of maternal health services

All participants who were single 2(100.0%) ranked the uptake of maternal health services as very high with 100%, more than three quarter 130(76.9%) of married CHWs ranked the uptake as very high with 76.9% while 3(1.8%) of them ranked the uptake of maternal health services as moderate.

The Fisher's exact test of independence indicated that was no relationship between uptake of maternal health services in the community and the marital status of CHWs ($X^2 = 7.861$, df =6 $p^* = .462$).

The results from the qualitative data did not support these assumptions; married *CHWs are more trustful by mothers in the community than those who are still single in the services*(KII16) Wangalwa et al., (2013) found the same results that uptake of maternal health care was independent to the marital status of CHWs.

But the results were different to the findings a research on effectiveness of CHWs in Kenya (Mulingwa, 2014), where it was discovered that there was a substantial correlation between the uptake of maternal health care and the marital status of CHWs, with more than half of them being married.

4.3.5. Working Experience of CHWs on uptake of maternal health services

Additionally, the research sought to determine how long CHWs had been offering maternal healthcare services. Most of CHWs 135(79.9%) with working experience of 7 – 9 years ranked the uptake of maternal health services as very high with 85.7% while less than half 8(47.2%) of those with 6months to 3 years of working experience ranked the uptake a very high with 47%.

Fisher's exact test of independence showed a significant relation between CHWs years of experience and the uptake of maternal health service ($X^2 = 17.312$ df =6 $p^* = .005$).

Highly experienced CHWs had a very high performance as compared to less experienced community health workers, this could be because they have enough knowledge as they are aware of the challenges and how to interact with mothers in the community, also they could have attended list of trainings as compared to those who are new in the field.

The same was also reported in an interview with CHWs supervisor; E*xperience of CHWs is a more important factor to consider because as well as CHWs are experienced in their work it means the skills also were improved because of training received in different packages comparatively to new CHWs recruited on the services and this has improved the uptake of maternal health care, the reason given by interviewed supervisors* (KII16).

Crispin, et al. (2012) did the study on the same in Kenya and found that, as the years of experience of CHWs improve also the uptake of maternal health services also increase, this was confirmed by increased uptake of ANC visit, delivery and uptake of family planning.

The same findings we also reported in the study Nigeria as the experience of CHWs was linked with the enhanced uptake of maternal Health care Since it was found that they had prior experience providing MHC services including counselling women on the value of attending prenatal, escorting mothers to deliver at HF and antenatal clinics, referrals, health education, women's health, family planning can be seen in table 4.4.

Table 4. 4. Association of sociodemographic characteristics of respondents on Uptake of Maternal Health Services

Socio-demographic Factors	Category	Uptake of Maternal Health Services			Chi-square p-value
		Moderate	High	Very High	
Age category of respondents	Between 20 - 30 years	0(0.0%)	1(16.7%)	5(83.3%)	$X^2 = 5.135$ df =6
	Between 31 - 40 years	1(2.3%)	6(14.0%)	36(83.7%)	*p** =.535
	Between 41 - 50 years	2(2.3%)	20(22.7%)	66(75.0%)	
	51 years and above	0(0.0%)	19(26.8%)	52(73.2%)	
Level of Education of respondent	None	0(0.0%)	10(71.4%)	4(28.6%)	$X^2 = 27.330$
	Primary	3(1.9%)	35(22.4%)	118(75.6%)	df =8
	Ordinary Level	0(0.0%)	0(0.0%)	23(100.0%)	*p** <.001
	Secondary	0(0.0%)	0(0.0%)	5(100.0%)	
	University	0(0.0%)	1(10.0%)	9(90.0%)	
Marital Status of CHWs	Single	0(0.0%)	0(0.0%)	2(100.0%)	$X^2 = 7.861$
	Married	3(1.8%)	36(21.3%)	130(76.9%)	df =6
	Widowed	0(0.0%)	9(25.0%)	27(75.0%)	*p** =.462
	Divorced	0(0.0%)	1(100.0%)	0(0.0%)	
Occupation/profession of respondents	Farmer	3(1.5%)	46(22.5%)	155(76.0%)	$X^2 = 7.842$
	Salaried	0(0.0%)	0(0.0%)	1(100.0%)	df =6
	Artisan	0(0.0%)	0(0.0%)	1(100.0%)	*p** =1.000
	None	0(0.0%)	0(0.0%)	2(100.0%)	
Working experience of CHWs	6 months to 3 years	0(0.0%)	9(52.9%)	8(47.1%)	$X^2 = 17.312$ df =6
	Between 4 - 6 years	0(0.0%)	4(50.0%)	4(50.0%)	*p** = .005
	Between 7 - 9 years	1(7.1%)	1(7.1%)	12(85.7%)	
	10 years and Above	2(1.2%)	32(18.9%)	135(79.9%)	

The two significant variables were modeled with the ordinal logistic regression analysis to develop a prediction model for the uptake of maternal health care. Bases on the results, the

Nagelkerke R-square showed that the model explains that 23.4% of the variance in the uptake of maternal health care was due to these variables as it shows in table 4.5.

Table 4. 5. Showing Regression model information, goodness -of-Fit and Pseudo R-Square of Social demographic characteristic of CHWs and uptake.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	67.664			
Final	30.537	37.127	7	.000

Link function: Logit.

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	12.586	15	.634
Deviance	8.903	15	.883

Link function: Logit.

Pseudo R-Square

Cox and Snell	.163
Nagelkerke	.234
McFadden	.149

Both CHWs' level of education and their working experience significantly contributed to the prediction model, the logistic regression finding showed that CHWs with a University education led to 15 times increase in the uptake of maternal health care services compared with those with no education.

Similarly, CHWs with more than 10 years of experience led to 3.6 times increase in the uptake of maternal health care compared with those with 6 months to 3 years of working experience as presented in table 4.6.

Table 4. 6. Ordinal logistic regression tables on influence of Social Demographic Factors of CHWs on Uptake of Maternal Health Services.

Parameter Estimates								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Uptake_of Maternal_health services_ Moderate]	-5.571	1.217	20.967	1	.000	-7.955	-3.186
	[Uptake_of_Maternal_Health_Services_ High]	-2.201	1.056	4.349	1	.037	-4.271	-.132
Location	[Education=1]	-2.714 **Exp(B)= .066**	1.190	5.204	1	.023	-5.046	-.382
	[Education=2]	-.838	1.079	.603	1	.437	-2.951	1.276
	[Education=3]	18.418	6219.700	.000	1	.998	-12171.970	12208.807
	[Education=4]	18.719	.000	.	1	.	18.719	18.719
	[Education=5]	0[a]	.	.	0	.	.	.
	[Working experience =1]	-1.285 **Exp(B)= .277**	.542	5.617	1	.018	-2.348	-.222
	[Working experience =2]	-1.301	.733	3.153	1	.076	-2.737	.135
	[Working experience=3]	-.099	.794	.015	1	.901	-1.654	1.457
	[Working experience =4]	0[a]	.	.	0	.	.	.

4.4. The Influence of Community Health Workers Roles on Uptake of Maternal Health Services.

Those who strongly agreed that Sending red Alert SMS by CHWs for pregnant mothers' emergencies has improved maternal health, 157(75.4%) and rated the uptake of maternal health as very high with 84.7%), and those who agreed the influence of sending red Alert,

48(23%) ranked the uptake of maternal as high with 47.9%).Chi-square test for independence demonstrated a significant relationship between Sending red Alert SMS by CHWs and uptake of maternal health services (X^2 = 30.510df =6 *p**=.001).

For the rate of the monthly report submitted by CHWs to the health center and contribution toward maternal health services, 49(23.5%) of those who had a high perception of the statement, and rated the uptake of maternal health as high with 34.7%) and those who had a very high perception on the statement were 158(75.9% rated the uptake as very high with 80.4%).

Fisher's exact test for independence revealed a significant relationship between report submitted by CHWs to the health center toward maternal health care services and uptake (X^2 = 9.120 df =4 *p** =.070).

Those who strongly agreed on CHWs' enrolment of girls and ladies of reproductive age has contributed positively to maternal health, 176(84.6%) rated the uptake as very high with 79.5%.

Fishers exact test for independence showed a significant association between CHWs' enrolment of girls and ladies of reproductive age and uptake of maternal health services (X^2 = 8.675 df =2 *p** =.011).

Additionally, 150(72.2%) of those who had a very high follow-up to the pregnancy has improved maternal health, rated the uptake as very high with 82.5%. 58(22.8%), and ranked the uptake as high with 16.2%).

Fisher's exact test for independence showed ,there was a significant association between the follow-up made to the pregnancy mothers and uptake of maternal health (X^2 = 11.727 df =2 *p** =.001)

Those who strongly agreed that health education of CHWs to the pregnant women on ANC improved maternal health, 172(82.6%) rated the uptake as very high with 80.2% while 34(16.3%), rated the uptake as high with 58.8%.

Fisher's exact test for independence showed a significant relationship between health education of CHWs to the pregnant women on ANC and uptake of maternal health (X^2 = 12.463df =4 *p** =.014),as shown in table 4.7.

