

**EFFECT OF COMMUNITY HEALTH STRATEGY ON SELECTED  
MATERNAL AND CHILD HEALTH OUTCOMES IN MWINGI WEST SUB -  
COUNTY, KITUI COUNTY, KENYA**

**BY**

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FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PUBLIC HEALTH**

**SCHOOL OF PUBLIC HEALTH AND COMMUNITY DEVELOPMENT**

**MASENO UNIVERSITY**

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## DECLARATION

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## **DEDICATION**

I dedicate this work to my love Caroline Ndoti and our children, Joy Muthoki, Joseph Nzioki, Christian Ngila, Roy Makau, Ryan Mumo and Sylvia Nelly Malaa.

## ABSTRACT

In Kenya, maternal and under-five mortality rates are high at 510/100 000 live births and 74/1000 live births respectively. This is attributed to poor Maternal and Child Health (MCH) outcomes reported across the country. In Mwingi, 38% of women do not seek Focused Antenatal Care (FANC), 55% deliver without Skilled Birth Care (SBC), 47.3% do not ensure their children complete immunization program, and 55.5% of infants are not exclusively breastfed. Since inception of Community Health Strategy (CHS) in Kenya, intervention effect on MCH outcomes in rural semi-arid regions such as Mwingi is not known. Specific objectives of this study were to establish effect of CHS on; FANC coverage, SBC utilization, Infant Vaccination Coverage (IVC), Exclusive Breastfeeding (EBF), and utilization of modern Postpartum Family Planning (PPFP) methods in Mwingi West sub-county. The study design was a pretest-post-test experiment with intervention and control sites. Mwingi West and Mwingi North sub-counties were intervention and control sites respectively. Participants in intervention and control sites received MCH care under CHS intervention and the standard MCH care in Kenya respectively. In each site, a baseline and 2 post-intervention surveys were conducted with each survey having a sample size of 422 participants. Data was collected using a structured questionnaire. Main respondents were women with a child aged 9-12 months. Both purposive and simple random sampling methods were employed. In the intervention arm; women at end term survey were 1.7 times more likely to seek ANC services for at least 4 times compared to baseline survey (*Adj. OR* 1.717,95%CI: 1.464-2.014,  $P<0.0001$ ), women in end-term survey were 1.6 times more likely to deliver under SBC compared to baseline (*Adj. OR*=1.556,  $P<0.0001$ ; 95%CI: 1.295-1.868), infants in end-term survey were 2.5 times more likely to have received all recommended vaccines compared to baseline survey (*adj. OR*=2.516,  $P<0.0001$ ; 95%CI: 1.796-3.5240), infants in end-term survey were 1.4 times more likely to be breastfed exclusively compared to baseline (*Adj. OR*=1.447,  $P<0.05$ ; 95%CI: 1.145-1.829), and women in end-term survey were 1.4 times more likely to utilize modern PPFP methods compared to women at baseline survey (*adj. OR*=1.386,  $P<0.05$ ; (95%CI: 1.164-1.651). The results suggest that CHS significantly improved MCH outcomes in Mwingi West sub-county. These findings are supported by several studies conducted to evaluate CHW led interventions in resource poor countries. To improve MCH outcomes in Kenya, all county governments need to implement CHS in areas where implementation has not yet been done.

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## LIST OF ABBREVIATIONS AND ACRONYMS

<b>AMREF</b>	African Medical and Research Foundation
<b>AMSTAR</b>	Assessing the Methodological Quality of Systematic Reviews
<b>ANC</b>	Antenatal Care
<b>APHIA</b>	AIDS, Population and Health Integrated Assistance
<b>APHRC</b>	African Population and Health Research Center
<b>ASAL</b>	Arid and Semi-Arid Land
<b>BCG</b>	Bacillus Calmette–Guérin
<b>BRAC</b>	Bangladesh Rural Advancement Committee
<b>CCT</b>	Conditional Cash Transfers
<b>CHEWs</b>	Community Health Extension Workers
<b>CHS</b>	Community Health Strategy
<b>CHW</b>	Community Health Worker
<b>CI</b>	Confidence Interval
<b>CSBA</b>	Community based Skilled Birth Attendants
<b>DiD</b>	Difference in Differences
<b>DPT</b>	Diphtheria, Pertussis, and Tetanus
<b>EBF</b>	Exclusive Breast Feeding
<b>FANC</b>	Focused Antenatal Care
<b>FP</b>	Family Planning
<b>GAVI</b>	Global Alliance for Vaccines and Immunization
<b>GDP</b>	Gross Domestic Product
<b>GII</b>	Gender Inequality Index
<b>GoK</b>	Government of Kenya
<b>HDI</b>	Human Development Index
<b>IEEC</b>	Information and Education for Empowerment and Change
<b>IMNCS</b>	Improving Maternal, Neonatal and Child Survival
<b>IMR</b>	Infant Mortality Rate
<b>IUD</b>	Intra Uterine Device
<b>IVC</b>	Infant Vaccination Coverage
<b>IYCN</b>	Infant and Young Child Nutrition
<b>KCHMN</b>	Kijabe Community Health Maternal Newborn Project
<b>KDHS</b>	Kenya Demographic and Health Survey
<b>KNBS</b>	Kenya National Bureau of Statistics
<b>LARC</b>	Long-Acting Reversible Contraception
<b>LHWs</b>	Lady Health Workers
<b>MCHIP</b>	Maternal and Child Health Integrated Program
<b>MDGs</b>	Millennium Development Goals
<b>MMR</b>	Maternal Mortality Rate
<b>MNCH</b>	Maternal Newborn and Child Health
<b>MNH</b>	Maternal and Newborn Health
<b>MoH</b>	Ministry of Health
<b>MOM</b>	Mobile Obstetric Medics
<b>MoPHS</b>	Ministry of Public Health and Sanitation
<b>MVMH</b>	My Village Is My Home

<b>NMR</b>	Neonatal Mortality Rate-
<b>NUHDSS</b>	Nairobi Urban Health and Demographic Surveillance System
<b>OPV</b>	Oral Polio Vaccine
<b>ORs</b>	Odds Ratios
<b>PATH2</b>	Partnership for Transforming Health Systems Phase 2
<b>PHC</b>	Primary Health Care
<b>PMTCT</b>	Prevention of Mother To Child Transmission
<b>PPFP</b>	Postpartum Family Planning
<b>PPP</b>	Purchasing Power Parity
<b>PURSE</b>	Peers Undertaking Reproductive and Sexual Health Education
<b>RCIP</b>	Routine Child Immunization Program
<b>RCT</b>	Randomized Controlled Trial
<b>SBA</b>	Skilled Birth Attendant
<b>SBC</b>	Skilled Birth Care
<b>SDGs</b>	Sustainable Development Goals
<b>SIDS</b>	Sudden Infant Death Syndrome
<b>SWAP</b>	Safe Water and AIDS Project
<b>TBA</b>	Traditional Birth Attendant
<b>UCT</b>	Unconditional Cash Transfers
<b>UI</b>	Uncertainty Interval
<b>UN</b>	United Nations
<b>UNICEF</b>	United Nations Children's Fund
<b>USAID</b>	United States Agency for International Development
<b>VHTs</b>	Village Health Teams
<b>WHO</b>	World Health Organization
<b>YDI</b>	Youth Development Index

## OPERATIONAL DEFINITIONS

**Community Health Strategy (CHS):** Community Health Strategy (CHS) is a Community Health Worker (CHW) led Primary Health Care (PHC) intervention in Kenya designed to improve health status of communities. Health service provision in CHS is provided at community level by volunteer CHWs. Among services provided by CHWs is Maternal and Child Health (MCH) education and promotion aimed at educating women on importance of; Focused Antenatal Care (FANC), Skilled Birth Care (SBC), Child Immunization, Exclusive Breast-Feeding (EBF), importance of child spacing and use of modern methods in Postpartum Family Planning (PPFP), and birth preparedness among others

**Effect:** This is a change that is as a result of an action. The action in this study is the CHS intervention.

**Exclusive Breast-Feeding (EBF) Practice:** World Health Organization (WHO) defines EBF practice as giving no other food or drink – not even water – except breast milk to infants for the first 6 months of life. It is recommended by WHO for optimal growth, development and health of infants.

**Focused Antenatal Care (FANC):** This is a WHO recommended mode of Antenatal Care (ANC) service provision in which expectant women with a normal pregnancy are supposed to seek ANC services for at least 4 times/visits from a competent health professional operating within a health facility.

**FANC Coverage:** The percentage of women aged 15–49 years with a live birth in a given time period that received ANC service from a skilled health personnel for at least four or more times during their pregnancy.



**Infant Vaccination Coverage (IVC):** The proportion of children aged 1 year and below who have received all the basic WHO recommended vaccines plus three doses of pneumococcal vaccination within their first year of life. In Kenya, a 1 year old child is considered to have been fully vaccinated if they have received the following vaccines; Bacillus Calmette–Guérin -BCG (at birth), Oral Polio Vaccine-OPV (at birth, 6wk, 10wk and 14wk), Pentavalent vaccine-(containing: Diphtheria, Pertussis, and Tetanus (DPT) and vaccinations against both hepatitis B and *haemophilus influenza type B*) (6wk, 10wk and 14wk), Pneumococcal vaccine-PCV 10 (6wk, 10wk and 14wk), and Measles (9 months). In Baringo, Keiyo, Koibatek and Marakwet sub counties a Yellow Fever vaccine is given to infants at 9 months because these sub-counties are considered high risk areas. By the age of 9 months, an infant in Kenya is supposed to have received these vaccines. This study therefore adopted IVC to mean the proportion of infants aged 9-12 months in Mwingi west sub-county who have received all WHO recommended vaccines.

**Maternal and Child Health (MCH):** This includes the health of women and children during pregnancy, childbirth and the postpartum period.

**MCH Outcomes:** Selected MCH outcomes investigated in this study are; Focused Antenatal Care (FANC) coverage, utilization of Skilled Birth Care (SBC), practice of Exclusive Breast-Feeding (EBF), Infant Vaccination Coverage (IVC) and utilization of modern Post-Partum Family Planning (PPFP) methods.

**Modern Post-Partum Family Planning (PPFP):** WHO defines Postpartum Family Planning (PPFP) as the prevention of unintended pregnancy and closely spaced

pregnancies through the first 12 months following childbirth. Modern PPF is the use of modern methods in PPF.

**Prevalence:** Proportion of an outcome of interest in a given population in a specific point in time.

**Skilled Birth Attendant (SBA):** Refers exclusively to accredited health professionals such as midwives, doctors or nurses who have been educated and trained to proficiency in the skills needed to manage normal pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in mothers and newborns.

**Skilled Birth Care (SBC):** The process by which a woman is provided with adequate care during labor, delivery and the early postpartum period by a Skilled Birth Attendant (SBA) operating within an enabling environment or health system capable of providing care for normal deliveries as well as appropriate emergency obstetric care for all women who develop complications during childbirth.

**Women with Need of Family Planning:** Proportion of women who want to stop childbearing or who want to space their next birth.

**Women with Unmet Need of Family Planning:** WHO defines Women with unmet need of Family Planning (FP) as those who are fecund and sexually active (married or in a union) but are not using any method of contraception, and report not wanting any more children or wanting to delay the next child.

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## **CHAPTER ONE: INTRODUCTION**

### **1.1. Background Information**

Globally, Maternal Mortality Rate (MMR) fell by nearly 44% over the past 25 years, to an estimated 216 maternal deaths per 100 000 live births in 2015, from a MMR of 385 in 1990 (WHO, 2015a). This is attributed to global efforts aimed at realization of the Millennium Development Goals (MDGs). Kenya is among 18 countries in Sub Saharan Africa estimated to have very high MMR in 2015 with 510 deaths per 100 000 live births, (WHO, 2015a) and (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui County, MMR is high at 330 per 100,000 live births (County Government of Kitui, 2013). Similarly, substantial global progress has been made in reducing child deaths since 1990. The number of under-five deaths worldwide has declined from 12.7 million in 1990 to 5.9 million in 2015 (UNICEF, 2015a). Despite these gains, Sub-Saharan Africa remains the region with the highest under- five mortality rate in all regions in the world, with 1 child in 12 dying before his or her fifth birthday (UNICEF, 2015a). In Kenya, child mortality rates are still high. Infant Mortality Rate (IMR) as reported by 2014 Kenya Demographic and Health Survey (KDHS) is 39 per 1000 live births while under-five mortality is 52 deaths per 1,000 births (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui County, under five mortality rate is 57 per 1000 live births (County Government of Kitui, 2013).

Focus has since shifted from meeting health related MDGs to meeting the Sustainable Development Goals (SDGs) and with this, there is a renewed focus from governments and development partners to help achieve health related SDGs targets. The targets are; a global MMR below 70 per 100,000 live births, and a neonatal mortality rate of 12 or fewer deaths

per 1,000 live births by the year 2030 (WHO, 2015a) and (UNICEF, 2015a). To achieve SDG targets related to MCH, efforts need to be directed towards improving Focused Antenatal Care (FANC) coverage, Skilled Birth Care (SBC), improving Infant Vaccination Coverage (IVC), Exclusive Breast-Feeding (EBF) and Post-Partum Family Planning (PPFP) among other MCH domains (WHO, 2015b). This calls for innovative interventions to help improve these MCH outcomes.

CHS is a Community Health Worker (CHW) led intervention which was designed by the Government of Kenya (GoK) in 2006 to support the delivery of Kenya Essential Package for Health (KEPH) at the community level (Ministry of Health, 2006). The CHS program structure provides for creation of Community Units (CUs) as the basis of PHC service provision. Each CU is designed to serve approximately 5000 people. The service providers in the CUs are trained CHWs and Community Health Extension Workers (CHEWs). CHWs are members of the community identified by the community and trained to serve their communities while CHEWs are trained health professionals (Nurses and Public health officers trained at certificate and/or diploma levels and working for the Ministry of Health). Each CHW is required to provide PHC services to 20 households. The responsibilities of CHEWs are; to supervise CHWs, to facilitate health education sessions in the community and to provide a linkage between CHWs and health facilities (Ministry of Health, 2006).

CHS was initiated in Mwingi West sub-county -a rural Arid and Semi-Arid Land (ASAL) in Kenya in March 2011 as a component of the AIDS, Population and Health Integrated Assistance plus- *kamili* (APHIA plus-*Kamili*) program. The program was funded by the United States Agency for International Development (USAID). The program was implemented by the Ministry of Public Health and Sanitation (MoPHS) of Government of

Kenya (GoK) in partnership with the African Medical and Research Foundation (AMREF) (Nzioki *et al.*, 2015).

FANC is a World Health Organization (WHO) recommended mode of Antenatal Care Service (ANC) provision in which expectant women with a normal pregnancy should seek ANC services for at least 4 times/visits from a competent health professional operating within a health facility (Lincetto *et al.*, 2013). Kenya has a unique problem in regard to FANC coverage. Whereas the women reported by 2008/09 Kenya Demographic and Health Survey (KDHS) to have sought ANC services (for at least 1 visit) from a medical staff is 92%, FANC coverage (these who sought ANC services as recommended (at least 4 times)) was low at 47% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2010). In the 2014 KDHS, expectant women who sought ANC services from a skilled attendant for at least 1 visit was 95.5% while FANC coverage was only 57.6% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This pattern indicates a unique problem suggesting that though majority of women in reproductive age are seeking ANC services from trained personnel, only a half of these women are seeking ANC services as recommended by WHO. In Kitui County where Mwingi west Sub County is located, a similar pattern is observed in the 2014 KDHS. The proportion of women in reproductive age who sought ANC services (for at least 1 time) from a skilled provider is 98%, but FANC coverage 62% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). These statistics draw a pattern indicating that skilled service providers may not be the solution to increasing the low levels of FANC coverage in Kenya. Perhaps CHWs implementing the CHS hold the key to improving utilization of FANC services. However, since inception of the CHS in Mwingi west Sub County, the effect of the CHS



on FANC coverage in the sub county is not known. This is the first knowledge gap this study sought to address.

SBC is the process by which a woman is provided with adequate care during labor, delivery, and early postpartum period by a skilled attendant operating within an environment capable of providing care for normal deliveries as well as appropriate emergency obstetric care” (Utz *et al.*, 2013) and (Canavan, 2009). By end of 2014, more than 71% of deliveries were conducted under SBC globally (United Nations, 2015). Literature reveals that regions with low SBC prevalence had the highest MMR and vice versa and despite strong evidence that SBC significantly reduces maternal deaths, one in four babies worldwide are delivered without SBC (United Nations, 2015). In Kenya proportion of women who delivered under SBC improved markedly from 43% in the 2008/09 KDHS to 61% in the 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). Despite this improvement, proportion of women delivering under SBC is still low in many parts of the Country. Nineteen out of the 47 Counties in Kenya have more than half of women delivering without SBC. In Tana river county, that proportion is 31%, Wajir County -18%, Marsabit County -25%, Turkana County -23%, West Pokot County -25%, Samburu County -24%, Trans Nzoia County -41% and in Kitui County where Mwingi West sub-county is located, the proportion of women delivering without SBC is low at 45%<sup>5</sup> (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). Improving SBC prevalence in Kitui County and other counties with low SBC utilization will help reduce the high MMR in Kenya and help meet not only the country’s vision 2030 but also the global Sustainable Development Goals (SDGs). This calls for innovative interventions. What is the effect of the CHJW led CHS intervention on SBC

utilization in Mwingi West Sub County? This is the second knowledge gap this study sought to address.

Child immunization is a cost-effective health intervention which averts an estimated 2 to 3 million deaths every year (WHO, 2009) and (UNICEF, 2015b). In Kenya, child routine vaccination coverage;- the proportion of children aged 12-24 months who have received the basic WHO recommended vaccines (plus three doses of pneumococcal vaccination) is at 67.5% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This coverage is low compared to 2015 global routine child immunization coverage of 86% (United Nations, 2015). This could be the cause of high infant mortality rate reported as 39 deaths per 1,000 live births and high under five mortality rates (52 deaths per 1,000 births) by 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui county where Mwingi west sub-county is located, Routine Child Immunization Coverage is 52.7%; even lower than the national coverage (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). These statistics point out to one thing; the need to design and implement innovative interventions to help increase child routine immunization coverage not only in Mwingi west Sub County but also Kenya. This in turn could help in reducing the high infant and under five mortality rates in the country. Since inception of the CHS intervention in Mwingi West Sub County, the effect of the intervention on IVC is not known. This is the third knowledge gap this study sought to address.

Exclusive Breastfeeding (EBF) is the practice of feeding an infant with only breast-milk for the first 6 months of life (no other food or water) has the single largest potential impact on child mortality of any preventive intervention (WHO and UNICEF, 2014) and (WHO

and UNICEF, 2015). Recent analyses indicate that suboptimal breastfeeding practices, including non-exclusive breastfeeding, contribute to 11.6% of mortality in children under 5 years of age (WHO and UNICEF, 2014). Despite growing evidence that exclusive breastfeeding plays a critical role in reducing maternal and child morbidity and mortality, global EBF prevalence by 2015 was low at 36% (NafeeElsayed and Al-Dossary, 2016). Regionally, Africa is reported to have EBF prevalence of 36% (UNICEF, 2014). In Kenya, EBF prevalence markedly increased from 32% in the 2008-09 KDHS to 61% in the 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). Though Kenya is a breastfeeding success story, poor breastfeeding practices are widely documented in the Country ) (Kimani-Murage *et al.*, 2015). In Kitui County, prevalence of EBF is 45% (County Government of Kitui, 2013). This indicates that more than half of women do not practice EBF and therefore there is need to implement an innovative intervention to help increase the prevalence of EBF in the County. Since inception of CHS in Mwingi west Sub County, no evaluation has been conducted to measure the effect of the CHS on the practice of EBF. This is the fourth knowledge gap this study sought to address.

Post-Partum Family Planning (PPFP) prevents unintended pregnancy and closely spaced pregnancies through the first 12 months following childbirth (WHO, 2013). Globally, PPFP is recognized as a key life-saving intervention for mothers and their children (WHO, 2013) and (Pasha *et al.*, 2015). Though both 2014 and 2008/09 KDHS leaves a data gap on PPFP in Kenya, researchers reanalyzed the 2008/09 KDHS and established that, from 0–5.9 months postpartum, the overall unmet need for PPFP in Kenya was 76%. At the end of one year postpartum (PP), overall unmet need decreased to 59%, and then to 48% by the end of the second year PP (USAID and MCHIP, 2010). The uptake of PPFP problem in

Kenya is confirmed by a recent study which acknowledged that PPF in Kenya is low due to inadequate sensitization and awareness among women, particularly in rural areas (Naanyu *et al.*, 2013). Though statistics on modern use of PPF are not available in Mwingi, country statistics indicate that unmet need of PPF is high at 59% as previously indicated. This also calls for an innovative approach to help increase number of women using modern PPF methods in both Mwingi West Sub County and the country at large. Will CHWs implementing the CHS in Mwingi west Sub County have any effect on use of modern PPF methods? This is the fifth knowledge gap this study sought to address.

In the developing world, Community Health Workers (CHWs) are increasingly recognized as a critical link in improving access to health services at the community level (Quayyum *et al.*, 2013) (Bucagu M., 2016), (Miriam L., 2011), (Chhetry, Clapham, and Basnett, 2005) and (Blazer and Prata, 2016). There is no doubt that CHW led interventions have improved Maternal and Child Health (MCH) outcomes in low and middle level countries. In Nepal, a study conducted to assess performance of CHWs established that they provided obstetric services, including antenatal care, birth attendance and postnatal and newborn care, at community level and identified complications for referral. The study however observed that, their productivity levels were very low, particularly in the remote hill areas, where they were most needed (Chhetry *et al.*, 2005). In rural Bangladesh, a study conducted to establish the impact of a community health intervention on utilization and equity of access to maternal health services established that the intervention increased ANC service utilization and uptake of child immunization services (Quayyum *et al.*, 2013).

A review of 34 studies from low and middle income countries associated community interventions with marginal improvements in ANC coverage and child immunization

(Mbuagbaw et al., 2015). In Nigeria, a deployed team of resident female Community Health Extension Workers (CHEWs) working in a remote rural community led to major and sustained increases in ANC coverage and child immunization (Uzondu *et al.*, 2015). Kenya has embraced a number of interventions aimed at improving MCH outcomes. Among the key interventions which have been implemented in parts of Kenya to help improve MCH outcomes is the Community Health Strategy (CHS) ( Nzioki *et al.*, 2015).

An integrated maternal health care intervention focused on deployment of Community based Skilled Birth Attendants (CSBAs) in Bangladesh increased SBC significantly among rural women(Huq et al., 2015). In Nigeria, evaluation of a community based intervention initiated to address transport as a barrier in accessing SBC was found to improve access to SBC among women in rural areas of Kano and Jigawa states(Memon, Khan, Soofi, Baig, & Bhutta, 2015). In Pakistan, evaluation of CHW led intervention which promoted SBC among other MCH services revealed that the intervention increased number of women delivering under SBC8.

Rwanda is one of the countries which reduced MMR by three quarters, between 1990 and 2015. This improvement made the country to achieve Millennium Development Goal (MDG) target (5A) (Bucagu M., 2016). This achievement is attributed to a number of community based interventions which included, village based CHWs- female mobilizers for maternal health, application of ehealth technology referred to as ‘RapidSMS’-a short mobile phone message based system designed to promote MCH (Bucagu M., 2016). Though Kenya did not meet MDG number 5, the country has embraced several interventions in an attempt to meet the MDGs. Evaluation of a Traditional Birth Attendant (TBA) led campaign in Yatta; eastern part of Kenya established that the TBA led

intervention was effective in increasing delivery under SBC (Tomedi, Tucker, and Mwanthi, 2013). In this intervention, TBAs were trained on importance of SBC and were tasked to bring expectant women to deliver under SBC and paid a stipend on each woman delivering under SBC (Tomedi et al., 2013). Another study conducted to establish effectiveness of a CHW led health education on SBC in three rural locations in Kenya found out that number of women delivering under SBC was higher for those mothers who reported exposure to one or more health messages, compared to those who did not (Adam et al., 2014).

Since inception of the CHS in Kenya, few studies have been conducted to assess effectiveness of CHS on MCH outcomes. The first study was conducted in a rural agrarian site of Busia-Kenya to evaluate effectiveness of CHS in delivering community-based Maternal Child and Newborn Health (MCNH) (Wangalwa *et al.*, 2012). Though the study established that CHS was effective in improving FANC coverage, SBC utilization, and EBF prevalence in Busia, the study adopted a pretest-posttest experiment without a control group and the researchers did not attempt to control for confounders. Due to these limitations in methodological design, the strength of evidence linking CHS with improved FANC coverage, improved utilization of SBC, and improved EBF prevalence in Busia was low.

The second study was conducted to evaluate effectiveness of CHS on selected health outcomes. The study sites were; a rural agrarian site (*Butere*), peri-urban site (*Nyalenda* and *Obunga*) and a nomadic site (*Garissa*) (Olayo *et al.*, 2014). This study indicated that utilization of SBC and ANC improved significantly in intervention sites (Olayo *et al.*, 2014). Though the study adopted a better methodology (pretest-posttest experiment with

both intervention and control sites) than the previously discussed, the researchers identified important limitations which could have compromised the strength of evidence in their findings. These include; inability to randomize the intervention to study participants in intervention site and failure to control for other independent variables/confounders that could have influenced outcome other than the CHS intervention.

The third study was conducted by Kimani-Murage *et al.*, (2015) with the aim of establishing the effect of CHS on the practice of EBF. The study established that CHS helped increase EBF prevalence among slum dwellers in Korogocho and Viwandani slums of Nairobi. The study adopted a stronger methodology compared to the previous 2 studies (quasi experiment which controlled for socio-demographic characteristics as potential confounding factors) and produced relatively stronger evidence linking CHS to improved EBF in Korogocho and Viwandani slums of Nairobi.

The larger Mwingi District was recently subdivided into two sub counties namely Mwingi west Sub County and Mwingi North Sub County. It is located in a rural arid and semi-arid region in Kenya. The two sub counties have many similarities. In regard to climatic conditions and ecological zones Mwingi West and Mwingi North Sub counties are located in a rural arid and semi-arid region characterized by hot and dry climate with unreliable rainfall. Road infrastructure in the two sub counties is poor. The roads are rendered impassable during the rainy season hindering development and access to market centers, schools and health facilities. Most people in the two sub counties are small scale farmers and are prone to food insecurity due to the unreliable rainfall patterns in the region (County Government of Kitui, 2013).

CHS was initiated in Mwingi West Sub County on March 2011. However, since inception of the CHS intervention in Mwingi West sub county, effect of the intervention on FANC coverage, utilization of SBC, IVC, practice of EBF, and utilization of modern PFP methods in the sub county is not known. As indicated in previous paragraphs in this background, CHS evaluation studies have been conducted in rural agrarian and peri-urban areas in Kenya. Evaluation of the CHS intervention in Mwingi will not only provide information on effect of the intervention on the MCH outcomes in Mwingi but also, it will avail data to help compare effect of CHS on the MCH outcomes in rural agrarian and peri-urban areas with effect of the CHS on MCH outcomes in Mwingi- a rural, arid and semi-arid region in Kenya.

## **1.2. Problem Statement**

Mwingi West Sub County suffers from poor MCH outcomes. As identified in the background section, 38% of women in Mwingi do not seek Focused Antenatal Care (FANC), 55% do not deliver under Skilled Birth Care (SBC), estimated half of infants (47.3%) do not complete child immunization program, and over half of infants (55.5%) are not exclusively breastfed. This contributes to the high infant and maternal mortality rates in Kenya. The likely cause of the poor MCH outcomes in Mwingi west Sub County is lack of an innovative intervention to help improve MCH in the sub county. In response to this need, the government of Kenya through the ministry of public health and sanitation and AMREF-Kenya initiated CHS in Mwingi West Sub County on March 2011. What is not known is whether the CHS intervention was responsive in improving MCH outcomes in the sub county. This information gap is the scope of this study.



Though previous studies have been conducted to assess effect of CHS on FANC coverage, practice of EBF and utilization of SBC in Kenya, the studies had important limitations which produced weak evidence. Studies investigating effect of CHS on IVC and use of modern PFP in Kenya have not yet been conducted. Lack of studies with strong evidence on effect of CHS on FANC coverage, practice of EBF and utilization of SBC in Kenya, as well as lack of studies assessing effect of CHS on IVC and use of PFP in the country creates a knowledge gap which informed the problem in this study.

In addition, since inception of the CHS intervention in Kenya, effect of the intervention on FANC coverage, utilization of SBC, IVC, practice of EBF, and utilization of modern PFP methods in Arid and Semi-Arid Lands (ASALs) such as Mwingi is not known.

### **1.3. Study Justification**

As indicated in the background statement: Kenya like many other developing countries suffers from a high MMR (510 deaths per 100 000 live births), high IMR (39 per 1000 live births) and high under five mortality rate (52 deaths per 1,000 births) (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui County, MMR is high at 330 per 100 000 live births. Though this rate is lower compared to the national MMR (510deaths/100,000 live births), it is still high compared to the SDG target of 70 deaths (or lower) per 100,000 live births by year 2030 (WHO, 2015a). Under five mortality rate is high at 57 per 1000 live births (County Government of Kitui, 2013). The poor MCH outcomes can be attributed to poor MCH seeking behavior among women of reproductive health in the sub county. Thirty Eight Percent ( 38%) of women in Mwingi west sub-county do not; seek ANC for at least 4 times (FANC coverage in Kitui County is 62%), Over half of women (55%) do not deliver under SBC (SBC prevalence in Kitui County is at 45%),

estimated half of infants (47.3%) do not complete child immunization program (IVC in Kitui County is at 52.7%) (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014), over half of infants (55.5%) are not exclusively breastfed (EBF prevalence in Kitui County is 45%) (County Government of Kitui, 2013).

Though Kenya does not have official statistics on PFP in the most recent KDHS, reanalysis of 2008/09 KDHS established that in Kenya, from 0–5.9 months postpartum, overall unmet need of PFP was 76%. At the end of one year postpartum, overall unmet need of PFP had decreased to 59%, and then to 48% by the end of the second year (USAID and MCHIP, 2010). In Summary, Mwingi West Sub County suffers from poor MCH outcomes and this informed implementation of the CHS intervention in Mwingi West Sub County (Nzioki *et al.*, 2015).

Previous studies have been conducted to assess effectiveness of CHS on selected MCH outcomes in Busia, Siaya, Western Kenya and some parts of Garrisa (Wangalwa *et al.*, 2012) and (Olayo *et al.*, 2014) however, the methodologies used in these studies were not adequate enough to produce strong evidence on the effect of CHS to FANC coverage, SBC, and EBF. This is based on the important limitations acknowledged by the researchers who conducted these studies, and observed methodological limitations pointed out in the background statement of this research work. Kimani-Murage *et al.*, (2015) conducted a study to evaluate the effect of CHS on EBF. Though the study adopted a stronger methodology and provided stronger evidence linking CHS to improved EBF, the study was conducted in a poor urban set up. None of the CHS studies evaluated effect of CHS on IVC and use of modern PFP. It is important also to note that none of the studies were conducted in a ASAL region. This information gap further strengthens the justification in this study.

The study findings will help in comparing effect of CHS on FANC coverage, SBC utilization, IVC, EBF practice and use of modern PFP methods in ASALs (Mwingi) against rural agrarian and peri-urban areas where similar studies have been conducted.

#### **1.4. Objectives of the Study**

##### **1.4.1. General Objective**

The general objective of this study was to assess the effect of CHS on selected MCH outcomes in Mwingi west sub-county; Kitui county, Kenya.

##### **1.4.2. Specific Objectives**

The specific objectives were;

1. To assess the effect of CHS on FANC coverage in Mwingi west sub-county.
2. To evaluate the effect of CHS on utilization of SBC in Mwingi west sub-county.
3. To determine the effect of CHS on IVC in Mwingi west sub-county.
4. To establish the effect of CHS on practice of EBF in Mwingi west sub-county.
5. To evaluate the effect of CHS on use of modern PFP methods in Mwingi west sub-county.

##### **1.4.3. Research Questions**

1. What is the effect of CHS on FANC coverage in Mwingi west sub-county?
2. What is the effect of CHS on utilization of SBC in Mwingi west sub-county?
3. What is the effect of CHS on IVC in Mwingi west sub-county?
4. What is the effect of CHS on practice of EBF in Mwingi west sub-county?
5. What is the effect of CHS on use of modern PFP methods in Mwingi west sub-county?

#### **1.4.4. Study Hypotheses**

The following were the null hypotheses adopted in this study;

1. In the intervention site, there is no difference in the odds of women seeking ANC services for at least 4 times (FANC) at baseline survey compared to end term survey.
2. In the intervention site, there is no difference in the odds of women delivering under SBC at baseline survey compared to end term survey.
3. In the intervention site, there is no difference in the odds of infants who received all recommended vaccines within 9-12 months of life at baseline survey compared to end-term survey.
4. In the intervention site, there is no difference in the odds of mothers who practiced EBF in feeding their lastborn child at baseline survey compared to end term survey.
5. In the intervention site, there is no difference in the odds of mothers using modern PFFP methods at 9-12 months postpartum at baseline survey compared to end term survey.

