

DETERMINATION OF THE COST-EFFECTIVENESS OF
CONTRACEPTIVE METHODS OFFERED IN KIAMBU COUNTY
HOSPITAL, KENYA

JAMES KIRAGU NGACHA

REGISTRATION NUMBER: H70/80667/2015

A PROJECT DISSERTATION SUBMITTED IN PARTIAL
FULFILLMENT OF THE AWARD OF THE DEGREE OF MASTER
OF SCIENCE IN HEALTH SYSTEMS MANAGEMENT IN
SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF NAIROBI.

JUNE 2019

APPROVAL

This Research Project has been submitted for examination with the approval of my supervisors;

SUPERVISOR:

Dr. Richard Ayah. MBChB; MSc, PhD
Lecturer, University of Nairobi
P.O. Box 19676, 00200
Nairobi.

Signature..... Date

Approved by the Director, School of Public Health, University of Nairobi

Prof. Mutuku A. Mwanthi. BSc.; MSEH; PhD.
Director, School of Public Health,
University of Nairobi,
P.O. Box 19676, 00200
Nairobi.

Signature Date.....

Dedication

To the women who use contraceptives

The pill that not only cures their personal ills

But all also cures the ills of their families

And even the ills of the society at large

That span beyond health and healthcare

While bearing most of the costs

Financial costs and a myriad of side effects

Acknowledgement

I wish to acknowledge with profound gratitude my supervisor Dr. Richard Ayah for the support he gave to me towards completion of this research project that went beyond the normal call of duty. I recognize his patience, encouragement and meticulous guidance. I also wish to thank the academic staff in the School of Public Health for their support and guidance. I also acknowledge the support given to me by the non-teaching staff as well my fellow students.

I acknowledge the invaluable support given by the management of health services in Kiambu County and Kiambu County Hospital in particular. I also wish to thank the administration staff at the Hospital, and the healthcare providers in the Maternal Child Health (MCH) clinic for going out of their way to make this study successful. I also acknowledge with gratitude those who assisted in the process of data collection, processing and analysis.

I finally wish to recognize the support and encouragement I received from my family and friends.

PLAGIARISM

UNIVERSITY OF NAIROBI

Declaration of Originality

Name of student:	JAMES KIRAGU
Registration No.:	H70/80667/2015
College:	COLLEGE OF HEALTH SCIENCES
Faculty/School:	SCHOOL OF PUBLIC HEALTH
Department:	SCHOOL OF PUBLIC HEALTH
Course name:	MSc. HEALTH SYSTEMS MANAGEMENT
Title of work:	DETERMINATION OF THE COST-EFFECTIVENESS OF CONTRACEPTIVE METHODS OFFERED IN KIAMBU COUNTY HOSPITAL, IN THE REPUBLIC OF KENYA

Declaration:

1. I understand what Plagiarism is and I am aware of the University's policy in this regard.
2. I declare that this Project Dissertation is my original work and has not been submitted elsewhere for examination, award of degree, or publication. Where other people's work or my own work has been used, this has been properly acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed and shall not allow anyone to copy my work with the intention of passing it off as his/her work.
5. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with the University of Nairobi's Plagiarism policy.

Signature: _____

Table of contents

Dedication.....	ii
Acknowledgement	iii
Declaration of Originality.....	iv
List of tables	vii
List of figures	vii
Definition of Terms	viii
Abbreviations.....	xi
Abstract	xiv
1.0 Introduction	1
1.1 Background.....	1
1.2 Statement of Research Problem.....	2
1.3 Conceptual Framework.....	4
1.4 Research Question	5
1.5 Objectives	5
1.5.1 Specific Objectives	5
2.0 Literature Review.....	6
3.0 Methodology.....	16
3.1 Study Design.....	16
3.2 Study area.....	16
3.3 Study population	17
3.4 Sampling and sample size determination.....	17
3.5 Variables	18
3.5.1 Contraceptive Methods Included in the Study (Alternatives).....	18
3.5.2 Cost – Dependent Variables.....	19
3.5.3 Effectiveness - Independent variables	19
3.6 Data Collection	19
3.6.1 Primary data from sample of Healthcare Providers	20
3.6.2 Secondary data	21
3.7 Data Analysis.....	22
3.8 Minimization of Errors and Biases	23
3.9 Ethical Considerations	24

4.0	Results.....	26
4.1	Inputs Required to Provide Services (Descriptive Statistics)	26
4.1.1	Supplies.....	26
4.1.2	Equipment.....	27
4.1.3	Capital.....	28
4.1.4	Overheads	29
4.1.5	Labour.....	30
4.1.6	Family Planning Workload.....	31
4.2	Cost of Providing Each Method (Analytical Statistics).....	33
4.3	Total Cost for Each Method.....	34
4.4	Cost-Effectiveness of Each Method.....	34
5.0	Discussion.....	36
	Study limitations	40
	Conclusion and Recommendations.....	41
	Budget.....	41
	Work Plan	42
6.0	Bibliography.....	43
7.0	Appendices	46
	Appendix I: ERC Approval	46
	Appendix II: Informed Consent.....	48
	Appendix III: Consent form.....	51
	Appendix IV – County Government Approval.....	53
	Appendix V - Payment to Kiambu County Hospital	54
	Appendix VI – CPR by Counties.....	55
	Appendix VII – Tally Sheet for Time Taken to Provide Contraceptive Methods.....	57
	Appendix VIII – Questionnaire	58
	Appendix IX - Secondary Data Abstraction Tables	68
	Appendix X – Plagiarism Screening Report.....	73

List of tables

Table 1: Independent Variables.....	19
Table 2: Secondary Data and their Sources.....	21
Table 3: Inputs and Contraceptive Methods.....	23
Table 4: Supplies and Contraceptive Methods (n=5).....	26
Table 5: Equipment and Contraceptive Methods (n=5).....	27
Table 6: Capital and Contraceptive Methods (n=5).....	28
Table 7: Overheads and Contraceptive Methods(n=5).....	29
Table 8: Healthcare providers Manning FP Clinic.....	30
Table 9: Staff Establishment 2016/17 FY (by Function).....	30
Table 10: Time and Contraceptive Methods (n=149).....	31
Table 11: FP Workload Per Service for Each Method (N = 3099).....	32
Table 13: Total Cost of Providing Each Method (n=149).....	34
Table 14: The Cost-Effectiveness of Each Method (N=149).....	35
Table 15: Activities and the Costs of Carrying Out the Project.....	41
Table 16: Milestones and Time Taken to Carry Out the Project.....	42

List of figures

Figure 1: Conceptual Framework.....	4
-------------------------------------	---

Definition of Terms

Capital cost: This refers to all fixed assets (medical and non-medical) and materials (medical and non-medical) that are not consumed in the process of providing services and were not exclusively used in the family planning clinic.

Combined Oral Contraceptive Pills (Pills): A set of 28 pills available in a pack of 3 strips consisting of 21 pills containing Ethinylestradiol 30mcg and Levonogestrel 150mcg, and an extra 7 pills containing Ferrous Sulphate commonly referred to as ‘Chaguo Langu’. This study excludes all other contraceptive pills.

Contraceptive Implants:

- 2-Rod Implants – refers to 2 flexible rods (43mm length x 2.5 mm diameter each) containing 75mg of Levonorgestrel each, which are inserted under the skin of the upper arm (non-dominant arm) and are effective for 5 years. The study excludes the Levonorgestrel based 2-Rod Implants that are effective for less than 5 years since they are not available through the public-sector supply chain.
- 1-Rod Implants – refers to 1 flexible rod (40mm length x 2mm diameter) containing 68mg of Etonogestrel and 15% Barium Sulphate, which is inserted under the skin of the upper arm (non-dominant arm) and is effective for 3 years.

Contraceptive Methods: This refers to any procedure performed or product dispensed or administered to a woman of reproductive age for the purpose of preventing pregnancy. In this study, only the 4 main methods used in Kenya were considered, that is, Intra-Uterine Copper Devices (IUCDs), Implants (2-Rod and 1-Rod Implant), Depot Medroxy-Progesterone (DMPA) and Combine Oral Contraceptive Pills (Pills).

Cost-Effectiveness Analysis (CEA): This refers to the comparison between the costs of

providing each contraceptive method to the extent each method prevents pregnancy – measured by Couple Years Protection (CYP) conversion factor associated with each method.

In this study costs were considered from the facility perspective only.

Cost of Inputs: Costs of various inputs were estimated from prices.

Depot Medroxy-Progesterone (DMPA): An injectable suspension containing 150mg Medroxy-progesterone and is administered intramuscularly every 3 months. This study excludes the subcutaneous version of the same hormone that is also active for 3 months, and has the option of self-administration since it is not yet widely available through the public-sector supply chain.