Table 4. 7. Association showing independence of overall Uptake on Maternal Health Services

CHWs Roles	Category	Uptake of Maternal Health Services			Chi-square p-value
		Moderate	High	Very High	
Sending red Alert SMS by CHWs for pregnant mothers' emergencies has improved maternal health	Disagree	0(0.0%)	1(100.0%)	0(0.0%)	X^2 = 30.510
	Neutral	0(0.0%)	0(0.0%)	2(100.0%)	df =6
	Agree	1(2.1%)	23(47.9%)	24(50.0%)	*p**=.001
	Strongly agree	2(1.3%)	22(14.0%)	133(84.7%)	
The rate of monthly report submitted by CHWs to the health center and contribution toward maternal health services	Moderate	0(0.0%)	0(0.0%)	1(100.0%)	X^2 = 9.120
	High	1(2.0%)	17(34.7%)	31(63.3%)	df =4
	Very High	2(1.3%)	29(18.4%)	127(80.4%)	*p** =.070
CHWs' enrolment of girls and ladies of reproductive age has contribute positively to maternal health	Agree	2(6.3%)	11(34.4%)	19(59.4%)	X^2 = 8.675
	Strongly agree	1(0.6%)	35(19.9%)	140(79.5%)	df =2
					*p** =.011
CHWs' follow-up to the pregnant has improve maternal health	High	1(1.9%)	21(38.9%)	32(59.3%)	X^2 = 11.727
	Very High	2(1.3%)	25(16.2%)	127(82.5%)	df =2
					*p** =.001
Health education of CHWs to the pregnant women on ANC has	Neutral	0(0.0%)	1(50.0%)	1(50.0%)	X^2 = 12.463
	Agree	2(5.9%)	12(35.3%)	20(58.8%)	df =4

improve maternal health	Strongly agree	1(0.6%)	33(19.2%)	138(80.2%)	p^* =.014

The results from findings showed that among those who agreed that sending red Alert SMS by CHWs for pregnant mothers' emergencies has improved maternal health, 48(23%) rated the uptake of maternal as high with 52.1% .The study showed that mothers completed ANC visits have increased at the health facility after CHWs started to work in the community.

While those strongly agreed that sending red alert SMS by CHWs towards maternal health services, 157(75.4%) rated the uptake of maternal health care as very high with 72%, only 1(0.4%) was disagreed, and 2(0.9) were neutral in the statement. The results showed that a statistically significant association between sending red alert SMS and uptake of maternal health services as very high (72%) with chi-square test results (X^2 = 17.493 df =6 p^* =.006).

48(23.0%),ranked high on the rate of the monthly report submitted by CHWs to the health center and contribution toward maternal health services, rated the uptake of maternal health as high ,while majority of respondents ,157(75.4%), rated the uptake of maternal as very high 72% with chi-square test results (X^2 =13.111 df =4 p^* =.008).

176(84.6%) strongly agreed that CHWs' enrolment of girls and ladies of reproductive age has contributed positively to maternal health, rated the uptake of maternal health as very high with 69.9%.This statement showed that mothers completed ANC visits have increased at the health facility after CHWs started to work in the community where chi-square test was significant with chi-square test results (X^2 = 9.788 df =2 p^* =.006).

58(22.2%),respondents had a high perception that CHWs' follow-up to the pregnant has improved maternal health, rated the uptake of maternal health as high with 78.7% while

150(72.1%) of respondents had very high perception, rated the uptake of maternal health as very high (78.7%) with chi-square test results (X^2 = 39.540 df =2 *p**=.001).

However, 34(16.3%) agreed that health education of CHWs to the pregnant women on ANC has improved maternal health, rated the uptake of maternal health services as high with 47.1%. Those who strongly agreed were 172(82.6%), rated the uptake of maternal health care as very high 70.9%, where chi-square test was significant with (X^2 = 18.317 df =4 *p** =.001).

The results showed that mother who completed ANC visits has increased at the health facility after CHWs started to work in the community. These results are confirmed by the research carried out by Ngabo et., al,2012. This can be deduced in table 4.8.

ANC at health facilities have been increased through the effort of CHWs done in health education and the promotion of visiting mothers in their village. This has influenced positively the changes of some miss understanding for certain mother and escorting pregnant women to deliver at health facility has also increased deliveries at a health facility, visit done by CHWs during the ANC period up to delivery this has decreased maternal and child mortality (KII 16).

Table 4. 8.The Influence of CHWs Roles on ANC Uptake among pregnant Mothers

CHWs Roles	**Category**	**Mothers completed ANC visits has increased at the health centre after CHWs started to work in the community**			**Chi-square p-value**
		Average	**High**	**Very High**	
Sending red Alert SMS by CHWs for pregnant mothers'	Disagree	0(0.0%)	1(100.0%)	0(0.0%)	X^2 = 17.493 df =6 *p** =.006
	Neutral	0(0.0%)	0(0.0%)	2(0.0%)	
	Agree	1(2.1%)	25(52.1%)	22(45.8%)	
	Strongly agree	3(1.9%)	41(26.1%)	113(72.0%)	

emergencies has improved maternal health					
The rate of monthly report submitted by CHWs to the health center and contribution toward maternal health services	Moderate High Very High	0(0.0%) 2(4.1%) 2(1.3%)	0(0.0%) 24(49.0%) 43(27.2%)	1(100.0%) 23(46.9%) 113(71.5%)	X^2 =13.111 df =4 *p** =.008
CHWs' enrolment of girls and ladies of reproductive age has contribute positively to maternal health	Agree Strongly agree	2(6.3%) 2(1.1%)	16(50.0%) 51(29.0%)	14(43.8%) 123(69.9%)	X^2 = 9.788 df =2 *p** =.006
CHWs' follow-up to the pregnant has improve maternal health	High Very High	1(1.7%) 3(2.0%)	38(65.5%) 29(19.3%)	19(32.8%) 118(78.7%)	X^2 = 39.540 df =2 *p**<.001
Health education of CHWs to the pregnant women on ANC has improve maternal health	Neutral Agree Strongly agree	0(0.0%) 3(8.8%) 1(0.6%)	2(100.0%) 16(47.1%) 49(28.5%)	0(0.0%) 15(44.1%) 122(70.9%)	X^2 = 18.317 df =4 *p** =.001

All these variables were then modelled with the ordinal logistic regression analysis to develop a prediction model on uptake of ANC among mothers. The model fitting statistic was significant (X^2 =56.841, *df* =9, *p* <.001), confirming that the model fits all these independent variables.

The Goodness-of-fit statistic was insignificant (X^2 =72.438, *df =57, p* =.082), which means that the model has a goodness-of-fit for the fitted data as it shows in table 4.9.

Table 4. 9.Showing the goodness-of-Fit and table showing Pseudo R-Square on ANC Uptake among pregnant mothers.

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	141.344			
Final	84.503	56.841	9	.000

Goodness-of-Fit			
	Chi-Square	Df	Sig.
Pearson	72.438	57	.082
Deviance	44.094	57	.894

Pseudo R-Square	
Cox and Snell	.239
Nagelkerke	.314
McFadden	.191

The model explained 31.4% of the variance in The Wald criterion demonstrates the influence of the five independent variables on the dependent variable. Community health worker's follow-up (p*<.001) and CHWs health education to pregnant women (p=.027) significantly contributed to the prediction model. Community health worker's follow-up of pregnant women leads to 5.8 times increase in mothers completing ANC visits.

Moreover, health education results in 2.7 times increase in the number of mothers completing ANC visits, this can be deduced in table 4.10.

Table 4. 10. Ordinal logistic regression tables on influence of CHWs Roles on ANC Uptake among Mothers

		Parameters Estimate						
							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Mothers completed ANC = 3]	-5.664	.633	79.976	1	.000	-6.905	-4.423
	[Mothers completed ANC = 4]	-1.727	.249	47.968	1	.000	-2.216	-1.238
Location	[Red Alert SMS for pregnant=2]	-3.696	2.335	2.505	1	.113	-8.272	.881
	[Red Alert SMS for pregnant=3]	18.168	.000	.	1	.	18.168	18.168
	[Red Alert SMS for pregnant=4]	-.381	.391	.953	1	.329	-1.147	.384
	[Red Alert SMS for pregnant=5]	0[a]	.	.	0	.	.	.
	[Monthly report submitted=3]	20.359	.000	.	1	.	20.359	20.359
	[Monthly report submitted=4]	-.624	.400	2.430	1	.119	-1.408	.161
	[Monthly report submitted=5]	0[a]	.	.	0	.	.	.
	[Enrolment of girls and ladies=4]	-.322	.455	.501	1	.479	-1.214	.570
	[Enrolment of girls and ladies=5]	0[a]	.	.	0	.	.	.
	[Pregnant women follow up=4]	-1.764 Exp(B) =.171	.367	23.150	1	.000	-2.483	-1.045
	[Pregnant women follow up=5]	0[a]	.	.	0	.	.	.
	[Educating pregnant on ANC=3]	-1.838	1.574	1.364	1	.243	-4.924	1.247
	[Educating pregnant on ANC=4]	-.990 Exp(B) =.372	.448	4.883	1	.027	-1.868	-.112
	[Educating pregnant on ANC=5]	0[a]	.	.	0	.	.	.

Considering the contribution on uptake of PNC period, the findings (table 4.11) showed that post-partum mothers' attendance at the HF has increased at 75.4%. The findings also showed that visiting mothers and giving them health education on uptake maternal health services during ANC up to PNC period has also increased the number post-partum mother's attendance at health facility withX^2 =26.749 df =12 *p** =.026

Secondly, the rate of monthly report submitted by CHWs reported to the health facility contributed toward post-natal care services. 49(23.3%) of participants rated high with 63.3% while a considerable number 75.9% rated very high that shows the influence of report submitted at HF, and ranked uptake as very high with 50.6% which is not significant with Chi-square X^2 =16.064 df =8 *p** =.093

The result also confirmed that the report from CHWs to the health facilities played remarkable influence on uptake of PNC visit at HF. Thirdly, CHWs' enrolment of girls and ladies of reproductive age has contributed positively to the uptake of maternal health. 84.6% strongly agreed that CHW's enrolment of girls and ladies has influenced the uptake of maternal health services significantly while 15.3% agreed. Further analysis showed a statistically insignificant association between CHWs' enrolment of girls and ladies of reproductive age by CHW with X^2 =7.429 df =4 *p** =.087

Fourthly, CHWs' follow-up with the pregnant mothers up to the post-partum period has enhanced the uptake of maternal health services and improved the number of PNC attendance at HF. The result showed that follow up made by CHWs for pregnant mothers and health education on maternal health services has significantly influenced the uptake of PNC attendance at health facility with X^2 =17.271 df =4 *p**<.001 .