#### **1.5. Study Significance**

Findings from assessment of this intervention will help CHS stakeholders to understand if their resources are producing the desired effect or not in regard to MCH outcomes. The findings will also provide additional evidence on the effect of CHW led interventions on MCH outcomes in the ASALs such as Mwingi west sub-county. This will not only add knowledge into existing body of knowledge in regard to effect of CHWs on MCH outcomes but also it will provide a chance to compare findings from this study with existing CHS evaluation findings in rural agrarian sites, peri-urban sites and the nomadic sites

where similar studies have been conducted. The findings will help inform policy formulation in regard to implementation of CHS in ASALs in Kenya.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter provides a review of literature of this research work. As indicated in chapter one, this study is comprised of five research objectives. The five research objectives formed the thematic areas which guided the review of this literature. A general overview of MCH outcomes both globally, regionally and locally introduces the literature review section. This is followed by literature review focusing on the five themes. These are; FANC coverage, utilization of SBC, IVC, practice of EBF, and utilization of PFP. In each theme, literature review focused on three key areas; global, regional and local trends of the thematic MCH outcome, evidence from previous studies evaluating interventions aimed at improving the thematic MCH outcome, and a synthesized summary of the literature review identifying the gaps of knowledge which justified undertaking of this study. The last section of this literature review is the study conceptual framework.

### **2.2. Overview of MCH Outcomes; Global, Regional and Local Statistics**

Globally, MMR reduced by nearly 44% over the past 25 years from a MMR of 385 (UI 359 to 427) in 1990 to an estimated 216 (80% Uncertainty Interval [UI] (207 to 249) maternal deaths per 100 000 live births in 2015 (WHO, 2015a). This is attributed to global efforts aimed at realization of the Millennium Development Goals (MDGs). The annual number of maternal deaths decreased by 43% from approximately 532 000 (UI 496 000 to 590 000) in 1990 to an estimated 303 000 (UI 291 000 to 349 000) in 2015 (WHO, 2015a). The Developing regions accounted for approximately 99% (302 000) of the global maternal deaths in 2015, with sub-Saharan Africa alone accounting for roughly 66% (201 000),

followed by Southern Asia (66 000) (WHO, 2015a). At the regional and country levels, Nigeria and India were estimated to account for over one third of all maternal deaths worldwide in 2015, with an approximate 58000 maternal deaths (19%) and 45000 maternal deaths (15%), respectively (WHO, 2015a). Sierra Leone is estimated to have the highest MMR at 1360 per 100 000 live births while Kenya is among 18 countries in sub Saharan Africa estimated to have very high MMR in 2015 with 510 deaths per 100 000 live births (WHO, 2015a) and (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui County, which hosts Mwingi west-sub-county, MMR is high (though lower than the national rate) at 330 per 100,000 live births (County Government of Kitui, 2013).

Regarding Child mortality, the world has made substantial progress in improving child survival in the past 25 years. The global under-five mortality rate dropped by 53 percent, from 91 deaths per 1,000 live births in 1990 to 43 deaths per 1,000 live births in 2015 (UNICEF, 2015a). At the regional level, all regions except Oceania have more than halved the under-five mortality rate (UNICEF, 2015a). Eastern Asia, Latin America, the Caribbean, and Northern Africa have reduced the under-five mortality rate by two thirds or more since 1990 (UNICEF, 2015a). At the country level, about a third of countries (62) have reduced their under-five mortality rate by two thirds or more and achieved the MDG 4 target set in 2000 (UNICEF, 2015a). Among them are 12 low-income countries which include; Cambodia, Ethiopia, Eritrea, Liberia, Madagascar, Malawi, Mozambique, Nepal, Niger, Rwanda, Uganda, and United Republic of Tanzania (UNICEF, 2015a).

Globally, the Neonatal Mortality Rate (NMR) fell from 36 deaths per 1,000 live births in 1990 to 19 deaths per 1,000 live births in 2015 (UNICEF, 2015a), and the number of neonatal deaths declined from 5.1 million to 2.7 million. Despite these gains, progress

remained insufficient to reach MDG 4 of reducing by two-thirds, between 1990 and 2015, the under-five mortality rate globally and in many regions, particularly in Caucasus and Central Asia, Oceania, Southern Asia and sub-Saharan Africa (UNICEF, 2015a). Sub-Saharan Africa remains the region with the highest under-five mortality rate in all regions in the world, with 1 child in 12 dying before his or her fifth birthday (UNICEF, 2015a).

In Kenya, child mortality rate is still high despite the efforts made by the government and other development partners in an attempt to meet MDG four. Infant Mortality Rate (IMR) as reported by 2014 KDHS is 39 per 1000 live births while under-five mortality is 52 deaths per 1,000 births during the five-year period before the survey (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). WHO and UNICEF reported even high statistics in 2015. Under-five mortality rate was reported as 74 deaths per 1000 live births (90% UI:57-97), Infant mortality rate was reported as 54 per 1000 live births while neonatal mortality rate is reported as 34 deaths per 1000 live births (UNICEF, 2015a). In Mwingi West sub county perinatal mortality (the number of perinatal deaths per 1000 pregnancies reaching seven months of pregnancy) was 49 deaths per 1000 pregnancies (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). Perinatal mortality is calculated by combining pregnancy deaths occurring within seven months of gestation (still births) plus deaths to live births within the first seven days of life (early neonatal deaths (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Kitui County, under five mortality rate is higher than the national at **57** per 1000 live births (County Government of Kitui, 2013).

Implementation of the CHS, which is one of Kenya's vision 2030 flagship programs was initiated in Mwingi West Sub county in 2012 (Nzioki *et al.*, 2015). Having documented



the poor state of MCH outcomes in Sub-Saharan Africa and Kenya in particular, it will be of interest to establish the effect of CHS on specific MCH outcomes in Mwingi west sub-county. These include FANC coverage, utilization of SBC, IVC, EBF and use of modern PFPF. Will the CHS improve MCH outcomes in Mwingi west sub-county? This is what this study sought to establish.

### **2.3. Overview of Focused Antenatal Care (FANC) Coverage**

#### **2.3.1. FANC; Global, Regional and Local Trends**

Routine antenatal care visits for healthy pregnant women were introduced in Europe and North America almost a century ago on the unproven assumption that they would improve outcomes for mother and baby (Hofmeyr and Hodnett, 2013). Since then studies have shown that provision of a broad range of health promotion services to expectant women during ANC is a critical element for reducing maternal and child mortality (Hofmeyr and Hodnett, 2013) and (Lincetto *et al.*, 2013). Previous studies acknowledge that reducing maternal and child mortality depends on an operational continuum of care which should be accessible and of high quality and provided before and during pregnancy, childbirth, and the postnatal period. An important element in this continuum of care is effective ANC (Lincetto *et al.*, 2013).

WHO measures ANC coverage in two broad ways; One-ANC coverage in which an expectant woman makes at least one visit which is defined as; the percentage of women aged 15–49 with a live birth in a given time period that received ANC service from a skilled health personnel at least once during their pregnancy, and two-ANC coverage in which an expectant woman makes at least four visits which is defined as; the percentage of women

aged 15–49 with a live birth in a given time period that received ANC service from a skilled health personnel four or more times during their pregnancy (WHO: Department of Health Statistics and Information Systems, 2015). None of these measurements measure the quality of ANC service provided to expectant women but the later which is referred to as Focused Antenatal Care (FANC) is the WHO preferred and recommended standard best practice.

FANC Policy, as recommended by WHO ensures that providers focus on assessment and actions needed to make decisions, and provides care for each individual woman's situation. In the FANC model, four ANC visits are recommended for women whose pregnancies are progressing normally, with the first visit in the first trimester (Lincetto *et al.*, 2013). Essential services provided in the FANC health package include early identification of pre-existing health conditions (for example; check for weight and nutrition status, anemia, hypertension, syphilis, HIV status), early detection of complications arising during pregnancy (for example; check for pre-eclampsia, gestational diabetes), Health promotion and disease prevention (for example; tetanus vaccine, prevention and treatment of malaria, nutritional support and counseling, micronutrient supplementation, family planning counseling), and birth preparedness and complication planning (for example; birth and emergency plan, breastfeeding counseling, antiretroviral for HIV positive women and reducing mother-to-child transmission of HIV and child spacing) (Lincetto *et al.*, 2013).

Globally, proportion of women receiving ANC at least once during pregnancy was 83% for the period 2007–2014. However, only 64% of pregnant women received the recommended minimum of four ANC visits or more. Poor attendance of ANC is associated with delivery of low birthweight babies and more neonatal deaths (WHO: Department of

Health Statistics and Information Systems, 2015). Kenya has a unique problem in regard to FANC coverage. Whereas the women reported by 2008/09 Kenya Demographic and Health Survey (KDHS) to have sought ANC services from a health facility for at least 1 visit is 92%, FANC coverage (those who sought ANC services as recommended (at least 4 times)) was low at 47% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2010). In the 2014 KDHS, expectant women who sought ANC services from a skilled attendant for at least 1 visit was 95.5% while FANC coverage was only 57.6% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This pattern indicates a unique problem in that though majority of women in reproductive age are seeking ANC services from health facilities, an estimated half of women of reproductive health in Kenya do not seek ANC services as recommended by WHO. In Kitui County where Mwingi west Sub County is located, a similar pattern is observed in the 2014 KDHS. The proportion of women in reproductive age who sought ANC services (for at least 1 time) from a skilled provider is 98%, but FANC coverage was 62% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). These statistics draw a pattern indicating that skilled service providers may not be the solution to increasing the low levels of FANC coverage not only in Mwingi west sub-county but also in Kenya. The solution could be found by designing and implementing innovative interventions.

### **2.3.2. Interventions Promoting FANC Coverage; Global, Regional and Local Overview**

Studies on CHW led interventions in promoting ANC service utilization in the developed world are scarce. This is due to the fact that CHWs work mostly in resource poor countries where they are increasingly being utilized to alleviate the shortage of human resources for health, particularly in the delivery of MCH interventions (Condo *et al.*, 2014).

A review of 34 studies from low and middle income countries indicates that community and health system interventions can improve FANC coverage (Mbuagbaw *et al.*, 2015). In this study, 34 trials involving approximately 400,000 women were assessed on their effectiveness in improving uptake of antenatal care. Components of the CHW interventions were; media campaigns, CHW led health education, and financial incentives for pregnant women, home visits for pregnant women or and supply of equipment for clinics. Findings from this review associated CHW and health system interventions to a marginal improvement of FANC coverage in low and middle income countries (Mbuagbaw *et al.*, 2015). The main weakness in this review is that the authors did not attempt to establish the quality of the methodology of individual studies involved in this systematic review using the AMSTAR (Assessing the Methodological Quality of Systematic Reviews) tool. Despite this limitation, the systematic review provided evidence that CHW led interventions can improve FANC coverage.

In rural Bangladesh, Bangladesh Rural Advancement Committee (BRAC), a non-governmental development organization operating in rural parts of Bangladesh initiated a community health intervention referred to as Improving Maternal, Neonatal and Child Survival (IMNCS) (Quayyum *et al.*, 2013). The study was a CHW led intervention in

which CHWs received basic training on: maternal, neonatal, and child health care management. Trained CHWs were then tasked with identifying all pregnancies in the intervention areas and provide MCH education at home and in the community. A quasi experiment with nonequivalent groups (3 in intervention site and 2 in control site) established that ANC utilization was higher in the intervention site compared to the control site and that there were more poor people utilizing ANC services in intervention site compared to control (Quayyum *et al.*, 2013). Though researchers in the study controlled for income as a potential confounder, the researchers overlooked important potential confounders such as maternal education, parity, and maternal age, which have previously been identified as factors that could influence MCH service utilization including ANC service utilization (Emelumadu *et al.*, 2014). Though the study provided some evidence suggesting the intervention improved FANC coverage, failure to control for important confounders could have compromised strength of evidence in the study.

In Pakistan, the government of Pakistan and the Aga Khan Health Services implemented a Lady Health Workers (LHWs) led low-cost community-based interventions aimed at improving perinatal and neonatal outcomes in a sub-population of the remote mountainous district of Gilgit, Northern Pakistan (Memon *et al.*, 2015). The aim of the intervention was to create awareness about positive maternal and newborn health care practices at household level. This included promotion of ANC, adequate nutrition during pregnancy and lactation, SBC, early initiation of breastfeeding, delayed bathing and recognition of danger signs that warrant for early referrals. In the Intervention site, the practices were promoted through community mobilization and education strategy that included formation of Community Health Committee (CHC) and group education sessions using flip charts and videos

(Memon *et al.*, 2015). Control areas continued to receive the routine services of governmental and non-governmental organizations in the area (Memon *et al.*, 2015). Assessment of the intervention established that ANC increased significantly in the intervention site compared to control. Though the study adopted a sound methodology especially in the use of Difference in Differences (DiD) model to establish the net effect of the intervention over the implementation period in intervention site compared to control, researchers did not account for any confounding variables that could have influenced woman's choice to seek ANC service in intervention site other than the intervention. This could have compromised strength of evidence in the study.

In 2010, another intervention in Bangladesh referred to as integrated maternal health care intervention was implemented in Shahjampur, a sub-district of the Sirajgonj district in Bangladesh (Huq *et al.*, 2015). Though the intervention focused on deployment of Community based Skilled Birth Attendants (CSBAs), promotion of FANC was part of the intervention package (Huq *et al.*, 2015). After two years of implementation, a pretest - posttest study established that the intervention, improved FANC coverage in intervention site (Huq *et al.*, 2015). The study adopted a sound methodology especially in the sampling method where villages in intervention site were clustered and randomly sampled into the study, and therefore causal evidence linking the intervention to increase in ANC utilization was fairly strong.

In Nigeria, a team of resident female CHEWs was deployed in the rural area of Kadawawa to provide essential MCH services. A quasi experiment conducted to assess effect of the intervention on MCH service provision established that the intervention led to major and sustained increase in ANC coverage (Uzondu *et al.*, 2015). The main weakness in this

evaluation is that potential confounders were not addressed in the methodology used and this could have compromised strength of causal evidence linking the intervention to increased utilization of ANC services.

A systematic review of 43 studies conducted in low and middle income countries reveals that community level interventions are effective in increasing ANC service utilization (Lassi *et al.*, 2014). The 43 reviews comprised of; 17 outreach services (home visitation and referrals) which assessed impact of structured nurse/or midwife based home visitation programs, 6 studies assessing impact of task shifting (task shifting for human resource management involves substituting specialized personnel with healthcare workers that are lesser trained but can perform some aspects of their tasks) by CHWs and Midwives (4 studies) and impact of task shifting in dietary counselling delivered through dietician versus nurses/doctors (2 studies), 18 studies assessed impact of human resource training on MCH outcomes and 2 studies evaluated the impact of community mobilization strategies and formation of community support groups on MCH outcomes (Lassi *et al.*, 2014). The overall quality of these reviews ranged from 3 to 11 with a median of 9 on the tool used for Assessing the Methodological Quality of Systematic Reviews (AMSTAR) (Lassi *et al.*, 2014) criteria and this implies that the strength of evidence linking the different community level interventions with increased utilization of ANC services is fairly strong.

Since inception of CHS intervention in Kenya, few studies have been conducted to measure effectiveness of CHS on MCH outcomes. The first study was conducted in Busia Kenya. Between 2008 and 2010, AMREF-Kenya implemented a community-based maternal and newborn care intervention package in Busia County using the CHS approach. An

evaluation of this intervention established a causal relationship between improved utilization of MCH services (FANC, SBC, EBF, and HIV counselling and testing among expectant women in Busia) and CHS implementation (Wangalwa *et al.*, 2012). However, a close scrutiny of the methodology used in this study revealed that, the study adopted a pretest-posttest experiment without a control group. The investigators also did not employ any attempt to control for any confounding factors. Though the study established some causal evidence linking CHS with improved MCH outcomes in Busia, the limitations in the method used could have highly compromised the strength of causal evidence linking improved utilization of MCH services with CHS intervention. Due to this methodology limitations, effectiveness of CHS on FANC, SBC, EBF, and HIV counselling among expectant women is still not known with certainty.

The second study is a quasi-experimental study conducted to assess effectiveness of the CHS on health outcomes in peri-urban, and rural agrarian contexts in Kenya. The CHS intervention was a partnership between the Ministry of Public Health and Sanitation and the Great Lakes University of Kisumu (Olayo *et al.*, 2014). The study established that the CHS was effective in improving FANC coverage in intervention sites (Olayo *et al.*, 2014). This study involved implementation of the CHS in parts of Siaya, western Kenya and Garissa. Implementation took place between 2011 and 2012. Following this, an evaluation survey was conducted to establish effectiveness of CHS on selected MCH outcomes. Though this study established improved utilization of FANC services in intervention site compared to control site, the binary logistic regression model used to test effect of CHS on MCH outcomes presented crude Odds Ratios (ORs). The implication is that the researchers did not control for potential confounders which could have influenced MCH service



utilization other than the CHS. The methodology limitation reduced the quality of evidence linking improved FANC service utilization to CHS. This is evident in the OR statistic which indicates that the odds of seeking FANC in intervention site compared to control was 21.162 with a 95% Confidence Interval (CI) ranging from 8.717 to 51.376 (Olayo *et al.*, 2014). Though the OR was significant at  $P < 0.0001$ , the wide margin of the 95% CI indicates that the precision of the OR was low. It is highly likely that the low precision which reduces strength of evidence in the results could have been contributed by uncontrolled confounding factors among other variables. In addition, the researchers did acknowledge other important limitations in their study as identified in chapter one.

These limitations coupled with the fact that the Olayo *et al.*, (2014) intervention was initiated during the same time as the Mwingi CHS intervention justifies the need to evaluate the Mwingi CHS intervention for the purpose of providing another set of evidences to help compare the findings. This is especially important based on the fact that the two interventions were going on at the same time in two geographically and ecologically different regions. Olayo *et al.*, (2014) CHS intervention was conducted in a peri urban and rural agrarian region in parts of Siaya, Western Kenya and Garissa while the Mwingi CHS intervention was initiated in a rural Arid and Semi-Arid Lands (ASALs) in Kitui County.

### **2.3.3. Summary and Identification of Gaps in Interventions Promoting FANC Coverage**

This section of literature review has established that globally, proportion of women receiving ANC at least once during pregnancy was 83% for the period 2007–2014. However, only 64% of pregnant women received the recommended minimum of four ANC visits or more. The literature review also revealed that in Kenya 42.4% of expectant women do not seek ANC services from skilled attendants for at least 4 times, (FANC coverage is at 57.6% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014)). In Mwingi west sub-county 38% of women do not seek ANC services as recommended by WHO (FANC coverage was 62% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014)). Previous studies underscored the importance of FANC in reducing maternal and child morbidity and mortality rates.

This literature review also featured evaluation studies on several interventions which included, systematic reviews of CHW led interventions and health provider led interventions aimed at improving FANC. Generally, the interventions were integrated MCH /safe motherhood programs in which improving FANC was among the components. Though most evaluation studies (assessing interventions other than the CHS) reported a positive association between increased FANC coverage and the specific intervention under assessment, some of the methods used in assessing effectiveness or impact of these interventions on FANC coverage had methodological limitations which reduced the strength of causal evidence linking interventions with improved FANC coverage. In general these limitations were; failure to use the AMSTAR (Assessing the Methodological Quality of Systematic Reviews) tool to estimate the quality of studies used in a systematic

review which reviewed evidence on effectiveness of CHW interventions in improving FANC coverage from 34 studies (Mbuagbaw *et al.*, 2015), a lack of a control group for comparison to help draw strong evidence on causal relationships in some evaluation surveys, and failure to control for confounding variables that would influence FANC coverage in intervention sites other than the intervention was evident in other studies. These limitations reduced the strength of evidence linking the interventions and improved FANC coverage.

There are two reasons which justify the need to carry out this study in Mwingi west sub-county. One; though the two studies conducted by Wangalwa *et al.*, (2012) and Olayo *et al.*, (2014) respectively reported that CHS improved FANC coverage, both studies had important limitations which reduced strength of causal evidence linking improved FANC coverage to CHS intervention. Due to the weak evidence, it is not possible to establish effect of CHS on FANC coverage in Kenya. Secondly; none of the studies was conducted in a rural ASAL like Mwingi west sub-county. The evaluation by Wangalwa *et al.*, (2012) was done in a rural agrarian region while Olayo *et al.*, (2014) was implemented in a peri-urban and rural agrarian region. It is therefore plausible to argue that the effect of CHS on FANC coverage in a rural ASAL in Kenya especially in Mwingi west sub-county (where the CHS intervention was implemented and has not yet been evaluated) is not known. This is the knowledge gap which justified the need to evaluate effect of CHS on FANC in Mwingi West Sub County.

## **2.4. Overview of Skilled Birth Care (SBC)**

### **2.4.1. SBC: Global, regional and Local Trends**

SBC is defined as “the process by which an expectant woman is provided with adequate care during labor, delivery and the early postpartum period by a skilled attendant operating within an enabling environment or health system capable of providing care for normal deliveries as well as appropriate emergency obstetric care for all women who develop complications during childbirth” while the term skilled birth attendants refers exclusively to accredited health professionals such as midwives, doctors or nurses who have been educated and trained to proficiency in the skills needed to manage normal pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in mothers and newborns (Utz *et al.*, 2013) and (Canavan, 2009).

By end of 2014, more than 71% of deliveries globally were conducted under SBC (United Nations, 2015). This is a tremendous progress compared to 59 % observed in 1990 (United Nations, 2015). This progress however was not without inequalities. Literature reveals that regions with low SBC prevalence had the highest MMR and vice versa. In sub-Saharan Africa and southern Asia countries for example, the prevalence of women delivering under SBC was reported as 52%, which was the lowest globally (United Nations, 2015). Consequently, Sub-Saharan Africa and Southern Asian regions have the highest MMR in the world with Sub-Saharan Africa alone accounting for roughly 66% of all maternal deaths globally (MMR 546 per 100 000 live births) followed by Southern Asia (176 per 100 000 live births) (WHO, 2015a). On the other hand, countries with a high prevalence of women delivering under SBC were reported to have low MMR. Latin American and Caribbean countries, Caucasus and Central Asia, and Eastern Asian countries proportion of women

delivering under SBC is 92%, 96% and 100% respectively (United Nations, 2015). Consequently, these regions had a low MMR with Latin America and Caribbean countries having a MMR of 67 deaths per 100,000 live births, caucas and central Asia had 33 per 100, 000 live births, and eastern Asia had 27 per 100, 000 live births (WHO, 2015a).

Despite strong evidence linking utilization of SBC with reduced maternal deaths, one in four babies worldwide are delivered without SBC (United Nations, 2015). This implies that millions of births occur annually without SBC. As previously indicated majority of these births are in sub-Saharan Africa and this is most likely the cause of the high MMR in the region. As noted before, developing countries accounted for approximately 99% (302 000) of the global maternal deaths by 2015, with sub-Saharan Africa alone accounting for roughly 66% (201 000), followed by Southern Asia (66 000) (United Nations, 2015). In Kenya proportion of women who delivered under SBC improved markedly from 43% in the 2008/09 KDHS to 61% in the 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). Despite this improvement, the proportion of women delivering under SBC is still low in many parts of the Country. Nineteen out of the 47 Counties in Kenya have more than half of women delivering without SBC (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). In Tana river county, the proportion of women delivering under SBC is 31.6%, Wajir County -18.3%, Marsabit County -25.8%, Turkana County -23.1%, West Pokot County -25.8%, Samburu County -24.5%, Trans Nzoia County -41.5% and in Kitui County where Mwingi West sub-county is located, the proportion of women delivering under SBC is low at 45.6% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014).

Studies have shown that most of maternal deaths are preventable. Researchers have established that hemorrhage is behind the greatest number of maternal deaths, accounting for 27% of maternal deaths in the developing regions and approximately 16 % in the developed regions (WHO, 2015a). Other causes of maternal death include infections, high blood pressure during pregnancy, complications from delivery and unsafe abortion (WHO, 2015a). SBC is one of the proven health interventions which can prevent or manage pregnancy and child birth related complications (United Nations, 2015). Improving SBC prevalence in Kenya will help reduce the high MMR in the country. This calls for innovative interventions.

#### **2.4.2. Interventions promotig SBC; Global, Regional nd Local Overview**

Studies have shown that different countries have embraced different interventions to help increase the number of women delivering under SBC. In Bangladesh, an integrated maternal health care intervention focused on deployment of Community based Skilled Birth Attendants (CSBAs) was initiated in Shahjadpur, a sub-district of the Sirajgonj district in Bangladesh between 2010 and 2011 (Huq *et al.*, 2015). The integrated package promoted delivery under SBC among other MCH outcomes (Huq *et al.*, 2015). After two years of implementation, a pre test -post test study established that the intervention improved utilization of SBC in intervention site (Huq *et al.*, 2015). The study adopted a sound methodology (cluster randomized controlled trial) and therefore evidence linking increased utilization of SBC in Bangladesh to CSBA led health education and counselling campaign is fairly strong.

Improving Maternal, Neonatal and Child Survival (IMNCS) is another similar intervention implemented by the Bangladesh Rural Advancement Committee (BRAC), a non-governmental development organization operating in rural parts of Bangladesh (Quayyum *et al.*, 2013). As explained in the FANC section of this literature review, the study was a CHW led intervention in which CHWs received basic training on: maternal, neonatal, and child health care management. trained CHWs were then tasked with identifying all pregnancies in the intervention areas and provide MCH education at home and in the community (Quayyum *et al.*, 2013). A quasi experiment with nonequivalent groups (3 in intervention site and 2 in control site) established that the intervention significantly increased utilisation of trained attendants for home delivery in the intervention areas compared to the control areas (Quayyum *et al.*, 2013). Though this was not SBC as defined in this research, the intervention demonstrated that CHWs can improve delivery by use of skilled attendants at home. It is however important to note that the strength of evidence in this study was low due to the methodology used. The researchers used non equivalent groups in intervention and control and, did not attempt to control for confounding variables and this limitation produced weak causal evidence.

As identified in the previous section of FANC, in Pakistan, the government of Pakistan and the Aga Khan Health Services implemented a Lady Health Workers (LHWs) and Community Health Workers (CHWs) led low-cost community-based interventions aimed at improving perinatal and neonatal outcomes in a sub-population of the remote mountainous district of Gilgit, Northern Pakistan (Memon *et al.*, 2015). The intervention promoted skilled birth attendance among other MCH issues. Assessment of the intervention established that proportion of women delivering under SBC increased

significantly in the intervention site compared to control. As highlighted before, the study adopted a sound methodology in assessing the effect of the intervention on MCH outcomes especially by use of the DiD model and therefore evidence linking increased utilization of SBC with the LWH/CHW led intervention was fairly strong.

Another Community Based Intervention referred to as Information and Education for Empowerment and Change (IEEC) was implemented in remote rural district of Balochistan province of Pakistan. The intervention was a safe motherhood initiative which comprised of a MCH education and campaign targeting women and their husbands, training of Traditional Birth Attendants (TBAs) in early recognition of obstetric danger signs and providing telecommunication and transportation services for women in need of emergency obstetric and neonatal care (Midhet and Becker, 2010). A study conducted to assess the impact of this program on MCH outcomes established that there was a small but significant increase in percentage of women who delivered under SBC (hospital deliveries) but no impact on the use of skilled birth attendants for women who preferred home deliveries (Midhet and Becker, 2010). The study employed a sound methodology (cluster randomized controlled trial) and therefore strength of causal evidence linking the intervention to marginal improvement in utilization of SBC in intervention site is fairly strong.

In Nigeria, the Partnership for Transforming Health Systems Phase 2 (PATHS2) program was initiated in 2009 as a community based intervention to support safe motherhood (Okereke *et al.*, 2014). A study conducted to assess the effect of PATH2 in addressing transportation as a barrier to accessing SBC established that the program addressed the challenge of transport as a barrier in accessing SBC among women in rural areas of Kano



and Jigawa states (Okereke *et al.*, 2014). This study however was not without methodological shortcomings. The researchers did not have a control group and also did not control for confounding variables. Though the study provided some evidence indicating that the intervention improved access to SBC care, causal evidence linking PATH2 intervention to improved access to SBC services was weak due to the observed study limitations.

In Rwanda, a review of a total of 63 papers in a systematic review established that community based interventions played a critical role in improving utilization of SBC and other MCH indicators in the period starting 2005 to 2015 (Bucagu M., 2016). The review acknowledged that each village in Rwanda has a CHW, 'a female known as mobilizer for maternal health' who is responsible for community-based interventions during and after pregnancy. The CHWs created a CHW led continuous MCH care service for expectant women which started from pregnancy to postpartum. This care coupled with use of a rapid SMS system to promote MCH education among expectant women were key in increasing utilization of SBC among other community led interventions (Bucagu M., 2016).

In Kenya, a number of interventions have been implemented to help improve utilization of SBC. A project entitled Kijabe Community Health Maternal Newborn Project (KCHMN) was implemented in 3 geographic areas namely; *Eburru*, *Nyakio* and *Kinale* (Adam *et al.*, 2014). The project recruited 83 volunteer CHWs and trained them on MCH issues in which the value of delivery under SBC was one of them (Adam *et al.*, 2014). The CHWs were then tasked to conduct MCH education and promotion campaigns within their localities. A quasi experiment conducted to assess effectiveness of the program established that the proportion of women delivering under SBC was higher among mothers who reported

exposure to one or more health messages, compared to those who did not (Adam *et al.*, 2014). Though the study showed some evidence linking the CHW led health education intervention with increase in utilization of SBC, the experiment had a methodological challenge which negatively influenced the strength of evidence provided in the study. The quasi experiment utilized post-test only measurements and did not have a control group (Adam *et al.*, 2014). Without a baseline survey, and a control group it was difficult to attribute increased utilization of SBC in intervention sites with the KCHMN project. This limitation, coupled with the fact that the researchers did not account for confounding variables which would have influenced utilization of SBC in the intervention site other than the KCHMN intervention compromised the strength of evidence in the study.

In Yatta sub county of Kenya, a TBA led intervention was implemented in March 2011 to help increase utilization of SBC in the region. The intervention involved recruitment of TBAs and training them on importance of SBC. The TBAs were then encouraged to educate pregnant women on the importance of delivering in health facilities and offered a small stipend for each pregnant woman they brought to a facility for SBC delivery (Tomedi *et al.*, 2013). A study conducted to assess effectiveness of the TBA led program in increasing utilization of SBC established that utilization of SBC increased by over 100% in intervention site compared to control site (Tomedi *et al.*, 2013). One of the shortcomings of this study is that investigators did not have a clear definition of intervention and control groups. Instead, two Ministry of Public Health and Sanitation (MOPHS) health facilities were chosen for the intervention (Katangi Health Center and Kisesini Dispensary), and other public health facilities in Yatta served as the controls (Tomedi *et al.*, 2013).

The assumption that expectant women in the locality served by intervention facilities were to deliver in these facilities only while expectant women living in the locality of control facilities would only seek SBC services at their local facilities is faulty. There is no guarantee that an expectant woman will choose to deliver at a health facility close to their residence and therefore it is difficult to prove that women who delivered in intervention facilities are only those who received the TBA led health education. This therefore lowers the strength of evidence in the study. Another limitation in the study is that investigators did not account for confounders such as maternal level of education and other socio-demographic factors which could have influenced utilization of SBC in intervention and control facilities other than the intervention. Though the study showed that TBAs increased utilization of SBC in intervention site, the strength of causal evidence was weak based on the observed limitations of the study.

As discussed in the FANC section of this literature review, since inception of CHS in Kenya, few studies have been conducted to assess its effectiveness on improving MCH outcomes. A study conducted in Busia Kenya established that CHS improved SBC utilization (Wangalwa *et al.*, 2012). As identified before, the particular study had important limitations which weakened the strength of evidence in the study. It was a pretest post test study without a control group. The study too did not account for potential confounders and therefore evidence linking increased utilization of SBC to the CHS intervention is weak.

Another study conducted to assess effectiveness of CHS in parts of Siaya, western Kenya and Garissa provided some evidence suggesting that CHS improved utilization of SBC in intervention sites (Olayo *et al.*, 2014). As identified in the FANC section of this literature review, though this study adopted a better methodology than the previous one, the

investigators acknowledged important limitations in which a failure to control for confounders was among them. This limitation lowered the strength of causal association between the CHS intervention and improved utilization of SBC in intervention site. Due to the limitations acknowledged, the effect of CHS on utilization of SBC in Kenya is not known with certainty more especially in Mwingi west sub-county where evaluation of the CHS program had not yet been done. This justified the need to carry out this study. Another reason why it was important to evaluate the Mwingi CHS intervention is that the two CHS interventions (one in Mwingi region and the second in Nyanza, western and Garissa regions) were initiated in two ecologically different zones and it was important to generate data to help compare if there could be differences in the findings which could be attributed to the different ecological regions.

#### **2.4.3. Summary and Identification of Gaps on Interventions Promoting SBC**

The literature review has underscored the importance of delivery under SBC in reducing maternal and child mortality rates. Literature has further highlighted that for the period starting 1990 to 2015, the proportion of women delivering under SBC improved tremendously globally due to national and international efforts geared towards meeting the MDGs by 2015. The literature further highlighted that despite these gains millions of mothers globally still deliver without SBC. The problem is more in Sub Saharan Africa and other resource poor countries. The literature also pointed out that Kenya suffers from this problem too with over half of women in 19 out of the 47 counties still delivering without SBC. In Kitui County, over half of women (54%) do not deliver under SBC.

The literature review featured the effect of several interventions which include, CHW led interventions, health provider led interventions and TBA led interventions on utilization of SBC. Generally the interventions were either single interventions whose aim was to improve SBC or integrated MCH /safe motherhood programs in which improving SBC was among the intervention's components. Though most evaluation studies reported a positive association between increased SBC utilization and the specific intervention under evaluation, some of the methodologies used to assess effectiveness or impact of these interventions on SBC utilization had methodological limitations which reduced the strength of evidence of causal relationships between interventions and SBC utilization.