Equipment: This refers to all medical fixed assets and all medical materials that do not get used up in the process of providing services, which were used in provision of contraceptive services in the facility in financial year (FY) 2016/2017. This includes weighing machines, examination beds, containers, among others, that were exclusively used in the family planning clinic.

Healthcare Providers: This refers to all healthcare professionals paid or unpaid, of any cadre, providing direct healthcare services or involved in administrative work. They include nurses, midwives, clinical officers, physiotherapists, medical officers, among others. It excluded all other workers in the hospital irrespective of their duties.

Intra-Uterine Copper Devices (IUCDs) - Copper T[®] (380A IUCD): A small “T-shaped” intra-uterine device, measuring 32 mm (width) x 36 mm (length) which is placed in a woman’s uterus to prevent pregnancy. It is made of polyethylene (diameter of 3mm) impregnated with barium sulfate and thin copper wire wound along the stem, with exposed surface area of approximately 380 square-millimeters. This study only included Copper T[®]

that is available in public health facilities through the public-sector supply chain in Kenya.

Labour: This refers to cost of providing services that was associated with healthcare providers directly involved in provision of services, measured in terms of time spent providing various contraceptive services in view of their remuneration per unit of time.

Long-term versus Short-term contraceptive methods: Long-term contraceptive methods refer to those whose effectiveness exceeds 3 months while short-term contraceptive methods are those whose effectiveness is less than 3 months. In this case therefore, DMPA was classified as a short-term method.

Overheads: This refers to administrative costs of running the health facility that can be attributed to each contraceptive method. This included administrative cost, operating expenses, office equipment, maintenance, general supplies, utilities and personnel (excluding healthcare providers directly involved in providing contraceptive services).

Supplies: This refers to all the materials that were used and consumed during the provision of each contraceptive method. These included the contraceptive commodities and all the medical supplies required, for example, gloves, local anesthesia, syringes, among others. However, it excludes all movable and immovable material, equipment and machines that are only subject to depreciation and are not consumed in the process of delivering services.

Workload: This refers to the total number of healthcare services provided in the facility in financial year 2016/2017. This was measured by number of visits for outpatient services and number of days spent in the hospital for inpatient services.

Abbreviations

AIDS	Acquired Immuno-Deficiency Syndrome
ACYP	Adjusted Couple Years Protection
ANC	Ante-Natal Clinic
ART	Antiretroviral Treatment
BP	Blood Pressure/British Pharmacopeia
BSN	Bachelor of Science in Nursing
CEA	Cost-Effectiveness Analysis
CHOICE	Choosing Interventions that are Cost-Effective
CHW	Community Health Workers
CM	Centimetres
CoC Pills	Combined Oral Contraceptive Pills
CPR	Contraceptives Prevalence Rate
CIP	Costed Implementation Plan
CSSD	Central Sterilization Services Department
CYP	Couple Years Protection
CWC	Children Wellness Clinic
DMPA	Depot Medroxy-Progesterone Acetate
DHIS 2	District Health Information System 2
Eto	Etonogestrel
FP	Family Planning
FY	Financial Year
GoK	Government of Kenya
HCP	Healthcare Providers

HIV	Human Immunodeficiency Virus
IM	Intra-Muscular
IMCI	Integrated Management of Childhood Illness
IUCD	Intra-Uterine Copper Device
IUD	Intra-Uterine Device
IUS	Intra-Uterine Systems
KDHS	Kenya Demographic and Health Survey
KEPH	Kenya Essential Package for Health
KeS	Kenya Shillings
KEMSA	Kenya Medical Supplies Authority
KHP	Kenya Health Policy 2012-2030
KHSSP	Kenya Health Sector Strategic and Investment Plan
KNBS	Kenya National Bureau of Statistics
KNH	Kenyatta National Hospital
KM	Kilometers
LARC	Long-Acting and Reversible Contraceptive
LNG - IUS	Levonorgestrel Intra-Uterine System
MCH	Maternal Child Health
MEDS	Mission for Essential Drugs and Supplies
PNC	Post Natal Care
PMTCT	Prevention of Mother-to-Child Transmission
SD	Standard Deviation
TB	Tuberculosis
UK	United Kingdom

UNFPA	United Nations Family Planning Agency
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
WHO	World Health Organization

Abstract

Background: In 2014, Kenya had a Contraceptive Prevalence Rate (CPR) of 53% (modern methods) among married women and required about Kenya Shillings (KeS) 30 Billion (300 Million USD) between 2017 and 2020 to increase the CPR to 58% (a target chosen by the country). Investing in the more cost-effective contraceptive methods would ensure higher benefits without additional cost. Several studies conducted mainly in developed countries have shown that long-acting methods are more cost-effective than short-acting methods. This may not be the case in developing countries, like Kenya.

Objective: The overall objective of this research was to determine the cost-effectiveness of the four main contraceptive methods provided in Kiambu County Hospital, from the hospital perspective.

Methodology: This was a cross-sectional study undertaken in the hospital. A purposeful sampling of healthcare providers and systematic sampling of the first 15 service delivery sessions of each method; IUCD, Implants, DMPA and CoC Pills, was done. The cost was determined using activity-based costing model with labour, overheads, equipment, capital and workload as the dependent variables and then divided by Couple Years Protection (CYP) conversion factors (independent variables) associated with each method. The contraceptive methods with lower cost of service delivery per CYP were deemed to be more cost-effective.

Result: The IUCD was found to be the most cost-effective contraceptive method at KeS 502 per CYP, followed by the 2-Rod Implant at KeS 655, the 1-Rod Implant at KeS 979, and DMPA at KeS 2,439. The CoC Pills were the least cost-effective at KeS 3,977 per CYP. The initial cost of providing each of the four methods was highest for the 2-Rod Implant, followed by 1-Rod Implant, IUCD and DMPA, while CoC Pills attracted the least cost.

Conclusion: Long-term methods were found to be more cost-effective than short-term methods despite having higher initial cost of service delivery. Investing in long-acting methods is an efficient way of using resources allocated to contraceptive services.

1.0 Introduction

1.1 Background

Contraceptive programmes are some of the most cost-effective tools available for tackling some of the public health challenges of our day (Jayatunga, 2018) (FROST *et al.*, 2014), and also contribute to economic growth and development (Guttmacher Institute, 2017) (Canning and Schultz, 2012). Contraceptives are known to significantly reduce maternal and child mortality, over and above directly reducing the number of unwanted pregnancies and unsafe abortions (Guttmacher Institute, 2017). Contraceptives have also been shown to contribute positively to factors of economic growth and development especially in relation to women and children (Canning and Schultz, 2012).

There is an estimated 1.6 billion women of reproductive age in the developing countries, of which, about 885 million need contraception. The unmet need for contraception in developing countries stands at about 24% translating to 214 million women (Guttmacher Institute, 2017). According to the Kenya Demographic and Health Survey (KDHS) 2014, Kenya had a contraceptive prevalence rate (CPR) of 58% for all methods (and 53% for modern methods) among married women, up from 46% in 2009. The unmet need for contraception in Kenya stands at 18% for married women (26% for all women of reproductive age) down from 26% (married women) in 2009 (Kenya National Bureau of Statistics (KNBS), 2014). The current contraceptive prevalence rate is dominated by Depot Medroxy-Progesterone Acetate (DMPA) contributing 26%, followed by implants at 10%. Pills contributed 8% while intrauterine contraceptive devices (IUCDs) and sterilization contributed about 3% each. The rest was contributed by condoms and traditional methods (Kenya National Bureau of Statistics

(KNBS), 2014). Kiambu County has a CPR that is higher than the national average at 74% for all methods and 68% for modern methods among married women.

The contribution of various methods to the CPR in Kiambu County also differs from the national average, with DMPA being the most popular method contributing 22%, followed by pills at 19%. Implants contribute 12%, IUCDs contribute 9%, female sterilization contributes 3%, while condoms and non-modern methods contribute the rest (Kenya National Bureau of Statistics (KNBS), 2014). The high CPR and higher contributions by long-term methods in Kiambu County increases the chance of obtaining costing data on all methods. Kiambu County is also geographically close to the City of Nairobi making it readily accessible and therefore a convenient site for the study. Although the County is generally more developed than most counties in Kenya, the cost of service delivery in public health facilities is likely to be generally the same throughout the country from the public health facilities point of view. This is because contraceptive commodities are centrally procured by the Kenya Medical Supplies Authority (KEMSA) and then distributed to counties for free and healthcare providers are all a part of the public service system. Other supplies needed to provide contraceptive services are also centrally procured by KEMSA or Mission for Essential Drugs and Supplies (MEDS) and then resold to counties at a uniform price.