Lastly, 172(82.6%) of respondents strongly accepted that health education of CHWs to the pregnant women on the importance of doing postnatal care has improved uptake of maternal health services as very high with 48.3% , 16.3% agreed however, 0.9% were neutral. The result demonstrated that education of CHWs to the pregnant women on ANC didn't indicate any significant relationship with uptake of maternal health servicesX^2 =10.842 df =8 *p** =.324

This should be one of the justifications for increasing PNC at health facility if health education could be well done in the area, these are supported by Rwanda Ministry of Health (2018) ,However, the result showed that was no significant relation between these parameters.

But this was not the case in qualitative findings as the CHWs supervisor reported that;

CHWs know pregnant women in the village and mother who have delivered , this record facilitated them to make follow up and encourage mothers to respect the postnatal care period as it has given at health facilities, with partnership and collaboration with CHWs and HF, PNC attendance has increased at health facility (KII 16).

Table 4. 11. Association showing the Influence of CHWs Roles on PNC Uptake among Post-partum Mothers

CHWs Roles	Category	The rate the post-partum mothers' attendance to PNC visit with respect to CHWs visit					Chi-square p-value
		Very Low	Low	Moderate	High	Very High	
Sending red Alert SMS by CHWs for post-partum mothers' emergencies has improved maternal health	Disagree	0(0.0%)	0(0.0%)	0(0.0%)	1(100.0%)	0(0.0%)	X^2 =26.749
	Neutral	0(0.0%)	0(0.0%)	0(0.0%)	1(50.0%)	1(50.0%)	df =12
	Agree	0(0.0%)	2(4.2%)	2(4.2%)	32(66.7%)	12(25.0%)	*p** =.026
	Strongly agree	2(1.3%)	2(1.3%)	3(1.9%)	68(43.3%)	82(52.2%)	
The rate of monthly report submitted by CHWs to the health center and contribution toward maternal health services	Moderate	0(0.0%)	0(0.0%)	0(0.0%)	1(100.0%)	0(0.0%)	X^2 =16.064
	High	0(0.0%)	2(4.1%)	1(2.0%)	31(63.3%)	15(30.6%)	df =8
	Very High	2(1.3%)	2(1.3%)	4(2.5%)	70(44.3%)	80(50.6%)	*p** =.093
CHWs' enrolment of girls and ladies of reproductive age has contribute positively to maternal health	Agree	0(0.0%)	1(3.1%)	2(6.3%)	20(62.5%)	9(28.1%)	X^2 =7.429
	Strongly agree	2(1.1%)	3(1.7%)	3(1.7%)	82(46.6%)	86(48.9%)	df =4 *p** =.087
CHWs' follow-up to the pregnant has improve maternal health	High	0(0.0%)	1(1.7%)	2(3.4%)	41(70.7%)	14(24.1%)	X^2 =17.271
	Very High	2(1.3%)	3(2.0%)	3(2.0%)	61(40.7%)	81(54.0%)	df =4 *p**<.001
Education of CHWs to the pregnant women on ANC has improve maternal health	Neutral	0(0.0%)	0(0.0%)	0(0.0%)	1(50.0%)	1(50.0%)	X^2 =10.842
	Agree	0(0.0%)	0(0.0%)	2(5.9%)	21(61.8%)	11(32.4%)	df =8 *p** =.324
	Strongly agree	2(1.2%)	4(2.3%)	3(1.7%)	80(46.5%)	83(48.3%)	

These two variables such as sending red alert and follow-up made by CHWs were modelled with the ordinal logistic regression analysis to develop a prediction model on PNC uptake among post-partum mothers. The model fitting statistic was significant (X^2 =19.085, df =4, p*=.001),this confirms that the model fits all the two independent variables.

The Goodness-of-fit statistic was insignificant (X^2 =14.499, df =16, p =.562). This confirms that the model has a goodness-of-fit for the data. The Nagelkerke R-square shows that the modelled variables explain 10.4% of the variance in the PNC uptake among post-partum mothers as it presented in table 4.12.

Table 4. 12. Showing the goodness-of-Fit and table showing Pseudo R-Square on PNC Uptake among post -partum mothers

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	67.982			
Final	48.898	19.085	4	.001

Link function: Logit.

Goodness-of-Fit			
	Chi-Square	Df	Sig.
Pearson	14.499	16	.562
Deviance	14.844	16	.536

Pseudo R-Square	
Cox and Snell	.088
Nagelkerke	.104
McFadden	.050

The Wald criterion demonstrates that the two independent variables significantly contributed to the prediction model: Sending red Alert SMS by CHWs (p*=.017) and

CHWs' follow-up (*p**=.007). Sending red Alert SMS by CHWs results in 2.3 times increase in PNC uptake among post-partum mothers .

CHW follow-up of pregnant women leads to 2.4 times increase in PNC uptake among post-partum mothers compared as it shown in table 4.13.

Table 4. 13.Ordinal logistic regression tables on influence of CHWs Roles on PNC Uptake among Post-partum Mothers

Parameters Estimate								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	Df	Sig.	Lower Bound	Upper Bound
Threshold	[Q14_Post_Partum_mothers_attendance = 1]	-5.302	.742	51.096	1	.000	-6.756	-3.848
	[Q14_Post_Partum_mothers_attendance = 2]	-4.187	.462	81.952	1	.000	-5.093	-3.280
	[Q14_Post_Partum_mothers_attendance = 3]	-3.553	.368	93.116	1	.000	-4.275	-2.831
	[Q14_Post_Partum_mothers_attendance = 4]	-.263	.175	2.272	1	.132	-.605	.079
Location	[Q12_Red_Alert_Sms_for_gregnant=2]	-1.908	2.105	.822	1	.365	-6.034	2.217
	[Q12_Red_Alert_Sms_for_gregnant=3]	-.196	1.406	.019	1	.889	-2.951	2.559
	[Q12_Red_Alert_Sms_for_gregnant=4]	-.830 Exp(B) = .436	.349	5.669	1	.017	-1.514	-.147
	[Q12_Red_Alert_Sms_for_gregnant=5]	0[a]	.	.	0	.	.	.
	[Q9_Pregnant_women_follow_up=4]	-.885 Exp(B)= .413	.327	7.309	1	.007	-1.526	-.243
	[Q9_Pregnant_women_follow_up=5]	0[a]	.	.	0	.	.	.

The researcher also wanted to know the influence of contribution of CHWs on uptake of family planning as shown in table 4.8, the most, 84.7.0% of participants strongly agreed that CHWs' enrolment of girls and women of reproductive age on uptake of maternal health care has influenced the rate of mother's uptake towards using FP after receiving health education in the community from CHWs as high 55.1% while 15.3% agreed.

This demonstrates that CHWs have provided their best by providing health education to the community about family planning and providing FP services to the client's needs and transferring others to the health facility.

However, when asked whether health education of CHWs to the pregnant woman on FP has improved the uptake of maternal health, 82.6% strongly agreed that health education on using family planning has increased uptake as very high with 58.7%.

This shows that CHWs are making efforts in sensitization and visiting mothers during the ANC period and immediately after delivery. In addition, among the respondents 72.1% rate very high, the contribution of CHWs in providing FP at community level and ranked the uptake of maternal health as very high with 58.7%. 27.8% rated it high and ranked uptake as high with 55.9%.

This implies that there is a high rate of contribution of visiting pregnant mothers by CHWs to offer maternal healthcare services and advising them on immediate family planning after delivery, birth spacing, and birth restriction as found in the study by Mwanaisha, (2015) and (NISR) et al., 2015). This was also supported by CHWs supervisors in the interviews.

Family planning attendance has increased at health facilities since CHWs started providing services at the community level. Other reasons are that health education is provided on family planning services. Certain mothers are transferred to HF to get the services that are not done by CHWs such as intrauterine devices (IDU), Contraceptive implants, and injectable contraceptives (KII 16).

To evaluate the influence of CHW's roles on FP uptake was computed, the findings showed that health education of CHWs on FP (X^2 = 25.599 df =6 p*<.001), Contribution of CHW on providing FP and uptake of maternal health with (X^2 = 15.290 df =3 p*

=.001),and CHWs' follow-up to the pregnant women X^2 = 14.044 df =3 p* =.001 were statistically associated with uptake of family planning as it shows in table 4.14.

Table 4. 14. Association showing the influence of CHWs roles toward family Planning Uptake

CHWs Roles	Category	The rate of mother's uptake towards using FP after providing health education on FP				Chi-square p-value
		Low	Moderate	High	Very High	
CHWs' enrolment of girls and ladies of reproductive age has contribute positively to maternal health	Agree Strongly agree	0(0.0%) 1(0.6%)	2(6.3%) 4(2.3%)	14(43.8%) 74(42.0%)	16(50.0%) 97(55.1%)	X^2 = 2.480 df =3 p* = .461
Health education of CHWs to the pregnant woman on ANC has improve maternal health	Neutral Agree Strongly agree	0(0.0%) 0(0.0%) 1(0.6%)	1(50.0%) 4(11.8%) 1(0.6%)	0(0.0%) 19(55.9%) 69(40.1%)	1(50.0%) 11(32.4%) 101(58.7%)	X^2 = 25.599 df =6 p*<.001
Contribution of CHWs in providing FP at community level	Agree Strongly agree	0(0.0%) 1(0.6%)	5(10.9%) 1(0.6%)	24(52.2%) 64(39.5%)	17(37.0%) 96(59.3%)	X^2 = 15.290 df =3 p* =.001
CHWs' follow-up to the pregnant has improve maternal health	High Very High	0(0.0%) 1(0.7%)	3(5.2%) 3(2.0%)	35(60.3%) 53(35.3%)	20(34.5%) 93(62.0%)	X^2 = 14.044 df =3 p* =.001

Further analyses were conducted with ordinal logistic regression, the model fitting statistic was less than the alpha value (X^2 =25.435, df =4, p =.001), confirming that the model fits all the modelled independent variables.

Additionally, the Goodness-of-fit statistic is greater than the alpha value (X^2 =25.814, df =23, p =.310). Thus, the model has a goodness-of-fit for the fitted data, the Nagelkerke R-square show that the model can explain 14.3% of the variance in the uptake of family planning services as it can be seen in table 4.15.