There are two reasons which justify the need to carry out this study in Mwingi west sub-county. One; though the two studies conducted by Wangalwa *et al.*, (2012) and Olayo *et al.*, (2014) respectively reported that initial CHS projects improved SBC utilization, both studies had important limitations which reduced strength of causal evidence linking SBC utilization to CHS intervention. Due to the weak evidence, it is not possible to establish with certainty the effect of CHS on SBC utilization in Kenya. Secondly; none of the studies was conducted in a rural ASAL like Mwingi west sub-county. As indicated previously, the evaluation by Wangalwa *et al.*, (2012) was done in a rural agrarian region while Olayo *et al.*, (2014) was implemented in a peri-urban and rural agrarian region. It is therefore plausible to argue that the effect of CHS on SBC utilization in a rural ASAL in Kenya especially in Mwingi west sub-county is not known. What is the effect of CHS intervention on SBC utilization in Mwingi west Sub County? This formed the knowledge gap for study objective two.

## **2.5. Overview of Infant Vaccination Coverage (IVC)**

### **2.5.1. Child Immunization: Global, Regional and Local Trends**

Immunization is a powerful and cost-effective health intervention which averts an estimated 2 to 3 million deaths every year (WHO, 2009) and (UNICEF, 2015b). WHO considers a child to have received all basic vaccinations if the child has received: BCG vaccination against tuberculosis; three doses of DPT vaccine to prevent diphtheria, pertussis, and tetanus (or three doses of pentavalent, which includes DPT and vaccinations against both hepatitis B and *haemophilus influenzae* type B); at least three doses of polio vaccine; and one dose of measles vaccine (UNICEF, 2015b). These vaccinations should be received during the first year of life (UNICEF, 2015b). In Kenya, an infant is considered to be fully vaccinated if the infant has received all WHO basic vaccinations and three doses of pneumococcal vaccine (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014).

Global vaccination coverage – the proportion of the world’s children who receive WHO recommended vaccines – has remained steady for the past few years (UNICEF, 2015b). Since 2000, Global Alliance for Vaccines and Immunization (GAVI) and the Vaccine Alliance has supported vaccination of 500 million children in the world’s poorest countries, saving an estimated 7 million lives (UNICEF, 2015b). By 2014, global vaccination coverage was 86% – up from 20% in 1980 (UNICEF, 2015b). The world is closer to realizing a world free from polio. In 1988 there were 350,000 cases of polio in the world and in 2014, only 359 (UNICEF, 2015b). Measles vaccines have averted an estimated 17.1 million deaths between 2000 and 2014 (UNICEF, 2015b). Maternal and neonatal tetanus has been eliminated from 35 out of 59 high-risk countries since 1999

(UNICEF, 2015b). By the end of 2014, over 47 million children were protected from pneumonia by a pneumococcal vaccine program implemented in 73 countries (UNICEF, 2015b). By the end of 2015; 85% of children had received 1 dose of measles vaccine by their second birthday, 160 countries had included a second measles dose as part of routine immunization and 61% of children received 2 doses of measles vaccine, 86% of infants around the world received 3 doses of polio vaccine and global coverage of pneumococcal vaccine was estimated at 37%, Mumps vaccine had been introduced nationwide in 121 countries, and Rotavirus vaccine and Rubella vaccine global coverages were estimated at 23% and 46% respectively (UNICEF, 2015b).

In Kenya, Infant Vaccination Coverage (IVC)-defined as the proportion of children aged 1 year and below who have received the basic WHO recommended vaccines plus three doses of pneumococcal vaccination within their first year of life, is not documented in the most recent 2014 KDHS. However, child routine vaccination coverage- the proportion of children aged 12-24 months who have received the basic WHO recommended vaccines plus three doses of pneumococcal vaccination) is at 67.5% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This coverage is low compared to the global routine child immunization coverage of 2015 reported as 86% (UNICEF, 2015b).

In Kitui county where Mwingi west sub-county is located, routine child Immunization coverage is 52.7% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This implies that estimated half of the children born in Mwingi west sub county and the larger Kitui county do not complete the WHO recommended Routine Child Immunization Program (RCIP) by the time they are 24 months old. This could be the cause of high infant mortality rate ( 39 deaths per 1,000 live births) and high under five mortality rates (52

deaths per 1,000 births) in the region (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). These statistics point out to one thing; routine child immunization is low in Kenya and Mwingi west subcounty in particular.

### **2.5.2. Overview of interventions Promoting Child Immunization; Global, Regional and Local**

Common approaches used to increase child immunization coverage involve offering incentives for vaccination, or knowledge translation and education to promote and sustain vaccine uptake and mixed strategies combining features of supply and demand approaches (Johri *et al.*, 2015). ‘My Village Is My Home’ (MVMH) is a community based intervention which was designed and implemented in two countries namely India and Timor-Leste (Jain *et al.*, 2015). The MVMH intervention employed use of a large, poster-sized record on which every infant in a community has his or her own row, with spaces for the child’s name, date of birth, and dates of each vaccination. In the two countries, local volunteer CHWs or health workers did a rapid census to fill in the names and birth dates of all infants, starting with the oldest in the bottom row and moving upward. Infants born or moving into the community during the year were added on the next open line above. A roof covered the listings as an illustration that each vaccination of each child fills in a brick or board that strengthens the entire house, which was equivalent to adding protection for the entire community from vaccine-preventable diseases (Jain *et al.*, 2015).

An impact evaluation survey conducted in 2015 established that MVMH is a promising tool that; strengthened community participation in immunization, increased demand for immunization within health services and among the public, increased identification of



young children requiring immunization, improved timeliness of vaccination, and boosted IVC (Jain *et al.*, 2015). Though the evaluation compared data from previous immunizations records (as baseline data) with immunization records after implementation of MVMH project, the investigators did not account for other confounding variables which could have influenced child immunization status other than MVMH project. This lowers strength of causal evidence in the study. However it is important to point that the study employed use of qualitative design to collect qualitative data to help strengthen their findings, but even so failure to account for extraneous variables other than the MVMH project which would have influenced child immunization status in intervention site compromised strength of evidence in the evaluation study.

In Pakistan, a health centre based intervention aimed at increasing DPT 3 vaccination coverage among children was designed in 2004. The components of the intervention were; a redesigned immunization card redesigned to help remind mothers on child immunizations when they are due, and a center based information and motivation session for mothers/caregivers (Usman *et al.*, 2011). The intervention was initiated in six centers located in the rural peripheries of Karachi, the capital city of Sindh Province. Assessment of the intervention established that inexpensive reminder immunization card or a short center-based education to mothers were both effective interventions for increasing DPT 3 child immunization coverage compared to standard care (Usman *et al.*, 2011). The strength of evidence in the study was high due to the method used-(randomized controlled trial).

A slightly different intervention was implemented in Karachi- Pakistan. As opposed to the previously discussed which was facility based health education program, this was a community based health education intervention targeting women with low literacy levels

in Karachi (Owais *et al.*, 2011). The intervention was a multi-site community-based, randomized controlled educational intervention trial conducted at five low-income sites in Karachi with the aim of increasing maternal knowledge on child immunization (Owais *et al.*, 2011). The intervention group received 3 key messages; the first key message highlighted how vaccines save children's lives, second- message provided logistic information about the address and location of the local vaccination centers, and third- emphasized on significance of retaining immunization cards. A copy of these pictorial messages was left with the mother.

The control group verbally received the general standard health promotion messages adapted from the curricula developed by the Pakistan Ministry of Health for the Lady Health Worker (LHW) Program in Karachi (Owais *et al.*, 2011). The intervention was implemented in one urban community and four other peri urban communities located about 45 minutes travel outside of Karachi (Owais *et al.*, 2011). Assessment of the intervention revealed a significant improvement in infant DPT-3/Hepatitis B vaccine immunization rates in the group of mothers who received home-based education on the importance of vaccines, compared to those who received standard health promotion messages only in Karachi (Owais *et al.*, 2011). The study demonstrated that providing vaccine-related targeted education to mothers at home is an effective and practical strategy to improve childhood immunization rates in low literacy settings in Karachi (Owais *et al.*, 2011). This being a community based randomized controlled trial, the strength of causal evidence in the study was high.

In 2009, a cash transfer program was implemented in Zimbabwe with the aim of measuring the effect of the intervention on child health and development (Robertson *et al.*, 2013). The

intervention comprised of Conditional Cash Transfers (CCT) and Unconditional Cash Transfers (UCT) in which regular cash payments were made to households with and without complying with certain conditions related to their children's wellbeing respectively (Robertson *et al.*, 2013). The aim was to raise awareness about beneficial behaviours and provide additional incentives to overcome sociocultural barriers (Robertson *et al.*, 2013).

In the intervention, every household enrolled in the UCT programme collected \$18 plus \$4 per child in the household (up to a maximum of three children) from designated pay points every 2 months. Households in the CCT group received the same amount, but were monitored for compliance with several conditions which include: application for a birth certificate within 3 months for all children younger than 18 years (including newborn babies), children younger than 5 years had to be up-to-date with vaccinations and attend growth- monitoring clinics twice a year; children aged 6–17 years had to attend school at least 90% of the time per month; and a representative from every household had to attend two-thirds of local parenting skills classes. Compliance cards were issued to CCT households and were signed by service providers when beneficiaries accessed services. Eligible households in all clusters UCT clusters, CCT clusters and control cluster (received no cash), had access to parenting skills classes and received maize seed and fertiliser as extra incentives.

Upon assessment to establish the effect of the intervention on child immunization, investigators established that the proportion of children aged 0–4 years with complete vaccination records was significantly higher in both the UCT and CCT groups compared to control group (Robertson *et al.*, 2013). The design of the evaluation methodology was a

cluster randomized controlled trial and therefore the strength of causal evidence in the study was high. The implication is that it is highly probable that a cash incentive would increase child vaccination coverage in resource poor countries.

In Kenya, a number of interventions have been piloted to help improve child immunization coverage. A health provider led campaign aimed at reminding women to return their infants for the next immunization schedule in time was implemented in 3 districts in Kenya namely, *machakos*, *Langata* and *Njoro* (Haji *et al.*, 2016). Women in the intervention site were randomly allocated to either a mobile phone reminder or a sticker reminding the mothers not to forget to avail their children in time for the next immunization date while women in control site relied on the standard practice of having dates for the next visit written in the immunization booklet (Haji *et al.*, 2016). The aim was to reduce infant drop out in the routine child immunization program.

Evaluation of the program revealed that SMS reminders were effective in reducing dropouts for vaccinations in intervention site and that vaccination coverage was significantly higher among those receiving SMS reminder than those relying on the notes in child immunization booklet (Haji *et al.*, 2016). The study also found out that there was no statistical difference between those who received stickers and those who relied on standard practice (use of child immunization booklets) in the control group (Haji *et al.*, 2016). The authors employed a scientifically sound methodology in through random assignment of the intervention components and therefore strength of causal evidence in their study was high. This implies that use of mobile phone based reminder messages can highly increase adherence to RCIP.

In Homa Bay district-Kenya, an intergrated intervention which combined both child routine vaccination and hygiene promotion was implemented as a component of the Safe Water and AIDS Project (SWAP) in 2009 (Ryman *et al.*, 2012). In the intervention, nurses and CHWs were trained on hygiene and sanitation, and tasked with promoting hygiene to women seeking child immunization services in urban and rural health centres and dispensaries in Homabay district. Hygiene promotion involved distribution of hygiene kits to mothers during infant vaccination visits by the nurse or a CHW (Ryman *et al.*, 2012). An evaluation using a pretest-posttest method to measure hygiene indicators and vaccination coverage established that hygiene indicators improved similarly in nurse and CHW sites while IVC increased in urban areas. In rural areas, IVC either remained unchanged or increased with exception of third dose poliovirus vaccine which decreased (Ryman *et al.*, 2012). The study had several limitations which include; it was a pretest post test experiment without control, the researchers did not control for confounding variables which would have influenced adherence or lack of adherence to child immunization programme, the researchers acknowledged a lack of immunization doses for children as a limitation during the implementation time. These limitations reduced strength of causal evidence linking the intervention to increased IVC in intervention sites.

As indicated previously, since inception of the CHS in Kenya, few studies have been conducted to assess effectiveness of CHS on MCH outcomes. Out of the studies conducted, Olayo *et al.*, (2014) CHS evaluation study reported that CHS was effective in increasing measles immunization coverage. The study however did not evaluate effect of CHS on IVC. In Kenya therefore, effect of CHS on IVC is not known.

### **2.5.3. Summary and Identification of Knowledge Gap on Interventions improving IVC**

Literature in this section has underscored the importance of routine child vaccination in reducing child morbidity and mortality rates. Further, the literature notes that global vaccination coverage is at 86% which is a 20% increment compared to 1980. Further the literature acknowledged that Measles vaccines have averted an estimated 17.1 million deaths between 2000 and 2014 and that Maternal and neonatal tetanus has been eliminated from 35 out of 59 high-risk countries by 2015 (UNICEF, 2015b). Data indicates that in Kenya, vaccination coverage of children between 12-24 months is at 67.5% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This implies that 32.5% of all children aged between 12-24 months in Kenya do not receive all the WHO recommended vaccines in the RCIP of Kenya. In Kitui County vaccination coverage of children between 12-24 months is at 52.7% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). This implies that 47.3% of children aged 12-24 months do not receive all the vaccines recommended in the RCIP of Kenya. Mwingi west subcounty is located in Kitui county and therefore these statistics indicate that estimated half of children aged between 12 to 24 months in the sub-county are not fully immunized.

In regard to interventions aimed at improving child immunization coverage, literature identified four types of interventions which have been embraced with the aim of improving child immunization coverage. These include; health provider- led health education and promotion targeting women with infants seeking MCH services including child immunization, CHW- led health promotion targeting women with children at household level through regular household visits, cash incentives aimed at motivating women to

ensure they do not default on child immunization schedules, and mobile phone based interventions aimed at reminding women on the specific dates their children are due for immunization. All the reviewed studies provided evidence that each intervention increased child immunization coverage except use of stickers to help remind mothers on due dates for immunization of their children. However, the strength of causal evidence was low in some studies due to limitations in their methodological designs.

As indicated before, since initiation of CHS program in Kenya, few studies have been implemented to investigate the effect of the CHS on MCH outcomes. Though one of the studies (Olayo *et al.*, 2014) reported that CHS was effective in improving measles immunization coverage, strength of evidence was low due to limitations observed and reported by the researchers. The study also did not evaluate effect of the CHS on IVC and this left an information gap. The effect of CHS on IVC in Kenya is not known. This is the knowledge gap for study objective three which justified undertaking of this study.

## **2.6. Overview of Exclusive Breast Feeding (EBF)**

### **2.6.1. EBF: Global, Regional, and Local Trends**

WHO recommends breast milk as the ideal food for newborns and infants (WHO and UNICEF, 2015). Optimal child breastfeeding practices consist of; early initiation of breastfeeding (within the first hour of life), EBF for the first six months and continued breastfeeding for 2 years or beyond (WHO and UNICEF, 2015). Breastfeeding has a wide range of benefits for mother and child. Besides providing infants with all the nutrients they need for healthy development, breastmilk is safe and contains antibodies that help protect infants from common childhood illnesses such as diarrhea and pneumonia which are the two primary causes of child mortality worldwide (WHO and UNICEF, 2015). Continued breastfeeding – which covers breastfeeding during the period between 6 months and 2 years of age or beyond – improves cognitive ability, translating into improved school performance, better long-term earnings and enhanced productivity (UNICEF, 2016) and (WHO and UNICEF, 2015). Beyond the immediate benefits for children, breastfeeding contributes to a lifetime of good health. Adolescents and adults who were breastfed as babies are less likely to be overweight or obese. They are less likely to have type-II diabetes and perform better in intelligence tests (Agunbiade and Ogunleye, 2012). Breastfeeding has substantial benefits on maternal health which include; improving birth spacing and reducing the risk of post-partum hemorrhage, decreasing risk of premenopausal breast cancer, ovarian cancer, type 2 diabetes and some cardiovascular diseases (WHO and UNICEF, 2015).

Besides reducing maternal and child morbidity and mortality, breastfeeding also contributes to environmental sustainability by providing a natural, renewable food that



needs no packaging, transportation, storage, or cooking, hence making it environmentally friendly (WHO and UNICEF, 2015). Based on this evidence, breastfeeding is explicitly recognized by the International Convention on the Rights of the Child as a key component of every child's human right (WHO and UNICEF, 2015). In 2011, suboptimal breastfeeding practices accounted for more than 800,000 deaths among children under five years of age (WHO and UNICEF, 2015). Suboptimal infant breastfeeding has been associated with an increased incidence of infectious morbidity, including otitis media, gastroenteritis, and pneumonia, as well as elevated risks of childhood obesity, type 1 and type 2 diabetes, leukemia, and Sudden Infant Death Syndrome (SIDS) (WHO and UNICEF, 2015). Among premature infants, lack of breast milk is associated with an increased risk of necrotizing enterocolitis (WHO and UNICEF, 2015).

Despite growing evidence that EBF plays a critical role in reducing maternal and child morbidity and mortality, 3 out of 5 infants under 6 months of age are not receiving the protective benefits of EBF globally (UNICEF, 2016). Global EBF prevalence by 2015 was at 43% (UNICEF, 2016). This was low compared to the tremendous efforts (to be discussed in next sub topic) employed by individual countries aimed at meeting MDGs by 2015. The highest EBF rates are found in South Asia, where almost 60 per cent of infants under 6 months of age receive only breastmilk, followed by Eastern and Southern Africa, where 57 % of infants under 6 months of age benefit from this practice (UNICEF, 2016). In west and central Africa, prevalence of EBF is 29%, East Asia and the Pacific -31%, Latin America and the Caribbean-32%, and Middle East and North Africa-35% (UNICEF, 2016). In Kenya, the proportion of infants younger than age 6 months who are exclusively breastfed markedly increased from 32% in the 2008-09 KDHS to 61% in the 2014 KDHS

(Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). More than half of children in Kenya (51%) are still breastfeeding at age 20-23 months (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014).

Though Kenya is a breastfeeding success story, poor breastfeeding practices are still widely documented in the Country ) (Kimani-Murage *et al.*, 2015).. In Kitui County, Infant and Young Child Nutrition (IYCN) practices are suboptimal across the County (County Government of Kitui, 2013). More than half of infants (55%) born in Mwingi west sub-county are not exclusively breastfed. Prevalence for EBF for six months is 45% (County Government of Kitui, 2013) This is a problem which needs intervention. Could volunteer CHWs working in the CHS intervention increase prevalence of EBF in Kitui county? What is the effect of CHS on EBF in Mwingi west sub-county? These are part of the questions this study sought to answer.

### **2.6.2. Overview of Interventions Promoting EBF: Global, regional and Local**

The need to improve MCH and meet targets of MDGs by 2015 saw many countries design and adopt a number of interventions aimed at improving EBF. A theory-based comprehensive nursing breastfeeding promotion intervention aiming at improving long-term EBF practice in China was initiated in 2013 in the Shanghai first maternity and infant Hospital, Tongji University (Wan, Tiansawad, and Yimyam, 2016). The participants in this intervention were first-time Chinese mothers seeking MCH services from the hospital. The breastfeeding promotion interventions were designed to change women's breastfeeding attitudes, subjective norms, and perceived breast-feeding control by focusing on their underlying beliefs and values. Family members of the women, including their

husbands, mothers, or mother-in-law, were invited to be involved in the activities to increase the women's subjective norm (Wan *et al.*, 2016). The intervention components included; promoting BF initiation at hospital, group education of mothers in their second day postpartum including their caretakers such as, husbands and mother-in-law's, promoting BF initiation at home through telephone counselling twice in a week within the first 2 weeks and once a week during weeks 3 to 6 postpartum and promoting continuation of BF during the regular check-ups (Wan *et al.*, 2016). An evaluation study to establish effectiveness of the intervention indicates that, overall, the intervention was effective in increasing EBF rates of the intervention group within 6 months postpartum (Wan *et al.*, 2016). The EBF rates at 4 and 6 months among the intervention group were significantly higher than the control group (Wan *et al.*, 2016).

This being a longitudinal, randomized, controlled-trial, with intervention and control sites, the strength of evidence is high and therefore it is highly probable that a provider led EBF promotion targeting both increasing awareness on importance of EBF as well as change in attitude and an attempted change in cultural norms would increase EBF. A unique thing in this intervention is that health service providers did not only target the expectant mothers and provide a continuum of care from ANC to delivery and postpartum, but also the intervention targeted husbands, mothers and mother in-laws of postpartum women to help create an enabling environment for EBF.

An intervention which focused on having fathers play an active role in promoting EBF was initiated in a large teaching hospital in Toronto, Canada. (Abbass *et al.*, 2014). The intervention aimed at improving co-parenting skills among primiparous (first time) mothers and fathers. The core skills for effective co-parenting which consist of effective

communication, problem solving, and conflict resolution were packaged in a multicomponent co-parenting intervention (Abbass *et al.*, 2014). Participants were recruited between March and July 2012. The trial intervention was a multifaceted co-parenting breastfeeding support intervention which was provided face to face on the postpartum unit. During this time, the couples were provided with breastfeeding information, and given the option of watching a video with EBF content.

The couples were followed up at home with e-mails at 1 and 3 weeks postpartum and a telephone call at 2 weeks postpartum (Abbass *et al.*, 2014). In addition to this the couples were provided with a co-parenting website, co-parenting booklets, and a breastfeeding video. A Randomized Controlled Trial (RCT) to evaluate effectiveness of the intervention on EBF established that significantly more mothers in the intervention group than in the control group reported that their partners provided them with breastfeeding help in the first 6 weeks. Although proportionately more mothers in the intervention group were exclusively breastfeeding at 6 and 12 weeks, these differences were not significant (Abbass *et al.*, 2014). The strength of evidence in the study was strong because the researchers adopted a RCT. Though the researchers did not assess the effect of the intervention on EBF at 6 months, the study did not find any significant difference between intervention and control groups on EBF at 6 and 12 weeks.

In Los Angeles County (USA), pregnant low-income Hispanic women were recruited from community health clinics and randomly assigned to either a control or an intervention group. The intervention in the study was a phone-based breastfeeding intervention delivered by lactation educators to low-income Hispanic women in the USA (Efrat *et al.*, 2015). Participants were recruited by case managers working at five community health

clinics serving a large population of low-income Hispanics in Los Angeles County. From July 2011 through July 2012, 289 pregnant low-income Hispanic mothers were randomized to either the control or intervention group. In the intervention, lactation educators used phone calls to educate participants on importance of EBF.

The intervention entailed four prenatal and seventeen postpartum phone calls (first call initiated when mothers were in the third trimester of pregnancy and the last call when mother was six months postpartum. Most of the calls were done in the first six weeks postpartum because it is considered the critical period for establishing breastfeeding and is likely the time that a mother will need the most EBF support and education (Efrat *et al.*, 2015). Assessment of the effect of the intervention on breastfeeding revealed a significant difference in the duration of EBF among participants during the infant's first week of life. The duration of EBF amongst all participants was, on average, longer for intervention group mothers compared to control group mothers (Efrat *et al.*, 2015). This again being a RCT and having controlled for confounding factors the strength of evidence in the study is strong and suggests that telephone-based breastfeeding interventions delivered by a lactation educator is an effective strategy for sustaining EBF for a longer duration, though it was not clear if any woman in intervention or control practiced EBF for the recommended 6 months.

Between April 2009 and March 2010, a group of 540 self-identified black and Latina postpartum women who delivered at a tertiary hospital located in New York City were randomized to receive a behavioral educational intervention or enhanced usual care (intervention (n=270) versus controls (n=270) (Howell *et al.*, 2015). The intervention aimed to prepare and educate mothers about postpartum symptoms and experiences

(including tips on breastfeeding and breast/nipple pain), bolster social support and self-management skills and included an in-hospital educational session with a social worker, educational materials, and a 2-week follow-up call (Howell *et al.*, 2015). Assessment of the effect of the intervention of breastfeeding revealed that though there was no statistically significant difference in EBF at six-months postpartum between the intervention group and control group, intervention increased breastfeeding duration in intervention site compared to control (Howell *et al.*, 2015). This being an RCT, strength of causal evidence is high. Though the intervention did not increase EBF at 6 month postpartum, it did increase the quantity of breast milk among infants in intervention site.

In South Africa, a CHW led intervention referred to as ‘Good-start’ package was implemented in 15 cluster intervention sites (Tomlinson *et al.*, 2014). The study site, Umlazi, is a peri-urban settlement with one million population near Durban, KwaZulu-Natal. The Good-start intervention was integrated in nature and comprised of; Prevention of Mother To Child Transmission (PMTCT), Integrated Management of Childhood Illness, counselling on EBF and newborn care guidelines done with the aim of helping mothers to confront barriers to EBF which had been identified as family and other social cultural barriers (Tomlinson *et al.*, 2014). Women in the intervention arm received 7 home based visits, 2- during pregnancy, 1- within 48 hours of delivery, 1- during days 3-4, 1- during days 10-14, 1-during weeks 3-4 and last 1-during 7-8 week. Low birth weight neonates were to receive 2 extra visits within the first week (Tomlinson *et al.*, 2014). Intervention service providers were trained CHWs (Tomlinson *et al.*, 2014). In another 15 control clusters, CHWs provided information and support on accessing social welfare grants and conducted three home-based visits: one during pregnancy and two during weeks 4–6 and

10–12 weeks post-delivery. One of the objectives of the intervention was to establish the effect of the intervention on levels of EBF (Tomlinson *et al.*, 2014). A cluster randomized trial established that the intervention was effective in almost doubling the rate of EBF in intervention sites (Tomlinson *et al.*, 2014).

This being a controlled cluster randomized controlled trial, the strength of causal evidence was high. It is therefore highly likely that the integrated intervention implemented in intervention arm could be attributed to the improved EBF prevalence in intervention site compared to control site.

In Mbale District- eastern Uganda, a behavior change EBF intervention was implemented between 2006 and 2011 (Fadnes *et al.*, 2016). This was done through a cluster RCT in which a total of 24 clusters within a 1 hour drive from Mbale Municipality in Mbale District were chosen (Fadnes *et al.*, 2016). Mothers in the intervention clusters received breastfeeding support by trained peer-counsellors. Each mother was offered at least five visits with the first visit during pregnancy, and others subsequently scheduled at week 1, 4, 7 and 10 after delivery. The peer counsellors provided information and supported EBF for 6 months and identified common breastfeeding problems such as a feeling of having insufficient breast milk, sore nipples, breast engorgement, mastitis and poor positioning of the breast. Growth assessment for children under five years who took part in the RCT established that while stunting was widespread at 2 and 5 years of age in both arms, it was more common in the intervention arm (Fadnes *et al.*, 2016). The strength of evidence in the study was high and this study questioned the capacity of community-based support from lay people (with short training and focusing only on EBF) in regard to improving child health and development (Fadnes *et al.*, 2016).

In Kenya, interventions aimed at improving EBF at 6 months postpartum are scarce. However, since inception of the CHS, two studies have been conducted to evaluate effectiveness of the CHS on EBF at 6 months postpartum. One study conducted in a rural set up (Busia-Kenya) established that CHS increased EBF by 32% (Wangalwa *et al.*, 2012). However, as discussed in previous subtopics of this literature review, the evaluation study in Busia had many limitations which weakened the strength of evidence in the study. These limitations included a lack of control group and failure to account for confounding variables which would have influenced EBF other than the CHS intervention. This undermined the strength of causal evidence in the study. Though the study provided some evidence suggesting that CHS improved EBF prevalence in Busia, the evidence in the study was highly compromised by the limitations used in the study methodology.

Another study which tested the effect of CHS on EBF was conducted in an urban poor slum setting in Nairobi-Kenya ) (Kimani-Murage *et al.*, 2015). The study was carried out in two slums of Nairobi, Kenya (*Korogocho* and *Viwandani*) by the African Population and Health Research Center (APHRC) through the Nairobi Urban Health and Demographic Surveillance System (NUHDSS) (Kimani-Murage *et al.*, 2015). The study established that CHS increased EBF in intervention site by over 55% and that after adjusting for baseline characteristics, the Odds of EBF at 6 months postpartum were higher in intervention site compared to control (Kimani-Murage *et al.*, 2015).

Though evidence from the first study (Busia study) was low due to the important limitations that compromised the strength of evidence, the second study employed a stronger methodology (Quasi experiment with intervention and control site). This implies that the strength of causal evidence between CHS and observed increase in proportion of



EBF at 6 months is high compared to the Busia study. It is however important to note that none of the two studies assessed the effect of CHS on EBF in an ASAL area like Mwingi west sub county. First study assessed CHS intervention implemented in a rural agrarian region (Busia) in Kenya and the second study assessed a CHS intervention implemented in an urban poor set up (*Korogocho* and *Viwandani-Nairobi*). Effect of CHS on EBF in a rural ASAL such as Mwingi west sub-county is not known with certainty. This justified the need for this study.

### **2.6.3. Summary and Identification of Knowledge Gaps on CHS and EBF**

This section of literature review reviewed not only the many documented benefits of EBF but also several interventions which have been implemented before to help increase the number of women practicing EBF. The review left out no doubt that though Kenya is a EBF success story with 61% of women practicing EBF as reported in most recent KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014), EBF is still a problem in many parts of the country. A good example is Mwingi west sub county where more than half of children (55%) born in Kitui County where Mwingi is located do not go through EBF. EBF prevalence in Mwingi west Sub County is 45%. (County Government of Kitui, 2013).

Interventions which have been implemented to help increase the number of women practicing EBF can be summarized as follows; provider led health education interventions with a component of behavior change targeting postpartum women, co-parenting intervention aimed at enlisting fathers support in EBF, mobile phone based EBF advocacy intervention, a continuum of care intervention which starts engaging women on importance

of EBF when expectant, during delivery and the immediate postpartum, use of peer counsellors and lactation educators to help increase EBF knowledge among Postpartum mothers, and CHW led interventions like in the two CHS studies in Kenya. Most of the studies have evidence that the interventions helped in improving EBF though some studies were found to have weaker evidence compared to others due to the important limitations which influenced strength of evidence in these studies.

Two studies conducted to evaluate effectiveness of CHS in promoting EBF in Kenya are of particular importance in this study. First study assessed CHS intervention implemented in a rural agrarian region (Busia) in Kenya and the second study assessed a CHS intervention implemented in an urban poor set up (Korogocho and Viwandani-Nairobi). Though both studies provided some evidence suggesting that CHS improved EBF prevalence in Busia and parts of Nairobi slums, none of the two studies assessed the effect of CHS on EBF in a rural ASAL in Kenya such as Mwingi west sub-county. This is the knowledge gap for study objective four.

## **2.7. Overview of Postpartum Family Planning (PPFP)**

### **2.7.1. PPFP: Significance of PPFP and Global, Regional, and Local Trends**

WHO defines Postpartum Family Planning (PPFP) as the prevention of unintended pregnancy and closely spaced pregnancies through the first 12 months following childbirth (WHO, 2013). While Family Planning (FP) is important throughout an individual's and couple's reproductive life, PPFP focuses on the prevention of unintended and closely spaced pregnancies through the first 12 months following childbirth. Globally, PPFP is recognized as a key life-saving intervention for mothers and their children (WHO, 2013). PPFP can avert more than 30% of maternal deaths and 10% of child mortality if couples space their pregnancies more than 2 years apart (WHO, 2013).

Closely spaced pregnancies within the first year postpartum are the riskiest for mother and baby, resulting in increased risks for adverse outcomes (WHO, 2013) and (Pasha *et al.*, 2015). Risk of child mortality is highest for very short birth-to-pregnancy intervals (<12 months)(WHO, 2013) and (Pasha *et al.*, 2015). If all couples waited 24 months to conceive again, under-five mortality would decrease by 13% and if couples waited 36 months, the decrease would be 25% (WHO, 2013). Children born three to four years after a previous birth are likely to have a significant survival advantage compared to children born within two years of the previous birth (Pasha *et al.*, 2015). Additionally, an early second pregnancy may negatively influence the health, development and survival of the first child (Pasha *et al.*, 2015).

A recent 10-year study of maternal mortality in 46 countries found that the risk of maternal death increases as the number of children per woman rises to four or more (WHO, 2013). The study also found that maternal deaths declined by 7–35% as the number of children

per woman fell (WHO, 2013). PFP, therefore, helps women to space and limit future pregnancies, while helping to lower rates of maternal and child death (WHO, 2013). Studies have also shown that the provision of quality family planning services in the postpartum period has the potential to reduce the voluntary termination of unwanted pregnancies and effect a reduction in both maternal and childhood mortality and morbidity arising from unsafe abortions (Pasha *et al.*, 2015). Demographic and Health Survey data analysis from 27 countries indicates that 65% of women who are 0–12 months postpartum want to avoid a pregnancy in the next 12 months but are not using contraception (WHO, 2013).

In 2015, 64 % of married or in-union women of reproductive age worldwide were using some form of contraception (United Nations Department of Economic and Social Affairs, 2015). However, in the least developed countries contraceptive use was much lower at 40 % and was particularly low in Africa at 33%. Among the other major geographic areas, contraceptive use was 59 % in Oceania and 75 % in Northern America (United Nations Department of Economic and Social Affairs, 2015). Within these major areas there are large differences by region. In Northern Africa contraceptive prevalence was 53%, Southern Africa-64%, sub-Saharan Africa-28.4%, and Western Africa-17%. Contraceptive use has been increasing recently in Eastern Africa and now stands at 40 %. In Kenya contraceptive prevalence by 2015 was 57.4% (any FP method), and 56% (modern FP methods). (United Nations Department of Economic and Social Affairs, 2015).