1.2 Statement of Research Problem

Investing in the most cost-effective family planning interventions is one way of ensuring prudent allocation of resources. Contraceptive programmes are very expensive. According to the Kenya National Family Planning Costed Implementation Plan 2017- 2020 (MOH, 2018),

the country needs to invest 30 billion Kenya Shillings (300 million USD) to increase CPR of modern methods from the current 53% to the targeted 58% by the year 2020 (a target chosen by the country). This is an annual average of 7.5 Billion Shilling (75 Million USD) in the next 4 years (although many aspects of health care delivery in Kenya are devolved, family planning and other vertical programmes are managed centrally, including availability of commodities and demand creation). The 30 Billion KeS investment is about 20% of the 2016/17 government allocation to the health sector (national and county combined) that stood at 152 billion (MoH 2017). The main cost drivers in the Costed Implementation Plan (CIP) are cost of commodities (52%), service delivery (27%), and demand creation (13%).

Several studies have shown that long-acting contraceptive methods are more cost-effective than short-term methods (Mavranezouli, 2008; Lipetz, Phillips and Fleming, 2009; Henry *et al.*, 2015). However, most of these studies have been carried out in developed or high middle-income countries where the health care and contraceptive programmes have differing dynamics compared to Kenya and therefore Kiambu County. Some of the contextual differences include: involvement of the private sector, social economic status of providers and clients, health insurance coverage, supply chain management of commodities and levels of unmet need. Over and above this, every country has a unique health system and therefore, country (and in this case county) specific data is more useful for decision making. This study was, therefore, designed to assess cost-effectiveness of various contraceptive methods in the context of Kiambu County.

1.3 Conceptual Framework

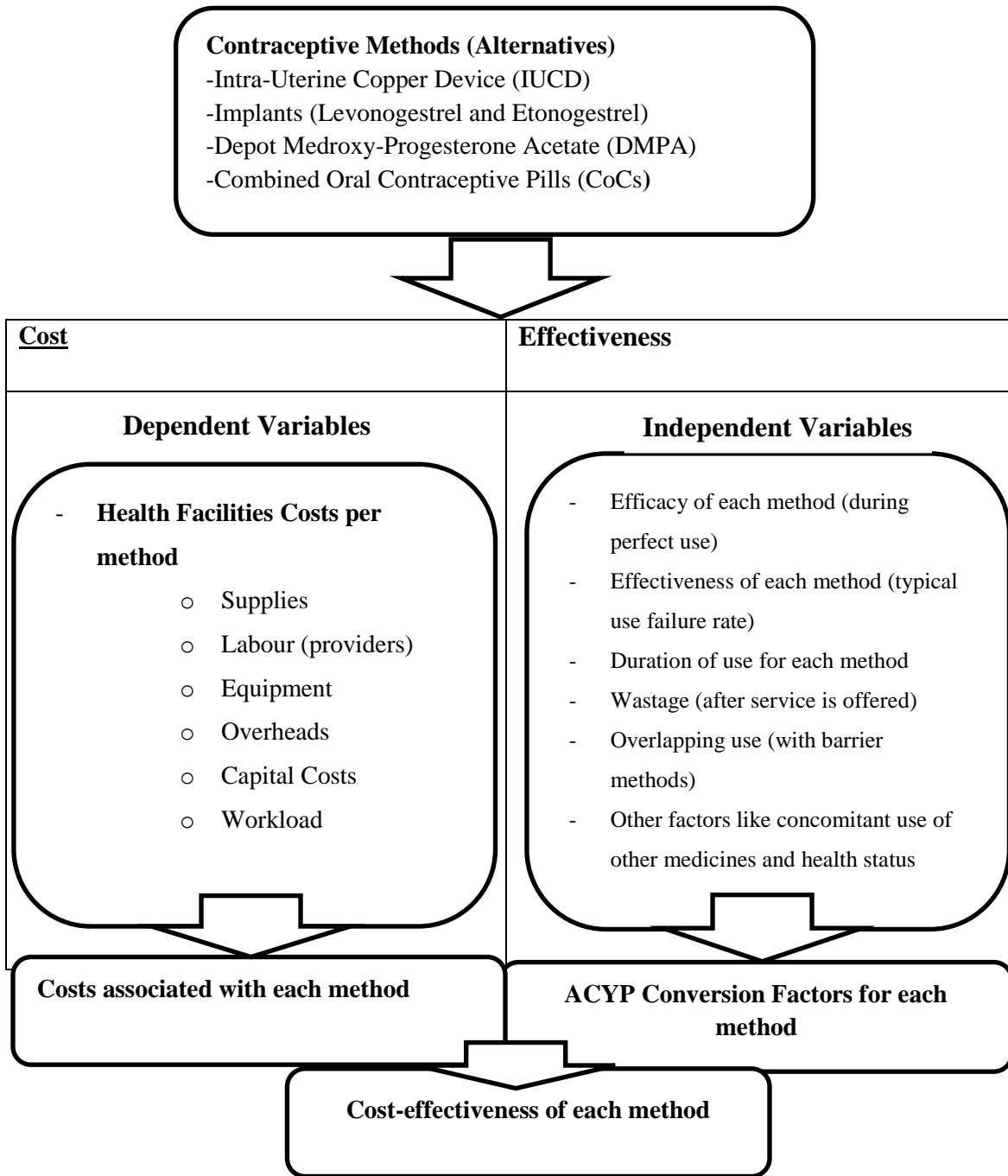


Figure 1: Conceptual Framework

Source: *Adapted from* (Nakhaee, Gorji and Mohammadi, 2002)

1.4 Research Question

What is the cost-effectiveness of contraceptive methods available in public sector health facilities?

1.5 Objectives

The overall objective of the study was to determine the cost-effectiveness of contraceptive methods available in public health facilities.

1.5.1 Specific Objectives

- i. To determine the health facilities' related costs of the four main contraceptive methods (that contributed 81% of CPR in Kenya and 84% of CPR in Kiambu County in KDHS 2014).
- ii. To calculate the cost-effectiveness of each of the four main contraceptive methods.

2.0 Literature Review

While the benefits of using contraceptives are clear (Trussell, 2004; Udeh, Losch and Spies, 2009; Lanzona, 2013; FROST *et al.*, 2014; Keen *et al.*, 2017; Mercy G. Mugo and Muriithi, 2017; Jayatunga, 2018), there are questions regarding which methods are more cost-effective. Long-acting contraceptive methods appear to be more cost-effective than short-acting methods from all perspectives. This is because of the following factors. Long-acting methods are more efficacious, that is, they have a lower failure rate when used correctly and consistently (WHO, 2011). This way, each service results into higher impact and therefore the cost of the service is duly diluted when determining cost-effectiveness. From clients' perspective, this means less visits to the health facilities. To add to this, long-acting methods are less dependent on user compliance and their efficacy is fairly similar to typical use effectiveness. There is, therefore, less cost associated with their failure and consequences of failure (Mavranzouli, 2008; WHO, 2011) (Henry *et al.*, 2015). Again, from clients' perspective, this means less costs associated with unwanted pregnancies and cost of raising a child. From the health system perspective, this means reduced workload in form of antenatal and postnatal care as well as peri-natal healthcare needs. From the society perspective, less contraceptive failure results into better population management and the economic benefits that come with it.

The World Health Organization (WHO) provides a comprehensive list of various methods and their efficacy, in terms of rate of unintended pregnancy under the heading 'consistent and correct use' (WHO, 2011). Efficacy reflects limitations associated with individual methods (products), it is usually expressed in terms of failure rate, and is generalizable across all

populations. Published data shows that implants are the most efficacious with about 0.05 unintended pregnancies per 100 women per year; IUCDs have a failure rate of 0.6, while DMPA and CoCs have a failure rate of 0.3 (WHO, 2011). This is in contrast to male condoms that have a failure rate of 2 unintended pregnancies per 100 women per year, 5 for female condoms, 6 for cycle beads, 18 for spermicides, and use of no method would result into about 85 pregnancies (WHO, 2011). However, contraceptives use outside clinical trial settings introduces the user as a factor in determining the failure rate of each method.

The effectiveness of short-term methods (CoCs and DMPA) is highly dependent on correct and consistent use (user compliance) while long-acting methods (IUDs, implants and sterilization) are not affected to the same extent by user characteristics (Lipetz, Phillips and Fleming, 2009). Although user compliance is not a major factor in determining effectiveness of Long-Acting Reversible Contraceptives (LARCs), discontinuation of a method does. The mean one year continuation rate of Etonogestrel implants, for example, was shown to be higher among women in middle-income countries during clinical trials (Palomba *et al.*, 2012). Subsequent studies show higher continuation rates in lower income countries (98% in Nigeria) (State, 2010)) than in developed countries (87% in the United States of America (USA) (Wilson *et al.*, 2014) and 75% in the United Kingdom (UK) (Lakha and Glasier, 2006)). Assuming that educated women are more likely to correctly and consistently use contraceptives, social economic status is a key determinant of the effectiveness of short-acting methods and affects to a lesser extent the effectiveness of long-acting methods (effect may be positive by having higher continuation rates). However, the effectiveness of both short-acting

and long-acting methods observed in developed countries cannot be assumed to be the same in developing countries given difference in socioeconomic status.