Table 4. 15. Showing the goodness-of-Fit and table showing Pseudo R-Square towards Family planning Uptake.

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	80.562			
Final	55.126	25.435	4	.000

Goodness-of-Fit			
	Chi-Square	Df	Sig.
Pearson	25.814	23	.310
Deviance	22.695	23	.479

Pseudo R-Square	
Cox and Snell	.115
Nagelkerke	.143
McFadden	.074

The reference category for the three variables is '*Very High'*, *'Strongly Agree'* and *'Strongly Agree',* respectively. All the relevant estimates are negative, the findings showed that health education of CHWs on FP (X^2 = 25.599 df =6 p* =.001) , contribution of CHW on providing FP and uptake of maternal health with (X^2 = 15.290 df =3 p* =.001),and CHWs' follow-up to the pregnant women X^2 = 14.044 df =3 p* =.001were statistically associated with uptake of family planning.

The odds ratio From the Exp(B) value generated from the parameter estimates, follow-up of pregnant mothers resulted in 2.3 times improve in the uptake of family planning services among mothers. CHWs contribute positively on providing FP results in 2.1 times increase. Furthermore, health education had 2.9 times increase in family planning uptake as it shows in table 4.16.

Table 4. 16. Ordinal logistic regression tables on influence ofCHWs Roles toward family Planning Uptake among Mother

Parameters Estimates								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Q15_Health_Education_on_FP = 2]	-6.303	1.053	35.809	1	.000	-8.368	-4.239
	[Q15_Health_Education_on_FP = 3]	-4.252	.455	87.292	1	.000	-5.144	-3.360
	[Q15_Health_Education_on_FP = 4]	-.730	.186	15.317	1	.000	-1.095	-.364
Location	[Q9_Pregnant_women_follow_up=4]	-.821 Exp(B)=.440	.331	6.145	1	.013	-1.469	-.172
	[Q9_Pregnant_women_follow_up=5]	0[a]	.	.	0	.	.	.
	[Q10_Educating_pregnant_on_ANC=3]	-1.611	1.483	1.181	1	.277	-4.517	1.295
	[Q10_Educating_pregnant_on_ANC=4]	-1.051 Exp(B) = .350	.398	6.975	1	.008	-1.830	-.271
	[Q10_Educating_pregnant_on_ANC=5]	0[a]	.	.	0	.	.	.
	[Q20_CHWs_activities_contribute_posively=4]	-.730 Exp(B) = .482	.359	4.126	1	.042	-1.434	-.026
	[Q20_CHWs_activities_contribute_posively=5]	0[a]	.	.	0	.	.	.

Last, the researcher examined the influence of Community Health Workers' roles on the rate of deliveries in the healthcare facilities. Theresults on the statement that "Sending Rapid SMS by CHWs for pregnant mothers has improved maternal health services. 75.4% strongly agreed, 23% agreed, 0.4% were Neutral, and 0.9% disagreed with the statement.

This study also showed that CHWs' record of pregnant mothers has increased the number of deliveries at the health facility as it helped CHWs to follow up and monitor pregnant

mothers easily and facilitate them to remember their appointment at HF for ANC and the expected date of delivery.

Secondly, the researcher analyzed rate of the monthly report submitted by CHWs to the health facility and their contribution toward uptake of maternal health services. 23.0% rated high, 75.4% answered very high and only 0.4% were on the view of moderated.

The result indicated that the report from CHWs to the health facility after discussion of data in the coordination meeting significantly influenced the number of deliveries at HF. Thirdly, CHWs' enrolment of girls and ladies of reproductive age has contributed positively to the uptake of maternal health services.

The respondents 84.6% strongly agreed that CHW's enrolment of girls and ladies has influenced the uptake of maternal health services significantly, while 15.3% agreed. Additionally, CHWs' follow-up with the pregnant has improved uptake of maternal health services. 72.1% rated very high on this statement, and 22.8% rated high.

These results showed that follow-up made by CHWs for pregnant mothers has contributed on the uptake of maternal health care and has increased the number of deliveries. finally, the majority 82.6% of participants strongly agreed with the statement that health education of CHWs to the pregnant women on ANC has improved uptake of maternal health services, 16.3% agreed while 0.9% were neutral.

This result showed the influence of CHW's Roles on increasing the number of deliveries at HF. These results are also supported by the research carried out in Ethiopia (Medhanyie

et al., 2012) and Ngabo et., al,2012. These were also supported by the findings from the interviews with CHWs supervisors.

Deliveries at health facilities have been increased at HF through the effort of CHWs done in health education and the promotion of visiting mothers in their village. This has influenced positively the changes of some miss understanding for certain mother and escorting pregnant women to deliver at health facility has also increased deliveries at a health facility, visit done by CHWs during the ANC period up to delivery this has decreased maternal and child mortality (KII 16).

Preliminary analysis with fisher's exact test for independence confirmed that all the variables had a significant relationship with the rate of deliveries in healthcare facilities. These were: Sending rapid SMS by CHWs X^2 = 34.346 df =6 p*<.001, rate of the monthly report submitted by CHWs (X^2 =11.612 df =4 p* =.022).

CHWs' enrolment of girls and ladies of reproductive age (X^2 =12.510 df =2 p* =.001), CHWs' follow-up to the pregnant (X^2 =22.279 df =2p*<.001), and health education of CHWs to the pregnant women (X^2 =14.886 df =4 p* =.004),as it shown in table 4.16.

Table 4. 17.Association showing the influence of CHWs Roles on uptake of deliveries at health facilities.

CHWs Roles	Category	CHW's record of pregnant mothers has increased deliveries in a health care facility			Chi-square p-value
		Moderate	High	Very High	
Sending red Alert SMS by CHWs for pregnant mothers' emergencies has improved maternal health	Disagree Neutral Agree Strongly agree	0(0.0%) 0(0.0%) 1(2.1%) 2(1.3%)	1(100.0%) 0(0.0%) 26(54.2%) 25(15.9%)	0(0.0%) 2(100.0%) 21(43.8%) 130(82.8%)	X^2 = 34.346 df =6 *p**<.001
The rate of monthly report submitted by CHWs to the health center and contribution toward maternal health services	Moderate High Very High	0(0.0%) 1(2.0%) 2(1.3%)	0(0.0%) 20(40.8%) 32(20.3%)	1(100.0%) 28(57.1%) 124(78.5%)	X^2 =11.612 df =4 *p** =.022
CHWs' enrolment of girls and ladies of reproductive age has contribute positively to maternal health	Agree Strongly agree	2(6.3%) 1(0.6%)	14(43.8%) 38(21.6%)	16(50.0%) 137(77.8%)	X^2 =12.510 df =2 *p** =.001
CHWs' follow-up to the pregnant has improve maternal health	High Very High	1(1.7%) 2(1.3%)	28(48.3%) 24(16.0%)	29(50.0%) 124(82.7%)	X^2 =22.279 df =2 *p**<.001
Health education of CHWs to the pregnant women on ANC has improve maternal health	Neutral Agree Strongly agree	0(0.0%) 2(5.9%) 1(0.6%)	0(0.0%) 15(44.1%) 37(21.5%)	2(100.0%) 17(50.0%) 134(77.9%)	X^2 =14.886 df =4 *p** =.004

The table 4.18. Shows the ordinal logistic regression analysis to develop a prediction model on the rate of birth in health center. The model fitting statistic was significant (X^2 =56.500, *df* =9, p<.001), confirming that the model fits all the five independent variables. The Goodness-of-fit statistic was insignificant (X^2 =53.479, *df =57, p* =.608), confirming that the model has a goodness-of-fit for these data. The Nagelkerke R-square shows that the model explains 33.1% of the variance in the dependent variable.

Table 4. 18. Showing the goodness-of-Fit and table showing Pseudo R-Square on uptake of deliveries at HC.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	134.900			
Final	78.400	56.500	9	.000

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	53.479	57	.608
Deviance	43.815	57	.900

Link function: Logit.

Pseudo R-Square

Cox and Snell	.238
Nagelkerke	.331
McFadden	.214

The Wald criterion demonstrates the influence of the five independent variables on the dependent variable such Sending red Alert SMS by CHWs (p<.001), CHWs' follow-up (p=.004) and CHWs education to pregnant women (p=.026) significantly contributed to the prediction model.

The odds ratio showed that sending red Alert SMS by CHWs results in 4.3 times increase in the rate of birth in healthcare center. Additionally, very high CHW follow-up of

pregnant women leads to three times increase in the rate of birth in health Center. Health education resulted in 2.8 times increase in the rate of birth in healthcare center as it can be seen in table 4. 19.

Table 4. 19. Ordinal logistic regression tables on influence of CHWs Roles on uptake of deliveries at health facilities

Parameters Estimate								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[Q11_Record_of_gregnant_mothers = 3]	-6.165	.734	70.466	1	.000	-7.605	-4.726
	[Q11_Record_of_gregnant_mothers = 4]	-2.263	.292	60.156	1	.000	-2.835	-1.691
Location	[Q12_Red_Alert_Sms_for_gregnant=2]	-4.214	2.335	3.259	1	.071	-8.790	.361
	[Q12_Red_Alert_Sms_for_gregnant=3]	16.822	7177.504	.000	1	.998	-14050.826	14084.471
	[Q12_Red_Alert_Sms_for_gregnant=4]	-1.455 Exp(B) = .233	.399	13.278	1	.000	-2.237	-.672
	[Q12_Red_Alert_Sms_for_gregnant=5]	0[a]	.	.	0	.	.	.
	[Q16_Monthly_report_submitted=3]	18.380	.000	.	1	.	18.380	18.380
	[Q16_Monthly_report_submitted=4]	-.393	.419	.880	1	.348	-1.213	.428
	[Q16_Monthly_report_submitted=5]	0[a]	.	.	0	.	.	.
	[Q8_Enrolment_of_girls_and_ladies=4]	-.755	.477	2.505	1	.113	-1.689	.180
	[Q8_Enrolment_of_girls_and_ladies=5]	0[a]	.	.	0	.	.	.
	[Q9_Pregnant_women_follow_up=4]	-1.108 Exp(B)= .330	.385	8.281	1	.004	-1.862	-.353
	[Q9_Pregnant_women_follow_up=5]	0[a]	.	.	0	.	.	.
	[Q10_Educating_pregnant_on_ANC=3]	18.447	6645.014	.000	1	.998	-13005.540	13042.435
	[Q10_Educating_pregnant_on_ANC=4]	-1.020 Exp(B)= .361	.459	4.942	1	.026	-1.920	-.121

[Q10_Educating_pregnant_on_ANC=5]	0[a]	.	.	0	.	.	.