Worldwide in 2015, 12 % of married or in-union women are estimated to have had an unmet need for family planning; that is, they wanted to stop or delay childbearing but were not using any method of contraception (United Nations Department of Economic and

Social Affairs, 2015). The level was much higher, 22 % in the least developed countries. In Sub-Saharan Africa, unmet need of FP was highest at 24 %, double the world average in 2015 (United Nations Department of Economic and Social Affairs, 2015). Unmet need was lowest (below 10 %) in Eastern Asia, Northern Europe, Western Europe and Northern America. Eastern Africa was among the regions with highest unmet need of FP by 2015 at 20%. In Kenya unmet need for FP was 18.5% in 2015 (United Nations Department of Economic and Social Affairs, 2015).

Data on prevalence of unmet need for PPFp is scarce both globally and locally. In Kenya, a study which reanalyzed FP data of the 2008/2009 KDHS established that in Kenya, unmet need of PPFp was distributed as follows, from 0–5.9 months postpartum, overall unmet need for PPFp was 76%, at the end of one year postpartum, overall unmet need decreased to 59%, and by the end of second year unmet need for PPFp was to 48% (USAID and MCHIP, 2010). The 2014 KDHS reports on overall unmet need for FP as opposed to PPFp. Data in the report indicates that unmet need of family planning among sexually active women in Kenya and unmet need of family planning of married women was 27% and 18% respectively (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014) .

### **2.7.2. Overview of Interventions Promoting PPFp**

In Bangladesh, a quasi-experiment was conducted to establish effectiveness of integrating PPFp promotion in a Community-Based Maternal and Newborn Health (MNH) Program (Ahmed *et al.*, 2015). In the experiment, women in intervention site received a package of integrated MNH and FP interventions while women in control site received MNH interventions only (Ahmed *et al.*, 2015). Locally recruited CHWs counselled women on

risks of closely spaced births, timing of return to fertility, and benefits of longer birth intervals. CHWs also promoted use of modern methods of PPFp as well as distributing oral pills and condoms (Ahmed *et al.*, 2015). Standard FP services from the Ministry of Health and Family Welfare were available in both the intervention and comparison areas (Ahmed *et al.*, 2015).

Evaluation of the intervention established that PPFp prevalence was higher in intervention site compared to control site. There was also a significant increase in the probability of women who used a modern contraceptive all through to 36 months postpartum in intervention site compared to control (Ahmed *et al.*, 2015). Researchers in the quasi experiment controlled for sociodemographic characteristics as potential confounding factors and therefore the strength of evidence in the study was relatively strong. The study demonstrated that integrating PPFp promotion in Community based MNH program was effective in promoting modern PPFp in intervention site.

In urban Uttar Pradesh (India), a study was conducted to assess the effect of integrating PPFp counselling to MCH services (Achyut *et al.*, 2015). The intervention entailed provision of FP information alongside other MCH services to women seeking ANC services. Evaluation of effectiveness of the intervention in utilization of modern PPFp indicated that provision of FP information as part of ANC in the third trimester, delivery and the early postpartum period had a positive association with postpartum modern contraceptive use in urban Uttar Pradesh (Achyut *et al.*, 2015). Though the study identified several limitations that compromised strength of evidence of the study findings which included a risk of recall bias as well as failure to account for confounding factors, The

study provides some evidence suggesting that integrating PFP promotion into routine MCH care can increase PFP utilization.

In Eastern Burma, a Project referred to as 'Mobile Obstetric Medics (MOM) was implemented between 2005-2008 by a coalition of health service providers which included Burma Medical Association, the Global Health Access Program, the Mae Tao Clinic in Mae Sot, Thailand, and the Center for Public Health and Human Rights at the Johns Hopkins University (Mullany *et al.*, 2010). The intervention was designed to serve internally displaced communities in Eastern Burma and focused on improving access to FANC, family planning, SBC, promotion of essential newborn care, and improved recognition of and care-seeking for maternal and newborn danger signs (Mullany *et al.*, 2010).

MOM was a Community-Based Maternal Health Worker led project in which service provision was done at three levels as follows: TBAs- provided improved antenatal care services, conducted normal deliveries, and created links between community members and the workers in upper tier, health workers- provided antenatal care and family planning supplies, attended deliveries, and provided universal misoprostol (medicine) for prevention of postpartum hemorrhage and, when necessary, intramuscular antibiotics for sepsis. Evaluation of the intervention established that compared to baseline, use of modern methods of family planning increased significantly and unmet need for contraception reduced significantly (Mullany *et al.*, 2010). The study employed a pretest post-test experiment and binomial regression analysis to control for any confounding variables. The strength of evidence linking increased use of modern FP to the intervention was fairly good.

In 2012, a team of researchers applied modern collaborative quality improvement methods to facilitate the integration of family planning and postpartum care services in 5 high-volume delivery hospitals in Kabul, Afghanistan (Tawfik *et al.*, 2014). To achieve this, researchers conducted a root cause analysis to identify barriers to integrating FP into postpartum care services. Following the analysis, the intervention adopted the following changes aimed at integrating FP services to postpartum services; creating a private counselling space near the postpartum ward, providing PPFPP counselling training and job aids to staff, and involving husbands and mothers-in-law in PPFPP counselling in person or via mobile phones. After 10 months, the proportion of postpartum women who received family planning counselling before discharge and the proportion of women who received family planning counselling with their husbands increased significantly (Tawfik *et al.*, 2014).

In addition, the proportion of postpartum women who agreed to use family planning and left the hospital with their preferred method also increased significantly. The study established that the number of women who self-reported pregnancy at 6 months' postpartum, 12 months postpartum and 18 months postpartum was significantly low in intervention site hospitals compared to control site hospitals. The study concluded that application of quality improvement methods helped providers recognize and overcome barriers to integration of family planning into postpartum services (Tawfik *et al.*, 2014). The strength of evidence in the study was relatively strong based on the fact that the researchers used a sound methodology (randomized samples in intervention and control sites) to measure the effect of the intervention on PPFPP. The researchers therefore demonstrated that identifying barriers in integrating family planning into postpartum care



and providing solutions for the same could help in integrating family planning into postpartum care and thus increase the number of postpartum women able to space pregnancies due to increased use of PPFp.

In South Africa, investigators designed a multi-faceted intervention which focused on reinforcement of counselling on postpartum family planning delivered to PMTCT clients in antenatal, delivery and child health services. The components of the intervention included; provider training on reproductive health services for HIV-positive women, training on Intra Uterine Device (IUD) insertion and removal, clinical supply management support, and strengthening referral system for female sterilization. Assessment of effectiveness of the intervention in promoting knowledge of PPFp established that the intervention failed to improve knowledge about the IUD and sterilization among PMTCT clients' or to increase use of those methods (Hoke *et al.*, 2014). Though the study showed that the intervention did not increase knowledge on PPFp among women seeking PMTCT services, the methodology used was weak (mixed method with no clear intervention and control groups) and therefore strength of evidence in the study was weak.

In Zimbabwe, a provider led intervention focused on integrating FP in PMTCT program was initiated in May to August 2011 (Sarnquist *et al.*, 2014). The program was referred to Peers Undertaking Reproductive and Sexual Health Education (PURSE). In intervention site, groups of 12 women seeking PMTCT services were given a 90-minute health education talk aimed at increasing FP use and sex negotiation power at health facility. The group discussions (part of the health education talk) sessions focused on sexual negotiation skills and empowerment, information about HIV, PMTCT, and FP, and communication

skills related to sex and FP. The control site received standard of care practice like any other PMTCT client in Zimbabwe (Sarnquist *et al.*, 2014).

Assessment of the intervention revealed that compared to control cohort, there was a significant increase in women having control over condom use, identification of IUDs as effective FP methods, disclosure of HIV status to partners, partners disclosing their HIV status, and power in sexual decision-making for women on the relationship dominance subscale (Sarnquist *et al.*, 2014). However, no significant difference was observed in utilization of Long-Acting Reversible Contraception (LARC) between intervention and control sites (Sarnquist *et al.*, 2014). The study employed a quasi-experiment in which no provision was made to control for confounding variables which could have influenced the outcomes of interest other than the independent variable (PURSE). Due to this limitation, the strength of evidence in the study was relatively low.

Integration of PFP with Immunization services is an intervention which has been explored by at least three African countries (Cooper *et al.*, 2015) and (Vance *et al.*, 2014). Researchers have argued that integrating immunization services with promotion of PFP services provides an opportunity to leverage existing health visits to offer women more comprehensive services including PFP (Cooper *et al.*, 2015). In March through November 2012, Liberia's government, with support from the Maternal and Child Health Integrated Program (MCHIP), piloted an integrated family planning and immunization model in 10 health facilities in Bong and Lofa counties (Cooper *et al.*, 2015). Vaccinators provided mothers bringing infants for routine immunization with targeted family planning and immunization messages and same-day referrals to family planning services. After three months, an evaluation was conducted to evaluate the effect of integrating vaccination

services with promotion of PPFp and the results indicated that PPFp utilization increased significantly in intervention hospitals (Cooper *et al.*, 2015). The study utilized previous years PPFp utilization as baseline statistics and compared that with the results of the pilot study. Though evidence adduced in the study is low due to the study design (lack of control group and failure to account for confounding variables which could have influenced PPFp utilization other than the pilot intervention), the study provides some evidence suggesting that integrating PPFp promotion in routine vaccination visits could improve utilization of PPFp among postpartum women seeking child immunization services.

A similar study conducted in Ghana and Zambia however provided different results. A cluster-randomized trial was used to test an intervention where vaccinators were trained to provide individualized FP messages and referrals to women presenting their child for immunization services (Vance *et al.*, 2014). In each of 2 countries, Ghana and Zambia, 10 public sector health facilities were randomized to control or intervention groups. Evaluation of the intervention indicated that there was no significant improvement in PPFp utilization in both countries and also there was no significant improvement in both countries in regard to referrals to FP services and women's knowledge of factors related to return of fecundity (Vance *et al.*, 2014). The researchers employed a rigorous methodology and hence the strength of evidence in the study was high. These findings contradict the previous study conducted in Liberia (Cooper *et al.*, 2015). Perhaps the lack of significant increase in women utilizing PPFp in intervention clusters compared to control clusters in both countries could be attributed to existing barriers in accessing PPFp products which the intervention could not address given that, the FP component of the

intervention was based on creating awareness through FP messages without providing FP products to women seeking vaccination services.

In Uganda, counselling on postpartum family planning use among early postpartum women was initiated in Masindi and Kiryandongo districts (Ayiasi *et al.*, 2015). The main intervention component was to offer counselling to postpartum women without giving them PPFp products. PPFp counselling was provided by CHWs which are popularly referred to as Village Health Teams (VHTs) during the prenatal period (Ayiasi *et al.*, 2015). Sixteen health centers were equally and randomly allocated to control and intervention arms. Mothers were consecutively recruited during their first antenatal clinic consultations. In the intervention arm VHT members made home visits and provided prenatal contraceptive advice and made telephone consultations with health workers for advice. In the control arm mothers received standard routine antenatal care offered in the health centers (Ayiasi *et al.*, 2015). Assessment of effectiveness of the intervention revealed that there was no significant difference in postpartum contraceptive use between intervention and control sites (Ayiasi *et al.*, 2015). The study was a RCT and therefore strength of evidence in the study is fairly strong. The study demonstrated using CHWs/VHT members to provide PPFp counselling without PPFp products may not be the solution to increasing number of women utilizing PPFp. Perhaps this could be due to existing barriers to accessibility or even acceptability of PPFp products among postpartum women living in Masindi and Kiryandongo districts Uganda.

In Kenya, Interventions to improve PPFp are scarce. A recent article on PPFp research reveals a study conducted in western Kenya to examine the most widely used types of FP, unmet needs among women, FP counselling and barriers to FP uptake (Naanyu *et al.*,

2013). Though the study established that PPF is common among women in Western Kenya, it also affirmed that PPF is low in Kenya (Naanyu *et al.*, 2013).

Another recent study on PPF in Kenya investigates programmatic aspects of postpartum family planning in developing countries in both Kenya and Ethiopia (Sonalkar, Mody, Phillips, & Gaffield, 2013). The study established a need to document contraceptive use to aid in commodity assessment and delivery, and need for additional informational materials to educate women on PPF, and also need to address challenges of delivering PPF services to those women who deliver away from a health care facility (Sonalkar *et al.*, 2013). Both studies did not identify any PPF promotion interventions in Kenya. As discussed elsewhere in this literature review, few studies have been conducted in Kenya to measure effectiveness of the CHS intervention on selected health outcomes. These are: a study conducted in; Busia, (Wangalwa *et al.*, 2012), Siaya and parts of western Kenya and Garissa (Olayo *et al.*, 2014) and a study conducted in urban-poor setup in Nairobi (Kimani-Murage *et al.*, 2015). In all the three studies, none evaluated effect of CHS on PPF.

### **2.7.3. Summary and Identification of Knowledge Gaps on CHS and PPF**

First section of literature review on PPF (section 2.7.1) has underscored the significance of birth spacing among postpartum women through PPF. The section also presented statistics indicating that proper birth spacing reduces MMR and increases child survival rates thus reducing infant and child mortality rates. Previous studies have shown that risk of child mortality is highest in very short birth-to-pregnancy intervals (<12 months) and the risk reduces with increasing birth-to-pregnancy interval. Literature has also shown that in 2015, unmet need for family planning is highest in Sub-Saharan Africa where unmet

need of FP is at 24 %, double the world average of 12%. In Kenya, unmet need of FP by 2015 was 18.5%. Though there are no official records from the 2014 KDHS report on PPF, re-analysis of 2008/09 KDHS indicates that overall unmet need of PPF in Kenya was high at 76%. This decreased to 59% by end of one year Postpartum (PP), and by the end of second year PP, unmet need for PPF reduced to 48% (USAID and MCHIP, 2010). In the absence of any other recent statistic, these statistics suggest that approximately half of Kenyan women have unmet need of PPF.

Second section of the PPF literature review described effect of different interventions on PPF among postpartum women. Reviewed interventions can be categorized into; Community based health education interventions led by CHWs or VHT, provider led PPF counselling sessions which target pregnant women seeking ANC services at health facility, and interventions which integrate PPF into other MCH services which include integrating PMTCT services with PPF promotion and integrating child vaccination services with PPF promotion, PPF counselling of spouses and other family members like mother in-laws and, use of mobile phones for PPF counselling and follow ups.

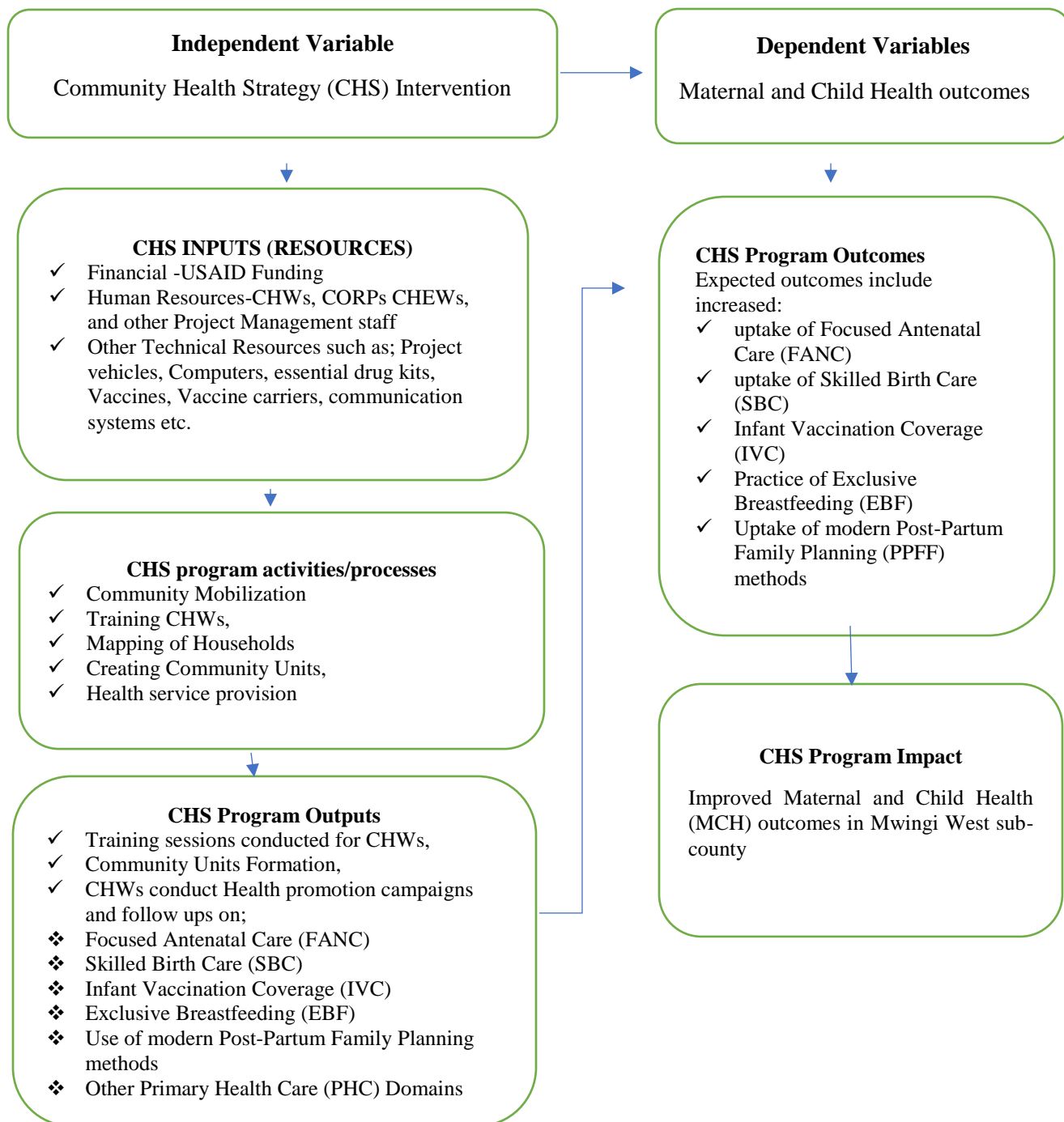
Though data presented had varying levels in regard to strength of evidence, most of the evaluation surveys indicated that the interventions were effective except; the intervention which integrated provision of vaccination services with PPF promotion in Ghana and Zambia (Vance *et al.*, 2014), a CHW led PPF health education initiated in Uganda (Ayiasi *et al.*, 2015), and the intervention in South Africa which integrated PMTCT services with PPF (Hoke *et al.*, 2014). These interventions did not show any improvement in regard to increasing utilization of PPF in intervention site.

The literature shows that in Kenya, research on interventions promoting PPF is scarce. Out of the three CHS evaluation studies (Wangalwa *et al.*, 2012), (Olayo *et al.*, 2014) and (Kimani-Murage *et al.*, 2015) none attempted to assess the effect of CHS in PPF. This omission together with lack of evaluation reports of other PPF promoting interventions in Kenya creates a knowledge gap. The problem is further compounded by the observation that in Kenya, the unmet need for PPF is high (women at 0-5.9 months PP-76%, women at 1 year PP-59%, and women at 2 years PP-48%) (USAID and MCHIP, 2010) and therefore there is need for innovative approaches to give postpartum women a chance to space their next pregnancies. What is the effect of the CHS on utilization of modern PPF methods in Mwingi west sub-county? This is the fifth knowledge gap this study sought to address.

## **2.8. Study Conceptual Framework**

The conceptual framework was adopted from (Olayo *et al.*, 2014), and developed further using the Ministry of Health (MoH) policy document on the CHS (Ministry of Health, 2006). The conceptual framework was modified to reflect the traditional logical framework employed in evaluating projects as recommended by (Hayes, 2011). The conceptual framework shows the relationship between the independent variable on one hand which is the CHS intervention and the dependent variables on the other hand which are the MCH outcomes under investigation (FANC coverage, SBC utilization, IVC, EBF and PFP). The independent variable has three components namely; CHS inputs (resources), CHS program activities/processes and CHS program outputs (immediate results observed after implementing CHS activities). On the other hand, the dependent variables are CHS program outcomes in regard to MCH (the intermediate results after implementing CHS activities). These are the outcomes expected on MCH indicators under investigation after implementation of the CHS intervention. The following Figure (Figure 2.1) is an illustration of the study conceptual framework.





**Figure 2.1: Study Conceptual Framework [adopted from Olayo *et al.*, 2014 and modified using Ministry of Health (2006) and Hayes (2011)]**

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Introduction**

This chapter is organized as follows; study area, the CHS intervention, community entry process, study design, study variables, study population, sample size, sampling methods, data collection tools, data collection process, data management, analysis and presentation, study reliability and validity, study limitations and ethical consideration.

### **3.2. The Study Area**

This was an experimental study with an intervention and a control site. The intervention site was Mwingi West sub-county and the control site was Mwingi North sub-county. Both sub counties are located in Kitui County. Mwingi West sub-county benefited from the CHS intervention while Mwingi North sub-county did not. This was the criteria used to identify Mwingi west sub-county as intervention site and Mwingi North sub-county as control site. Mwingi West Sub County had a total population of 103,774 people in the 2009 population census with a projection of 111,346 people by 2015. While Mwingi North sub county was reported to have a total population of 139,967 in the 2009 population census with a projection of 150,179 persons by 2015 (Kenya National Bureau of Statistics (KNBS), 2010).

The two sub counties have many similarities. In regard to climatic conditions and ecological zones Mwingi West and Mwingi North Sub counties are located in a rural ASAL characterized by hot and dry climate with unreliable rainfall. Road infrastructure in the two sub counties is poor. The roads are rendered impassable during the rainy season hindering development and access to market centers, schools and health facilities. Most people in

the two sub counties are small scale farmers and are prone to food insecurity due to the unreliable rainfall patterns in the region (County Government of Kitui, 2013).

The major environmental hazard in Mwingi west and Mwingi North sub-counties is drought. Water supply is a major problem in Kitui County, particularly during the drought periods. There are no sufficient water sources and water levels in the shallow wells dug near streams either get significantly low or dry up during the dry periods. Residents also walk for long distances in search of water for both domestic use and livestock watering. Droughts usually increase food insecurity through frequent crop failures and decreased forage supply for livestock. The prevalence of communicable diseases increases during periods of droughts which is worsened by inadequate medical facilities in both sub counties (United Nations Development Programme and Government of Kenya, 2012).

In the Larger Kitui County, the Human Development Index (HDI) as per the 2009 HDI report indicates that the County has; a life expectancy of 58.9 (years), literacy levels of 63.2 %, school enrollment rate is 72.3%, and a Gross Domestic Product (GDP) per capita measured in Purchasing Power Parity (PPP) of 828. The Youth Development Index (YDI) of Kitui is 0.5952 which is above the national YDI of 0.5817. Though data on Gender Inequality Index (GII) was not available, land ownership structure is skewed towards men with the majority of land being under ownership of men. Only about 10% of women have title deeds and can control land in Kitui County (County Government of Kitui, 2013).

In the intervention site data was collected in eight sub-locations/villages located in three Divisions/wards (Administrative units used in the provincial administration which include Divisions and sublocations were converted to Wards and Villages respectively by Kitui county government for administration purposes (The County Government of Kitui, 2014).

These sub-locations/villages are; Mwambui, Ikuusya, and Thonoa of Waita Division/ward which hosts Waita Community Unit (CU) Kyethani, Wikithuki, and Kairungu of Kiomo/Kyethani Division/ward which hosts Kyethani CU, Mbondoni and Kavuvwani of Kiomo/kyethani Division/ward which hosts Kiomo CU. While in the control site (Mwingi North Sub County) data was collected in a total of nine sub-locations/villages namely Kamuwongo, Ngaie, and Kimangao, (Kyuso Division/ Ward), Kimela, Mitamisiyi, and Ikime, (Ngomeni Division/ Ward) Mutanda, Kyandali and Kakuyu (Mumoni Division/ Ward). The following are figures (Figure 3.1, Figure 3.2 and Figure 3.3) represent maps of the intervention site, control sites and map of Kenya showing intervention and control sites respectively.

**MWINGI SOUTH SUB COUNTY-INTERVENTION SITE**

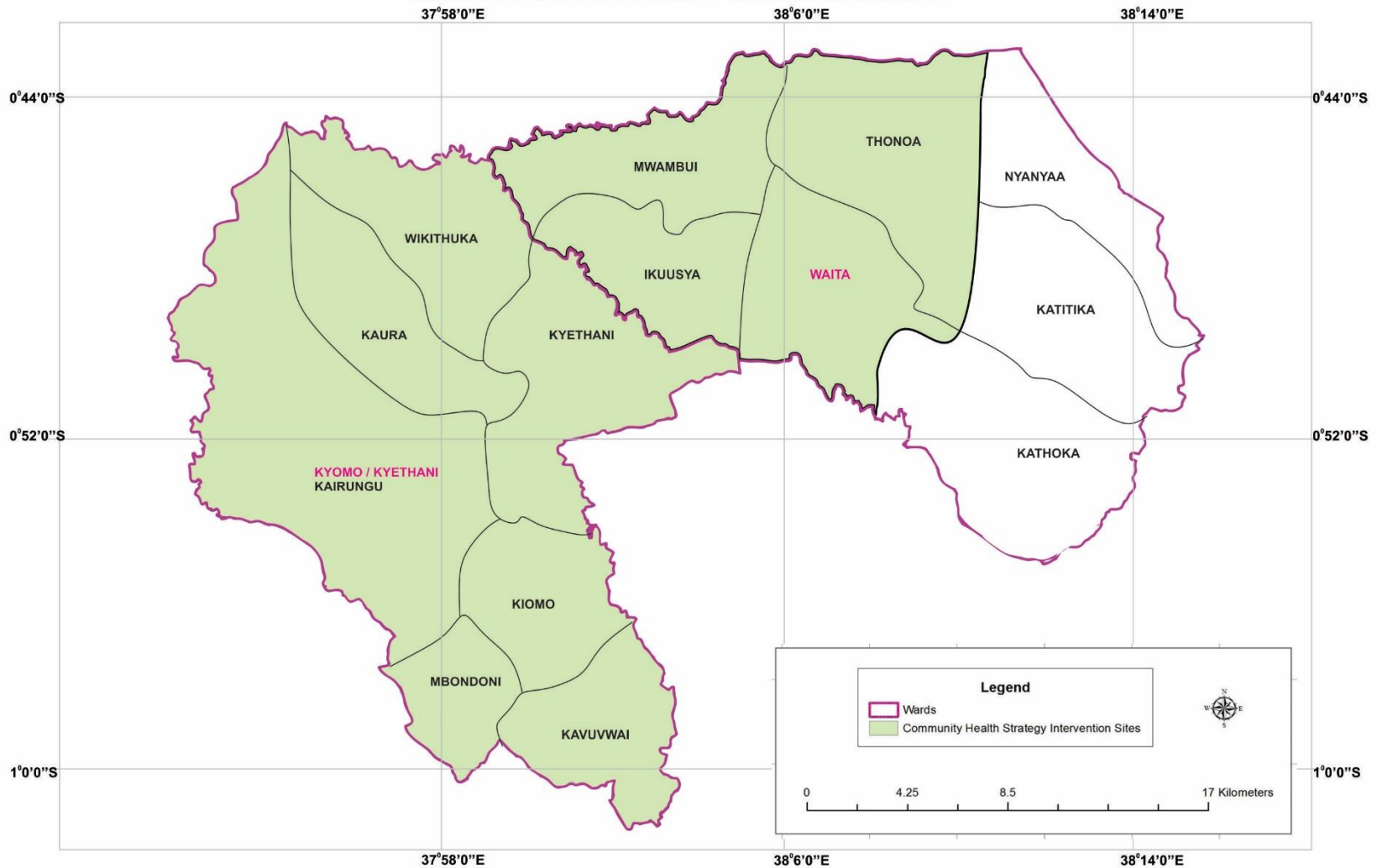


Fig. 3.1. Map of Mwingi West Sub County Showing Itervention sites (source: KNBS)

### MWINGI NORTH SUB COUNTY-CONTROL SITE

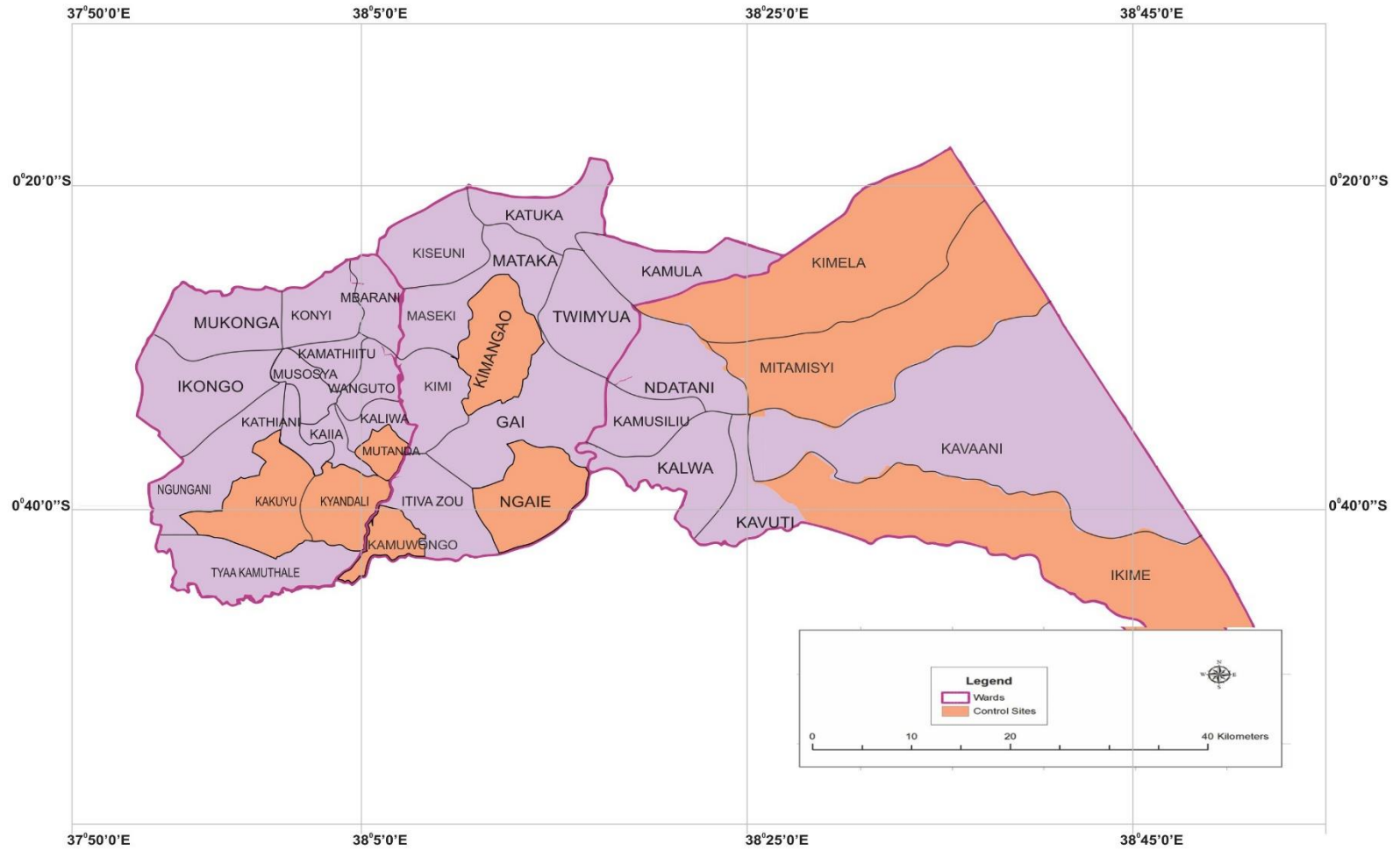


Fig. 3.2. Map of Mwingi North Sub County Showing Control sites (source: KNBS)

Map of Kenya: Intervention and Control Sites

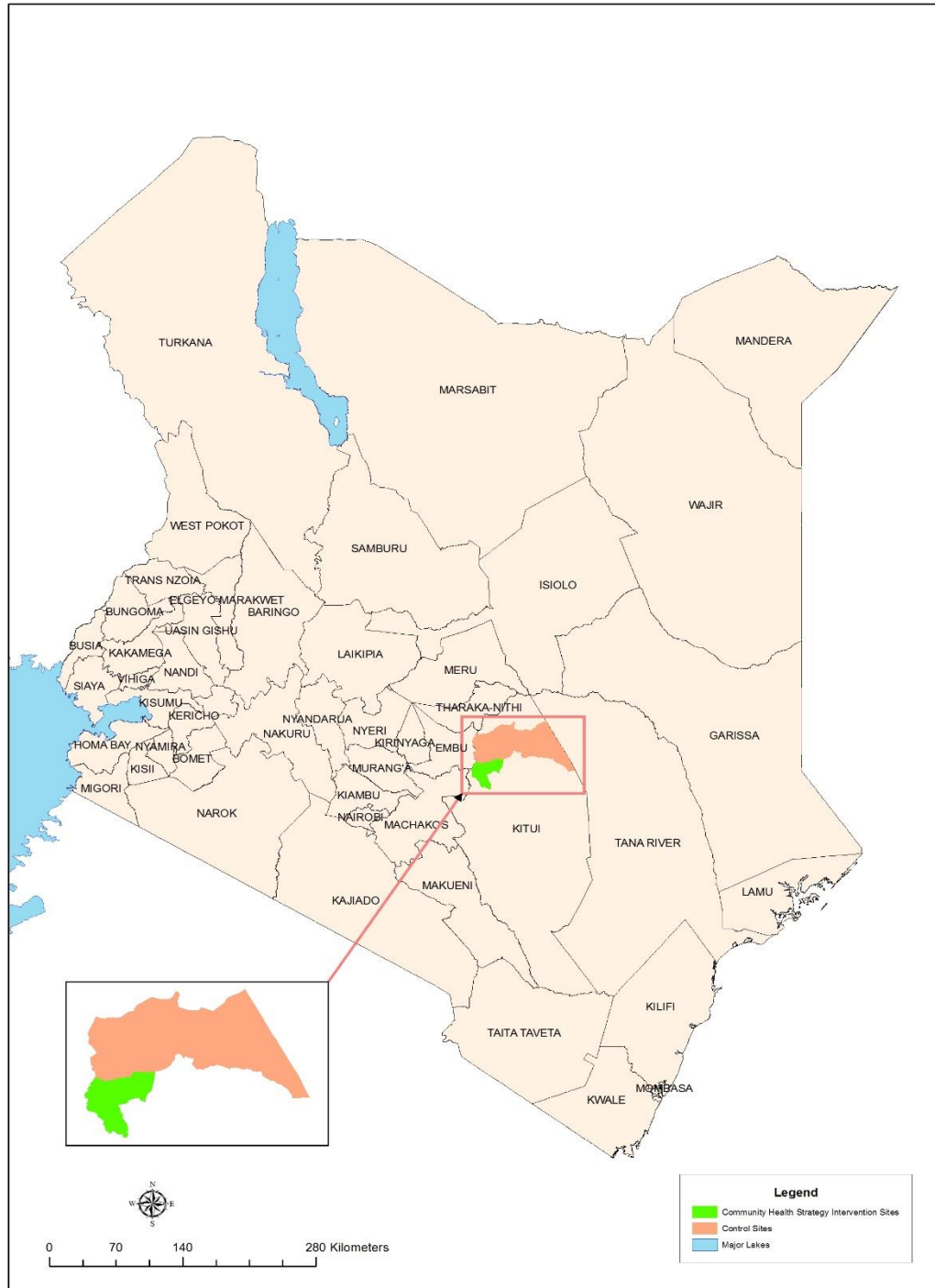


Figure 3.3. Map of Kenya Showing Intervention and Control sites (source: KNBS)

### **3.3. The CHS Intervention**

As previously indicated in the background statement of this thesis, CHS was designed in 2006 to support delivery of Kenya Essential Package for Health (KEPH) at level one (Community level). The CHS program structure provides for creation of Community Units (CUs) as the basis of PHC service provision (Ministry of Health, 2006). Each CU is designed to serve approximately 5000 households. Service providers in the CUs are trained CHWs and Community Health Extension Workers (CHEWs) (Ministry of Health, 2006). The CHS policy provides that each CHW should provide PHC services to 20 households. However, it was observed that in Mwingi west sub-county, the lowest number of households served by a CHW by the time of initiation of this study was 84 households while the highest number of households served by a single CHW was 197 households. The following were the key elements of the CHS intervention;

#### **3.3.1. Community mobilization**

CHS was implemented in Mwingi west sub-county by the MoPHs of GoK in partnership with AMREF-Kenya. Therefore, the two partners (MoPHS and AMREF-Kenya) mobilized community members in Mwingi west sub-county. This was achieved through community meetings led by local chiefs (popularly referred to as chief *barazas*). The aim was to create awareness of the new intervention and mobilize community members to select potential volunteer CHWs for training.