Drug interactions and general health status of users also determine effectiveness of contraceptives. Various drugs especially protease inhibitors used as part of Antiretroviral Therapy (ART) in treatment and prophylaxis of HIV/AIDS are known to reduce effectiveness of hormonal contraceptive methods (WHO, 2011). This is also the case for medicines used in treatment of Tuberculosis (TB) and epilepsy. Further, diseases affecting the digestive system such as diarrhea and vomiting are known to affect effectiveness of oral contraceptives (WHO, 2011). Given the high prevalence of HIV, TB and other infectious diseases in developing countries, the effectiveness of contraceptives observed in developed countries cannot be directly translated into effectiveness in developing countries including Kenya including Kiambu County.

There are other user factors that affect effectiveness of various methods. Age of users is important when it comes to sterilization. The younger the user is, the higher the number of pregnancies prevented in the life of the woman (Mavranezouli, 2008). Frequency of sexual intercourse is important for methods that are dependent on sexual activity for example diaphragm, spermicides and condoms (Stover *et al.*, 1997). As such, contextual factors are important when interpreting the effectiveness of contraceptive methods.

Given the large number of factors that affect effectiveness of contraceptives, measuring effectiveness for public health programmes is difficult. Use of appropriate models that

account for factors that are important in the local settings like age of users, duration of use, consistency of use, discontinuation rates and others to estimate effectiveness would be ideal (Stover *et al.*, 1997). For example, in 2008, Mavranezouli and the LARC Guideline Development Group in UK, examined the cost-effectiveness of long-acting reversible contraceptive methods in the UK. They used a Markov Model to determine the effectiveness and costs associated with Copper Intrauterine Device (IUD), Levonorgestrel Intrauterine System (LNG-IUS), Etonogestrel Subdermal Implant and Depot Medroxyprogesterone Acetate (DMPA). They compared these with costs and effectiveness of combined oral contraceptive pill (COC) and female sterilization (Mavranezouli, 2008). A study in Sweden used a Markov Model (Henry *et al.*, 2015) while one in the US used a decision tree (Sauer and Ann, 1999) to estimate costs and effectiveness. The main advantage of modeling is that it ensures consideration of local factors. Various standard models can be adjusted and adapted to fit the local context. The main disadvantage of modeling, however, is that a lot of data is required. Such local data is expensive to obtain and requires a lot of time to generate. This approach is suited to the developed countries where local data is largely available and the cost is not a major constraint.

Utilizing the Couple Years Protection (CYP) conversion is another possible measure of effectiveness that translates services into common impact (prevention of pregnancy). The CYP method was developed to evaluate outcomes of contraceptive projects and programmes funded by the United States Agency for International Development (USAID) (Stover *et al.*, 1997). The method is simple and fit for use in the field with use of readily available programme data. The method seeks to translate either distributed contraceptive products or

contraceptive services offered into number of years a couple is protected from unwanted pregnancies (Stover *et al.*, 1997). CYP conversion factors take into account the efficacy of each method, duration of use, effectiveness (typical failure rate in various countries), coital frequency (for coitus dependent methods), wastage (for self-administered methods), misreporting (accounts for data quality), age (for sterilization), consistency of use (in various countries), non-contraceptive use (for condoms), and overlapping coverage (use of more than one method at a time) that influence effectiveness of contraceptive services (Stover *et al.*, 1997). However, the CYP method has been criticized for being too simple and failing to directly measure the number of unwanted pregnancies averted (Stover *et al.* 1997). The main advantage of using CYP is the ease of use and utilization of data that is readily available, that is, the number of services offered, or volume of commodities distributed as the only input needed. A study conducted in Iran used Adjusted CYP conversion factors as the measure for effectiveness of various methods (Nakhaee, Gorji and Mohammadi, 2002) and quoted its robustness and ease of use as the reasons for choosing it. Conversion factors are available in literature (USAID, 2014) and are regularly updated to accommodate new methods and realities of various contraceptive programmes. The conversion factors are prepared with developing countries in mind since these are the regions where USAID-funded projects and programmes are located. Data used to construct conversion factors often include data from developing countries on factors that affect effectiveness of contraceptive services (Stover *et al.*, 1997). In a nutshell, the use of CYP conversion factors as a measure of effectiveness is simple, uses readily available data, considers the context of developing countries and is appropriate for use in study like this one.

Costs associated with various contraceptive methods can be evaluated from various perspectives, notably, the clients' perspective, the health system perspective or the wider society's perspective. From the clients' perspective, costs include user fee and other costs incidental to accessing contraceptive methods, costs associated with the consequence of method failure, and other intangible costs including psychological costs associated with method failure (Mavranouzouli, 2008) (Trussell and Shochet, 2003) (Sweileh and Barham, 2003). From the health system perspective, costs can be divided into labour (healthcare providers), administrative (at the facility and various health system management levels), as well as commodities and overheads (including space and other inputs required in services delivery) (Nakhaee, Gorji and Mohammadi, 2002). From the societal perspective, costs may include opportunity cost of providing the services but more specifically those associated with method failure (Mavranouzouli, 2008), (Trussell and Shochet, 2003), (Lipetz, Phillips and Fleming, 2009). Depending on who is the targeted consumer of the research results, studies can be done from one or more of these perspectives. The societal perspective is the most comprehensive since it looks at all the costs associated with contraceptive use and service provision.

Measuring the cost associated with various contraceptive methods is a complex issue. Some costs like those of commodities, labour and overheads can be calculated directly from administrative data (Nakhaee, Gorji and Mohammadi, 2002). The costs can then be allocated to various contraceptive services and compared to effectiveness associated with the services (Sweileh and Barham, 2003). The less well defined costs such as the cost associated with contraceptives failure and its consequences are subject to expert opinion (Mavranouzouli,

2008) or average national costs of various procedures like delivery and termination of pregnancy, among others (Lipetz, Phillips and Fleming, 2009). Similarly, societal costs are subject to expert opinion, national or regional averages or modeling since they are much more difficult to define or quantify. Some studies have used statistical models to estimate societal costs (Henry *et al.*, 2015), while others did not consider them at all (Trussell and Shochet, 2003) (Sweileh and Barham, 2003). Essentially, there seems to be no specific model for systematically costing health services, including contraceptive services. Various studies appear to follow the approach of being as comprehensive as possible while others only consider the costs that are deemed significant in the researcher's opinion or constraints. As such, the decision on the actual costs to include in the study depends on objectives of the study, resources available, and time constraints among other factors.

As mentioned earlier, various studies have shown that long-acting methods are more cost-effective when compared to short-acting methods (Mavranezouli, 2008), (Lipetz, Phillips and Fleming, 2009), (Henry *et al.*, 2015), (Lafuma *et al.*, 2015). A cost-effective study in the UK examined the cost-effectiveness of long-acting reversible contraceptive methods. Findings from the UK study showed that female sterilization was the most cost-effective, followed by implants, LNG-IUS and DMPA, while CoCs were found to be the least cost-effective (Mavranezouli, 2008). Another study in the UK examined the cost-effectiveness of a long-acting reversible contraceptive (Implanon®) relative to oral contraception in a community setting. The study found that Implanon® was more cost-effective than CoCs (Lipetz, Phillips and Fleming, 2009). Another study conducted in Sweden did a cost-effectiveness analysis of a low-dose contraceptive Levonorgestrel intrauterine system. It found that the IUS is more cost-

effective than CoCs and resulted in fewer pregnancies and significantly increased QALYs (Henry *et al.*, 2015). A study conducted in France assessed the cost-effectiveness of nexplanon® (Etonogestrel implant) compared to other reimbursed contraceptive methods in France based on real life data. It found that the implant was more cost-effective than Copper IUD, CoCs and Hormonal IUD (Lafuma *et al.*, 2015). In Palestine, a study examining cost-effectiveness of contraceptive methods (cost/effectiveness ratio) from a customer's perspective found that IUD and DMPA were the most cost-effective methods, while the least cost-effective were the progestin only and combined oral contraceptive pills. Studies in Europe and one study in the Middle East showed that long-acting methods are more cost-effective with the length of use (effectiveness) being almost a predictor of cost-effectiveness. Generally, we can conclude from the aforementioned studies that long-acting methods are more cost-effective than short-acting methods.