4.5. Influence of CHW's Knowledge on Uptake of Maternal Health Services

The knowledge of CHWs also were assessed to establish whether there was any association with the uptake of maternal health care, these variables were measured using a five-point Likert scale. When CHWs were asked how they know that a pregnant woman is in an emergency situation, the majority (85.1%) cited vaginal bleeding and high fever with vaginal bleeding (12.5%) as the most common danger sign.

When community health workers were asked what they do in order to help the mothers in the case of home deliveries, 89.4% of participants responded that they would implement the administration of Misoprostol, Transfer to the health facility, and send a red alert (Rapid SMS) comprehensively as it can be seen table 4.20.

When knowledge of pregnancy complications triggering CHWs' attention to give mothers direct transfer to the health facility was asked , they mentioned vaginal bleeding (10.6%), high fever (3.8%), and a large percent proportion of them (84.6%) would transfer the mother if they see any of the above complications.

Though the findings showed that a large number of CHWs recognized that they have the necessary knowledge leading them to help pregnant mothers when providing maternal health care in the village, a small number of CHWs still do not consider all dangers signs for pregnant mothers when making their decisions and this could negatively affect maternal health services and involved maternal mortality in the community.

The result shows that CHWs needs a common understanding of primary health care offered to home delivery in the community so that maternal health should be improved in their respective village even if the majority of CHWs indicated that were on primary care provided on that level.

The result showed that a small number of community health workers have insufficient knowledge about pregnancy complications that can attract them to give transfer at HF, so improving their knowledge must be considered to improve maternal health care provision.

In contrast to this study, other studies have shown that CHWs are trained for more advanced practice despite recognizing the danger sign (Olanian et al., 2019) and Gatwaza (2016). The qualitative findings also supported that there was a clear link between the knowledge of CHWs.

When community health workers received an emergency case, immediately they give transfer to the health facility and therefore they make follow up until the mother gets intervention from the health facility, and send Rapid SMS in addition to basic services provided by CHWs, these has influenced positively the uptake of maternal health services (KII 16).

The findings shows that CHWs had the necessary training to provide care to the mother in their community 105(50.4%) and among those who were Strongly agreed 101 (48.5%) ranked the uptake of maternal health services as very high with 90.1%.

Considering the level of knowledge of CHWs on maternal emergencies, those who had a moderate level of knowledge 5(2.5%) rated the uptake of maternal health services as low. 122(58.6%) of those who had a very high level of Knowledge on maternal emergencies,

rated the uptake of maternal health services as very high with 85.2%) and then 78(37.5%) were answered high ,and ranked the uptake as high with 34.6%.

Among participants, those were answered high 120(57.6%) confirmed that they have skills on the administration of misoprostol for PPPH towards maternal health services, ranked the uptake as high with 31.6%).

The majority were responded very high 83(39.9%) and ranked the uptake of maternal health as very high with 91.6%), and only 3(1.4%), were moderate as is seen in table 4.20

The findings are consistent with existing literature as similar results were reported by Mwizerwa (2018) that confirmed the knowledge and contribution of CHWs on maternal health uptake. These results were also supported by qualitative data from CHWs supervisors.

CHWs have the necessary knowledge of maternal emergencies through the training provided to them and this has increased their skills related to the pregnant mother who has an emergency case and how they decide to transfer directly, CHWs need regular refresher training in order to perform well their work (KII 16).

Note that because CHWs are not regarded to be certified health professionals, they are not recognized to be able to treat patients at home (e.g., nurses, doctors). Moreover, taking into consideration the instruction they have received, they are able to identify and assist patients in some situations. However, when a patient requires full medical attention, they refer them to health facilities, or hospitals for additional examinations, diagnostics, and care.

Table 4. 20. Distribution of CHW's Knowledge

Variable	Category	Frequency	Percentage
Danger signs that make CHWs think that a pregnant woman has an emergency case	Apply all	177	85.1
	High fever	1	.5
	Loss of consciousness	4	1.9
	Vaginal bleeding	26	12.5
Primary care CHWs give to the home deliveries when they meet them in the community	Administration of misoprostol	17	8.2
	Transfer to the health centre	1	.5
	Red Alert	4	1.9
	Apply all	186	89.4
The pregnancy complications which attract CHW's attention to give mothers direct transfer to the health centre	Vaginal bleeding	22	10.6
	Lower abdominal pain	2	1.0
	High fever	8	3.8
	Apply all	176	84.6

4.5.1. Association between CHW's Knowledge and Uptake of Maternal Health Services

This research sought to find out whether there is an association between knowledge and uptake of maternal health services.

The analysis's results revealed a statistically significant correlation between CHWs' had necessary training to provide services to the mothers and uptake of maternal health services (X^2 =25.401 df =8 p* =.001), this was run to assess whether there was a relationship between CHW's knowledge of maternal emergencies and uptake of maternal health care, and the results revealed that there was a statistically significant association

between the two examined variables (X^2 =21.525 df =6 *p** =.001). About skills of CHWs on administration of misoprostol to prevent PPPH and uptake of maternal was significant with X^2 =28.152 df =6 *p**=.001), as it shows in table 4.21.

Table 4. 21.CHW's knowledge and uptake of maternal health services

Bivariate Analysis – Chi-square Test of Independence

CHWs Knowledge	Category	Uptake of Maternal Health Services			Chi-square p-value
		Moderate	High	Very High	
CHWs had necessary training to provide care to mothers	Strongly disagree	0(0.0%)	1(100.0%)	0(0.0%)	X^2 =25.401
	Disagree	0(0.0%)	2(28.6%)	5(71.4%)	df =8
	Neutral	0(0.0%)	1(25.0%)	3(75.0%)	*p** =.001
	Agree	2(1.9%)	34(32.4%)	69(65.7%)	
	Strongly disagree	1(1.1%)	8(8.8%)	82(90.1%)	
Knowledge of CHWs on maternal emergencies	Very Low	0(0.0%)	0(0.0%)	3(100.0%)	X^2 =21.525
	Moderate	1(20.0%)	1(20.0%)	3(60.0%)	df =6
	High	2(2.6%)	27(34.6%)	49(62.8%)	*p** =.001
	Very High	0(0.0%)	18(14.8%)	104(85.2%)	
Ranking the skills of CHWs on administration of misoprostol for PPPH.	Low	0(0.0%)	0(0.0%)	2(100.0%)	X^2 =28.152
	Moderate	1(33.3%)	1(33.3%)	1(33.3%)	df =6
	High	2(1.7%)	38(31.7%)	80(66.7%)	*p**=.001
	Very high	0(0.0%)	7(8.4%)	76(91.6%)	

These variables proceeded to the following analysis step with ordinal logistic regression. The model fitting statistic was less than the alpha value (X^2 =62.518, df =14, p <.001), confirming that the final regression model fits all the independent variables. Additionally, the Goodness-of- fit statistic is greater than the alpha value (X^2 =89.666, df =90, p =.490). Thus, the model has a goodness-of-fit for the fitted data as it shown in table 4.22.

Table 4. 22. Showing Multivariate Analysis – Ordinal Logistic Regression on Knowledge of CHWs towards uptake of maternal health services.

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	160.891			
Final	98.373	62.518	14	.000

Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	89.666	90	.490
Deviance	62.282	90	.989

Pseudo R-Square

Cox and Snell	.260
Nagelkerke	.371
McFadden	.250

The odds ratio shows that CHW's had strongly agreed necessary training to provide care to mother resulted in 2.9 times in increase uptake compared mere agreed. A very High Knowledge of CHWs in maternal emergencies leads to 2.3 times increase in the uptake of maternal health care. Similarly, very high skills of CHWs on administration of misoprostol to 5.1 times increase as it shown in table 4.23.

Table 4. 23. Logical Regression of CHW's knowledge on uptake of maternal health

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[Uptake_of_Maternal_Health_Services_Grouped = 3]	-7.845	.940	69.632	1	.000	-9.688	-6.003
	[Uptake_of_Maternal_Health_Services_Grouped = 4]	-4.125	.619	44.445	1	.000	-5.338	-2.912
	[Q17_Knowledge_on_maternal_emergencies=1]	16.631	8940.5	.000	1	.999	-17506.410	17539.672
	[Q17_Knowledge_on_maternal_emergencies=3]	-.237	.994	.057	1	.812	-2.185	1.712
	[Q17_Knowledge_on_maternal_emergencies=4]	-.843 **Exp(B)= .431**	.412	4.174	1	.041	-1.651	-.034
	[Q17_Knowledge_on_maternal_emergencies=5]	0[a]	.	.	0	.	.	.
	[Q19_CHW's_had_training to provide care=1]	-2.671	2.477	1.163	1	.281	-7.525	2.183
	[Q19_CHW's_had_training to provide care=2]	-.638	1.055	.365	1	.545	-2.705	1.430
	[Q19_CHW's_had_training to provide care=3]	.975	1.508	.418	1	.518	-1.980	3.931
	[Q19_CHW's_had_training to provide care=4]	-1.081 **Exp(B)= .339**	.474	5.193	1	.023	-2.010	-.151
	[Q19_CHW's_had_training to provide care=5]	0[a]	.	.	0	.	.	.
	[Q21_ CHW's_ skills_ on_ administration_ of misoprostol=2]	17.030	.000	.	1	.	17.030	17.030
	[Q21_ CHW's_ skills_ on_ administration_ of misoprostol =3]	-2.890	1.469	3.869	1	.049	-5.770	-.010

[Q21_ CHW's_ skills_ on_ administration_ of misoprostol =4]	-1.622 **Exp(B)= .198**	.481	11.355	1	.001	-2.565	-.678
[Q21_ CHW's_ skills_ on_ administration_ of misoprostol _=5]	0[a]	.	.	0	.	.	.