### **3.3.2. Identification and training of volunteer CHWs**

Identified volunteer CHWs were trained on two things; one, Primary Health Care (PHC) service provision (including Maternal, Newborn and Child Health) and two, formation and maintenance of Community Units (CUs).

### **3.3.3. Enumeration, mapping of households and creating Community Units (CUs)**

Enumeration of the community members was conducted at household level. The product of this exercise was creation of 10 CUs namely; Kisovo, Waita, Kyethani, Kairungu, Nzeluni, Kea, Kalanga, Mutyangome, Munyuni and Kiomo CUs. Data on socio-demographic characteristics of households in each CU was entered in household registers and maintained by CHWs.

### **3.3.4. Recruitment and training of Community Health Extension Workers (CHEWs)**

CHEWs were selected from medical staff trained at certificate and/or diploma levels and working for the Ministry of Health. CHEWs were mostly certificate or diploma holders in nursing and public health professionals. The professionals were identified from dispensaries and health centers within the CUs, trained and recruited to work in the CHS intervention. Their role was to support, supervise and coordinate CHWs. Each CHEW supervised up to 25 CHWs. CHEWs also facilitated health education meeting sessions in the community and provided a linkage between CHWs and health facilities.

### **3.3.5. Health Service Provision in the CHS Intervention**

Day to day health service provision was done by CHWs at their respective CUs. CHWs provided health services at household and community level. These services included; health education on obstetric danger signs and birth preparedness, health education on

Prevention of Mother To Child Transmission (PMTCT) of HIV, health education on importance of seeking ANC services for 4 or more times (FANC) and tracking newly expectant women in CUs to ensure that they sought ANC services for 4 or more times, health education on importance of delivering under SBC and follow up of all expectant women in CUs to ensure that they delivered under SBC, health education on importance of child immunization and follow up of all infants in the CUs to ensure that they received all recommended vaccines in time, health education on appropriate infant nutrition and counselling on proper feeding practices including importance of EBF to infants in the first six months of life, and health education and counselling on use of modern methods in both PFPF and regular FP. In summary, besides providing MCH promotion and education, CHWs identified and tracked newly expectant women to ensure that they received a continuum of health care from FANC to SBC and all the postpartum services including PFPF and child immunization services. CHWs ensured that newly expectant women sought ANC services as recommended (for at least 4 times), delivered under SBC, received postnatal care services including PFPF, and that their infants received all vaccines recommended in Routine Child Immunization Program (RCIP) in time. Other services included; promotion of community hygiene and environmental sanitation, and provision of Insect Treated Mosquito Nets (ITNs). CHWs also played a role in detecting complications related to pregnancy and child birth and providing referral services for treatment at dispensaries and health centers. It is important to mention that study participants in the control site received standard MCH services provided in Kenya.

### **3.4. Community Entry Process**

The first step was to seek clearance from Maseno university graduate school. This was followed by seeking research ethical clearance and permit from the Kenya National Council for Science and Technology (NCST). NCST granted the researcher ethical approval and a three-year research permit (from 2012-2014) Copies of these documents are found in appendix III-VI). The researcher further sought permission to be enjoined into the CHS intervention project as a student researcher from MoPHS and Ministry of Medical Services (MMS) authorities in Mwingi district (now Mwingi West sub county). This was granted verbally with the support of a recommendation letter from Maseno university graduate school and research authorization letter from NCST. Other authorities from which permission was sought are; the Mwingi District Commissioner, Kyuso District Commissioner, Kyuso District Medical officer of Health, the Medical superintendent - Kyuso district and Kyuso district public health office.

Through the District Commissioners in each district (now sub counties), District Officers, chiefs, assistant chiefs and village elders were informed on the study and the locations where data will be collected. After this process, the researcher identified suitable research assistants (research assistant selection criterion was a minimum of C- (minus) in the Kenya Certificate of Secondary Education and good knowledge in Swahili and the Kamba language), trained them and engaged them in data collection (process of data collection described in one of the following subtopics).

### **3.5. The Study Design**

This was a prospective experimental study with 1 pre- test and 2 post-test time series surveys conducted in both intervention and control sites. Data was collected at 3 time points; a pre-intervention survey was used to collect baseline data before implementation of CHS in both the study site and control site. First post intervention survey data (referred to as midterm evaluation) was collected 9 months after implementation of the CHS in both intervention and control sites while the 2nd post intervention survey data (referred to as end term survey) was collected in both intervention and control sites 18 months after implementation of the CHS. The times series samples were independent of each other in that data collection from the baseline survey, midterm survey and end-term survey was done from different participants/respondents. The time series surveys were conducted for the purpose of enhancing strength of evidence in regard to effect of intervention on selected MCH outcomes as suggested by (White & Sabarwal, 2014). This study was a household based survey in which the main respondents/participants were women of reproductive age with child/children aged 9-12 months.

The justification for use of different participants in the pre-test and post-test surveys is based on nature of variables to be measured in this study. It was impossible to measure the same variable twice or thrice from the same participant/respondent. For example, it was not possible to measure FANC or completion of child immunization program in time from a mother and her child respectively and repeat the same measures again to the same mother and child 9 months later. Chances are the mother may not have been expectant within that period of time and therefore, it would not have been possible to collect data on FANC and completion of child immunization program from the same participant again.

Though a broader description of the study method will be described in the proceeding subtopics, the following is a brief summary of the study design. The first step was to conduct a pre-intervention survey to collect baseline data in both Mwingi West (intervention/study site) and Mwingi North (control site) Sub Counties. The aim was to obtain pretest measurements on both the intervention and control groups to allow assessment of the initial comparability of the two groups as suggested by (Harris *et al.*, 2006). In the intervention site, baseline data was collected in three villages (former sub-locations) namely Mwambui, Ikuusya, and Thonoa, in Waita ward which hosts Waita Community Unit (CU) while in the control site baseline data was also collected in 3 villages namely Kamuwongo, Ngaie, and Kimangao, in Kyuso Ward. This exercise took place from March 2012 to June 2012.

Baseline survey was followed by two post intervention surveys in both the intervention and control sites. Midterm survey was conducted 9 months (from March 2013 to June 2013) after implementation of the CHS. In the intervention site (Mwingi West Sub County) midterm survey took place in three villages namely; Kyethani, wikithuki and Kairungu in Kyethani/Kiomo Ward which hosts Kyethani CU and in the control site (Mwingi North Sub County) data collection took place in three villages namely; Kimela, Mitamisyi and Ikime of Ngomeni Ward. End-term survey took place 18 months (from March 2014 to June 2014) after implementation of the CHS. Data collection in intervention site was done in two villages namely; Mbondoni and Kavuvwani in Kiomo/Kyethani ward which hosts Kiomo CU and in the control site, data was collected in three villages namely; Mutanda, Kyandali and Kakuyu of Mumoni Ward.

### **3.6. Variables in the Study**

The quasi-independent variable for objective one to five is the CHS intervention. While the depended variables for study objective one, two, three, four, and five are FANC coverage, SBC utilization, IVC, practice of EBF, and use of modern PFP methods respectively.

### **3.7. The Study Population**

The study population was women of reproductive age (15-49 years) in Mwingi West and Mwingi North sub counties. According to the most recent population census (2009 population census) total number of women of reproductive age in Mwingi West sub county (former Mwingi district) and Mwingi North sub county (former Kyuso district) are 57,074 and 31,401 respectively (Kenya National Bureau of Statistics (KNBS), 2010).

#### **3.7.1. Study Target Population**

Study target population was women aged 18 years to 49 years with child/or children aged between 9-12 Months in Mwingi West and Mwingi North Sub counties. The first criterion of Women aged between 18 to 49 years was based on the fact that they are considered adults in Kenyan law and able to give consent in accordance to research ethical principles. The second criterion of a child aged 9-12 months was informed by two phenomena under investigation in this study which are IVC and use of modern PFP. The study sought to measure effect of CHS on vaccination coverage among infants aged 9-12 months (IVC) as well as effect of CHS on use of modern PFP methods among mothers at 9 to 12 moths postpartum.

### **3.7.2. Research Participant Inclusion Criteria**

As described in the study target population, the criteria used in recruiting study participants in this study were; a study participant had to be a woman aged between 18 to 49 years and a woman with a child or children aged 9-12 months.

### **3.7.3. Research Participant Exclusion Criteria**

The exclusion criteria of research participants in this study was based on the following; a woman not in the age of 18 to 49 years and a woman who did not have a child aged between 9 to 12 months.

### **3.8. Sample Size determination**

The population of women of reproductive age in Mwingi west sub county (former Mwingi district) and Mwingi North sub county (former Kyuso district) are 57,074 and 31,401 respectively (Kenya National Bureau of Statistics (KNBS), 2010). This being over 10,000, a representative sample size of 422 women was determined using a formula by Fisher (Fisher *et al.*, 1998). For each of the three surveys conducted in intervention and control sites (baseline, midterm and end-term surveys) a total of 422 women were sampled from 422 households.

The following is the adopted formula as used by Fisher *et al.*, (1998);

The formula is as follows;

$$n = \frac{Z^2 pq}{d^2}$$

Where; n = is the desired sample size (when the study target population is over 10,000)

**Z** - is the standard normal deviate=1.96. (Corresponding to 95% Confidence Interval)

$p$  - Proportion of the target population estimated to have the desired characteristics.

$$q = 1.0 - p$$

$d$  = Degree of accuracy required usually set as 0.05

Though the proportion of women of reproductive age (aged 15-49 years) in Kenya was estimated at 45.4% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2010),

The proportion of the target population (women of reproductive age with a child aged between 9-12 months) was not available. Therefore, in the absence of a reasonable estimate Fisher *et al.*, (1998) recommends  $p$  to be estimated at 50% (0.50).

$$p = 50/100 \text{ or } 0.50$$

$$q = 1 - p = 1 - 0.50 = 0.50$$

Hence, the desired sample size ( $n$ ) was calculated as follows.

$$n = \frac{Z^2 pq}{d^2} = \frac{1.96^2 \times 0.50 \times 0.50}{(0.05)^2}$$

$$n = \frac{0.9604}{0.0025}$$

$n = 384.16$  which is approximately 384.

**10%** of 384 participants were added to increase representativeness and non-response of respondents.

Thus 10% of 384 = 38.4 subjects.

Thus  $n = 384 + 38.4 = 422$

Therefore, total sample size ( $n$ ) for each of the surveys conducted was 422 women with a child aged 9-12 months.



### **3.9. The Sampling Methods**

This study employed two sampling methods namely; purposive sampling, and simple random sampling.

#### **3.9.1. Purposive Sampling**

This sampling method was used to select the study site and the control site. Mwingi West Sub County was purposively selected based on two considerations: one; the county had posted poor MCH outcomes as evident in the 2008/2009 KDHS report, and two; the fact that the Government of Kenya (GoK) (through MoPHS) in partnership with AMREF-Kenya was implementing a USAID funded five-year CHS program. On the basis of the CHS intervention, Mwingi West Sub County was purposively sampled as the study/intervention site. Mwingi North Sub County was also purposively sampled as the control site based on the following; the sub county borders Mwingi West and is considered to have similar ecological and climatic characteristics, the communities living in Mwingi North sub-county and Mwingi West Sub county were assumed to be homogeneous, and the CHS pilot program was not under implementation in the Sub County. Purpose sampling was also used to identify the data collection sites within intervention and control sites.

The main criteria in identifying the data collection sites in both intervention and control sites was that the site was to be located in a rural set up and the site was to have a population perceived to be able to produce sufficient number of women with a child or children aged 9-12 months. This criterion was used in an attempt to match the intervention and control sites on socio-demographic characteristics (by ensuring that the respondents were all from a rural set up) and to maximize on the chances of getting a representative sample size of women with a child aged 9-12 months. Based on these criteria, 8 and 9 villages were

identified in intervention and control sites respectively. In each site, the villages were grouped into three clusters and each cluster was given an equal chance to belong to either baseline, midterm and end-term survey by using simple random sampling (described next subtopic) to assign the clusters for baseline, midterm and end-term surveys.

### **3.9.2. Simple Random Sampling**

Simple random sampling was first used to assign the three clusters of data collection sites in each of the two sites (intervention and control sites) into baseline, midterm and end-term surveys. In intervention site, Mwambui, Ikuusya and Thonoa villages of Waita Division/Ward were grouped in 1 cluster and randomly assigned for baseline survey, Wikithuki, Kairungu, and Kyethani villages of Kyethani Division/Ward were also in 1 cluster and randomly assigned for midterm survey, and Mbondoni and Kavuvwani villages of Kiomo Division/Ward were also in 1 cluster and randomly assigned for end-term survey. In control site, Kamuwongo, Ngaie, and Kimangao villages of Kyuso Division/Ward were grouped in 1 cluster and randomly assigned for baseline survey, Kimela, Mitamisyi, and Ikime villages of Ngomeni Division/Ward were also in 1 cluster and randomly assigned to midterm survey and Mutanda, Kyandali, and Kakuyu villages of Mumoni Division/Ward were in 1 cluster and randomly assigned for end-term survey (Maps showing these sites are in figure 3 and figure 4)

Simple random sampling was also applied in all the pre-and post-intervention surveys in the study and control sites. The first step was to develop a sampling frame for each of the three clusters in the intervention and the control sites respectively. House-Holds (HHs) included in the sampling frame were only those with child/children aged between 9-12

months. In intervention site, sampling frames were developed using household registers which were developed during creation of CUs. The household registers had socio-demographic data of all community members in a given CU. Community meetings (*barazas*) were conducted to help identify the households with mothers of a child/children aged 9-12 months who had been selected in the household register. In the control site, community meetings facilitated by village elders and local chiefs were used in identification of households with mothers of a child or children aged between 9-12 months. Sampling frames were developed shortly before commencement of each survey. At baseline survey, midterm survey and end-term surveys sampling frames were developed in March/April 2012, February/March 2013, and March/April 2014 respectively.

In intervention site, sampling frames were developed as indicated in the following; Mwambui, -482 HHs, Ikuusya-389 HHs and Thonoa-372HHs, (Total-1243 for baseline survey cluster), Wikithuki-302 HHs, Kairungu-383 HHs, Kyethani-242 HHs (total-927 for midterm survey cluster)), and Mbondoni -491HHs, Kavuvwani -616 HHs (total-1107 for end-term survey cluster)). In control site, sampling frames were developed as indicated in the following; Kamuwongo -337 HHs Ngaie-311HHs, Kimangao-323HHs (total 971 for baseline survey cluster), Kimela-313HHs, Mitamisiyi, -317 HHs, Ikime-402 HHs (total 1032 HHs for midterm survey cluster)) and Mutanda-343 HHs, Kyandali -502 HHs, Kakuyu -363 HHs (total 1208 for end-term survey cluster).

A formula was used to calculate the proportion of representative sample size in each sub-location/village in a cluster as shown in the following;

**Formula:  $N_p = C/D \times n$**

Where;

**Np**= Proportion of sample size of a given Sub-location/Village

**C**= total number of HHs in a Sub-location/village with a mother of a child /children aged 9-12 months

**D**= total number of HHs with a child aged 9-12 months in a given data collection cluster (data collection site)

**n** = desired sample size (calculated as (422 HHs)

Example: representative sample size for *Mwambui* village was calculated as follows;

**Np=C/D x n** where **C**=482, **D**=1243, and **n**=422, **Np** was calculated to be **164**

The following is a Table (Table 3.2) indicating a summary of the number of HHs in each sampling frame per sublocation/village and the proportion of households sampled in each of the sampling frames in both intervention and control sites.

**Table 3.1. Sampling Frames and Proportional Sample size in Intervention and Control Sites**

	Intervention Site Mwingi West Sub County			Control Site Mwingi North Sub County			
	Waita Ward/cluster 1			Kyuso Ward/cluster 1			
Baseline Survey (March 2012 - June 2012)	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	
		<i>Mwambui</i>	482	164	<i>Kamuwongo</i>	337	146
		<i>Ikuusya</i>	389	132	<i>Ngaie</i>	311	135
		<i>Thonoo</i>	372	126	<i>Kimangao</i>	323	141
		<b>Total</b>	<b>1243</b>	<b>422</b>	<b>Total</b>	<b>971</b>	<b>422</b>
Midterm survey (March 2013- June 2013).	Kyethani Ward/cluster 2			Ngomeni Ward/cluster 2			
	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	
		<i>Wikithuki</i>	302	137	<i>Kimela</i>	313	128
		<i>Kairungu</i>	383	175	<i>Mitamisiyi,</i>	317	130
		<i>Kyethani</i>	242	110	<i>Ikime</i>	402	164
		<b>Total</b>	<b>927</b>	<b>422</b>	<b>Total</b>	<b>1032</b>	<b>422</b>
End-term Survey (March 2014- June 2014)	Kiomo Ward/cluster 3			Mumoni ward/cluster 3			
	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	Village/ Sub-location	No. of HHs with child (9-12 mths)	Sample size (Np)	
		<i>Mbondoni</i>	491	187	<i>Mutanda</i>	343	120
		<i>Kavuwani</i>	616	235	<i>Kyandali</i>	502	175
					<i>Kakuyu</i>	363	127
	<b>Total</b>	<b>1107</b>	<b>422</b>	<b>Total</b>	<b>1208</b>	<b>422</b>	

Total sample size for each cluster was arrived at by adding up all the representative sample sizes calculated for each village/sub location in a particular cluster. For example, total sample size for baseline survey in the intervention site was; 422 HHs calculated by adding *wikithuki* village sample size (137), *Kairungu* village sample size (175) and *Kyethani* village sample size (110).

Each household identified in the sampling frame was allocated a unique identification number starting from 001 to the last number which signified the total number of households

in each sampling frame. Statistical Package for the Social Sciences (SPSS) was then used to generate random numbers for each sampling frame (in a particular village/sublocation) equivalent to the proportional sample size calculated. HHs identified in the simple random method through the SPSS program were identified and data was collected from women in these HHs.

### **3.10. Data Collection Tools**

Data was collected using a structured research assistant administered questionnaire. Interviews were conducted at the household level. Women of reproductive age with a child aged between 9 to 12 months were the main respondents. The questionnaire is available in appendix I of this thesis

### **3.11. Data Collection Process**

After meeting all the research ethical considerations, a pre-intervention survey was conducted in both Mwingi West (intervention site) and Mwingi North (control site) sub-counties. This provided baseline data for the study. Households included in the sample were identified through the help of village elders. Research assistants then moved in, administered a verbal informed consent and collected data from women with a child/children aged 9-12 months (who were the main respondents in this study) at their households. The decision to use verbal informed consent was reached after an observation in the pilot study which indicated that a good number of women could not read and sign a written informed consent even in their own mother tongue. The same process was used to collect data in the midterm and end-term surveys. The following Table (Table 3.3) indicates the actual number of respondents who participated in the study.

**Table 3.2. Summary of Respondent Participation in Data Collection in Intervention and Control sites**

Survey	Intervention Site Mwingi West sub county			Control Site Mwingi North sub county		
	Village	HHs sample size	Actual data collected	Village	HHs sample size	Actual data collected
<b>Baseline Survey</b> (March 2012 - June 2012)	<i>Mwambui</i>	164	<b>161</b>	<i>Kamuwongo</i>	146	<b>142</b>
	<i>Ikuusya</i>	132	<b>131</b>	<i>Ngaie</i>	135	<b>130</b>
	<i>Thonoa</i>	126	<b>124</b>	<i>Kimangao</i>	141	<b>139</b>
	<b>Total</b>	<b>422</b>	<b>416</b>	<b>Total</b>	<b>422</b>	<b>411</b>
<b>Midterm survey</b> (March 2013- June 1013).	<i>Wikithuki</i>	137	<b>135</b>	<i>Kimela</i>	128	<b>127</b>
	<i>Kairungu</i>	175	<b>170</b>	<i>Mitamisyi,</i>	130	<b>126</b>
	<i>Kyethani</i>	110	<b>108</b>	<i>Ikime</i>	164	<b>160</b>
	<b>Total</b>	<b>422</b>	<b>413</b>	<b>Total</b>	<b>422</b>	<b>413</b>
<b>End-term Survey</b> (March-June 2014)	<i>Mbondoni</i>	187	<b>185</b>	<i>Mutanda</i>	120	<b>119</b>
	<i>Kavuvwani</i>	235	<b>233</b>	<i>Kyandali,</i>	175	<b>175</b>
				<i>Kakuyu</i>	127	<b>126</b>
	<b>Total</b>	<b>422</b>	<b>417</b>	<b>Total</b>	<b>422</b>	<b>420</b>

### 3.12. Data Management, Analysis and Presentation

#### 3.12.1. Data Management

Data management was done in two steps. Step one involved storage of filled questionnaires in designated storage cabinets. The second step involved data entry into the Microsoft excel software, cleaning, and importing the data into SPSS version (20) for analysis.

### **3.12.2. Data Analysis and Presentation**

Frequencies and percentages were used to provide descriptive statistics. Effect of CHS on FANC coverage, SBC, IVC, EBF and use of modern PFPF was estimated using three statistical analysis as described in the following: Z score tests were used to determine if proportions of; FANC coverage, SBC, IVC, EBF and women who used modern PFPF methods were significantly different before and after the intervention. Difference-in-Differences (DiD) model also known as the ‘double difference’ method was used to estimate the net change (over the 18 months CHS implementation period) in proportions of; FANC coverage, SBC utilization, IVC, practice of EBF and modern PFPF utilization over time between intervention and control groups as proposed by (White and Sabarwal, 2014) and (Memon *et al.*, 2015).

Binary logistic regression analysis was used to estimate the probability of a MCH outcome before and after the CHS intervention. That is the probability that; an expectant woman will seek FANC service, an expectant woman will utilize SBC service, a mother will ensure that her infant received all recommended vaccines in RCIP, a mother will practice EBF, and a mother will utilize modern PFPF before (at baseline) and after the CHS intervention (midterm and end-term surveys). These probabilities were estimated in the intervention sites to compare probabilities before (at baseline) and after the intervention (midterm and end-term surveys). In control group, binary logistic regression analysis was used to establish if there was any significant difference in the probabilities of the five MCH outcomes (FANC, SBC, IVC, EBF and PFPF) at baseline, midterm and end term surveys.

Binary logistic regression analysis model was also used to test the five study hypotheses in this study. This was more preferred compared to other hypothesis testing methods because



all the depended variables were in a dichotomous scale and most data was in discrete or categorical in nature. The model was the most relevant method to control for potential extraneous variables (socio-demographic characteristic of respondents) which would have influenced MCH outcomes other than the CHS intervention.

In the binary regression analysis model, the following steps were followed in data analysis; dichotomous variables were created as follows; intervention site=1, control site =0. MCH variables were also assigned binary codes as follows; at least 4 ANC visits=1, less than 4 ANC visits=0, facility delivery (SBC)=1, home delivery=0, completion of child immunization program within 9-12 months =1, not completing child immunization program within 9-12 months=0, child exclusively breastfed=1, child not exclusively breastfed=0, mother reports to have utilized modern PFP method at 9-12 months PP =1, mother reports not having utilized a modern PFP method 9-12 months PP=0. After ensuring that all dependent variables of interest were coded in dichotomous form, binary logistic regression analysis was used to assess the effect of the independent variable (CHS) on the dependent variables. This was done at 2 time points (time 1 was nine months after implementation of the CHS denoted by midterm survey, and time two was 18 months after implementation of the CHS in intervention denoted by 2<sup>nd</sup> end-term survey).

Baseline data was first regressed against midterm survey data in both intervention and control sites. This was followed by regressing baseline survey data against end-term survey data in both intervention and control sites. In this analysis, both crude and adjusted Odds Ratios (ORs) at 95% Confidence Interval (CI) were obtained. In the adjusted ORs, socio-demographic characteristics were treated as potential confounders and controlled for in the binary logistic regression model. In the intervention site, the adjusted ORs comparing Odds

of MCH outcomes between end-term survey and baseline survey were used in testing study hypotheses. This was considered as the most reliable hypothesis test statistic because it not only tested effect of CHS intervention on MCH outcomes at the end-term survey compared to baseline, but also it provided a methodology to control for socio-demographic characteristics as potential confounders. Data was presented using tables.

### **3.13. Study Reliability**

A pilot study was conducted before implementation of this study. The objective of the pilot was to test and improve reliability of the data collection tool. Piloting for the household questionnaire was done in *Nzeluni* sub location of *Mwingi* Central Sub County (study site). Data was collected in a randomly selected sample of 45 households (slightly above 10% of sample size (422 respondents)). Upon testing the data on reliability, the coefficient of internal consistency (Cronbach's alpha) was 0.864. This value was within the recommended range of 0.70-0.95 as recommended by (Tavakol and Dennick, 2011), and therefore based on the Cronbach's alpha test result, the questionnaire was found to be reliable. Reliability was further enhanced by careful selection and training of research assistants. Research assistant selection criteria was a minimum of C- (minus) in the Kenya Certificate of Secondary Education and good knowledge of Swahili and the Kamba language. Total of 12 research assistants were identified and trained on research ethics and data collection tools.

### **3.14. Study Validity**

In regard to internal validity which aims at ensuring that the study made valid inferences about causal relationships, the following measures were employed; the first measure was

the application of a sound methodology which was a pretest-posttest experimental study with 1 pretest and 2 posttest surveys in clearly defined intervention and control sites. Comparison of results from the 3 surveys in each of the two sites (intervention and control site) provided an opportunity to make a scientifically sound judgment in regard to the effect of CHS on the selected MCH outcomes-which was the general objective of this study. This enhanced internal validity of this study.

The second measure was use of adequate representative sample size in all the surveys. The calculated sample size of 422 participants in each survey was adequate enough to produce valid results. This is evident in the highly precise Odds Ratios (ORs) presented in the results section of this thesis (Chapter 4). It was observed that the margins of the 95% Confidence Intervals are too narrow. Wide margins imply that the ORs are not precise and are an indication of inadequate sample size among other factors.

Use of sound test statistics for data analysis was the third measure. The study employed Z score measures to test if there is a significant difference between proportions in MCH outcomes. A DiD model was also employed to measure the difference in MCH outcome between intervention and control sites over the 18 months CHS implementation period. Binary logistic regression was used to measure the probability of occurrence of a MCH outcome of interest between baseline, midterm and end term surveys in both intervention and control sites. This method enabled the researcher to adjust for potential confounders and compare effect of CHS intervention on MCH outcomes with and without adjusting for confounding variables. Hypothesis tests were based on this sound test statistic. This enhanced validity of the inferences in this study.

To enhance external validity of the study, the investigator used a representative sample size of 422 participants in each of the surveys (baseline, midterm and end-term surveys) conducted. This sample was sufficient to allow generalization of study conclusions to the broader population.

### **3.15. Limitations of the Study**

This study had several limitations; the most important of these was selection of intervention and control sites. Since the implementation of the CHS was a partnership between MoPHS and AMREF-Kenya project which was designed to be implemented in Mwingi West sub county as a whole, it was not feasible to randomly assign the CHS intervention to community members in Mwingi west sub county. This is the reason why pre-test and post-test experimental study design with intervention and control site was deemed appropriate as opposed to a cluster randomized study. Though this method has been employed in other similar studies such as (Olayo *et al.*, 2014), (Harris *et al.*, 2006), (Irvin and Kaplan, 2014),(Adam *et al.*, 2014), (Quayyum *et al.*, 2013), the strength of evidence is weaker compared to a Randomized Controlled Trial (RCT).

Secondly, it was also not possible to account for possibility of other programs that could have influenced MCH outcomes of interest (other than CHS) in the intervention site. However, there was an attempt to reduce the effect of confounding factors through, treating socio-demographic factors of both intervention and control sites as potential confounders and having them controlled in the binary logistic regression model used in hypothesis testing. Matching the control to the intervention sites by geographical location (rural ASAL) and infrastructural characteristics also helped reduce the effect of confounding.

Lastly, part of the data collection involved collecting data from a Mother and Child Health booklet. In the event that this booklet was not available, respondents were requested to remember the antenatal and postnatal care events that happened in a span of 9-12 months. Though this method has been successfully used in other studies including demographic and health surveys, the method introduced a retrospective data collection aspect that required respondents to recall past events. Though this was limited only to respondents who could not produce their mother and child booklets, it was a potential source of recall bias error.

### **3.16. Study Ethical Considerations**

The National Council of Science and Technology (NCST) of the Government of Kenya GoK subjected the research proposal of this study to ethical review. Upon successful ethical review, NCST provided ethical clearance and granted a research permit for this study. Copies are available in appendices IV, V and VI respectively. Permission was sought from graduate school and granted as shown in a letter present in appendix III. In addition other research ethical principles were applied in the entire process of research which include administration of oral informed consent and maintaining confidentiality of the information provided by the research participants

## **CHAPTER FOUR: RESULTS**

### **4.1. Introduction**

This chapter presents data analysis. Presentation of results has been done in the following order; socio-demographic characteristics of the study respondents, effect of CHS on FANC coverage in Mwingi West sub-county, effect of CHS on utilization of SBC in Mwingi West sub-county, effect of CHS on IVC in Mwingi West sub-county, effect of CHS on practice of EBF in Mwingi West sub-county and effect of CHS on utilization of modern PFP methods in Mwingi West sub-county

### **4.2. Sociodemographic Characteristics of Study Respondents**

Data on socio-demographic characteristics of the study participants focused on respondent's age, parity, and level of education, marital status, occupation and average household income (monthly).

#### **4.2.1 Age of Respondents**

At Baseline survey, age distribution was as follows; in Waita ward of Mwingi West Sub County (intervention site), data was collected from a total of 416 respondents. Eight (8) women (1.2%) were aged between 16-20 years, 35 women (8.4%) were within the age of 21-25 years, 106 women (25.5 %) were aged between 26-30 years, 149 women (35.8%) were aged between 31-35 years, 113 women (27.2%) were aged between 36-40 years, and only 5 women (1.2%) were aged between 41-45 years. In Kyuso Ward of Mwingi North Sub County (control site), data was collected from a total of 411 respondents. Age distribution was as follows; 12 women (2.9%) were aged between 16-20 years, 63 women (15.3%) were aged between 21-25 years, 134 women (32.6%) were aged between 26-30 years, 139 women (33.8%) were aged between 31-35 years, 57 women (13.9% were aged

between 36-40 years and only 6 women were aged between (1.5%) were 41-45 years. In the first post intervention survey (midterm survey), age distribution was as follows; in Kyethani ward of Mwingi West Sub county (intervention site), data was collected from 413 women of reproductive age. Fourteen (14) women (3.4%) were aged between 16-20 years, 61 women (14.8%) were in the age of 21-25 years, 141 women (34.1%) were aged between 26-30 years, 126 women (30.5%) were between 31-35 years, 69 women (16.7%) were aged between 36-40 years and only 2 women (0.5%) were between 41-45 years). In Ngomeni Ward of Mwingi North Sub County (control site), data was collected from a total of 413 women of reproductive age. Respondent's age was distributed as follows; 18 women (4.4%) were aged between 16-20 years, 59 women (14.3%) were aged between 21-25 years, 127 women (30.8%) were aged between 26-30 years, 143 women (34.6%) were aged between 31-35 years, 59 women (14.3%) were aged between 36-40 years and only 7 women (1.7%) were aged between 41-45 years.