Several other studies deviate from the picture depicted above. One study undertaken in the USA and one in the Middle East showed a similar picture of long-acting methods being more cost-effective. However, the study also showed a higher cost-effectiveness of DMPA than other long-acting methods. A study in the Republic of Iran (Nakhaee, Gorji and Mohammadi, 2002) assessing the cost-effectiveness of various contraceptive methods found that vasectomy was the most cost-effective while implants were the least cost-effective. These findings are different from other studies that consistently found DMPA to be the least cost-effective long-acting method. The Iran study also showed female sterilization to be less cost-effective than IUDs and the cost-effectiveness of pills, condoms and female sterilization to be rather close (cost-effective ratios of 21, 24 and 28 respectively when compared to the ratios of vasectomy

(10), IUDs (13), DMPA (47), and implants (83)) (Nakhaee, Gorji and Mohammadi, 2002). A study conducted in the US examined the cost-effectiveness of various contraceptive methods among women in the Department of Defense. It found that DMPA was the most cost-effective (cost per averted pregnancy) method followed by IUCD and pills while the implants were least cost-effective. The cost-effectiveness of IUCD and pills was rather similar (338 USD per pregnancy avoided and USD 350 respectively), when compared to USD 222 for DMPA and USD 503 for implants) (Sauer and Ann, 1999). Another study undertaken in Uganda showed that DMPA is more cost-effective than female sterilization, condoms and pills (Ssewanyana and Kasirye, 2017). A cross-sectional study in Kenya found that female sterilization is the most cost-effective method, followed by the IUCD, male condoms, CoC pills and DMPA while the Implant was found to be the least cost-effective (Futures Group, 2010). As such, findings from some studies are inconsistent with the thinking that long-term methods are more cost-effective.

Although there is strong evidence that higher length of effectiveness results into more cost-effectiveness across all perspectives, there are some studies that show shorter-acting methods dominating their longer-acting counterparts (Sauer and Ann, 1999; Nakhaee, Gorji and Mohammadi, 2002; Sweileh and Barham, 2003). Whereas studies in Europe looked at total costs from the wider society perspective, others only considered cost from provider perspective (Sauer and Ann, 1999) (Nakhaee, Gorji and Mohammadi, 2002), and another from clients' perspective (Sweileh and Barham, 2003). The difference seen could be attributed to study design; for example, considering cost from different perspectives. However, given that the fundamentals that drive cost (cost of a service) and those that reduce cost (higher

effectiveness) apply the same way across all perspectives, differences in study design alone cannot explain the differences in results.

The above provides some evidence that contextual factors or issues may be the reason for the differences seen in various studies in different parts of the world. This is further supported by the fact that the cost savings vary from study to study, even if the cost-effectiveness pattern is the same. While one study in UK showed cost saving of close to 40 thousand Sterling Pounds (Mavranouzouli, 2008) another study in Sweden showed a saving of about 311 Kroners (Henry *et al.*, 2015) (about 30 Pounds at today's exchange rate) per pregnancy averted between the most cost-effective and the least cost-effective methods. There is, therefore, a clear need to perform a cost-effectiveness study in our local Kenyan setting in order to capture the effect of local context for more responsive decision making on contraceptive service provision.

3.0 Methodology

3.1 Study Design

This research was a cross-sectional study to determine the cost-effectiveness of contraceptive methods offered in Kiambu County Hospital in Kenya.

3.2 Study area

Kiambu County Hospital was chosen as the study area because of convenience (close proximity to Nairobi City where the researcher operates from) and the possibility of observing provision of all the methods being studied. This is because the County has a higher CPR (74%) than the national average of 58%, and higher contribution of IUCD and Implants than the national average (Kenya National Bureau of Statistics (KNBS), 2014). The full list of counties and their respective CPRs is in Appendix (VI).

Kiambu County Hospital is one of the 45 Level 4 (according the Kenya Essential Package for Health (KEPH) classification) hospitals in Kenya - 36 of the hospitals (80%) being private (for and not for profit) while 9 of the hospitals (20%) are public (Ministry of Health, 2018). In 2016/17 financial year, Kiambu County Hospital had a total work load of 355,910 (outpatient visits plus number of bed days) (Ministry of Health (a), 2018), and a staff establishment of 462 (according to hospital administration records). The total Maternal and Child Health (MCH) work load was 29,321 (8.24% of total work load) (Ministry of Health (a), 2018), offered in a space of about 336 square metres (according to maintenance records). Family planning (FP) services including a two weeks' baby clinic (work load of 871) and post-natal care (PNC) services (workload of 1,272) (Ministry of Health (a), 2018) are offered in two

rooms - one used for triage and the other for provision of various contraceptive methods, that measure about 21.60 square metres (according to maintenance record of the hospital).

The Hospital's MCH department is divided into two main blocks; one (about 72.00 square metres) offering Children Wellness Clinic (CWC) services and the other (about 220.50 square metres) offering antenatal care (ANC), children nutrition services, integrated management of childhood illnesses (IMCI), prevention of mother to child transmission (PMTCT), post-natal care (PNC), 2 weeks baby clinic, FP and outpatient services for under 5 years. The CWC room has an open plan where various vaccination services are offered. The larger room is divided into 9 rooms and a common waiting area. Several desks in the waiting area are used as triage for babies and children. According to the duty roster in the month of August 2018, the MCH department was manned by 2 Clinical Officers, 6 Nursing Officers, 5 Bachelor of Science in Nursing (BSN) interns, and 10 nursing students. Data was collected between the months of July and October 2018.

3.3 Study population

The study population consisted of the healthcare providers who offer family planning services in the hospital.

3.4 Sampling and sample size determination

A purposeful sampling of all the healthcare providers manning the FP clinic in Kiambu County Hospital on day one of the study, and healthcare providers who manage the MCH department was done. In total, 5 healthcare providers were interviewed - 3 out of the 6

healthcare providers that are permanently stationed in the MCH department and 2 senior most members of the MCH department who were present on day one of the study.

Cost of labour was one of the main variables in determining cost of providing the contraceptive methods studied. The time used to provide the contraceptive services was used to calculate labour cost.

Sample size of the number of services to be observed was calculated as follows; (Charan and Biswas1, 2013)

$$n = (Z_{1/2\alpha})^2 \times SD^2 / d^2$$

Where – $Z_{1/2\alpha} = 1.96$

SD – expected standard deviation

d = acceptable level of error (5%)

The assumptions were that the slowest method to provide will take an average of 40 minutes, standard deviation (SD) was estimated to be 5 minutes, and the desired precision was 3 minutes. Therefore, sample size is equal to 15 services per method.

3.5 Variables

3.5.1 Contraceptive Methods Included in the Study (Alternatives)

Below is a list of the contraceptive methods studied;

- Intra-Uterine Copper Devices (IUCDs)
- Implants (2-Rod and 1-Rod Implants)
- Depot Medroxy-Progesterone Acetate (DMPA)

- Combined Oral Contraceptive Pills (CoCs)

3.5.2 Cost – Dependent Variables

The following is a list of dependent variables for the study;

- Supplies
- Labour
- Equipment
- Overheads (utilities)
- Capital cost
- Workload

3.5.3 Effectiveness - Independent variables

The independent variables for the study were as set out in Table 1 below.

Table 1: Independent Variables

Method	CYP Per Unit
Copper-T 380-A IUD	4.6 CYP per IUD inserted
3-year implant (e.g. Implanon)	2.5 CYP per implant
5-year implant (e.g. Jadelle)	3.8 CYP per implant
Oral Contraceptives	15 cycles per CYP
Depo Provera (DMPA) Injectable	4 doses per CYP

Source: (USAID, 2014)

3.6 Data Collection

Data was collected between the months of July and October 2018.

3.6.1 Primary data from sample of Healthcare Providers

- Time taken to provide IUCDs (insertion, checkups and removal); Implants (insertion, checkups and removal); DMPA and CoC Pills was measured. A trained data collector sat outside the only FP room in the hospital and timed how long each client took inside the service delivery room. Information on the service provided was obtained from healthcare providers who had consented to the study after getting full information on the study through the informed consent (Appendix II) and signing the consent form (Appendix III). Relevant data was entered into the designated data collection tool (tally sheet) (Appendix VI).
- Data on supplies and equipment required to provide IUCDs (insertion, checkups and removal); Implants (insertion, checkups and removal); DMPA and CoC Pills was collected with the aid of a questionnaire (Appendix VIII). This included the list of required supplies and quantity of each item. The data collector interviewed 3 of the 6 service providers who are permanently stationed in the MCH department of the hospital, and two BSN Interns who consented to the study.
- Data on the number of routine follow-up visits per method (checkups) or visits to manage side effects or for any reason was collected by interviewing the 5 service providers mentioned above using the same questionnaire (Appendix VIII).
- The questionnaire aided interviews were followed by in-depth interviews with 2 of the 5 respondents who had consented to the study to clarify the client's pathway and types of the various supplies and equipment used. Information from the in-depth interviews and questionnaires was validated through procurement records and observation of available supplies and equipment.