4.6. Factors Associated with the Performance of CHWs towards Uptake Maternal Health

The researcher also examined factors (i.e. Benefits from cooperatives, supervision, regular refresher training, provision of transport and incentives) could be associated with the performance of CHWs towards uptake of maternal health services. About 25 (12.0%) of CHWs who were very satisfied by benefits they receive from cooperatives as members ranked the uptake of maternal Health services as very high 80.0%.

2(2.1%) of those who were satisfied ranked the uptake of maternal health services as moderate. While12(27.3%) of those who were said were neutral regarding the level of satisfaction of the benefits from cooperative ranked the uptake of maternal health care as high.

Those who were satisfied on benefits they are receiving from their cooperative as member ranked the uptake of maternal health services as high with 75.0%. Fisher's exact test determined that there was no association between the level of satisfaction of CHWs and the uptake of Maternal Health care (X^2 = 5.972, df =8, p* =.635).

This is different from the findings in a study done by Mugeni (2014),Where CHWs level of satisfaction was associated with the uptake of maternal health care as the satisfaction of

profits from their cooperative was linked with the increased uptake of the health care in the village.

Most of CHWs 118 (56.7%) who said regular supervision of CHWs affects the uptake of maternal health services rated the uptake as very high with 87.3% and only 3(3%) of them rated the uptake as moderate with 3.3%. There was an association between regular supervision of CHWs and the uptake of maternal health services (X^2 = 18.462, df 1, *p**<.001).

Maybe because working under supervision increase pressure and no one would want to make a mistake by negligence. In an interview with CHWs supervisor 16, the supervisor pointed out that; "*Regular supervision is also limited while it is a very important factor that helps CHWs to enhance the uptake of maternal health services at the village through the exchange of ideas with their supervisors"* (KII 16).

Musoke et al (2019), also reported the same findings on supervision of CHWs in a study in Uganda where the study found that, improved supervision of CHWs enhance their performance in their daily activities like health education and household visiting.

More than half 113(54. 3%) of CHWs who said regular refresher training influence the uptake of maternal health services rated the uptake as very high with 85.0% while only 3(3.2%) of them rated the uptake as moderate. While 95(45.6%) of those who said refresher, training is not affecting the uptake of maternal health services rated the uptake as high.

Fisher's exact test of independence found a significant association between the regular refresher training of CHWs and the uptake of maternal health services (X^2 = 11.036, df =1,

p =.002). Findings were similar to the findings from David Musoke et al (2019) who found that training covering the scope of CHWs found to increase the performance of CHWs in providing health care services.

Findings from a qualitative research on Rwanda's developing CHWs system found that inconsistent training and inadequate supervision continue to be the biggest obstacles to CHWs performing to their full potential (Condo et al., 2014).

Among the CHWs who said transport is one of the factors affecting their performance, those who said that transport was not a factor affecting their performance, 89(57.2%) rated the uptake as high with 39.3% while those who perceived transport as a factor, 119(57.2) ranked the uptake of maternal health services as very high with 90.8%.

Those who said transport is affecting their performance, ranked the uptake of maternal hath services as very high was (57.3%) and none of them ranked the uptake as moderate. There was a significant association between the transport as a factor affecting CHWs performance and the uptake of maternal health services (X^2 = 31.950, df =2, p<.001).

This is the same with a research conducted in Rwanda by Gatwaza 2016 which reported that about 60.8% of CHWs reported transportation is the barrier to their daily activities and there was a statistical relationship between transportation as the barrier to their activities in the community with p = 0.048.

On incentives, about 114 (54.8%) CHW who perceived incentives as a major factor to their performance, rated the uptake as very high with 89.5% and 3(3.2%) of them rated the uptake to be moderate. However,96 (46.1%) of CHWs reported incentives was not affecting their performance rated the uptake of maternal health care in the village as high ,none of them rated the uptake as moderate.

In bivariate analysis with fisher's exact test of independence, there was a significant relationship between the incentives given to CHWs and the uptake of maternal health services (X^2 = 24.260, df 2, p*<.001). Findings from an interview also revealed the importance of incentives to CHWs as it shows in table 4.24.

"The incentives of CHWs called PBF is a very important factor that is associated with their performance but is not sufficient and not given on time"(KII 16).

The same findings were also reported by Debra2015 in a research on the impact of compensation and incentives on CHWs' motivation and concentration, where giving more incentives and motivation to CHWs increases their focus from other part-time works to their work as CHWs in delivering health services to the community members at the community level.

Table 4. 24.Association showing the factors associated with the Performance of CHWs towards Uptake Maternal Health Services.

Bivariate Analysis – Chi-square Test of Independence

Factors Associated with the Performance of CHWs towards Maternal Health Services	**Category**	**Uptake of Maternal Health Services**			**Chi-square p-value**
		Moderate	**High**	**Very High**	
Level of CHWs satisfaction on benefits they are receiving from their cooperative as member	Very Dissatisfying	0(0.0%)	0(0.0%)	8(100.0%)	X^2 = 5.972 df =8 *p** =.635
	Dissatisfying	0(0.0%)	8(22.9%)	27(77.1%)	
	Neutral	0(0.0%)	12(27.3%)	32(72.7%)	
	Satisfied	2(2.1%)	22(22.9%)	72(75.0%)	
	Very Satisfied	1(4.0%)	4(16.0%)	20(80.0%)	
CHW's appreciation on their work	Neutral	0(0.0%)	2(33.3%)	4(66.7%)	X^2 = 17.182 df =4 *p** =.001
	Satisfied	1(1.2%)	30(35.3%)	54(63.5%)	
	Very satisfied	2(1.7%)	14(12.0%)	101(86.3%)	
Regular supervision is	No	3(3.3%)	31(34.4%)	56(62.2%)	X^2 = 18.462

associated with performance	Yes	0(0.0%)	15(12.7%)	103(87.3%)	df =2 *p**<.001
Transportation is associated with the performance	No	3(3.4%)	35(39.3%)	51(57.3%)	X^2 = 31.950
	Yes	0(0.0%)	11(9.2%)	108(90.8%	df =2 *p**<.001
Refresher Training is associated with performance	No	3(3.2%)	29(30.5%)	63(66.3%)	X^2 = 11.036
	Yes	0(0.0%)	17(15.0%)	96(85.0%)	df =2 *p** =.002
Consideration from Local Leaders is associated with performance	No	1(1.0%)	18(17.1%)	86(81.9%)	X^2 = 3.605
	Yes	2(1.9%)	28(27.2%)	73(70.9%)	df =2 *p** =.138
Motivation or Incentives (PBF) is associated with performance	No	3(3.2%)	34(36.2%)	57(60.6%)	X^2 = 24.260
	Yes	0(0.0%)	12(10.5%)	102(89.5%)	df =2 *p**<.001

The five variables linked with the dependent variable were modeled with ordinal logistic regression. This developed a prediction model on factors linked with the performance of CHWs towards maternal health care service. Results from the model fitting statistic were significant (X^2 =79.434, *df* =6, *p*<.001), and thus the model fits the two independent variables.

The Goodness-of-fit results are statistically insignificant (X^2 =44.294, *df* =62, *p* =.957), which means that the model bears an acceptable goodness-of-fit for the fitted data. The Nagelkerke R-square shows that the prediction model explains a 45.4% variance in the uptake of maternal health care as presented in table 4.25.

Table 4. 25. Showing Model Fitting Information, Goodness-of-Fit and Pseudo R-Square and factors associated with uptake of maternal health services.

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	156.663			
Final	77.229	79.434	6	.000

Link function: Logit.

Goodness-of-Fit			
	Chi-Square	Df	Sig.
Pearson	44.294	62	.957
Deviance	36.648	62	.996

Link function: Logit.

Pseudo R-Square	
Cox and Snell	.317
Nagelkerke	.454
McFadden	.318

The odds ratio from the Exp(B) value shows that CHWs' regular supervision increased the odds of maternal services uptake by 3.7. CHWs' regular motivation/incentives (PBF) result in 3 times increase in the uptake of maternal health care, while CHWs' regular refresher training leads to 3 times increase.

CHWs transportation brings up to 7.8 times increase in the uptake of maternal health care, additionally, CHW's appreciation of their work led to 4.3 times increase in the uptake of maternal health care compared to mere appreciation as shown in the table in 4.26

Table 4. 26. Ordinal logistic regression tables showing factors associated with the performance of CHWs towards Uptake Maternal Health Services

Parameter Estimates								
							95% Confidence Interval	
		Estimate	Std. Error	Wald	Df	Sig.	Lower Bound	Upper Bound
Threshold	[Uptake_of_Maternal_Health_Services_Grouped = 3]	-3.368	.690	23.833	1	.000	-4.721	-2.016
	[Uptake_of_Maternal_Health_Services_Grouped = 4]	.597	.424	1.983	1	.159	-.234	1.429
Location	[Appreciation_of_work=3]	-1.496	1.064	1.976	1	.160	-3.582	.590
	[Appreciation_of_work=4]	-1.462 Exp(B)= .232	.431	11.504	1	.001	-2.308	-.617
	[Appreciation_of_work=5]	0[a]	.	.	0	.	.	.
	[Regular supervision is associated with performance? =0]	1.303 Exp(B)= 3.682	.435	8.978	1	.003	.451	2.156
	[Regular supervision is associated with performance? =1]	0[a]	.	.	0	.	.	.
	[Transportation is associated with performance? =0]	2.047 Exp(B)= 7.748	.471	18.931	1	.000	1.125	2.970
	[Transportation is associated with performance? =1]	0[a]	.	.	0	.	.	.
	[Regular refresher Training is associated with performance? =0]	1.087 Exp(B)= 2.966	.432	6.343	1	.012	.241	1.933
	[Regular refresher Training is associated with performance?=1]	0[a]	.	.	0	.	.	.
	[Regular motivation Incentives is associated with performance? =0]	1.107 Exp(B)= 3.026	.442	6.268	1	.012	.240	1.974
	[Regular motivation Incentives is associated with performance =1]	0[a]	.	.	0	.	.	.