In the end term survey, age distribution was as follows; in Kiomo ward of Mwingi west Sub County (study/intervention site), a total of 417 respondents participated in this study. Twenty nine (29) women (7%) were aged between 16-20 years, 64 women (15.3%) were between 21-25 years, 112 women (26.9%) were aged between 26-30 years, 132 women (31.7%) were aged between 31-35 years, and 80 women (19.2%) were aged between 36-40 years. No respondent was aged 41 years and above. In Mumoni Ward of Mwingi North Sub County, a total of 420 respondents participated in the study. Age of the respondents was distributed as follows; 20 women (4.8%) were aged between 16-20 years, 76 women (18.1%) were aged between 21-25 years, 117 women (27.9%) were aged between 26-30 years, 138 women (32.9%) were aged between 31-35 years, 63 women (15%) were aged

between 36-40 years and 6 women (1.4%) were aged between 41-45 years. These results are summarized in table 4.1.

#### **4.2.2. Respondent's Parity**

At Baseline survey, Data collected in Waita ward of Mwingi west sub County (intervention site) indicates that; 20 respondents (4.8%) reported to have given birth to 1 child, 19 respondents (4.6%) had given birth to 2 children, 60 respondents (14.4%) had given birth to 3 children, 105 respondents (25.2%) had given birth to 4 children, 93 respondents (22.4%) had given birth to five children, 63 respondents (15.1%) had given birth to six children and 56 respondents (13.5%) reported to have given birth to more than 6 children. In Kyuso Ward of Mwingi North Sub County (control site); 23 respondents (5.6%) reported that they had only 1 child, 22 respondents (5.4%) had 2 children, 58 respondents (14.1%) had 3 children, 124 respondents (30.2%) had 4 children, 89 respondents (21.7%) had 5 children, 74% of the respondents had 6 children and 21 respondents (5.1%) had more than 6 children.

At midterm survey, data from Kyethani ward of Mwingi West Sub county (intervention site) indicates that; 25 respondents (6.1%) had given birth to only 1 child, 28 respondents (6.8%) had given birth to 2 children, 74 respondents (17.9%) had given birth to 3 children, 93 respondents (22.5%) had given birth to 4 children, 95 respondents (23%) had given birth to 5 children, 66 respondents (16% had given birth to 6 children and 32 respondents (7.7%) had given birth to more than six children. In Ngomeni Ward of Mwingi North Sub County (control site); 22 respondents (5.3%) reported to have given birth to 1 child, 15 respondents (3.6%) had given birth to 2 children, 64 respondents (15.5%) had given birth to 3 children, 93 respondents (22.5%) had given birth to 4 children, 113 respondents (27.4



%) had given birth to 5 children, 82 respondents (19.9%) had given birth to 6 children and 24 respondents had given birth to more than 6 children.

At end term survey, data collected in Kiomo ward of Mwingi west Sub County (intervention site) indicates that; 13 respondents (3.1%) had given birth to only 1 child, 26 respondents (6.2%) had given birth to 2 children, 65 respondents (15.6%) had given birth to 3 children, 122 respondents (29.3%) had given birth to 4 children, 99 respondents (23.7%) had given birth to 5 children, 65 respondents (15.6%) had given birth to 6 children and 27 respondents (6.5%) had given birth to more than 6 children. In Mumoni Ward of Mwingi North Sub County; 30 respondents (7.1%) reported to have given birth to 1 child, 13 respondents (3.1%) reported to have given birth to 2 children, 67 respondents (16%) had given birth to 3 children, 89 respondents (21.2%) had given birth to 4 children, 100 respondents (23.8%) had given birth to 5 children, 88 respondents (21%) had given birth to 6 children and 33 respondents (7.9%) reported to have given birth to more than 6 children. These results are summarized in table 4.1.

#### **4.2.3. Education Level of respondents**

At baseline survey, data collected in Waita ward of Mwingi west Sub County (intervention site) indicates that 33 respondents (7.9%) had no formal education, 141 respondents (33.9%) had Primary level of education, 149 respondents (35.8%) had secondary level of education while the remaining 93 respondents (22.4%) reported to have had college/university level of education. In Kyuso Ward of Mwingi North Sub County (control site); 12 respondents (2.9%) reported that they had no formal education, 86 respondents (20.9) reported to have primary level of education, 228 respondents (55.5%) reported to

have secondary level of education while the remaining 85 respondents (20.7%) had college/university education as their highest level of education.

At midterm survey, data from Kyethani ward of Mwingi West Sub county (intervention site) indicates that; 25 respondents (6.1%) did not have any formal education, 127 respondents (30.8%) reported their highest level of education as primary level of education, and 167 respondents (40.4%) reported having studied up to secondary level of education while 94 respondents (22.8%) reported having a college/university level of education. In Ngomeni Ward of Mwingi North Sub County (control site); 16 respondents (3.9%) reported that they did not have any formal education, 108 respondents (26.2%) reported having primary education as their highest level of education, and 187 respondents (45.3%) reported having secondary level of education as their highest level while the remaining 102 respondents (24.7%) had college/university level of education.

At end term survey, data collected in Kiomo ward of Mwingi west Sub County (intervention site) indicated that; 27 respondents (6.5%) did not have any formal education, 102 respondents (24.5%) had primary level of education, and 208 respondents (49.9%) had secondary level of education while 80 respondents (19.2%) had college/university level of education. In Mumoni Ward of Mwingi North Sub County; 8 respondents (1.9%) had no formal education, 124 respondents (29.5%) reported having primary level of education as their highest level of education, and 167 respondents (39.8%) reported having secondary education as their highest level of education. These results are summarized in table 4.1.

#### **4.2.4. Respondents' Occupation**

At baseline survey, data collected in Waita ward of Mwingi west sub County (intervention arm) revealed that; 8 (1.9%) respondents were not engaged in any income generating

activity, 206 respondents (49.5 %) were peasant farmers, and 105 respondents (25.2%) were operating small scale businesses while 97 respondents (23.3%) were in employment. In Kyuso Ward of Mwingi North Sub County (control site); 10 respondents (2.4 %) were not in any income generating activity, 233 respondents (56.7%) were peasant farmers, and 117 respondents (28.5%) were operating small scale businesses , while the remaining 51 respondents (12.4%) were in employment.

At Midterm survey, data collected from Kyethani ward of Mwingi West Sub County (intervention site) revealed that; 13 respondents (3.1%) were not in any income generating activity, 225 respondents (54.5%) respondents were peasant farmers, and 92 respondents (22%) were operating small scale businesses while the remaining 84 respondents (20.3%) were in gainful employment. In Ngomeni Ward of Mwingi North Sub County (control site); 15 respondents (3.6%) reported that they were not involved in any income generating activity, 247 (59.8%) respondents were peasant farmers, 92 respondents (22.3%) were operating small scale businesses while 59 respondents (14.3%) were in employment.

At end term survey, data collected in Kiomo ward of Mwingi west Sub County (intervention site) indicated that; 34 respondents (8.2%) were not involved in any income generating activity, 226 respondents (54.2%) were peasant farmers, 99 respondents (23.7%) were operating small scale businesses while 58 respondents (13.9%) were in employment. In Mumoni Ward of Mwingi North Sub County; 15 respondents (3.6%) reported that they were not involved in any income generating activity, 230 respondents (54.8%) reported that they were peasant farmers, 108 respondents (25.7%) were involved in small scale businesses while the remaining 67 respondents (16%) were in gainful employment. These results are summarized in table 4.1.

#### **4.2.5. Marital Status of Respondents**

At baseline survey, data collected in Waita ward of Mwingi west sub County (intervention site) indicates that; 21 respondents (5%) were single, 306 respondents (73.6%) were married, 24 respondents (5.8%) were windowed and the remaining 65 (15.6%) respondents were either separated or divorced. In Kyuso Ward of Mwingi North Sub County (control site); 31 respondents (7.5%) were single, 350 respondents (85.2% married, 12 respondents (2.9%) windowed and the remaining 18 respondents (4.4%) were either separated or divorced.

At midterm survey, data collected from Kyethani ward of Mwingi West Sub county (intervention site) indicates that; 30 respondents (7.3%) reported that they were single, 299 respondents (72.4 %) reported that they were married, 16 respondents (3.9%) were windowed and 68 respondents (16.5%) were either separated or divorced. In Ngomeni Ward of Mwingi North Sub County (control site); 44 respondents (10.7% reported that they were single, 328 respondents (79.4%) reported that they were married, 15 respondents (3.6%) were windowed and remaining 26 respondents (6.3%) were either separated or divorced.

At end term survey, data collected in Kiomo ward of Mwingi west Sub County (intervention site) indicated that; 40 respondents (9.6%) were single, 311 respondents (74.6%) were married, 18 respondents (4.3 %) were windowed and the remaining 48 respondents (11.5%) were either separated or divorced. In Mumoni Ward of Mwingi North Sub County; 34 respondents (8.1 %) reported that they were single, 337 respondents (80.2 %) were married, 18 respondents (4.3%) were windowed and the remaining 31 respondents (7.4%) were either separated or divorced. These results are summarized in table 4.1.

#### **4.2.6. Average Monthly Household Income**

At baseline survey, distribution of average monthly household income in Waita ward of Mwingi West Sub County (intervention site) was as follows: mean monthly income; Kshs. 5884.62, median; Kshs. 4000, mode; Kshs.2500 and minimum and maximum monthly average household income was Kshs. 1,000 and 22, 000 respectively. Out of the 416 households represented; 28.4% earned Kshs. 2,500 and below, 31% earned between Kshs. 2501-5000, 10.8% earned between Kshs. 5,001-7,500, 15.9% earned between Kshs. 7501-10,000 and only 13.9% earned more than Kshs. 10,000. In Kyuso Ward of Mwingi North Sub County (control site); average household monthly income distribution was as follows: mean monthly household income; Kshs. 4226.28, median; Kshs. 2500.00 mode; Kshs. 2000 and minimum and maximum household monthly income was Kshs. 500 and Kshs. 25, 000 respectively. Out of the 411 households represented, 53.3% earned Kshs. 2,500 and below, 26.5% earned between Kshs. 2501-5000, 7.8% earned between Kshs. 5,001-7,500, 2.9% earned between Kshs. 7501-10,000 and only 9.5% earned more than Kshs. 10,000.

At midterm survey, data collected from Kyethani ward of Mwingi West Sub county (intervention site) indicated that; mean monthly household income was, Kshs. 5716.71, median was Kshs. 3500.00 mode was Kshs. 2000 and minimum and maximum household monthly income was Kshs. 1000.00 and 25,000 respectively. Out of the 413 households represented, 37% earned Kshs. 2,500 and below, 29.5% earned between Kshs. 2501-5000, 12.8% earned between Kshs. 5,001-7,500, 3.4% earned between Kshs. 7501-10,000 and only 17.2% earned more than Kshs. 10,000. In Ngomeni Ward of Mwingi North Sub County (control site); mean monthly household income was, Kshs. 4579.90, median was

Kshs. 2500.00 mode was Kshs. 2000 and minimum and maximum household monthly income was Kshs. 500 and 22,000 respectively. Out of the 413 households represented, 53.5% earned Kshs. 2,500 and below, 22.8% earned between Kshs. 2501-5000, 7% earned between Kshs. 5,001-7,500, 4.4% earned between Kshs. 7501-10,000 and only 12.3% earned more than Kshs. 10,000.

At end term survey, data collected in Kiomo ward of Mwingi west Sub County (study/intervention site) indicated that; mean monthly household income was, Kshs. 5296.16, median was Kshs. 3000.00 mode was Kshs. 2000 and minimum and maximum household monthly income was Kshs. 0.00 and 26,000 respectively. Out of the 417 households represented, 38.6% earned Kshs. 2,500 and below, 31.9% earned between Kshs. 2501-5000, 11.3% earned between Kshs. 5,001-7,500, 3.6% earned between Kshs. 7501-10,000 and only 14.6% earned more than Kshs. 10,000. In Mumoni Ward of Mwingi North Sub County; mean monthly household income was, Kshs. 4282.14, median was Kshs. 2500.00 mode was Kshs. 2000 and minimum and maximum household monthly income was Kshs. 500 and 24,000 respectively. Out of the 420 households represented, 57.6% earned Kshs. 2,500 and below, 20.5% earned between Kshs. 2501-5000, 5.2% earned between Kshs. 5,001-7,500, 4.5% earned between Kshs. 7501-10,000 and only 12.1% earned more than Kshs. 10,000. The Table in the following page (Table 4.1), is a summary of the sociodemographic characteristics of the study respondents.

**Table 4.1. Summary of Socio-demographic Characteristics of Respondents**

Variable	Categories	Baseline Survey				Midterm Survey (9 Months)				End term Survey (18 months)				
Age		Mwingi West		Mwingi North		Mwingi West		Mwingi North		Mwingi West		Mwingi North		
		F	%	F	%	F	%	F	%	F	%	F	%	
	<b>16-20 years</b>	8	1.9	12	2.9	14	3.4	18	4.4	29	7.0	20	4.8	
	<b>21-25 years</b>	35	8.4	63	15.3	61	14.8	59	14.3	64	15.3	76	18.1	
	<b>26-30 years</b>	106	25.5	134	32.6	141	34.1	127	30.8	112	26.9	117	27.9	
	<b>31-35 years</b>	149	35.8	139	33.8	126	30.5	143	34.6	132	31.7	138	32.9	
	<b>36-40 years</b>	113	27.2	57	13.9	69	16.7	59	14.3	80	19.2	63	15.0	
	<b>41-45 years</b>	5	1.2	6	1.5	2	0.5	7	1.7	0	0	6	1.4	
	<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>	
Parity		<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	
		1 Child	20	4.8	23	5.6	25	6.1	22	5.3	13	3.1	30	7.1
		2 children	19	4.6	22	5.4	28	6.8	15	3.6	26	6.2	13	3.1
		3 children	60	14.4	58	14.1	74	17.9	64	15.5	65	15.6	67	16.0
		4 children	105	25.2	124	30.2	93	22.5	93	22.5	122	29.3	89	21.2
		5 children	93	22.4	89	21.7	95	23.0	113	27.4	99	23.7	100	23.8
		6 children	63	15.1	74	18.0	66	16.0	82	19.9	65	15.6	88	21.0
		7 and above	56	13.5	21	5.1	32	7.7	24	5.8	27	6.5	33	7.9
	<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>	
Education Level		<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	
		No education	33	7.9	12	2.9	25	6.1	16	3.9	27	6.5	8	1.9
		Primary level	141	33.9	86	20.9	127	30.8	108	26.2	102	24.5	124	29.5
		Secondary level	149	35.8	228	55.5	167	40.4	187	45.3	208	49.9	167	39.8
		College/ University	93	22.4	85	20.7	94	22.8	102	24.7	80	19.2	121	28.8
	<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>	
Occupation		<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	
		Not working	8	1.9	10	2.4	13	3.1	15	3.6	34	8.2	15	3.6
		Peasant Farmer	206	49.5	233	56.7	225	54.5	247	59.8	226	54.2	230	54.8
		Business employment	105	25.2	117	28.5	91	22.0	92	22.3	99	23.7	108	25.7
		<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>
Marital Status		<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	
		Single	21	5.0	31	7.5	30	7.3	44	10.7	40	9.6	34	8.1
		Married	306	73.6	350	85.2	299	72.4	328	79.4	311	74.6	337	80.2
		Widowed	24	5.8	12	2.9	16	3.9	15	3.6	18	4.3	18	4.3
		Separated/ Divorced	65	15.6	18	4.4	68	16.5	26	6.3	48	11.5	31	7.4
	<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>	
Monthly Income		<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	<b>F</b>	<b>%</b>	
		≤2500	118	28.4	219	53.3	153	37.0	221	53.5	161	38.6	242	57.6
		2501 - 5000	129	31.0	109	26.5	122	29.5	94	22.8	133	31.9	86	20.5
		5001 - 7500	45	10.8	32	7.8	53	12.8	29	7.0	47	11.3	22	5.2
		7501 - 10000	66	15.9	12	2.9	14	3.4	18	4.4	15	3.6	19	4.5
		> 10000	58	13.9	39	9.5	71	17.2	51	12.3	61	14.6	51	12.1
	<b>Total</b>	<b>416</b>	<b>100</b>	<b>411</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>413</b>	<b>100</b>	<b>417</b>	<b>100</b>	<b>420</b>	<b>100</b>	

Table legend: F=Frequency

### 4.3. Study Objective 1: Effect of CHS on FANC Coverage ( $\geq 4$ visits) in Mwingi West Sub-county

#### 4.3.1. Antenatal Care (ANC) Coverage ( $\geq 1$ visit) vs FANC ( $\geq 4$ visits)

The following Table (Table 4.2) shows a summary of the proportion of women who sought ANC services for at least 1 visit ( $\geq 1$  visit) compared to proportion of women who sought ANC services as recommended for at least 4 times (FANC) in intervention and control sites.

**Table 4.2. Summary of Antenatal Care (ANC) Coverage ( $\geq 1$  visit) vs FANC ( $\geq 4$  visits) in Intervention and Control Sites**

Survey	Intervention site (Mwingi West)				Control Site (Mwingi North)			
	Women who sought ANC services for ( $\geq 1$ visit)		Women who sought ANC services for $\geq 4$ times		Women who sought ANC services for ( $\geq 1$ visit)		Women who sought ANC services for $\geq 4$ times	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
<b>Baseline</b>	400/416	<b>96.1</b>	162/416	<b>38.9</b>	392/411	<b>95.4</b>	143/411	<b>34.8</b>
<b>Midterm (9months)</b>	404/413	<b>97.8</b>	200/413	<b>48.4</b>	399/413	<b>96.7</b>	120/413	<b>29.1</b>
<b>End-Term (18 months)</b>	404/417	<b>96.9</b>	246/417	<b>59.0</b>	402/420	<b>95.7</b>	163/420	<b>38.8</b>

#### 4.3.2. Comparison of ANC services provided in intervention and control group

Health services received during ANC visits in both intervention and control sites are; deworming, Tetanus Toxoid (TT) immunizations, health education, counselling and physical examination, laboratory examination, HIV counselling and testing, folic and ferrous supplementation, antimalarial prophylaxis, and provision of an Insect Treated Mosquito Nets (ITNs). The following Table (Table 4.3) shows a comparative summary of descriptive statistics on the ANC services received in both intervention and control sites.



**Table 4.3. ANC Services Received in Intervention and Control Sites**

	ANC Service	Intervention site (Mwingi West)						Control Site (Mwingi North)					
		Baseline Survey		Midterm Survey		End term Survey		Baseline Survey		Midterm Survey		End term Survey	
		Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%
1.	Deworming	191	45.9	267	64.6	336	80.6	183	44.5	175	42.4	119	28.3
2.	Tetanus Toxoid (2doses)	178	42.8	267	64.6	336	80.6	148	36.0	178	43.1	239	56.9
3.	Health Education & Counselling	370	88.9	361	87.4	373	89.4	323	78.6	351	85.0	356	84.8
4.	Physical examination	368	88.5	361	87.4	373	89.4	328	79.8	350	84.7	357	85.0
5.	Laboratory Examination	346	83.2	313	75.8	344	82.5	261	63.5	288	69.7	333	79.3
6.	HIV counselling and testing	333	80.0	352	85.2	361	86.6	291	70.8	308	74.6	305	72.6
7.	Folic and Ferrous Supplementa tion	48	11.5	76	18.4	104	24.9	33	8.0	41	9.9	44	10.5
8.	Antimalarial Prophylaxis	326	78.4	352	85.2	350	83.9	305	74.2	332	80.4	324	77.1
9.	Mosquito net	338	81.3	332	80.4	316	75.8	277	67.4	327	79.2	318	75.7

### 4.3.3. Effect of CHS on FANC Coverage ( $\geq 4$ visits)

#### 4.3.3.1. Change in FANC Coverage ( $\geq 4$ visits) in Intervention and Control sites

This subsection answers the following question; is there a significant difference in FANC coverage between baseline survey, midterm survey and end term survey in intervention and control sites? The question is answered by use of Z score tests to establish if there is a significant difference in the proportion of women who sought ANC services for at least 4 times between baseline and midterm survey and between baseline and end-term survey in both intervention and control sites.

In the intervention site, proportion of FANC coverage increased from baseline survey to midterm survey by 9.5%, (48.4%-38.9%). A comparison of intervention site baseline survey and end-term survey indicates that the same proportion (FANC coverage) increased by 20.1 % (59%-38.9%). In the control site, the proportion of FANC coverage at baseline reduced by 5.7% compared to the midterm survey (34.8%-29.1%), and compared to end term survey the same proportion increased by 4% (38.8%-34.8%) (Summary of data is in Table 4.2).

Z score analysis established that in the intervention arm/site, the proportion of FANC coverage at baseline (38.9%) was significantly different from the proportion of FANC coverage at midterm (48.4%) ( $Z=2.7528$ ,  $P<0.05$ ). The proportion of FANC coverage at baseline (38.9%) was also found to be significantly different from proportion of FANC coverage at end term (59%) ( $Z= 5.7881$ ,  $P<0.0001$ ). In the control site, proportion of FANC coverage at baseline (34.8%) was not different from the proportion of FANC coverage at midterm survey (29.1%) ( $Z=1.7665$ ,  $P>0.05$ ). The proportion of FANC coverage at baseline (34.8%) was also not significantly different from the proportion of FANC coverage at end term survey (38.8%) ( $Z=1.2002$ ,  $P>0.05$ ).

Further analysis using Z score tests involved initial comparability at baseline to establish if there was a significant difference in FANC coverage at baseline between intervention site and control site. No significant difference in the proportions of FANC coverage between intervention and control site was established at baseline survey ( $Z=1.2365$ ,  $P>0.05$ ). The critical statistic in this section of data is that FANC coverage in intervention site increased significantly by 9.5% from baseline to midterm survey (48.4%-38.9%) and

by 20.1 % from baseline survey to end-term survey (59%-38.9%). The following Table (Table 4.4) shows a summary of these findings.

**Table 4.4. Z score tests Testing Differences in FANC coverage**

Site	Baseline	Mid-term	End term	Mid-Term Baseline	Vs.	End-term Baseline	Vs
<b>Intervention (Mwingi West)</b>	162/416 (38.9%)	200/413 (48.4%)	246/417 (59.0%)	Z=2.7528 P=0.00596*		Z=5.7881 P=0.0001*	
<b>Control (Mwingi North)</b>	143/411 (34.8%)	120/413 (29.1%)	163/420 (38.8%)	Z=-1.7665 P=0.07672		Z=1.2002 P=0.23014	
<b>Intervention vs Control (Z tests)</b>	Z=1.2365, P=0.21498.	Z=5.7139 P=0.0001*	Z=5.8407 P=0.0001*				

*Table legend: \* means test statistic is significant at  $P < 0.05$*

#### **4.3.3.2. Net Change in FANC coverage between intervention and Control Arms over 18 months' CHS intervention period**

What is the net change (estimated impact) of FANC coverage in the intervention site compared to control site over the 18 months' CHS intervention period? Estimating impact over time is done by calculating the change in FANC coverage over the 18 months of CHS intervention between intervention and control arms. This was done by use of Difference in Differences (DiD) model as recommended by (White and Sabarwal, 2014) and (Memon *et al.*, 2015). The first step was to find the difference between intervention site end-term survey FANC coverage (59%) (refer to table 4.2) and intervention site baseline survey FANC coverage (38.9%); which is 20.1%. Second step was to find the difference between control site end-term FANC coverage (38.8%) and control arm baseline FANC coverage (34.8%); which is 4%. Third step was to find the difference between the two differences (i.e. 20.1% - 4%), DiD = 16.1%.

$$\text{DiD} = [(59\% - 38.9\%) - (38.8\% - 34.8)] = 16.1\%$$

Compared to control site, CHS intervention increased FANC coverage in the intervention site by 16.1% over the 18 months' implementation period

#### **4.3.3.3. Observed Change in FANC Coverage in Intervention Arm**

The null hypothesis on the effect of CHS intervention on FANC coverage focused on measuring the probability of expectant woman seeking FANC services with and without the CHS intervention. The binary logistic regression model used provided both crude and adjusted Odds Ratios (ORs). The adjusted ORs were adjusted for sociodemographic characteristics-age, parity, maternal education, household income, and occupation as potential confounders. The adjusted ORs formed the basis of hypothesis testing.

The null hypothesis was;

In the intervention site, there is no difference in the odds of women seeking ANC services for at least 4 times (FANC) at baseline survey compared to end-term survey.

A binary logistic regression analysis that compared intervention site end-term survey and intervention site baseline survey established that women at the end term survey were 1.5 times and 1.7 times more likely to seek ANC services for at least 4 visits compared to women at baseline survey in the crude and adjusted ORs respectively [(Crude OR: 1.502, 95%CI: 1.307-1.725,  $P < 0.0001$ ) (*Adj.* OR 1.717, 95%CI: 1.464-2.014,  $P < 0.0001$ )].

Based on the adjusted OR (*Adj.* OR 1.717, 95%CI: 1.464-2.014,  $P < 0.0001$ ) the null hypothesis is hereby rejected and alternative hypothesis 'there is a significant difference in the odds of women seeking ANC services for at least 4 times (FANC) at baseline survey compared to end term survey in intervention site' is adopted. The odds of seeking ANC

services for at least 4 times (FANC) were higher in end term survey (1.7 times higher) compared to baseline survey. The following Table (Table 4.5) shows a comparative summary of the odds of FANC utilization between baseline survey and midterm survey and between baseline survey and end term surveys in both intervention and control sites. The hypothesis test statistic is in **bold**.

**Table 4.5. Comparison of the Odds of FANC Service utilization in Intervention and Control Sites**

<b>Int. vs Ctr.</b>		<b>Crude vs Adj.</b>	<b>Sig</b>	<b>OR</b>	<b>95%CI</b>
Intervention site (Mwingi West)	Midterm vs Baseline	Crude OR	0.006*	1.472	1.117-1.940
		Adj. OR	0.008*	1.512	1.112-2.057
	<b>End term Vs Baseline (Hypothesis test)</b>	<b>Crude OR</b>	<b>0.0001*</b>	<b>1.502</b>	<b>1.307-1.725</b>
		<b>Adj. OR</b>	<b>0.0001*</b>	<b>1.717</b>	<b>1.464-2.014</b>
Control Site (Mwingi North)	Midterm vs Baseline	Crude OR	0.078	0.768	0.572-1.030
		Adj. OR	0.052	0.723	0.521-1.002
	End term Vs Baseline	Crude OR	0.216	1.095	0.948-1.264
		Adj. OR	0.535	1.050	0.899-1.227

Table legend: \* means test statistic is significant at P<0.05

#### 4.4. Study Objective 2. Effect of CHS on utilization of SBC in Mwingi West Sub-County

##### 4.4.1. Prevalence of SBC Utilization in Intervention and Control Sites

The following Table (Table 4.6) shows a summary of the frequency and percentage (prevalence) of women who delivered under SBC in their most recent delivery.

**Table 4.6. SBC Service Utilization among Women in Intervention and Control sites**

Survey	Intervention site (Mwingi West)				Control Site (Mwingi North)			
	SBC		Non -SBC		SBC		Non-SBC	
	Frq.	%	Frq.	%	Frq.	%	Frq.	%
<b>Baseline</b>	241	<b>57.9</b>	175	42.1	191	<b>46.5</b>	220	53.5
<b>Midterm (9months)</b>	275	<b>66.6</b>	138	33.4	203	<b>49.2</b>	210	50.8
<b>End-Term (18 months)</b>	294	<b>70.5</b>	123	29.5	212	<b>50.5</b>	208	49.5

##### 4.4.2. Effect of CHS on Utilization of SBC in Mwingi West Sub-County

###### 4.4.2.1. Change in SBC Utilization in Intervention and Control Sites

This sub-section answers the following question; Is there a significant difference in utilization of SBC between baseline survey, midterm survey and end-term surveys in intervention and control sites?

Z score tests established that in the intervention site; proportion of women who delivered under SBC at midterm survey (66.6%) was significantly different to proportion of women who delivered under SBC at baseline survey (57.9%) ( $Z= 2.5697$ ,  $P<0.05$ ). A comparison between proportion of women who delivered under SBC at end term survey (70.5%) in intervention site to proportion of women who delivered under SBC at baseline survey (57.9%) also revealed a significant difference ( $Z= 3.7846$ ,  $P< 0.0001$ ).

In the control site; a comparison between baseline SBC proportion (46.5%) and midterm SBC proportion (49.2%) yielded no significant difference between the two proportions ( $Z=0.7702$ ;  $P>0.05$ ). Similarly, no significant difference was observed by comparing baseline SBC proportion (46.5%) with end-term SBC proportion (50.5%) in the control site ( $Z=1.1547$ ;  $P>0.05$ ). In intervention site, proportion of women who delivered under SBC increased significantly by 8.7% and 12.6% at midterm survey and end term survey respectively compared to baseline. In control site, no significant increase was observed between baseline SBC utilization and end term SBC utilization. The following Table (Table 4.7) shows a summary of these findings;

**Table 4.7. Z score tests Testing Differences in Prevalence of SBC utilization**

Site	Baseline	Mid-term (9 months)	End term (18 months)	Midterm vs Baseline	End term vs Baseline
<b>Intervention (Mwingi West)</b>	241/416 (57.9%)	275/413 (66.6%)	294/417 (70.5%)	$Z= 2.5697$ $P=0.01016^*$	$Z= 3.7846$ $P= 0.00016^*$
<b>Control (Mwingi North)</b>	191/411 (46.5%)	203/413 (49.2%)	212/420 (50.5%)	$Z= 0.7702$ $P= 0.4413$	$Z= 1.1547$ $P= 0.25014$
<b>Intervention vs Control (Z tests)</b>	$Z= 3.2991$ $P= 0.00096^*$	$Z= 5.0736$ $P=0.00001^*$	$Z= 5.925$ $P=0.00001^*$		

*Table legend: \* means test statistic is significant at  $P<0.05$*

Initial Comparability at baseline through Z score test revealed a significant difference between proportion of women delivering under SBC in intervention site (57.9%) and proportion of women delivering under SBC control arm (46.5%) ( $Z= 3.2991$ ,  $P< 0.001^*$ ). This called for further analysis through a binary logistic regression which enabled the investigator to control for sociodemographic characteristics as potential confounders to establish if the difference in SBC utilization could be as a result of confounders.

Crude Odds Ratios (ORs) from a binary logistic regression analysis indicated that at baseline survey, women in intervention site were 1.6 times more likely to deliver under SBC compared to control (OR=1.586, P<0.05;95%CI=1.205-2.088). However, after controlling for sociodemographic characteristics which included; maternal age, parity, level of education, marital status and average household income, the adjusted OR indicated no significant difference in the odds of mothers who delivered under SBC between intervention and control site at baseline survey (*Adj.* OR=0.993, P>0.05, 95%CI: 0.681 - 1.448). These results are summarized in the following table (Table 4.8).

**Table 4.8. Odds of SBC Utilization at Baseline survey in Intervention Vs Control**

Baseline Survey	Crude vs <i>Adj.</i>	Sig.	OR	95% CI
<b>Intervention Vs Control (Mwingi west Vs Mwingi North)</b>	Crude OR	0.001*	1.586	1.205 -2.088
	Adjusted OR	0.970	0.993	0.681 -1.448

*Table legend: \* means test statistic is significant at P<0.05*

#### **4.4.2.2. Net Change in utilization of SBC between intervention and Control Sites over 18 months' CHS intervention period**

What is the net change (estimated impact) in utilization of SBC in the intervention site compared to control site over the 18 months' CHS intervention period?

Calculated Difference in Differences (DiD) is 8.6% as shown in the following equation;

$$DiD = [(70.5\% - 57.9\%) - (50.5\% - 46.5\%)] = 8.6\%$$

Compared to control site, CHS intervention increased utilization of SBC among expectant women in the intervention site by 8.6% over the 18 months' implementation period.



#### **4.4.2.3. Observed Change in SBC Utilization in Intervention Arm**

**The null hypothesis of this objective was:**

In the intervention site, there is no difference in the odds of women delivering under SBC at baseline survey compared to end term survey

A comparison between baseline survey and end term survey in intervention site indicated that women in the end-term survey were 1.3 times more likely to deliver under SBC compared to women at baseline survey (crude OR=1.321,  $P<0.0001$ ; 95% CI: 1.144-1.525). After adjusting for socio-demographic characteristics women in end term survey were found to be 1.6 times more likely to deliver under SBC compared to women at baseline (Adj. OR=1.556,  $P<0.0001$ ; 95%CI: 1.295-1.868).

Based on this observation the null hypothesis was rejected and alternative hypothesis (In the intervention site, there is a significant difference in the odds of women delivering under SBC at baseline survey compared to end term survey) adopted.