3.6.2 Secondary data

Data from hard copies of various records was abstracted using a note book and Abstraction Tables (Appendix IX). Data from electronic records was exported to Microsoft Excel sheets and then abstracted into smaller tables on each worksheet. The following data were obtained from the listed sources as shown on Table 2;

Table 2: Secondary Data and their Sources

Data	Source
Staff Establishment for Kiambu County Hospital	Hospital Admin Records – Human Resource
Posting to MCH Clinic and Duty Roster Salary Scale for various job groups	Hospital Admin Records - Duty Roster County Admin Records (<i>data from Nairobi County was used</i>)
Hospital Expenditure for the 2015/17 Financial Year	Hospital Admin Records – Accounts Report
Space used for MCH (including FP services) and Central Sterile Services Department (CSSD)	Maintenance Records
Workload for 2016/17 Financial Year	<ul style="list-style-type: none"> • DHIS 2 and MoH 717 (Service workload) • MoH 711 (FP) • CSSD records
Equipment and Capital	<ul style="list-style-type: none"> • Hospital Admin Records – Accounts Report • Maintenance Records
Prices of supplies, equipment and FP commodities	<ul style="list-style-type: none"> • KEMSA Pricelist (KEMSA, 2018) • UNFPA Pricelist (UNFPA, 2018) • Private sector Vendors • FP Quantification and Forecasting booklet • Hospital Admin (procurement) Records
Useful life of various equipment and capital used to provide Contraceptive methods	<ul style="list-style-type: none"> • WHO Website (CHOICE) - Capital Items (Useful Lives Reported by Country Experts) • University of California - Equipment Useful Life Table For Depreciation • Kenya Insurance Guideline on Useful Life for compensation purposes.

3.7 Data Analysis

At the end of each day, completed questionnaires, abstraction tables and tally sheets were visually scanned for completeness and other obvious errors. This provided an opportunity to make any corrections by clarifying responses with the respondents or visually confirming various entries. Data was then entered into pre-prepared Microsoft Excel templates and the hard copies were filed.

The digital data underwent cleaning by checking for missing values, double entries, inconsistent values or out of range values. After cleaning, data was organized into various fields corresponding to each contraceptive method.

The study utilized an Activity Based Costing model to estimate the cost of providing the various contraceptive services to clients (Cooper and Kaplan, 1991; Kaplan and Anderson, 2003). The following steps were followed to estimate cost:

- Identification of inputs needed per activity and per method
- Quantification of inputs per method
- Costing of inputs per method
- Computation of cost per method
- Calculation of cost per Couple Years of Protection.

The required inputs included supplies, labour costs, equipment, overheads (utilities and operations costs) and capital. The various methods were then ranked according to their cost-

effectiveness with the method showing the lowest cost per couple years' protection being deemed the most cost-effective.

The key drivers to the costs of the various methods were determined and documented as shown on Table 3.

Table 3: Inputs and Contraceptive Methods

Variables	IUCD	Implants		DMPA	CoC Pills
		2-Rod Implant	1-Rod Implant		
Supplies		<ul style="list-style-type: none"> • Identification of Inputs 			
Labour		<ul style="list-style-type: none"> • Cost of Input 			
Equipment and other Supplies		<ul style="list-style-type: none"> • Total cost per Method. 			
Overheads (utilities)					
Capital cost					
Workload					
Total	Total cost	Total cost	Total cost	Total cost	Total cost
CYP Conversion Factors	4.6	3.8	2.5	0.25	0.0667
Cost per CYP	xxx	Xxx	xxx	xxx	xxx

Source: Author 2017

3.8 Minimization of Errors and Biases

Biases and errors related to data collection tools were minimized by having the data collector who administered the questionnaires (Appendix VIII) assist in recording responses as well as clarifying each question. The questionnaires (Appendix VIII) had various validating questions

to reduce the possible effect of the interviewer (research assistant) on the respondents and their responses.

Research assistants underwent training before the field work to ensure that they all had a common understanding of the objectives of the study, expected quality of the data collected, terms used in the data collection tools, and most importantly the significance of the study and its possible impact in the field of family planning.

To reduce recall bias, respondents were only required to report on the events of the last contraceptive-related service they provided and the information was later validated from secondary data sources or direct observation of equipment and supplies available in the hospital. In the case of secondary data, multiple sources (as detailed in the data collection section) were used for triangulation purposes.

3.9 Ethical Considerations

Ethical approval was obtained from Kenyatta National Hospital / University of Nairobi Ethical Review Committee (KNH/UoN-ERCA210) (Appendix I). Further approval was received from the Kiambu County Health Research Development Unit (Appendix IV) and the Kiambu County Hospital management (Appendix V) before commencing the study.

The results of this study are envisaged to be beneficial to the healthcare providers and clients who participated in the study and the wider population. This is because the results can be used to design and prioritize interventions that would improve working conditions for service

providers as well as improve quality of services for the clients. No monetary or in-kind benefits (including meals, transport costs or airtime) were provided to the participants. Due care was taken to ensure minimum disruptions to normal operations of the participating healthcare providers, including interviewing healthcare providers during their break time. Observation of insertion and removal procedures was done in the least intrusive way possible. Personally identifiable information was only collected for the purposes of accountability and need for clarification of unclear responses. No personally identifiable information was, however, included in data processing or reports.

4.0 Results

4.1 Inputs Required to Provide Services (Descriptive Statistics)

4.1.1 Supplies

From the questionnaire guided interviews of healthcare providers, in-depth interviews and direct observation of available inputs in the months of July and August 2018, the following supplies, as depicted in Table 4 were required to provide the four main contraceptive methods offered in Kiambu County Hospital.

Table 4: Supplies and Contraceptive Methods (n=5)

Inputs	Implants - 2 rod			Implants - 1 rod			IUCD			DMPA	CoC Pills
	Insertion	Check up	Removal	Insertion	Check up	Removal	Insertion	Check up	Removal	Initiation	Initiation
1. 380A IUCD, sealed in polymer pouch, terminally sterilized.	-	-	-	-	-	-	1	-	-	-	-
2. Depo Medroxy-progesterone acetate 150mg/ml.(DMPA)	-	-	-	-	-	-	-	-	-	1	-
3. Implant - 1 Rod (Eto/Implanon)	-	-	-	1	-	-	-	-	-	-	-
4. Implant - 2 Rod (Levo/Jadelle)	1	-	-	-	-	-	-	-	-	-	-
5. Pills (CoC 3 Cycles)	-	-	-	-	-	-	-	-	-	-	1
6. Alcohol Pre Injection Swabs	-	-	-	-	-	-	-	-	-	1	-
7. Bandages cotton L/woven BP Size 10CMX4.5M BP	1	-	1	1	-	1	-	-	-	-	-
8. Chlorhexidine gluconate solution 5% 5000ml	-	-	-	-	-	-	10ml	10ml	10ml	-	-
9. Cotton gauze plain, L/wvn, absorbent - cut into Swabs	-	-	-	-	-	-	-	-	-	-	-
10. Cotton wool, absorbent white, 400g BP (Rolled into balls)	X	-	X	X	-	X	X	X	X	-	-
11. Gloves, latex examination, large 50 pairs	-	1	-	-	1	-	-	-	-	-	-
12. Gloves, surgical, size 7.5" (sterile) 50 pairs	1	-	1	1	-	2	1	1	1	-	-
13. Lidocaine (lignocaine) Inj 1%, 1mg/1mL 30ml vial	2	-	1	1	-	1	-	-	-	-	-
14. Povidone iodine solution 10% 1000ml	5ml	-	5ml	5ml	-	5ml	-	-	-	-	-
15. Surgical blades size 22, s.s/c/s on disp BP handle (Sterile)	-	-	1	-	-	1	-	-	-	-	-
16. Surgical masks	-	-	-	-	-	-	1	1	1	-	-
17. Syringes 2pc 2ml RUP with G23 needle x 1" 100's (with Needle)	1	-	-1	1	-	1	-	-	-	1	-

Key

- 'X' means the equipment was used

-Digits (1, 2, 3.....) means the number of times an item was used to provide each method.

-Dash (-) means the equipment was not used

4.1.2 Equipment

Information on equipment required to provide the four main contraceptive methods offered in Kiambu County Hospital was collected for the month of July and August 2018, and the same is set out in Table 5.