CHAPTER FIVE
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.0. Summary of Findings

The aim of conducting this study was to assess the influence of CHWs on the uptake of maternal health services in Musanze District, Northern province, Rwanda. The study was targeting the CHWs and CHW's supervisors. In this analytical cross-sectional study, data were collected using both qualitative and quantitative methodologies., that is Questionnaire, and KII guide.

The research had 208 responders, and because the required sample size was reached, the response rate was 100%. Sociodemographic factors on uptake of maternal health services, the results indicated that level of education and working experience were linked with uptake of maternal health services. This study also found that the uptake of maternal health services was regarded as very high and among those services, deliveries at the Health Facilities were at 73.6%, Antenatal care at 65.9%, Family planning at 54.3%, and the rate of postnatal care was at 45.7%.

The respondents 85.1% were knowledgeable on the warning signs of an emergency among pregnant mothers, and 89.4% reported that they would act based on these warning signs. CHWs had training to provide care to mothers and then skills of CHWs on administration of misoprostol was significant, and the researcher also examined factors that contributed the effect of CHWs towards uptake of maternal health services were, regular supervision, regular refresher training, provision of transport and incentives) could be associated with the performance and uptake of maternal health care.

5.1. Conclusion

The research found that the uptake of maternal health care in Musanze District was 76.4%, while deliveries at HF, ANC, FP, and PNC were 73.6%, 65.9%, 54.3%, and 45.7% respectively.

The research demonstrated the influence of social demographic factors on uptake of maternal health services and results revealed that there was a significant association between education of CHWs and uptake of maternal health services ,there was also a significant relationship between CHWs years of expertise and the uptake of maternal health service.

Majority of CHWs with a working expertise of 7 – 9 years ranked the uptake of maternal health services as very high ,Fisher's exact test of independence also revealed a substantial correlation between CHWs years of experience and the uptake of maternal health service.

Community health workers were knowledgeable on the warning signs of an emergency among pregnant mothers, and reported that they would act based on these warning signs, CHWs had necessary training to provide care to the pregnant mothers and skills that CHWs have on administration of misoprostol to prevent post-partum hemorrhage was significant..

The study showed that there was a statistically significant relationship between CHWs' training's and uptake of maternal health services ,CHW's knowledge on maternal emergencies was a significantly associated with uptake of maternal health services, additionally ,there was also a statistically significant correlation between the skills of CHWs on administration of misoprostol and uptake of maternal health services.

Majority of community health workers reported that regular supervision influence the uptake of maternal health services. There was a statistically a significant relation between routine supervision of CHWs and uptake of maternal health services.

More than half of CHWs who reported that regular refresher training influence the uptake of maternal health care rated the uptake as very high and chi-square test of independence found a significant association between the regular refresher training of CHWs and the uptake of maternal health services.

Regarding the factors that influence the effectiveness of CHWs towards maternal health service, transport was significant correlation with the uptake of maternal health care, Incentives given to CHWs was also significantly associated with the uptake of maternal health care.

5.2. Recommendations

The research recommends the following:

1. The Ministry of health to increase maternal health services through regular training and regular supervision for CHWs.
2. The governmental through Ministry of health to provide transport to CHWs and regularly motivate them through provision of incentives.
3. The CHWs who are more than 70 years of age should replace or retire because many of them have vision challenges and they are not able to perform their tasks as expected.

4. The CHWs should approach local authorities to assist their activities of promoting awareness about the value of maternal healthcare services in the reduction of mortality rates in Musanze District.

These will ultimately decrease mortality rates in the community unit and contribute to achieving the third SDG of the 2030 Agenda for Sustainable Development: Good Health and Well-Being for All.

Suggestions for Further Studies

Future research should be conducted on a large scale, particularly in the entire Rwandan District to identify the specific successes and obstacles that CHWs confront when providing MHC services

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APPENDICES

APPENDIX A: CONSENT FORM

Written consent form.

The name of Health Facility----------

Research topic Assessing the influence of Community Health Workers on uptake of Maternal Health services in Musanze District, Northern Province, Rwanda

Invitation to participate in the study

As community health workers, you are encouraged to participate in this study since you can offer the data needed for it..

Introduction and aim of the study

I'm NIYONGABO Livingstone Eric, a student at MKU, and I'm conducting research on assessing the influence of CHWs on uptake of Maternal Health services.

The research aims was to assess the role of community health workers on the uptake of maternal health services. This survey is purely academic.

Research description

This study was meant to examine sociodemographic factors of CHWs ,to determine the influence of CHWs roles on uptake of maternal health services,to determine the necessary CHW's knowledge associated with uptake of maternal health services in Musanze District,to examine factors affected the performance of CHWs towards maternal health care in Musanze District.This study is targeting to reach 208 CHWs from 16 health facilities of Musanze District and 16 Community health supervisors from health facilities. You'll be questioned about your private details, CHWs' role, Knowledge, attitude and Practices of CHWs, Factors linked with CHWs performance in your village.

Voluntary participation and Withdrawal from the research

Your choice to take part in this research is entirely up to you, and you are free to revoke your consent at any time with no consequence.

Potential benefits

Being a part of this study may not directly help you, but the study will come up with the influence of CHWs on uptake of Maternal health services ,challenges facing CHWs and

recommendations that can be utilized to increase awareness about community health workers and their role in enhancing maternal health services.

Potential risk and discomfort

You may feel uneasy answering to some of the delicate questions, In this instance, you have the option of not responding to a question..

Confidentiality and anonymity

The original study, introduction, and aim will be explained how the information collected will be used. Your name will not be disclosed, the questionnaires will be destroyed, and the audio-recorded data will be removed as soon as the results have been analyzed, presented, and published.

Contact Information

You are welcome to contact me with any queries you may have related to research now or at any moment while it is being conducted. My phone number is +250 7888 90812, and my email address is niyoliving@gmail.com. Through jgkariuki@mku.ac.ke, you can also get in touch with the faculty advisor and the Dean of the School of Public Health. Contact the Institutional Ethical Review Committee (IERC) office at Mount Kenya University at research@mku.ac.ke if you have any concerns about how your privacy will be protected during this research or if you feel you are in danger.

Participant statement

A researcher has outlined the study's goals, potential advantages, and risks. I am aware that my participation is entirely willingly and that I'm free to end it at every moment. The researcher has answered all of my questions about this study, and I understand that all of the information I gave will be kept private. I voluntarily choose to take part in the research.

☐ **Yes**

☐ **No**

Researcher statement

Each participant has received an explanation of the study's purpose in a language they are comfortable with.

Participant's thumbprint or signature

……. Date ……

Author's signature**…… ……** **Date ……**

Appendix B: QUESTIONNAIRE FOR COMMUNITY HEALTH WORKERS

QUESTIONNAIRE ON ASSESSING INFLUENCE OF CHWs ON UPTAKE OF MATERNAL HEALTH SERVICES IN MUSANZE DISTRICT, NORTHERN PROVINCE, RWANDA.

Instructions for filling the questionnaire

Kindly fill in with the correct answer as necessary.

Wherever indicated, please provide a brief description of your response.

SECTION 1: IDENTIFICATION OF RESPONDENT

1. Gender (Please tick)

Male ☐ Female ☐

2. Age category of respondent

Between 20-30 years ☐

Between 31-40years ☐

Between 41-50years ☐

Between 51 and above ☐

3. Education:

a. None ☐

b. Primary ☐

c. Ordinary level ☐

d. Secondary ☐

e. University ☐

4. Marital Status ☐ Single ☐ Widow ☐

Married ☐ Divorced ☐

5. What else do you do other than being CHWs?

Farmer ☐ Artisan ☐

Businessman ☐ None ☐

Salaried ☐

6. Working experience of the respondent as CHWs

From 6 months -1 year ☐
Between 2-3 years ☐
Between 4-5 years ☐
Between 5-10 years ☐
From 10 years and above ☐

Section A: The influence of CHWs on uptake of maternal health services.

1. As CHWs, do you think that the number of mothers completed ANC visit has increased at health Center after you started to work? (**Please tick the rate of your perception below)**

Very High ☐
High ☐
Average ☐
Low ☐
Very low ☐

2.As CHWs, do you agree with enrolment of girls and ladies of reproductive age has contribute positively to maternal health in respective catchment zone?

Strongly agree ☐
Agree ☐
Neutral ☐
Disagree ☐
Strongly disagree ☐

3. As CHWs, can rate howpregnant women's follow-up has improve maternal health in the catchment zone?

1. Very high ☐
2.High ☐
3.Average ☐
4.Low ☐
5.Very low ☐

4. As a CHW, how do you agree that educating pregnant on ANC has improve maternal health in the catchment zone?

Strongly agree ☐
Agree ☐
Neutral ☐
Disagree ☐
Strongly disagree ☐

5. Basing on your record of pregnant mothers from your catchment area, how can you rate the delivery in health center?

Very High, ☐
High, ☐
Moderate, ☐
Low ☐
Very low ☐

6. As a CHW, do you think that send rapid SMS for pregnant mothers has improved maternal health in the catchment zone?

Strongly agree ☐
Agree ☐
Neutral ☐
Disagree ☐
Strongly disagree ☐

7.After sending Red Alert SMS for emergency case, how are you satisfied with the response and intervention from health facility?

Extremely Satisfied ☐
Satisfied ☐
Neutral ☐
Dissatisfied ☐
Extremely dissatisfied ☐

8. As a CHW, how can you rate the post-partum mothers 'attendance to PNC visit with respect to your visit?

Very High, ☐
High, ☐
Moderate ☐
Low ☐
Very Low ☐

9. After providing health education on FP, how can you rate the uptake of mothers towards using FP?

Very High ☐
High ☐
Moderate ☐
Low ☐
Very low ☐

10. As a CHW, how can you rate your monthly report submitted to the health center has contribute positively on practices toward maternal health services?