The following table (Table 4.9) shows a comparative summary of the odds of women delivering under SBC between baseline survey and midterm survey, and between baseline survey and end term surveys in both intervention and control sites. The hypothesis test statistic is in bold.

**Table 4.9. Comparison of the Odds of delivery under SBC in Intervention and Control Sites**

Site	Survey	Crude Vs. Adj.	Sig	OR	95%CI
<b>Intervention site (Mwingi West)</b>	Midterm vs Baseline	Crude OR	0.010*	1.447	1.091-1.919
		Adjusted OR	0.005*	1.681	1.168-2.419
	<b>End term Vs Baseline (Hypothesis test)</b>	<b>Crude OR</b>	<b>0.0001*</b>	<b>1.321</b>	<b>1.144-1.525</b>
		<b>Adj. OR</b>	<b>0.0001*</b>	<b>1.556</b>	<b>1.295-1.868</b>
<b>Control Site (Mwingi North)</b>	Midterm vs Baseline	Crude OR	0.441	1.113	0.847-1.464
		Adjusted OR	0.386	1.154	0.835-1.594
	End term Vs Baseline	Crude OR	0.249	1.083	0.945-1.241
		Adjusted OR	0.255	1.097	0.936-1.285

*Table legend: \* means test statistic is significant at  $P < 0.05$*

## **4.5. Study Objective 3: Effect of CHS on Infant Vaccination Coverage (IVC)**

### **4.5.1. IVC in intervention and Control Sites**

In Kenya, IVC is the proportion of children aged 1 year and below who have received the basic WHO recommended vaccines plus three doses of pneumococcal vaccination within their first year of life. In this study ‘within the first year of life’ was interpreted to mean by 9 months of life based on the fact that by 9 months, an infant in Kenya is supposed to have received all the vaccinations prescribed in the child health immunization program. (This is with the exception of the 2<sup>nd</sup> measles dose which was introduced in Kenya in 2013 to be administered to children in the 18<sup>th</sup> month of life (Ministry of Health, 2013). These vaccines are; Bacillus Calmette–Guérin -BCG (at birth), Oral Polio Vaccine-OPV (at birth, 6wk, 10wk and 14wk), Pentavalent vaccine which contains-Diphtheria, Pertussis (whooping cough), and Tetanus (DPT)) and (Hepatitis B and *Haemophilus influenzae* type B vaccines) (given at 6wk, 10wk and 14wk), Pneumococcal vaccine-PCV 10 (received at 6wk, 10wk and 14wk), and first dose of Measles vaccine (received at 9 months).

IVC in this study is therefore the proportion of infants whose mothers reported that they had received all the vaccines prescribed in the child immunization program by the time of the survey (at 9 to 12 months of age). Data collectors verified the information provided in the GoK mother and child booklets, and any other child clinic records available. Women who did not have any records were requested to recall and respond accordingly. At baseline survey, IVC was 88.7% and 84.4% in intervention and control arm respectively, at midterm survey, IVC was 92.5% and 83.3% in intervention and control arms respectively, and in end term survey, IVC was 98.8% and 86.0% in intervention and control arms respectively.

#### 4.5.2. Vaccination Coverage for five Vaccines in intervention and Control Sites

The following table (Table 4.10) shows a summary of statistics on five vaccines recommended to be received within the first 9 months of an infant's life in Kenya.

**Table 4.10. Vaccination Coverage for Five Vaccines in intervention and Control Sites**

	Vaccine	Intervention site (Mwingi West)						Control Site (Mwingi North)					
		Baseline		Midterm		End term		Baseline		Midterm		End term	
		Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%
1	<b>BCG Immunization</b>	389	93.5	404	97.8	411	98.6	379	92.2	361	87.4	396	94.3
2	<b>Oral polio (4 doses)</b>	394	94.7	400	96.9	412	98.8	379	92.2	377	91.3	389	92.6
3	<b>Penta valent (3 doses)</b>	393	94.5	403	97.6	412	98.8	381	92.7	364	88.1	379	90.2
4	<b>Pneumococcal (3 doses)</b>	379	91.1	400	96.9	412	98.8	370	90.0	349	84.5	380	90.5
5	<b>Measles (1 dose)</b>	373	89.7	391	94.7	412	98.8	356	86.6	347	84	367	87.4

#### 4.5.3. Effect of CHS on IVC in Mwingi West Sub-County

##### 4.5.3.1. Change in IVC in intervention and Control Sites

Initial comparability of intervention and control sites at baseline indicated a difference of 4.3% in IVC (88.7% -84.4%). A Z score test revealed no significant difference between the 2 proportions ( $Z = 1.8026$ ;  $P > 0.05$ ). In the intervention site, IVC at baseline increased by 3.8% at midterm (92.5%-88.7%) and by 10.1% at end term survey (98.8%-88.7%). Z score tests indicated no significant difference between midterm survey IVC and baseline survey IVC ( $Z=1.8698$ ;  $P > 0.05$ ) but a comparison between baseline IVC and end-term IVC proportions in intervention arm established a significant difference ( $Z = 6.0241$ ;  $P < 0.0001$ ).

In the control site, difference between midterm survey IVC and baseline survey IVC was - 1.1% (83.3%-84.4%) while the difference between end term survey IVC and baseline survey IVC was 2.7% (86%-83.3%). Z score tests indicated no significant difference between; midterm IVC and baseline IVC ( $Z = 0.4429$ ;  $P > 0.05$ ) as well as between baseline IVC and end term IVC ( $Z=0.6186$ ;  $P>0.5$ ).

The critical statistic in regard to effect of CHS on IVC is that in intervention site, CHS significantly increased IVC by 10.1%. These results are summarized in the following table (Table 4.11).

**Table 4.11. Z score tests measuring changes in IVC in Intervention and Control Sites**

Study site	Baseline	Mid-term	End term	Midterm Vs Baseline	End term Vs Baseline
<b>Intervention (Mwingi west)</b>	88.7% (369/416)	92.5% (382/413)	98.8% (412/417)	$Z = 1.8698$ $P = 0.06148$	<b><math>Z = 6.0241</math></b> <b><math>P &lt; 0.0001^*</math></b>
<b>Control (Mwingi North)</b>	84.4% (347/411)	83.3% (344/413)	86.0% (361/420)	$Z = -0.4429$ $P = 0.65994$	$Z = 0.6186$ $P = 0.53526$
<b>Intervention vs Control</b>	$Z = 1.8026$ $P = 0.07186$	<b><math>Z = 4.0533</math></b> <b><math>P &lt; 0.0001^*</math></b>	<b><math>Z = 6.9941</math></b> <b><math>P &lt; 0.0001^*</math></b>		

*Table legend: \* means test statistic is significant at  $P < 0.05$*

#### **4.5.3.2. Net Change in IVC between Intervention and Control Sites Over 18 months' CHS intervention period**

The net change/estimated impact of CHS on IVC in the intervention site compared to control site over the 18 months' CHS intervention period was calculated using the DiD model.

Calculated Difference in Differences (DiD) is 8.5% as shown in the following equation;

$$\text{DiD} = [(98.8\% - 88.7\%) - (86.0\% - 84.4\%)] = 8.5\%$$

Compared to control site, CHS intervention increased IVC in Mwingi west sub-county (intervention site) by 8.5% over the 18 months' implementation period.

#### **4.5.3.3. Observed Change in IVC in Intervention Arm**

The null hypothesis for study objective three was;

In the intervention arm, there was no difference in the odds of infants who received all recommended vaccines within 9 to 12 months of life at baseline survey compared to end-term survey.

Binary logistic regression established a significant difference in the in the odds of an infant receiving all recommended vaccines within 9 to 12 months between baseline survey and end-term survey. In both the crude and adjusted odds ratios infants in the end term survey were 2.5 times more likely to receive all recommended immunizations in the routine child immunization program compared to infants at baseline [(crude OR=2.475, P<0.0001; 95% CI: 1.794-3.414) Adj. OR=2.516, P<0.0001; 95% CI: 1.796-3.524)].

Based on this test, the null hypothesis was rejected and the alternative hypothesis (In the intervention arm, there was a significant difference in the odds of infants who received all recommended vaccines within 9-12 months of life at baseline survey compared to end-term survey) was adopted.

The following table (Table 4.12) shows a comparative summary of the odds of infants who received all the recommended vaccines within 9 to 12 months of life between baseline survey and midterm survey, and between baseline survey and end-term surveys in both intervention and control sites. The hypothesis test statistic is in bold.

**Table 4.12. Comparison of the Odds of an infant receiving all recommended vaccines within 9 months of life in intervention and control sites**

Study Arms		Crude vs adj.	Sig	OR	95%CI
<b>Intervention site (Mwingi West)</b>	Midterm vs Baseline	Crude OR	0.063	1.570	0.976-2.525
		Adjusted OR	0.072	1.571	0.960-2.572
	<b>End term Vs Baseline (Hypothesis test)</b>	<b>Crude OR</b>	<b>0.0001*</b>	<b>2.475</b>	<b>1.794-3.414</b>
		<b>Adjusted OR</b>	<b>0.0001*</b>	<b>2.516</b>	<b>1.796-3.524</b>
<b>Control Site (Mwingi North)</b>	Midterm vs Baseline	Crude OR	0.658	0.920	0.634-1.333
		Adjusted OR	0.757	0.942	0.643-1.379
	End term Vs Baseline	Crude OR	0.540	1.061	0.879-1.280
		Adjusted OR	0.384	1.089	0.898-1.321

*Table legend: \* means test statistic is significant at  $P < 0.05$*

#### **4.6. Study Objective 4: Effect of CHS on practice of EBF in Mwingi West Sub-County**

##### **4.6.1. EBF prevalence in Intervention and Control Sites**

In the intervention site, the proportion of women who reported to have exclusively breastfed their infants in the first six months of life (without introduction of water or any food stuff) was 7.5%, 10.5% and 13.9% at baseline, midterm and end-term surveys respectively. In the control site the proportion of infants who received EBF in the first 6 months of life was 9.5%, 5.8% and 7.4% at baseline, midterm and end-term surveys respectively (summary of findings is in Table 4.13).

##### **4.6.2. Effect of CHS Intervention on Practice of EBF in Mwingi West Sub-County**

###### **4.6.2.1. Change in EBF Prevalence in Intervention and Control Sites**

Initial assessment at baseline indicated a 2% difference between prevalence of EBF in intervention site (7.5%) and prevalence of EBF in control site (9.5%). Z score test however, indicated no significant difference between the 2 proportions ( $Z=-1.0523$ ;  $P>0.05$ ). A comparison between baseline survey and midterm survey EBF prevalence in intervention site, (7.5% and 10.5% respectively) indicated that the 3.2% increment in EBF prevalence was not significant ( $Z=1.6069$ ;  $P>0.05$ ). In the same site (intervention site), EBF prevalence increased from 7.5% at baseline to 13.9% at end term survey. The 6.4% increase was confirmed significant by a Z score test ( $Z=3.0164$ ;  $P<0.05$ ).

In the control site, EBF prevalence decreased by 3.7% from 9.5% at baseline to 5.8% at midterm. Z score test confirmed the 3.7% difference as significant ( $Z=-1.9865$ ;  $P<0.05$ ). (However, a binary logistic regression (shown in table 17 (*in italics*)) indicated no significant difference between the adjusted odds of a mother breastfeeding their last-born child exclusively at control arm-baseline survey and the odds of a mother breastfeeding



their lastborn child exclusively in control arm- midterm survey. [(crude OR=0.588, P<0.05; 95% CI: 0.347-0.998), Adj. OR=0.592, P>0.05; 95%CI: 0.344-1.016)].

In the control arm, no significant difference was found between baseline EBF prevalence (9.5%) and end term EBF prevalence (7.4%) (Z= -1.0939 P>0.05). The critical statistic in this subsection is that CHS significantly increased EBF prevalence by 6.4% (from 7.5% at baseline to 13.9% at end-term survey) in intervention site These results are summarized in the following table (Table 4.13).

**Table 4.13. Z score tests measuring change in EBF prevalence in intervention and Control sites**

Study site	Baseline Survey	Mid-term Survey	End term Survey	Midterm vs Baseline	End term vs Baseline
<b>Intervention (Mwingi West)</b>	7.5% (31/416)	10.7% (44/413)	13.9% (58/417)	Z=1.6069 P=0.1074	<b>Z=3.0164</b> <b>P=0.00252*</b>
<b>Control (Mwingi North)</b>	9.5% (39/411)	5.8% (24/413)	7.4% (31/420)	<b>Z=-1.9865</b> <b>P=0.0466*</b>	Z=-1.0939 P=0.27572
<b>Intervention vs Control</b>	Z=-1.0523 P=0.29372	<b>Z=2.5318</b> <b>P= 0.0114*</b>	<b>Z=3.0633</b> <b>P=0.00222*</b>		

*Table legend: \* means test statistic is significant at P<0.05*

#### **4.6.2.2. Net Change in EBF prevalence between Intervention and Control Sites Over 18 months' CHS intervention period**

The net change/estimated impact of CHS on EBF prevalence in the intervention site compared to control site over the 18 months' CHS intervention period was calculated using the DiD model.

Calculated (DiD) is 8.8% as shown in the following equation;

$$\text{DiD} = [(13.9\% - 7.5\%) - (7.4\% - 9.5\%)] = 6.4\% - (-2.4\%) = 8.8\%$$

Compared to control site, CHS intervention increased EBF prevalence in Mwingi west sub-county (intervention site) by 8.8% over the 18 months' implementation period.

#### **4.6.2.3. Observed Change in the Practice of EBF in Intervention Arm**

The null hypothesis for study objective three was;

In the intervention site, there is no difference in the odds of mothers who practiced EBF in feeding their lastborn child at baseline survey compared to end term survey

Binary logistic regression analysis revealed that in intervention site, infants in end-term survey were 1.4 times more likely to be exclusively breastfed compared to infants at baseline survey of the same site [(crude OR=1.411, P<0.05; 95% CI: 1.126-1.767), Adj. OR=1.447, P<0.05; 95% CI: 1.145-1.829)].

Based on these results, the null hypothesis was rejected and alternative hypothesis (There is a significant difference in the odds of mothers who practiced EBF in feeding their lastborn child at baseline survey compared to end term survey in intervention site.) was adopted.

The following table (Table 4.14) shows a comparative summary of the odds of women who practiced EBF in feeding their lastborn child between baseline survey and midterm survey, and between baseline survey and end term surveys in both intervention and control sites. The hypothesis test statistic is in bold.

**Table 4.14. Comparison of the Odds of practicing EBF in feeding infants among women in Intervention and Control sites**

Study sites	Surveys	Crude & Adj.	Sig	OR	95%CI
<b>Intervention site (Mwingi West)</b>	Midterm vs Baseline	Crude OR	0.110	1.481	0.915-2.396
		Adjusted OR	0.069	1.588	0.344-1.016
	<b>End term Vs Baseline (Hypothesis test)</b>	<b>Crude OR</b>	<b>0.003*</b>	<b>1.411</b>	<b>1.126-1.767</b>
		<b>Adjusted OR</b>	<b>0.002*</b>	<b>1.447</b>	<b>1.145-1.829</b>
<b>Control Site (Mwingi North)</b>	Midterm vs Baseline	Crude OR	0.049*	0.588	0.347-0.998
		Adjusted OR	0.057	0.592	0.344-1.016
	End term Vs Baseline	Crude OR	0.255	0.861	0.665-1.114
		Adjusted OR	0.249	0.857	0.660-1.114

Table legend: \* means test statistic is significant at  $P < 0.05$

## **4.7. Study Objective 5: Effect of CHS intervention on utilization of modern PPF**

### **Methods in Mwingi West sub-county**

#### **4.7.1. Descriptive Statistics on Different PPF Proportions**

##### **4.7.1.1. Proportion of Women without Need for PPF in Intervention and control sites**

In both intervention and control sites a proportion of participants indicated that they were not married (or in any union) and did not intend to postpone their next pregnancy. This group was categorized as women without need for PPF. In the intervention site, proportion of women without need of PPF was 3.8%, 6.3%, and 7.9% at baseline, midterm and end-term surveys respectively. In the control arm, the proportion of women without need for PPF was 5.4%, 5.1% and 6.4% in baseline, midterm and end-term surveys respectively. These results are summarized in Table 4.15.

##### **4.7.1.2. Proportion of Women with Need for PPF in Intervention and Control sites**

Proportion of women with need for PPF are women who indicated that they were married (or in a union) and had the intention of postponing their next pregnancy. In the intervention site, proportion of women with need for PPF was; 96.2%, 93.7% and 92.1% at baseline, midterm and end-term surveys respectively. In control arm, proportion of women with need for PPF was 94.6%, 94.9% and 93.6% at baseline, midterm and end-term surveys respectively. These results are summarized in Table 4.15.

##### **4.7.1.3. Women with Met Need of PPF at 9-12 months Post-Partum (PP)**

This is the proportion of women with need for PPF which reported to be using any family Planning method (both modern PPF and any other method (Rhythm method, withdrawal method or any other traditional method). In the intervention site, proportion of women with met need of PPF at 9-12 months PP was 55.8%, 61.5%, and 62.5% at baseline, midterm

and end-term surveys respectively. In the control site, proportion of women with met need for PPFp at 9-12 months PP was 52.7%, 56.6%, and 53.6% at baseline, midterm and end-term surveys respectively. These results are summarized in Table 4.15.

#### **4.7.1.4. Proportion of Women with unmet need for PPFp at 9-12 months PP**

This was the proportion of women who expressed a need for PPFp at 9-12 months PP and reported that they were not using any PPFp method in the time of the survey. In the intervention arm, the proportion of women with unmet need of PPFp at 9-12 months PP was 44.2%, 38.5% and 37.5% at baseline, midterm and end-term surveys respectively. In the control arm, proportion of women with unmet need of PPFp at 9-12 months PP was 47.3%, 43.4% and 46.4% at baseline, midterm and end-term surveys respectively. These results are summarized in Table 4.15.

#### **4.7.1.5. Proportion of Women with need of PPFp who used Modern PPFp Methods**

In intervention arm, proportion of women with need for PPFp who used modern PPFp methods was 51.5%, 57.9% and 60.4% at baseline, midterm and end-term surveys respectively. In the control site, proportion of women with need for PPFp who used modern PPFp methods was 49.1%, 52.3% and 50.9% at baseline, midterm and end-term surveys respectively. The following table, (Table 4.15) presents a summary of these findings.

**Table 4.15. Different Proportions on PFP in Intervention and Control Sites**

PFP Proportions	Intervention site (Mwingi West)			Control Site (Mwingi North)		
	Baseline	Mid-term	End-term	Baseline	Midterm	End-term
<b>Women without need of PFP</b>	3.8% (16/416)	6.3% (26/413)	7.9% (33/417)	5.4% (22/411)	5.1% (21/413)	6.4% (27/420)
<b>Women with need for PFP</b>	96.2% (400/416)	93.7% (387/413)	92.1% (384/417)	94.6% (389/411)	94.9% (392/413)	93.6% (393/420)
<b>Met Need of PFP (Utilization of all FP methods for PFP)</b>	55.8% (223/400)	61.5% 238/387	62.5 % (240/384)	52.7% (205/389)	56.6% (222/392)	53.6% (210/392)
<b>Unmet Need for PFP</b>	44.2% (117/400)	38.5% (149/387)	37.5% (144/384)	47.3% (184/389)	43.4% (170/392)	46.4% (182/392)
<b>Met Need of PFP (Utilization of Modern PFP methods)</b>	51.5% (206/400)	57.9% (224/387)	60.4% (232/384)	49.1% (191/389)	52.3% (205/392)	50.9% (200/393)

#### **4.7.2. PFP Methods Used in Intervention and Control Sites**

A range of Family planning methods were used for PFP in both intervention and control sites. Pills, injectable FP methods, use of Implants, IUDs, female sterilization and male condoms are the modern PFP methods study participants reported to have used. Other methods used were the rhythm method and withdrawal method. The following table (Table 4.16) shows a summary of the different PFP methods used along with the proportion of participants who used these methods in intervention and control sites.

**Table 4.16. Summary on Use of PFP Methods in Intervention and Control Sites**

No	PFP Used	Intervention site (Mwingi West)						Control Site (Mwingi North)					
		Baseline		Midterm		End term		Baseline		Midterm		End term	
		Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%	Frq.	%
1	Pill	89	21.4	106	25.7	114	27.3	82	20.0	112	27.1	101	24.0
2	Injectables	92	22.1	91	22.0	101	24.2	94	22.9	76	18.4	82	19.5
3	Implant	8	1.9	13	3.1	4	1.0	8	1.9	6	1.4	9	2.2
4	IUD	6	1.5	5	1.2	2	0.5	2	0.5	4	1.0	0	0
5	Female sterilization	8	1.9	5	1.2	5	1.2	4	1.0	3	0.7	5	1.2
6	Male sterilization	0	0	0	0	0	0	0	0	0	0	0	0
7	Male Condom	3	0.7	4	1.0	6	1.4	1	0.2	4	1.0	3	0.7
8	Female Condom	0		0		0		0		0		0	0
9	Spermicides	0	0	0	0	0	0	0	0	0	0	0	0
	<b>Modern use of PFP (totals)</b>	206	49.6	224	54.2	232	55.6	191	46.5	205	49.6	200	47.6
10	Others; Rhythm and withdrawal	17	4.1	14	3.4	8	1.9	14	3.4	17	4.1	10	2.4
	<b>Total All methods (PFP use)</b>	223	53.6	238	57.6	240	57.6	205	49.9	222	53.7	210	50
	<b>Non-Use of PFP</b>	193	46.4	175	42.4	177	42.4	206	50.1	191	46.3	210	50
	<b>Totals (sample size and %)</b>	416	100	413	100	417	100	411	100	413	100	420	100

*Table legend: The proportions in the above table (Table 4.16) do not isolate women with and women without need for FP. The proportions are based on fractions of the total sample size in each survey.*

### **4.7.3. Effect of CHS on Use of Modern PPFM Methods in Mwingi West Sub-County**

#### **4.7.3.1. Change in Proportion of Women Utilizing Modern PPFM Methods at 9-12 Months PP**

Z score test analysis conducted to establish if there was a significant difference between proportions of women (with a need for PPFM) who used modern PPFM at 9-12 months PP established the following;

In intervention site, proportion of women with need of FP who utilized modern PPFM increased from 51.5% at baseline to 57.9% at midterm survey (data summarized in table 18). The 6.4% increment was however not significant ( $Z=1.7976$ ,  $P>0.05$ ). A comparison between proportion of women who used modern PPFM at intervention arm-baseline with women who used modern PPFM at intervention arm-end-term survey established a significant increment of 8.9% ( $Z= 2.5135$ ,  $P<0.05$ ).

In the control site, an increment of 3.2% and 1.8 % was observed on women who used modern PPFM between baseline and midterm surveys, and between baseline and end-term surveys respectively. Analysis using Z score tests revealed no significant difference between proportion of women who used modern PPFM at baseline and midterm surveys ( $Z=0.8932$ ,  $P>0.05$ ) and between baseline and end-term surveys ( $Z=0.5006$ ,  $P>0.05$ ).

The critical statistic in this section is that CHS increased the proportion of women using modern PPFM methods at 9-12 months PP (among women with expressed need of PPFM) significantly by 8.9%. These results are summarized in the following table (Table 4.17).



**Table 4.17. Z scores showing Changes in Modern PFP Utilization Proportions among Women with Need of PFP**

Study site	Baseline	Mid-term	End term	Midterm vs Baseline (Z tests)	End term vs Baseline (Z tests)
<b>Intervention Modern PFP (Mwingi West)</b>	51.5% (206/400)	57.9% (224/387)	60.4% (232/384)	Z=1.7976 P=0.07186	Z= 2.5135 P= 0.01208*
<b>Control Modern PFP (Mwingi North)</b>	49.1% (191/389)	52.3% (205/392)	50.9% (200/393)	Z=0.8932 P=0.37346	Z=0.5006 P=0.61708
<b>Intervention vs Control (Z tests)</b>	Z=-0.674 P=0.50286	Z=1.5669 P= 0.11642	Z=2.672 P=0.00758*		

*Table legend: \* means test statistic is significant at P<0.05*

**4.7.3.2. Net Change in Proportion of Women utilizing Modern PFP methods between intervention and Control Sites Over 18 months' CHS intervention period**

The net change/estimated impact of CHS on utilization of modern PFP methods at 9-12 months PP in the intervention site compared to control site over the 18 months' CHS intervention period was calculated using the DiD model.

Calculated (DiD) is 7.1% as shown in the following equation;

$$\text{DiD} = [(60.4\% - 51.5\%) - (50.9\% - 49.1\%)] = 7.1\%$$

Compared to control site, CHS intervention increased utilization of modern PFP among Women with need for PFP in Mwingi west sub-county (intervention site) by 7.1% over the 18 months' implementation period.

#### **4.7.3.3. Observed Change in use of Modern PPFM Methods in Intervention Arm**

**The null hypothesis for study objective five was;**

In the intervention site, there is no difference in the odds of mothers using modern PPFM methods at 9-12 months postpartum at baseline survey compared to end term survey.

Binary logistic regression analysis revealed that in intervention site, women in end-term survey were 1.4 times more likely to use a modern PPFM at 9-12 months PP compared to women at baseline survey of the same site [Adj. OR=1.386, P<0.05; (95%CI: 1.164-1.651)].

Based on these results, the null hypothesis was rejected and alternative hypothesis (In the intervention site, there is a significant difference in the odds of mothers using modern PPFM methods at 9-12 months postpartum at baseline survey compared to end term survey.) was adopted.

The following table (Table 4.18) shows a comparative summary of the odds of women who utilized modern PPFM between baseline survey and midterm survey, and between baseline survey and end term surveys in both intervention and control sites. The hypothesis test statistic is in bold.

**Table 4.18. Comparison of the Odds of utilizing Modern PFP among women in Intervention and Control sites**

Study sites	Surveys	Crude & Adj.	Sig	OR	95%CI
<b>Intervention site (Mwingi West)</b>	Midterm vs Baseline	Crude OR	0.174	1.208	0.920-1.587
		Adjusted OR	0.0001*	3.081	1.985-4.784
	<b>End term Vs Baseline (Hypothesis test)</b>	<b>Crude OR</b>	<b>0.077</b>	<b>1.131</b>	<b>0.987-1.296</b>
		<b>Adjusted OR</b>	<b>0.0001*</b>	<b>1.386</b>	<b>1.164-1.651</b>
<b>Control Site (Mwingi North)</b>	Midterm vs Baseline	Crude OR	0.363	1.135	0.864-1.492
		Adjusted OR	0.191	1.284	0.883-1.868
	End term Vs Baseline	Crude OR	0.745	1.023	0.893-1.172
		Adjusted OR	0.881	1.014	0.849-1.210

Table legend: \* means test statistic is significant at  $P < 0.05$

## **CHAPTER FIVE: DISCUSSION**

### **5.1. Introduction**

This chapter provides a discussion of the results. The results are discussed in the order of the five study objectives of this study as follows; effect of CHS intervention on FANC coverage in Mwingi West Sub-county, effect of CHS intervention on utilization of SBC in Mwingi west sub-county, effect of CHS on IVC in Mwingi West sub-county, effect of CHS intervention on the practice of EBF in Mwingi West sub county and lastly effect of CHS intervention on utilization of modern PFP methods among women at 9-12 months PP in Mwingi West sub-county.

### **5.2. Effect of CHS intervention on FANC Coverage in Mwingi West sub-county**

At baseline, FANC coverage was at 38.9% and 34.9% in intervention and control sites respectively. Z score test revealed that the two proportions were not significantly different ( $Z=1.2365$ ,  $P>0.05$ ). This could be interpreted to mean that both intervention arm and control arm are homogenous at baseline in regard to FANC coverage. Comparison of the observed baseline survey FANC coverage with the 2014 KDHS report which posts FANC coverage for Kitui County as 62.2% (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014) indicates that the FANC coverage for Kitui county was far much higher than observed FANC coverage at baseline. This could be attributed to the fact that baseline data was collected in Mwingi west and Mwingi North sub-counties close to two years (March 2012) before the 2014 KDHS survey was conducted and interventions including the CHS could have contributed in improving FANC in Kitui County.

In regard to effect of CHS intervention on FANC coverage, there are four critical statistics which provides evidence indicating the effect of CHS on FANC coverage. The first two

are; the 9.5% significant increment in FANC coverage from baseline survey to midterm survey in CHS intervention site, and the 20% significant increment in FANC coverage from baseline to end-term survey in CHS intervention site. These two significant increments could be attributed to the effect of CHS intervention. This is based on the fact that, in the control site, no significant increase in FANC coverage was observed between baseline and midterm surveys and between baseline and end-term surveys and the main difference in regard to health service provision between intervention and control sites was the CHS intervention.

The third statistic is the DiD statistic which indicates that over the 18 months of CHS intervention in Mwingi west sub-county, the intervention improved FANC coverage in intervention site by 16.1% compared to control site. This increment in FANC coverage can be attributed to the CHS intervention. CHWs working in the CUs could have been highly effective in following up expectant women in their CUs to ensure that they sought ANC services in health facilities for at least 4 times. The last critical statistic which provides evidence on the effect of CHS on FANC coverage is the Odds Ratio which estimates the probability of an expectant woman in seeking ANC services for at least 4 times in intervention arm compared to control arm. After adjusting for socio-demographic characteristics as potential confounders, women at midterm survey in the intervention site were 1.5 times more likely to seek ANC services for at least 4 times compared to women at baseline survey. A comparison of end-term survey and baseline survey in intervention site (which formed the basis of hypothesis test for study objective one) established that women at the end term survey were 1.7 times more likely to seek ANC services for at least 4 times compared to baseline.

In the control site, no significant difference was observed in the odds of women seeking ANC services for at least 4 times between baseline and midterm and, between baseline and end-term surveys. This further strengthens the observation that the CHS intervention was effective in increasing FANC coverage in the intervention site. This is based on the fact that the only thing done in intervention arm which control arm did not receive was the CHS intervention.

These findings have been corroborated by other studies locally, regionally and globally. In Kenya, a study conducted in Busia- Kenya indicates that CHS increased FANC coverage in intervention site from 39% to 62 % (Wangalwa *et al.*, 2012). Another study conducted in parts of Nyanza, Western Kenya and Garissa also revealed that CHS increased FANC coverage significantly (Olayo *et al.*, 2014). Studies conducted in Bangladesh (Quayyum *et al.*, 2013) and Nepal (Chhetry *et al.*, 2005) on effectiveness of CHW led interventions on MCH have also been associated with increase in FANC coverage. A systematic review of 43 studies conducted in low and middle income countries also revealed that community level interventions are effective in increasing ANC service utilization (Lassi, Das, Salam, & Bhutta, 2014). Other studies in Pakistan (Memon *et al.*, 2015) and Nigeria (Uzondu *et al.*, 2015) have also provided some evidence that CHWs have capacity to increase utilization of ANC services.

Though this study has established that CHS increased the number of women seeking ANC services for at least 4 times (FANC coverage) as required, the study did not establish the quality of ANC services provided to the women who sought services for at least 4 times. The FANC coverage which is a standard measurement of ANC service provision is based on the assumption that women seeking services for at least 4 times will have the

opportunity to meet a health practitioner for a sufficient number of times. It is assumed that through these visits, women will be able to receive quality ANC service. This may not be the case in many times especially in Kenya and other resource poor nations. Though this study has provided evidence that CHS intervention increased number of women who sought ANC services for the required number of times (at least 4 times) in Mwingi west sub-county, it will be important to further investigate the effect of CHS in provision of quality ANC services in Mwingi west sub-county.

### **5.3. Effect of CHS intervention on Utilization of SBC in Mwingi West Sub-County**

The effect of CHS on utilization of SBC cannot be discussed without acknowledging observed significant difference in prevalence of women who delivered under SBC at baseline survey. This prevalence was 57.9% and 46.5% in intervention and control sites respectively. Z score tests found that the 2 proportions are significantly different. This could be the result of confounders mostly coming from a difference in the socio-demographic characteristics of the two populations. A binary logistic regression analysis indicated that after adjusting for socio-demographic characteristics as potential confounders, there was no significant difference in the odds of women who delivered under SBC in intervention site compared to control site at baseline. This therefore suggests that the two SBC proportions could be equal if not for the influence of the difference in socio-demographic characteristics in the two populations. These results are within the range of Kitui County SBC utilization prevalence which is reported as 45.6% by the 2014 KDHS survey report (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014).

In regard to the effect of CHS on SBC in Mwingi west sub-county, the proportion of women who delivered under SBC at midterm survey increased significantly by 8.7%, from 57.9% at baseline survey to 66.6% at midterm survey. This was supported by a binary regression analysis conducted to assess the probability of SBC utilization among expectant women at midterm and baseline surveys. After adjusting for potential confounders, women at midterm survey were 1.7 times more likely to deliver under SBC compared to women at baseline survey. The highest significant increase in SBC utilization in intervention site was however observed at end term survey. SBC utilization increased by 12.6% (from 57.9% at baseline to 70.5% at end-term survey). Binary logistic regression analysis indicated that



expectant women at intervention arm- end term survey were 1.6 times more likely to deliver under SBC compared to women at intervention arm-baseline survey. The estimated impact of CHS on SBC utilization (calculated by the DiD model) is that over the 18 months CHS implementation period, the proportion of women utilizing SBC in intervention site increased by 8.6% compared to control.

In control site, no significant difference was observed between base line SBC proportion and midterm survey SBC proportion. A comparison between end-term and baseline survey SBC proportions yielded a marginal 4% increment in SBC utilization which was not significant. Binary regression analysis comparing probability of SBC utilization in control site between baseline and midterm surveys and, between control site baseline and end-term surveys indicated no significant difference in probability of SBC utilization among women between these groups.