Table 5: Equipment and Contraceptive Methods (n=5)

Input	Implants - 2 rod			Implants - 1 rod			IUCD			DMPA	CoC Pills
	Insertion	Check up	Removal	Insertion	Check up	Removal	Insertion	Check up	Removal	Initiation	Initiation
Triage and Waiting Area											
1. Blood pressure machine Omron	x	x	x	x	x	x	x	x	x	x	x
2. Weighing scale - Wt and Ht (Seca)	x	x	x	x	x	x	x	x	x	x	x
3. Thermometer (Digital)	x	x	x	x	x	x	x	x	x	x	x
4. Stethoscope	x	x	x	x	x	x	x	x	x	x	x
Service Delivery Room											
1. Bucket with lid to clean used instruments in - 20 Litres	-	-	3	-	-	3	3	3	-	-	-
2. Bucket with lid to put waste - 30 Litres	2	2	2	2	2	2	2	2	2	2	1
3. Cotton Material Green for use in theatre.	1	-	1	1	-	1	-	-	-	-	--
4. Drum, sterilizing, diameter 260mm	1	-	1	1	-	1	1	1	1	-	-
5. Extermination bed (<i>Jiechang Motor, 5 function electric Medical Hospital Bed</i>)	1	-	1	1	-	1	1	1	-	-	-
6. Forceps, artery, Mosquito, 12.5cm, curved	-	-	1	-	-	1	-	-	-	-	-
7. Forceps, artery, Mosquito, 12.5cm, Straight	-	-	1	-	-	1	-	-	-	-	-
8. Forceps, sponge-holding, Forester, 25 cm, straight	-	-	-	-	-	-	1	1	1	-	-
9. Forceps, sterilizer, Cheatle, 27 cm, curved	1	-	1	1	-	1	1	1	1	-	-
10. Large kidney dish	-	-	-	-	-	-	1	1	1	-	-
11. Light, examination, mobile	1	1	1	1	1	1	1	1	1	-	-
12. Mackintosh (1 metre ² thick plastic/rubber)	1	-	1	1	-	1	1	1	-	-	-
13. Medium kidney dish - stainless steel	1	-	1	1	-	1	1	1	1	-	-
14. Polythene Bags / Bin Liners (Black) - 30 litres 100's	1	1	1	1	1	1	1	1	1	1	1
15. Polythene Bags / Bin Liners (Yellow) - 30 litres 100's	1	-	1	1	-	1	1	1	1	1	-
16. Protective Apron for Gynecological use (<i>non-sterile, non-disposable</i>)	-	-	-	-	-	-	1	1	1	-	-
17. Safety Box 5 Litres	1	-	1	1	-	1	-	-	-	1	-
18. Scissors, gynaecological, 20cm, curved, blunt/blunt	-	-	-	-	-	-	1	1	1	-	-
19. Small gallipot - stainless steel	1	-	1	1	-	1	1	1	1	-	-
20. Sound, uterine, Martin, 32cm	-	-	-	-	-	-	1	-	-	-	-
21. Speculum, vaginal, Cusco, 9.5 x 3.5 cm	-	-	-	-	-	-	2	1	1	-	-
22. Tenaculum (Forceps, uterine, Duplay, 28cm, curved)	-	-	-	-	-	-	1	-	1	-	-
23. Tray, instruments, stainless steel, 32x20x8cm, with cover	1	-	1	1	-	1	1	1	1	-	-
24. Trolley, dressing, stainless steel, 2 trays	1	1	1	1	1	1	1	1	1	1	1

Key - 'X' means the equipment was used

- Digits (1, 2, 3....) means the number of times the equipment was used to provide each method

- Dash (-) means the equipment was not used

4.1.3 Capital

Data on the capital items required to provide the four main contraceptive methods offered in Kiambu County Hospital in the months of July and August 2018 was captured and results are set out in Table 6.

Table 6: Capital and Contraceptive Methods (n=5)

Inputs	Implants - 2 rod			Implants - 1 rod			IUCD			DMPA	CoC Pills
	insertion	Check up	Removal	Insertion	Check up	Removal	Insertion	Check up	Removal	Initiation	Initiation
1. Pews / forms - Wooden, (waiting area)- 18	x	x	x	x	x	x	x	x	x	x	x
2. Seats - metal with cushion and Backrest (Triage and Service Delivery Room)- 3	x	x	x	x	x	x	x	x	x	x	x
3. Seats - Plastic (Triage and Service Delivery Room) – 3	x	x	x	x	x	x	x	x	x	x	x
4. Storage Cabinets (4x8 Feet) - Wooden (Service Delivery Room) – 1	x	x	x	x	x	x	x	x	x	x	x
5. Table - Office (Wooden, in Triage and Service Delivery Room) – 1	x	x	x	x	x	x	x	x	x	x	x
6. Toyota Double Curb, (Purchased in 2009 Model No. K4N 35R - PRMD HN) – 1	x	x	x	x	x	x	x	x	x	x	x
7. Autoclave Equipment - Estima 108 A – 1	x	x	x	x	x	x	x	x	x	x	x
8. Building Space (Waiting Area, Triage and Service Delivery Room) – 314 Sq M	x	x	x	x	x	x	x	x	x	x	x

Key – ‘X’ means that the capital item was used.

4.1.4 Overheads

Information on the overheads required to provide the four main contraceptive methods offered in Kiambu County Hospital in the months of July and August 2018 was obtained for the study. Findings therefrom are set out in Table 7.

Table 7: Overheads and Contraceptive Methods (n=5)

Inputs	Implants - 2 rod			Implants - 1 rod			IUCD			DMPA	CoC Pills
	Insertion	Check up	Removal	Insertion	Check up	Removal	Insertion	Check up	Removal	Initiation	Initiation
1. Admin (e.g. office Supplies, Software, Printing, etc)	x	x	x	x	x	x	x	x	x	x	x
2. Operating Expenses (e.g. Accommodation, Daily Subsistence e Allowance etc)	x	x	x	x	x	x	x	x	x	x	x
3. Office Equipment (e.g. computers, Furniture etc)	x	x	x	x	x	x	x	x	x	x	x
4. Maintenance	x	x	x	x	x	x	x	x	x	x	x
5. Supplies (Fuel, Lubricants, cleaning material etc)	x	x	x	x	x	x	x	x	x	x	x
6. Personnel (Casuals, Contractual employees, training etc)	x	x	x	x	x	x	x	x	x	x	x
7. Utilities (Electricity,	x	x	x	x	x	x	x	x	x	x	x

Key – ‘X’ means that the overhead was required.

4.1.5 Labour

Information on the number of paid healthcare personnel providing contraceptive services at Kiambu County Hospital was documented. As set out in Table 8, there was an average of 1.25 paid personnel (nurses and BSN Interns) manning the triage of the FP clinic and an average of 2 paid personnel (nurses and BSN Interns) in the service delivery room in the month of July 2018.

Table 8: Healthcare providers Manning FP Clinic

Dates	Triage			Service Delivery Room		
	BSN Interns	Nurses	Nursing Students	BSN Interns	Nurses	Nursing Students
Week 1 - 2nd to 6th July 2018	1	1		1	1	1
Week 2 - 9th to 13th July 2018	1		1	1	1	
Week 3 - 16th to 20th July 2018	1		1	1	1	1
Week 23rd to 27th July 2018	1		1	1	1	1
Average No. of Paid Personnel		1.25			2	

Information on the current staff establishment at the Hospital was also captured. As set out in Table 9, there were a total of 462 staff members in Kiambu County Hospital in 2016/17 financial year. Of these, 416 were professional healthcare providers, 196 of them being nurses and 62 being part of the internship programme.

Table 9: Staff Establishment in 2016/17 FY (by Function)

Function	Number	Percentage of Total
HCP	416	90%
Non-HCPs	46	10%
Internship	62	13%
Nurses	196	42%
Study Leave	11	2%
Attrition	9	2%

From the service provision observations, information was obtained on the time it took health providers to serve clients seeking contraceptive services at Kiambu County Hospital. On average, it took 45 and half minutes to provide IUCD (insertions, checkups and removal), 35 minutes and 12 seconds to provide (insertion, checkups and removal) the 2 Rods Implant, 28 minutes and forty seconds for the 1 Rod Implant (insertion, checkups and removal), 6 and half minutes for DMPA and 7 minutes, 6 seconds to provide 2 cycles of the CoC pills. These findings are shown in Table 10.