Very High ☐
High ☐
Moderate ☐
Low ☐
Very low ☐

Section B:CHW's knowledge associated with uptake of maternal health services.

1. According to you, how can you rate your knowledge on maternal emergencies?

Very High, ☐
High ☐
Moderate ☐
Low ☐
Very low ☐

2. What are the danger signs that make you think that a pregnant woman has an emergency case**?**

- Vaginal bleeding ☐
- Loss of consciousness ☐
- High fever ☐
- Lower abdominal pain ☐
- Apply all ☐

3. As CHWs do you think you have had necessary training to provide care to mothers in your respective area?

- Strongly agree ☐
- Agree ☐
- Neutral ☐
- Disagree ☐
- Strongly disagree ☐

4. As a CHWsRanking yours skills on administration of misoprostol for PPPH towards maternal health program in your community?

- Very High, ☐
- High, ☐
- Moderate, ☐
- Low ☐
- Very low ☐

5. When you meet home delivery in your community, what are primary care do you give to them**?**

1. Administration of Misoprostol ☐
2. Transfer to the health facility ☐
3. Red alert (Rapid SMS) ☐
4. Apply all ☐
5. Others /specify…….. ☐

6.Among the below pregnancy complications which one (s) attract your attention to give mothers direct transfer to the health center?

Vaginal bleeding 1

Anemia 2

Lower abdominal pain 3

High fever 4

Apply all 5

Section C: Factors associated with performance of the CHWs towards maternal health services.

1. As Community health work rate level of your satisfaction on benefits you are receiving from CHWs' cooperative as you are member?

Very Satisfied ☐

Satisfied ☐

Neutral ☐

Dissatisfying ☐

Very dissatisfying ☐

2. As CHWs in charge of maternal health, how do you appreciate your work?

Very Satisfied ☐

Satisfied ☐

Neutral ☐

Dissatisfying ☐

Very dissatisfying ☐

3.The factors associated with effectiveness (performance) of CHWs towards maternal health care:

1. supervision is associated with performance? Yes No

2.Transport is associated with performance? Yes No

3. Refresher training is associated with performance? Yes No

4.Consideration from local leaders is associated with the performance? Yes No

5. Motivation or incentives (PBFP). Yes No

KEY INFORMANT INTERVIEWS

These questions will be utilized in the assessment of CHWs supervisors to enrich the responses from the study participants on the influence of CHWs on uptake of maternal health services and factors associated with performance.

1. What are the socio-demographic factors of CHWs that influence uptake of maternal health care in Musanze District?
2. As a CHW supervisor, what do you think is the influence of community health workers roles on uptake of maternal health services?
3. a) As CHW's Supervisor, do you think the knowledge provided to the CHWs has influenced on uptake of maternal health services in Musanze District?

b) Basing on basic health are provided by CHWs to the pregnant women who have danger sign, do you think has influenced on uptake of maternal health services at community level?

4. Basing on your perspective and experience, what are the factors associated with performance of CHWs towards the uptake of maternal health services in Musanze District?

The end

We appreciate you participating in this activity.

Appendix C: ERC CERTIFICATE

Mount Kenya University

REF: **MKU/ERC/2055**
TO: **NIYONGABO LIVINGSTONE ERIC**

Date: 26 January 2022

REG: **MPH/2019/58956**

Dear Sir/Madam,

RE: ASSESSING THE INFLUENCE OF COMMUNITY HEALTH WORKERS ON UPTAKE OF MATERNAL HEALTH SERVICES IN MUSANZE DISTRICT, NORTHERN PROVINCE, RWANDA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1128.** The approval period is **26/01/2022 - 25/01/2023.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

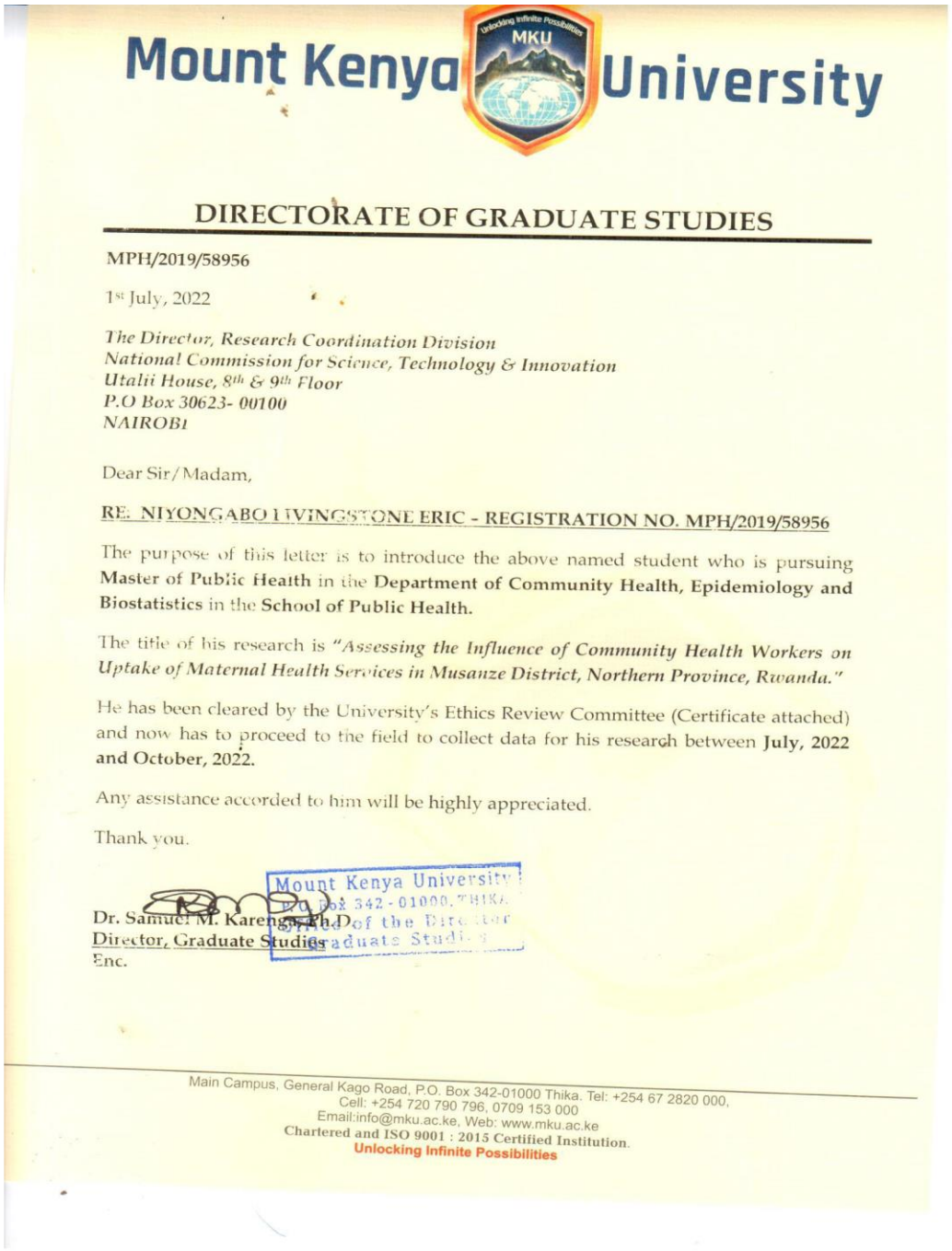
Prior to commencing your study, you will be expected to comply with any additional requirements from the relevant authorities in the country where this study will be conducted

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P. O. Box 342 - 0100, Thika

Dr. Peter G. Kirira
Chairman, Mount Kenya University IERC

Appendix D: POSTGRADUATE INTRODUCTORY LETTER



Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2019/58956

1st July, 2022

The Director, Research Coordination Division
National Commission for Science, Technology & Innovation
Utalii House, 8th & 9th Floor
P.O Box 30623- 00100
NAIROBI

Dear Sir/Madam,

RE: NIYONGABO LIVINGSTONE ERIC - REGISTRATION NO. MPH/2019/58956

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the **Department of Community Health, Epidemiology and Biostatistics** in the **School of Public Health.**

The title of his research is *"Assessing the Influence of Community Health Workers on Uptake of Maternal Health Services in Musanze District, Northern Province, Rwanda."*

He has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data for his research between **July, 2022 and October, 2022.**

Any assistance accorded to him will be highly appreciated.

Thank you.

Mount Kenya University
P.O. Box 342-01000, THIKA
Office of the Director
Graduate Studies

Dr. Samuel M. Karenga, PhD
Director, Graduate Studies
Enc.

Main Campus, General Kago Road, P.O. Box 342-01000 Thika. Tel: +254 67 2820 000,
Cell: +254 720 790 796, 0709 153 000
Email:info@mku.ac.ke, Web: www.mku.ac.ke
Chartered and ISO 9001 : 2015 Certified Institution.
Unlocking Infinite Possibilities

Appendix E: PERMIT FROM MUSANZE DISTRICT

REPUBLIC OF RWANDA

Musanze, on ..... 28 JAN 2022

NORTHERN PROVINCE
MUSANZE DISTRICT
P.O. BOX 03 MUSANZE
E-mail : info@musanze.gov.rw
website: www.musanze.gov.rw
Ref:DA.HRM

N°.1262../07.04.03

To NIYONGABO Livingstone Eric
C/O Mount Kenya University

Re: Response to your letter

Dear Eric,

Refering to your letter dated on 27th Janaury 2022 requesting for collecting data ,in Musanze District;

I hereby inform you that you are allowed to carry out the research on " **ASSESSING THE INFLUENCE OF COMMUNITY HEALTH WORKERS ON UPTAKE OF MATERNAL HEALTH SERVICES IN MUSANZE DISTRICT, NORTHERN PROVINCE, RWANDA".**

Yours sincerely.

BAGIRISHYA Pierre Claver
Executive Secretary of MUSANZE District.

Appendix F: Musanze district administration map