These observations lead to one possibility, that the observed increase in proportion of women delivering under SBC from intervention arm-baseline to intervention arm-end-term surveys and the increment in SBC utilization in intervention site compared to control site over the 18 months' CHS implementation period was the result of the effect of CHS intervention. This is further confirmed by the observed increase in the odds of women delivering under SBC in intervention arm-end-term survey compared to intervention arm baseline survey. CHW led health education and counselling program and follow up of expectant women by CHWs in intervention arm (to ensure that they delivered in a health facility) was effective in increasing the number of women visiting health facilities to seek SBC.

It is important to also note that, though national implementation of the free maternity services in Kenya started on 1st June, 2013 (Ministry of Health, 2013), it seemed to have had little or no impact on the proportion of women who delivered under SBC in both intervention and control sites. This is based on the observation that no significant change in SBC utilization was observed in control arm-midterm and end term surveys compared to control arm-baseline survey. End-term survey data was collected in both intervention and control arms in less than one year (from march 2014 to June 2014) after implementation of free maternity services in Kenya and this perhaps was not sufficient time for the free maternity service to have had a significant impact in the community.

These results are supported by a number of studies. A study conducted in the remote mountainous district of Gilgit, Northern Pakistan to evaluate the effect of a CHW led health intervention established that the intervention significantly increased utilization of SBC in intervention site 18 months after it was implemented (Memon *et al.*, 2015). Rwanda is one of the African countries that achieved MDG goal target 5A- to reduce MMR by three quarters between 1990 and 2015 (Bucagu M., 2016). A review of 12 articles revealed that one of the reasons that led to meeting this target was that Rwanda has a network CHWs which play a critical role in linking expectant women in the communities to health facilities hence improving utilization of SBC in the country (Bucagu M., 2016).

Other studies with evidence supporting CHWs' effectiveness in improving utilization of SBC include two studies from Bangladesh (Huq *et al.*, 2015) and (Quayyum *et al.*, 2013) and another study conducted in Pakistan (Midhet and Becker, 2010). In Kenya, a number of studies have confirmed that CHWs are effective in promoting utilization of SBC. A CHW led health education program conducted in rural parts of central Kenya was found

to be effective in increasing deliveries under SBC (Adam *et al.*, 2014). Two other similar studies conducted to assess effectiveness of CHS in selected health outcomes in parts of western Kenya , Nyanza, Garissa (Olayo *et al.*, 2014) and in Busia (Wangalwa *et al.*, 2012) indicated that CHS was effective in promoting SBC.

#### **5.4. Effect of CHS intervention on IVC in Mwingi West Sub-County**

As described earlier in other sections of this thesis, IVC in this study is the proportion of Infants whose mothers reported that they had received all the vaccines prescribed for infants in the child immunization program by the age of 9 to 12 months of age. Three critical statistics best provide evidence describing effect of CHS on IVC. These are; the 10.1% significant increment on IVC in intervention site (from 88.7% at baseline to 98.8% at end-term survey), the 8.5% Difference in Differences (DiD) statistic which indicates that compared to control site, the CHS intervention increased IVC by 8.5% in the intervention arm over the 18 months' implementation period, and lastly the adjusted OR which indicates that after adjusting for socio-demographic characteristics as potential confounders, infants in the intervention arm-end-term survey were found to be 2.5 times more likely to have received all the WHO recommended vaccines within 1 year of age compared to infants at intervention arm-baseline survey. It is important to point out that initial assessment of IVC at baseline did not indicate a significant difference between baseline IVC in intervention arm (88.7%) and baseline IVC (84.4%) in control arm.

These observations can be attributed to the effect of the CHS in the intervention site especially due to the fact that in the control site, no significant difference between baseline survey IVC and end-term survey IVC was observed. As explained previously, CHWs in the intervention site could have been highly effective in tracing women with infants in their CUs and ensuring that they did not delay or miss their infant immunization schedules. Z score tests indicate that increased IVC at midterm survey in intervention arm was not significantly different from IVC at baseline but IVC at end-term survey (intervention arm) was significantly different from IVC at baseline (intervention arm). The same pattern is

replicated in the binary logistic analysis which showed no significant difference in the odds of infants who received all recommended immunizations within 9-12 months between baseline and midterm survey in intervention arm. Comparison of end-term survey and baseline survey however indicated a significant difference in IVC between the two groups. This suggests that effectiveness of CHWs in tracing mothers with infants and ensuring that their infants received all recommended vaccinations within their first year of life improved significantly overtime. The lack of significant increase in IVC between baseline and midterm and between baseline and end-term survey in control site could only be explained by the absence of CHS intervention in control arm.

Findings in this study are supported by other studies conducted in resource poor countries. A recent study in India associated increased community participation in immunization with improvements in vaccination coverage (Jain *et al.*, 2015). A WHO report on global experience of CHWs in delivery of health-related MDGs indicates that CHWs played a critical role in improving child immunization coverage in resource poor countries through tracking child immunization defaulters and referring them to health facilities (World Health Organization and Global Health Workforce Alliance, 2012). A review of 17 studies conducted in 10 developing countries reported that CHWs were effective in promoting child immunization coverage (Gilmore and McAuliffe, 2013). In Kenya, a study conducted to evaluate effectiveness of the CHS in promoting positive health outcomes also reported that CHS was effective in improving measles immunization coverage (Olayo *et al.*, 2014). Though the Olayo *et al.*, (2014) study did not measure effect of CHS on IVC, the results indicating that CHS increased measles vaccination coverage is a good indication that CHWs have the capacity to increase IVC. Another study conducted in parts of Homa

Bay Kenya revealed that employing CHWs in a project integrating hygiene promotion and promotion of child immunization improved immunization coverage (Ryman *et al.*, 2012). These studies support the argument that considerable increase in IVC in the CHS intervention site (Mwingi West Sub County) could have been the effect of CHWs working in the CHS intervention.

### **5.5. Effect of CHS intervention on Practice of EBF in Mwingi West Sub-County**

Statistics which best provide evidence on effect of CHS on the practice of EBF are the following: One, 6.4% significant increase in prevalence of EBF in intervention site (from 7.5% at baseline to 13.9% at end-term survey. Two, the estimated impact of CHS intervention on practice of EBF in intervention site compared to control site in which DiD statistic indicated that, compared to control arm, practice of EBF increased by 8.8% in the intervention site over the 18 months' CHS implementation period. The last statistic is the increase in the probability of women practicing EBF in feeding their last-born child. Compared to intervention arm-baseline survey, both crude and adjusted ORs showed that intervention arm infants in the end term survey were 1.4 times more likely to be exclusively breastfed in the first six months of their life.

Though the 6.4% significant increase in EBF prevalence between intervention arm baseline survey and intervention arm end-term survey did not factor in any effect of confounding factors, it is highly likely that the observed marginal increment in EBF prevalence could be as a result of the effect of the CHS intervention. This conclusion is based on two things; pattern of EBF prevalence observed in the control site and binary logistic regression model which controlled socio-demographic characteristics as potential confounders.

In the control site; a different pattern of EBF prevalence was observed compared to intervention arm. In the control arm, baseline EBF survey prevalence of 9.5% decreased significantly by 3.7% at midterm survey. A crude OR also indicated a significant difference between baseline and midterm surveys in the odds of infants who were exclusively breastfed in their first six months of life between the two groups. This slight decrease in EBF prevalence at midterm survey could be accounted for by confounding

socio-demographic characteristics. This was confirmed by adjusted OR (OR adjusted for; maternal age, maternal education, parity, marital status and average household income) which indicates no significant difference between baseline survey and midterm survey in the odds of infants who received EBF in the first six months of their life. A comparison between end-term EBF prevalence and baseline EBF prevalence in control arm indicated no significant difference in the 2 proportions. This was also confirmed by both crude and adjusted ORs which showed no significant difference between the 2 groups.

The lack of any significant increase in practice of EBF in control arm and the presence of a significant increase in EBF practice in intervention arm can be explained by the presence of CHS in intervention site and the absence of the same in control site. CHWs working in intervention arm could have been effective in promoting practice of EBF through their health education and counselling sessions. It is however important to mention that though there is a significant increase in practice of EBF in intervention site, EBF prevalence in both intervention and control arms are far much lower compared to the national EBF prevalence reported as 61% by the 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). There is therefore need for further study to help establish why EBF prevalence in Mwingi west (intervention arm) and Mwingi north (control arm) sub-counties is low compared to the national EBF prevalence.

A number of studies support these findings. A review of 110 studies on breastfeeding interventions conducted in resource poor countries indicates that community interventions which targeted breastfeeding education and support increased EBF rates in intervention sites (Miriam L., 2011). Another review of 17 articles from low and middle income countries on effectiveness of CHWs in delivering preventive interventions on MCH



provided evidence suggesting that CHWs are effective in promoting EBF in resource poor countries (Perry and Zulliger, 2012). A WHO report which assessed the role of CHWs in the interventions geared towards achieving MDGs in different countries of the developing world indicates that CHWs played a significant role in promoting EBF among other MCH services (World Health Organization and Global Health Workforce Alliance, 2012). In India, a study established that CHW led counselling was effective in increasing practice of EBF (Das *et al.*, 2016). Two studies conducted in Kenya to assess effectiveness of CHS intervention in increasing EBF also provided data suggesting that CHS was effective in increasing EBF prevalence in Busia (Wangalwa *et al.*, 2012) and the poor urban slums of Nairobi (Kimani-Murage *et al.*, 2015). These studies provide some evidence which supports the findings of this study.

## **.6. Effect of the CHS Intervention on Utilization of Modern PPFM by women at 9-12 Months PP in Mwingi West sub-county**

Key statistics which best provide evidence on effect of CHS on modern PPFM methods by women at 9-12 months PP in the intervention site (Mwingi West sub-county) are the following: One, 8.9% significant increment in utilization of modern PPFM methods among women at 9-12 months PP in intervention arm. Two, the estimated impact of CHS intervention in intervention arm on utilization of modern PPFM methods among women at 9-12 months PP. The DiD statistic indicated the estimated impact as 7.1%. This implies that compared to control site, CHS intervention increased the number of women utilizing modern PPFM methods by 7.1% in the intervention site over the 18 months' CHS implementation period. The last critical statistic is the OR derived from comparing the probability of utilizing a modern PPFM method by a woman at 9-12 months PP between intervention arm-baseline survey and intervention arm end-term survey. Women in intervention arm end-term survey were 1.4 times more likely to use a modern PPFM method at 9-12 months PP compared to women at intervention arm-baseline survey.

The significant increment in prevalence of women utilizing modern PPFM methods in intervention site compared to control, and the high probability of utilizing modern PPFM methods among postpartum women in intervention arm end-term survey compared to intervention arm baseline survey could be associated with the CHS intervention. This is based on the observation that, no significant difference between the prevalence of women utilizing modern PPFM methods was observed in the control arm in end-term survey compared to baseline survey. The absence of significant differences between the compared groups in control arm in regard to utilization of modern PPFM methods and in particular

the lack of any significant increment in the proportion of women utilizing modern PPF methods in control arm end-term survey compared to control arm baseline survey could be accounted for by lack of CHS intervention in the control arm. This implies that, though CHWs working in the CHS intervention were not actively involved in distribution of FP commodities, their health education and counselling program which had a focus in promoting utilization of modern FP methods during and after postpartum period was effective in causing a significant increment in utilization of modern PPF methods among women at 9-12 months PP in the intervention site. This in turn helped in reducing the unmet need of PPF.

Previous studies have shown that integrating PPF with other provider led MCH services such as integrating PPF with health provider led ANC service, and integrating PPF with provider led infant vaccination services has worked before in some countries like in India (Achyut *et al.*, 2015) and Liberia (Cooper *et al.*, 2015) respectively. However, studies involving CHWs in promoting modern PPF methods are scarce and hence few studies do support the findings in this study. A quasi-experiment conducted in Bangladesh to establish if integrating PPF promotion in a Community-Based Maternal and Newborn Health (MNH) Program was effective in promoting PPF established that, the CHW led intervention was effective in promoting use of modern methods in PPF among women at 36 months PP (Ahmed *et al.*, 2015).

Another intervention implemented in Uganda provided contrasting results. In the intervention CHWs were employed to provide counselling on postpartum family planning use among early postpartum women in Masindi and Kiryandongo districts. Assessment on effectiveness of the intervention in promoting PPF indicated no significant difference in

modern postpartum contraceptive use between intervention and control sites (Ayiasi *et al.*, 2015).

With such a contradicting finding, it is important to conduct more studies to investigate the effect of employing CHWs in promotion of modern PFP. Though this study showed a significant improvement in use of modern PFP in Mwingi West sub-county, there is need to further test the effect of CHS intervention in promoting use of modern PFP. As indicated before, CHWs working in the CHS intervention were not supplying any FP commodities in the intervention site. The intervention focused in raising awareness through health education and counselling on importance of modern PFP methods. It will be important to explore the effect of CHS on utilization of modern PFP when the CHS intervention has been redesigned to provide subsidized modern FP products and FP services. Perhaps cost of FP products and FP services could be a barrier influencing access and utilization of modern PFP methods in Mwingi West sub-county. Providing free/subsidized modern FP commodities and subsidized FP services to community members in Mwingi West sub-county could probably increase number of women utilizing modern PFP methods in the sub county.

## **CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS**

### **6.1. Introduction**

On the basis of the findings of this study, this chapter presents conclusions recommendations, and suggestions for further studies.

### **6.2. Conclusions**

1. In the intervention site (Mwingi west sub-county), CHS increased FANC coverage in intervention arm end term survey compared to intervention arm baseline survey. No significant difference in FANC coverage was observed between control arm (Mwingi North Sub County) end term survey compared to control arm baseline survey.
2. In the intervention site (Mwingi west sub-county), CHS increased SBC utilization in intervention arm end term survey compared to intervention arm baseline survey. No significant difference in SBC utilization was observed between control arm (Mwingi North Sub County) end term survey compared to control arm baseline survey.
3. In the intervention site (Mwingi west sub-county), CHS increased IVC in intervention arm end term survey compared to intervention arm baseline survey. No significant difference in IVC was observed between control arm (Mwingi North Sub County) end term survey compared to control arm baseline survey.
4. In the intervention site (Mwingi west sub-county), CHS intervention increased EBF prevalence in intervention arm end term survey compared to intervention arm baseline survey. No significant difference in EBF prevalence was observed between control arm (Mwingi North Sub County) end term survey compared to control arm baseline survey.
5. In the intervention site (Mwingi west sub-county), CHS increased utilization of modern PFP methods among women at 9-12 moths PP in intervention arm end term survey

compared to intervention arm baseline survey. No significant difference in use of modern PFP among women at 9-12 months PP was observed between control arms (Mwingi North Sub County) end term survey compared to control arm baseline survey.

### **6.3. Recommendation**

CHS intervention in Mwingi west sub-county has provided some evidence suggesting that it improved the MCH outcomes investigated in this study. Based on these findings, the following are the study recommendations;

1. To increase FANC coverage in Kenya, county governments need to support CHW led interventions focusing on providing MCH education and following up all expectant women to ensure that they sought ANC services from skilled professionals for at least 4 times. This can be done through scaling up CHS intervention to cover areas where the CHS intervention has not been implemented and through supporting creation and implementation of other CHW led interventions which promote MCH education and follow up newly expectant women to ensure that they sought ANC services as recommended.
2. To increase utilization of SBC among women of reproductive age in Kenya, county governments need to embrace and support interventions focusing on CHW led health education and follow-up of expectant women to ensure that they deliver at a health facility assisted by a SBA. This can be achieved through scaling up CHS intervention to cover areas where the CHS intervention has not been implemented, and through supporting creation and implementation of other CHW led

interventions which focus on CHW led MCH education and following up of expectant women to ensure that they delivered in a health facility assisted by a SBA.

3. To achieve universal coverage of IVC in Kenya (like the 98.8% IVC observed in end-term survey in intervention site), county governments need to support CHW led interventions which focus on MCH education and carry out follow up of all infants in the community to ensure that the infants receive all recommended vaccinations in time. This can be achieved through scaling up the CHS intervention and supporting development and implementation of other CHW led interventions focusing on MCH education and follow up of infants to ensure that they are vaccinated in time.
4. To improve the practice of EBF in Kenya, county governments need to support CHW led interventions focusing in providing MCH education and providing counselling on appropriate child feeding practices. This can be achieved through scaling up the CHS intervention and supporting development and implementation of other CHW led interventions focusing on counselling mothers on appropriate child feeding practices.
5. To increase utilization of modern PFP methods in Kenya and help reduce the proportion of women with unmet need of PFP, county governments across Kenya need to support CHW led interventions providing MCH education and counselling of new mothers on use of modern PFP methods. This can be achieved through scaling up the CHS intervention in areas where it has not yet been implemented and supporting development and implementation of other CHW led interventions focusing on counselling new mothers on use of modern PFP methods.

#### **6.4. Suggestions for Further Research**

To further understand the effect of CHS intervention on MCH outcomes in Mwingi west Sub County, the following knowledge gaps which this study could not fill need to be explored;

1. The effect of CHS intervention on quality of ANC services received in Mwingi west sub-county. Literature shows that FANC coverage does not measure quality of ANC service provided but it measures the number of times an expectant woman seeks ANC services. This study did not measure effect of CHS on quality of ANC services provided.
2. Barriers to the practice of EBF in Mwingi west sub-county need to be explored too. EBF prevalence in Mwingi West sub-county is low (from 7.9% at baseline to 13.9% at end term survey) compared to the high national EBF prevalence (61%) reported in the 2014 KDHS (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2014). There is need to establish why EBF prevalence in Mwingi west sub-county is far much lower than the national prevalence.
3. The effect of CHS on use of modern PFP methods when CHWs are facilitated to distribute FP commodities/products (FP pills, condoms and others) to women in intervention site need to be explored. This could probably produce different results than what was observed in the CHS intervention in Mwingi where CHWs in the CHS intervention did not distribute any FP products in their CUs.



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**APPENDIX 1: QUESTIONNAIRE**

**MASENO UNIVERSITY**

**SCHOOL OF PUBLIC HEALTH AND COMMUNITY  
DEVELOPMENT**

**Questionnaire**

**Village Name.....**

**Enumerator Name.....**

**HOUSE HOLD CODE.....**

**SECTION 1: Demographic Information**

101. How old are you?

- 1. 16-20 Years
- 2. 21-25 Years
- 3. 26-30 Years
- 4. 31-35 Years
- 5. 36-40 Years

- 6. 41-45 Years
- 7. Over 45 Years

102. How many children have you given birth to? (Seek to get total number of children born of the respondent both alive and still births (these who did not survive) 1.  2.  3.  4.  5.  6. Over 6

103. What is the age of your last born child?

- 1. 9 months
- 2. 10 months
- 3. 11 months
- 4. 12 months

104. What is your level of Education?

- 1. Primary
- 2. Secondary
- 3. College/university

105. What is your primary occupation?

- 1. Peasant farming
- 2. Engaged in Small scale business
- 3. in gainful Employment
- 4. Other \_\_\_\_\_

106. What is your Marital Status?

- 1. Single
- 2. Married
- 3. Separated
- 4. Divorced

107. What is your combined (your income + your spouse income) average total monthly income in Kshs. \_\_\_\_\_

**SECTION 2: ANTENATAL AND POSTNATAL CARE**

**201.** During your last pregnancy did you attend any antenatal care visits?

- 1=Yes
- 2=No
- 4=Don't Remember
- 9=Don't know

**202.** If Yes, how many antenatal visits did you make?

- 1=Once
- 2=Twice
- 3=Three times
- 4=Four times or more
- 9=Don't Know

**(confirm from mother to child booklet (if available) on number of visits done to hospital for ANC services)**

**203.** When did you start your antenatal visits)

- 1. during first trimester (within 1<sup>st</sup> three months of pregnancy)
- 2. during second trimester (within 2<sup>nd</sup> three months of pregnancy)
- 3. during third trimester (within 3<sup>rd</sup> three months of pregnancy)

**204.** If Yes what care did you receive? **(Check to confirm in the clinic booklet, if records not available ask the mother to remember and respond appropriately)**

Code	ANC service Provided	Tick as Appropriate	
		1 dose	2 doses
1.	Tetanus Vaccination		
2.	Counselling		
3.	PMTCT		
4.	Physical Examination		
5.	Lab Investigations		
6.	Received a Mosquito Net		
7.	Iron and Folic tablets received		
8.	deworming drugs received		
9.	Anti-Malarial drugs received for prophylaxis		
10.	Others Specify		

**205.** If No why?

.....

.....

.....

**206.** During your last pregnancy for how long did you take iron and folic tablets

- 0. Did not take any iron and folic tablets
- 1. Less than four weeks
- 2. Seven to nine weeks
- 3. 10 to 12 weeks
- 4. Over 12 weeks

**207.** During your last pregnancy, did you have any birth plan?

- 1= Yes
- 2=No

**208.** If Yes which one (tick as appropriate)

Code	Plan	tick as appropriate
1	Transport	
2	Health Facility	
3	Companion to health facility	
4	Delivery fees (money)	
5	Child clothing	
6	Others	

**209.** If No plan why?.....

**210.** Who assisted you in the delivery of your last child?

- 1=Self
- 2=Home (Assisted by relatives and neighbors)
- 3=TBA/CHW
- 4=Health Facility (Health professional)
- 8=Others

(Specify)

**211.** If not delivered at health facility, why?

.....  
.....

**212:** After delivery did you and your child seek postnatal care?

- 1. Yea
- 2. No

**213.** If yes how long did you take to seek postnatal care?

- 1. within two days after delivery
- 2. Three days and more after delivery

**214.** Are you currently married or in any union which can predispose you to pregnancy?

1=Yes

2=No

**215.** Are you currently expecting a child?

1=Yes

2=No

**216.** Do you want to postpone future pregnancies?

1=Yes

2=No

**217.** If yes in **question 216**, which methods of Family planning are you using? (Tick appropriately in the table below)

No.	Method(s) known	Methods Currently Using
1.	Pills	
2.	IUCD	
3.	Injectables e.g. depoprovera	
4.	Implants	
5.	Spermicides	
6.	Female Condoms	
7.	Tubaligation/sterilization	
8.	Natural Method	
9.	Others (Specify)	

**SECTION 3: CHILD HEALTH: (Use Mother and Child clinic booklets for last born child and Respond as appropriate)**

<b>Immunization</b>	<b>Status</b>
Immunization Card/booklet: 1=Present 2=Not present	
BCG 0=Not given 1=given 2=Scar present	
Polio (Drop from bottle given at birth) 0=Not given 1=given	
Penta valent (injection on the thigh) 0=Not given 1=given	
Measles 0=Not given 1=given	
Pneumococcal 0=Not given 1=given	
Vitamin A 0=Not given 1=given once 2=given twice	

**300.** If child has defaulted any antigen seek to know the reason and fill in the space below,  
 .....

**301** Did the child complete all the recommended Immunizations within 9-12 months?

1 Yes

2 No

**(check the last date of immunization and confirm if it measles immunization was given within 9 months. If record not available ask mother whether the child received measles Immunization and when the vaccination was given)**

**302.** In the first 3 days after delivery, did you give the baby anything other than breast milk to drink?

1=Yes

2=No

**303.** If yes, what was given, (probe: ask what else)

1=Plain Water

2=Glucose water

3=Other Milks

4=Gripe Water

5=Formula

6=Others Specified.....

**304.** Are you currently breastfeeding this child?

1=Yes

2=No

**305.** How soon after birth did you first put last born child on breast milk?

1=Immediately/within first hour after delivery

2=after the first hour

3=After one day

4=After more than one day

**306.** At what age did you start giving additional food other than breast milk to your last-born child?

1=0-3 Months

2=4-5 Months

3=At 6 Months

4=After 7 months

5=Not applicable (children younger than 6 months)

6=Don't Know

**307.** If before 6 months, why?.....

**309.** Observe growth monitoring Card: Was this child weighed and recorded within the last two months?

1=Yes



2=No

3=Not applicable (card not present)

**310.** If yes, what is the trend of the curve?

1=Upwards-above the lines

2=Level-within the lines

3=Down-wards below the lines

7=Not Applicable



## APPENDIX II: INFORMED CONSENT

**Maseno University**

**Student Name: Japheth Mativo Nzioki**

**Registration No. PG/PHD/091/2011**

**Research Title: EFFECT OF COMMUNITY HEALTH STRATEGY ON SELECTED MATERNAL AND CHILD HEALTH OUTCOMES IN MWINGI WEST SUB -COUNTY, KITUI COUNTY, KENYA**

### **1.0 Introduction**

My Name is Japheth Mativo Nzioki, A PhD student in Maseno University studying a Doctor of Philosophy (PhD) degree in Public Health. As part of the requirements of the award of the degree of Doctor of Philosophy in Public Health of Maseno University, I will be carrying out a study that will involve data collection in Mwingi and Kyuso Districts.

### **Kamba Translation:**

#### ***1.0 Kwithielesya kwa mbee***

*Kwa iswitwa nitawa Japheth Mativo wa Nzioki, Nisomaa Univasiti yitawa Maseno, ndikilii ya iulu yitawa utheu wa andu aingi, Nikenda nikwate ndikilii ino naile kuka kwenyu nosanye mauvoo mekivanukanyo ma uima wa mwii wa iveti na syana.*

## **2.0 Study general Objectives**

The general objective of this study is to evaluate the impact, effectiveness and efficiency of the Community Strategy in providing Maternal and Child Health (MCH) services in Mwingi District

### **Kamba Translation:**

#### ***2.0 Kieleelo kinene kya usomi***

*Kieleelo kinene kya usomi uu ni kwenda Kumanya undu murandi umwe ukwitwa “Community Strategy” withiitwe utyailya uiti wa iveti na syana kisioni kii, ovamwe na undu silikali ithiitwe ikitumia mbesa na aiti kwailya uiti uu mweu.*

## **3.0 Benefits of the study**

The findings of this study will generate data and information that will be useful to the following groups of people.

### **Kamba Translation:**

#### ***3.0 Useo wa kisomo kii***

*Kisomo kii nikikuate uvuanyo ula ukwithiwa wi wa vata muno kwa andu ano*

## **3.1 Benefit to Women and Children in Kenya**

This study will evaluate the performance of the Community Strategy in providing Maternal and Child Health services at the Community level in Mwingi District. Report generated from this study will be shared with the Government of Kenya to help improve Maternal and Child Health services provided to Women and Children under this Strategy. This in turn will directly be of benefit to Women and Children in this Country.

**Kamba Translation:**

**3.1 Useo kwa Iveti na Syana**

*Kisomo kiii ni kikumya uvuanyo ula ukyonanya undu iveti na syana makwataa uiiti kisioni kii. Uvuanyo uu ukanenganwe kwa silikali nikenda yaiye uiiti wa syana na iveti.*

**4.0 Whose data will be collected?**

It is important to note that this study will collect data pertaining you (as woman of reproductive age) and data pertaining any of your child who is under 5 years. It is important also to note that data pertaining your child will **only** be collected with your **permission**.

**Kamba Translation:**

**4.0 Mauvoo me kivathukanyo meosanya kwau?**

*Mauvoo me kivathukanyo maumanitwe na uiiti meosanw'a kwa iveti ila syi na syana syi itheo wa miaka Itano. Uvoo wa syana syoo onaw'wo nukwosanw'a . Musyai nukumanyiwa kana uvoo iulu wa uiiti wa kana kake wailitwe kwosanya amina kwitwa luusa na kwitikila.*

**4.1 Risks associated with this study**

The main risk associated with this study is the provision of your private information regarding your health and the health of your children (under five years) as well as your health seeking behavior.

**Kamba Translation**

**4.1 Maundu matonya Kwitwa Matemaseo nthini wa Kisomo kii**

*Undu ula utonywa kwithiwa utemuseo nthini wa kisomo kii ni kana musomi nu kwosanya maundu maku na makana kaku ma kinthini muno iulu wa uiti waku na wakana kaku.*

#### **4.2 Risk Mitigation measures**

The risk mentioned above will be mitigated/ alleviated through making all the respondents in this study anonymous/ No names of research participants will be revealed to anyone. Hence your privacy will be highly maintained.

#### **Kamba Translation**

##### *a. Undu wa kumina mauthuku nthini wa kisomo kii*

*Nikenda tumine uthuku wa kunengane mauvoo maku ma kinthini, musomi ndeumilya masyitwa menyu, kana ma syana syenyu kwa mundu ona wiva. Musomi onake ndulya maswtwa ma mundu ona wiva ula ukunengane uvoo wake nthini wa kisomo kii. Kwoou sili syaku nisykwiwa nesa vyu.*

**NOTE:** Kindly note the following,

#### **Kamba Translation:**

**Umanyithyo:** Kwa Ndaia manya kana,

- i) You are free to discontinue our interview with you at any point in the event you feel uncomfortable or offended by any of the questions you will be required to respond.

#### **Kamba Translation:**

i) *Nukwithiwa na uthasyo wa kulea kuendee na makulyo ma kisomo kii, kukosa kuendee kwithwa kumanitwe na kwiw'a makulyo aa mateku kwendeesya.*

- ii) Data about your child will be collected through you. Kindly ensure that before the interviewer collects any data about your child, your approval has been sought.

**Kamba Translation:**

ii) *Mauvoo iulu wa kana kaku makoosanya kwisila vala ui. Mauvoo iulu wa uiiti wa kana kaku matanosanywa, tia wavikiia kunegana luusa waku.*

- iii) Kindly provide the correct information to the best level of your knowledge and understanding.

**Kamba Translation:**

iii). *Nuukulw'a Kwa ndaia uvikiie kutunenga mauvoo maw'o kwianana na umanyi ula wi naw'o.*

**Your Consent:**

**Having read and understood the above information, I agree to take part in this study**

**Signature** \_\_\_\_\_ **Date** \_\_\_\_\_

**Kamba Translation:**

**Luusa Waku:**

*Ninasoma na naelewa iulu wa usomi uu, na ningwitikila kwithwa niumwe kati wala mekwithiwa maitumika nthini wa usomi uu.*

*Saii:* \_\_\_\_\_ *Matuku:* \_\_\_\_\_

**APPENDIX III. MASENO UNIVERSITY GRADUATE SCHOOL  
RECOMMENDATION LETTER**



**MASENO UNIVERSITY  
SCHOOL OF GRADUATE STUDIES  
*Office of the Director***

**Our Ref:** PG/PHD/091

Private Bag, MASENO, KENYA  
Tel: (057) 351622/351008/351011  
Email: [sgs@maseno.ac.ke](mailto:sgs@maseno.ac.ke)

**DATE:** 5<sup>th</sup> June, 2012

**TO WHOM IT MAY CONCERN**

Dear Sir/Madam,

**RE: JAPHETH MATIVO NZIOKI – PG/PHD/091/2011**

This is to confirm that the above named person was registered for Doctor of Philosophy in Public Health in the School of Public Health and Community Development of Maseno University, Kenya in the year 2011.

He has successfully completed his course work and research proposal entitled ***“Evaluating the Effectiveness of the Community Strategy in Providing Maternal and Child Health Services in Mwingi District, Kitui County, Kenya”***. He therefore needs to gather data to write his PhD thesis.

The purpose of this letter is to request your office to accord him necessary assistance.

Thanking you in advance for your anticipated positive response.



Prof. P. Okinda Owuor  
**DIRECTOR, SCHOOL OF GRADUATE STUDIES**

## APPENDIX IV. RESEARCH AUTHORIZATION

REPUBLIC OF KENYA



### NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349  
254-020-310571, 2213123, 2219420  
Fax: 254-020-318245, 318249  
When replying please quote  
secretary@ncst.go.ke

P.O. Box 30623-00100  
NAIROBI-KENYA  
Website: www.ncst.go.ke

Our Ref: NCST/RCD/12A/012/114

Date: 20<sup>th</sup> July 2012

Japheth Mativo Nzioki  
Maseno University  
P.O.Box 333-40105,  
Maseno.

#### RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Evaluating the effectiveness of community strategy in providing maternal and child health services in Mwingi District, Kitui County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Mwingi and Kyuso Districts** for a period ending **30<sup>th</sup> June, 2014.**

You are advised to report to **the District Commissioners, the District Education Officers and the District Medical Officers of Health, Mwingi and Kyuso Districts** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

  
**DR. M. K. RUGUTT, Ph.D, HSC.**  
**DEPUTY COUNCIL SECRETARY**

Copy to:  
The District Commissioners  
The District Education Officers  
The District Medical Officers of Health  
Mwingi District  
Kyuso District.

*“The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development.”*



**APPENDIX V. NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY  
RESEARCH PERMIT**

PAGE 2

PAGE 3

Research Permit No. **NCST/RCD/12A/012/14**

THIS IS TO CERTIFY THAT: **Prof./Dr./Mr./Mrs./Miss/Institution**

**Prof./Dr./Mr./Mrs./Miss/Institution**


**Japheth Mavio Nzioki**  
of (Address) **Maseno University**  
**P.O.Box 333-40105,**  
has been permitted to conduct research in

**Mwingi & Kyuso** location  
**Eastern** Districts  
Province

on the topic: **Evaluating the effectiveness of**  
**community strategy in providing maternal**  
**and child health services in Mwingi District,**  
**Kitui County, Kenya.**

for a period ending **30<sup>th</sup> June, 2014.**

Date of issue **20<sup>th</sup> July, 2012**  
Fee received **KSH. 2,000**



**Japheth Mavio Nzioki**  
Applicant's Signature

**M. Nzioki**  
Secretary  
National Council for  
Science & Technology

**APPENDIX VI. EVIDENCE OF RESEARCH ETHICAL REVIEW AND  
APPROVAL BY NACOSTI**