Table 10: Time and Contraceptive Methods (n=149)

Methods	Service	Average Time (Min) Per Visit	Standard Deviation (Min)	Confidence Interval (Min)	Average Time Required to Provide Each Method
Implants - 2 Rods	Insertion	14.20	4.44	11.22 - 17.18	35.19
	Removal	17.58	10.88	10.67 - 24.50	
Implants - 1 Rod	Insertion	11.50	6.97	8.04 - 14.96	28.66
	Removal	14.40	8.19	9.86 - 18.94	
IUCD	Insertion	20.05	9.99	15.24 - 24.87	45.51
	Checkups	12.00	8.19	4.43 - 19.57	
	Removal	15.86	11.28	5.43 - 26.29	
DMPA	Provision	6.52	2.46	5.51 - 5.51	6.52
CoC Pills (2 Cycles)	Provision	7.11	8.17	3.43 - 10.78	7.11

4.1.6 Family Planning Workload

In the 2016/17 financial year, Kiambu County Hospital provided 3,099 family planning services (number of visits). This is approximately 0.87% of the total hospital workload of 355,910 (in and out patients—with one day as inpatient being equated to one outpatient visit). DMPA (I.M. suspension containing 150 mg Medroxy-progesterone) contributed 856 visits (28%) of all FP services. CoC Pills (Strips of 28 pills - 21 each containing Ethinylestradiol 30 mcg, and Levonogestrel 150 mcg and an extra 7 containing Ferrous Sulfate) contributed 705

visits (23%). The 2-Rod Implants (2 flexible rods containing 75 mg of Levonorgestrel each) contributed 347 visits (11%). IUCDs (Intra-Uterine Copper Devices 380-Copper T[®]) contributed 316 visits (10%). The 1-Rod Implants (1 flexible rod containing 68 mg of Etonogestrel) contributed 215 visits (7%). Other methods including male condoms and Progestogen only pills accounted for 660 visits (21%). New provision of various methods accounted for 45% of all the FP visits, while revisits comprising continuation of methods and checkups accounted for 55% of all FP visits. Removal of implants and IUCDs accounted for 10% of all the services and provision of contraceptive methods accounted for 90%. Table 11 presents the results of FP workload in the Hospital.

Table 11: FP Workload per Service for Each Method (N = 3099)

Method	Insertion/ Provision	Revisit/ Continuation	Removal	Total	
Implants -Rod 2	230	51%	117	347	11%
Implants -Rod 1	145	68%	70	215	7%
IUCD	198	74%	118	316	10%
DMPA	856	54%	N/A	856	28%
CoC Pills	705	60%	N/A	705	23%
Other	660	37%	N/A	660	21%
Average %age Contribution / Total	90%	55%	10%	3099	100%

4.2 Cost of Providing Each Method (Analytical Statistics)

Costs of providing each contraceptive method were calculated using the formulae set out in the Methodology section. The costs of providing the methods studied for each dependent variable and each method per service offered are shown in Table 12.

Table 12: Dependent Variables Per Method and Cost Per Service

Dependent Variable	Method	Insertion/ Provision (KeS)	Check – ups (KeS)	Remov al (KeS)	Total Cost (KeS)	Confidence Interval
Supplies	Implants -Rod 2	1 018	2	70	1 090	- -
	Implants -Rod 1	1 033	2	70	1 105	- -
	IUCD	121	26	43	190	- -
	DMPA	115	-	-	115	- -
	CoC Pills	25	-	-	25	- -
Labour	Implants -Rod 2	288	46	329	663	[464 - 863]
	Implants -Rod 1	266	43	296	605	[404 - 806]
	IUCD	355	217	311	883	[541 - 1225]
	DMPA	219	-	-	219	[185 - 253]
	CoC Pills	109	-	-	109	[53 - 165]
Equipment	Implants -Rod 2	60	112	60	132	- -
	Implants -Rod 1	60	12	60	132	- -
	IUCD	54	43	54	151	- -
	DMPA	18	-	-	18	- -
	CoC Pills	3	-	-	3	- -
Overheads	Implants -Rod 2	247	49	247	543	- -
	Implants -Rod 1	247	49	247	543	- -
	IUCD	356	285	356	997	- -
	DMPA	229	-	-	229	- -
	CoC Pills	114	-	-	114	- -
Capital	Implants -Rod 2	29	6	29	64	- -
	Implants -Rod 1	29	6	29	64	- -
	IUCD	31	25	31	87	- -
	DMPA	28	-	-	28	- -
	CoC Pills	14	-	-	14	- -

4.3 Total Cost for Each Method

The total cost of providing each of the four contraceptive methods was computed from the data obtained at the Kiambu County Hospital. From the calculations, it was found that the average cost of providing the 2 Rods Implant to one client was KeS 2,492 (Supplies 44%, Labour 27%, Equipment 5%, Capital 3% and Overheads 22%). To provide the 1 Rod Implant, it cost an average of KeS 2,449 (Supplies 45%, Labour 25%, Equipment 5%, Capital 3% and Overheads 22%). On the other hand, it cost an average of KeS 2,308 (Supplies 8%, Labour 38%, Equipment 7%, Capital 4% and Overheads 43%) to provide an IUCD to one client. Further, it cost an average of KeS 609 (Supplies 19%, Labour 36%, Equipment 3%, Capital 5% and Overheads 38%) to provide one DMPA injection to a client. Finally, it cost an average of KeS 265 (Supplies 9%, Labour 41%, Equipment 1%, Capital 5% and Overheads 43%) to provide one cycle of CoC Pills. These results are set out in Table 13.

Table 13: Total Cost of Providing Each Method (n=149)

Methods	Supplies		Labour		Equipment		Capital		Overheads		Total
	(KeS)	(%)	(KeS)	(%)	(KeS)	(%)	(KeS)	(%)	(KeS)	(%)	(KeS)
Implants -Rod 2	1,090	44%	663	27%	132	5%	64	3%	543	22%	2,492
Implants -Rod 1	1,105	45%	605	25%	132	5%	64	3%	543	22%	2,449
IUCD	190	8%	883	38%	151	7%	87	4%	997	43%	2,308
DMPA	115	19%	219	36%	18	3%	28	5%	229	38%	609
CoC Pills	25	9%	109	41%	3	1%	14	5%	114	43%	265
Total	2,525	31%	2,479	31%	435	5%	256	3%	2,426	30%	8,123

4.4 Cost-Effectiveness of Each Method

The cost-effectiveness of each of the four contraceptive methods was also computed using the formula described in the Methodology section. From the computation, the cost to the hospital

per Adjusted Couple Years of Protection (ACYP) was found to be KeS 655 for the 2 Rod Implant, KeS 979 for the 1 Rod Implant, KeS 502 for IUCD, KeS 2439 for DMPA, and KeS 3,977 for the CoC Pills. The results of the computation are set out in Table 14.

Table 14: The Cost-Effectiveness of Each Method (N=149)

Method	Total Cost Per Method	CYP Conversion Factors	Cost Per CYP	Cost-Effectiveness Ratio	Confidence Interval
Implants -Rod 2	2,492	3.80	655	1.30	[603 - 708]
Implants -Rod 1	2,449	2.50	979	1.95	[899 - 1,059]
IUCD	2,308	4.60	502	1.00	[428 - 577]
DMPA	609	0.25	2,439	4.86	[2,303 - 2,576]
CoC Pills	265	0.07	3,977	7.92	[3,131 - 4,822]

5.0 Discussion

Many previous studies have shown that long-term methods are more cost-effective than short-term methods (Mavranezouli, 2008; Lipetz, Phillips and Fleming, 2009; Henry *et al.*, 2015; Lafuma *et al.*, 2015). The results of this study are generally consistent with majority of the earlier studies with the IUCD attracting the lowest cost per couple years' protection (CYP), followed by the 2-Rod Implant (1.3 times more than IUCD), the 1-Rod Implant (1.95 times), DMPA (4.86 times), and finally COC Pills (7.92 times).

The results of this study were only partially consistent with a similar study carried out in Kenya that considered only the variable costs (commodities and personnel) from the provider perspective (Futures Group, 2010). In the 2010 Futures Group study, the IUCD attracted the least cost per CYP at 2.76 USD when compared to the Pill at 8.2 USD, DMPA at 8.55 USD, and finally the implants at 13.42 USD. The difference can be explained by differing commodities costs between 2009 and 2019 (Jacobstein and Stanley, 2013) (Christofield and Lacoste, 2015) and the failure to consider fixed costs in the Futures Group study.

The results of this study were also partially consistent with a retrospective study undertaken in Iran over a 12 months' period that considered both variable and fixed costs from the providers perspective (Nakhaee, Gorji and Mohammadi, 2002). In the Iran study, the IUCD attracted the least cost per CYP at 13.4 USD when compared to the Pill at 21.1 USD, DMPA at 46.8 USD, and Implants at 82.8 USD. Although it is not possible to compare the absolute costs due to differing market dynamics and time of the study, the pattern of cost-effectiveness between long-term and short-term methods is completely different with dominance of the IUCD being

the only similarity. This difference can be explained by the reduction in the cost of Implants in 2013 (Jacobstein and Stanley, 2013) (Christofield and Lacoste, 2015) as well as differing market dynamics between Kenya and Iran.

Two studies showed DMPA to be the most cost-effective method. A retrospective study conducted in Uganda, from the provider perspective, only considered recurrent costs. Findings from the Uganda study showed that DMPA is 5.5 times more cost-effective than pills (Ssewanyana and Kasirye, 2017) and this is generally consistent with the results of this study (1.6 times more cost-effective than the pill). A cost modeling study in the US, from provider perspective, showed that DMPA was the least costly method per avoided pregnancy at 221 USD, followed by IUCD at 338 USD and the Pill at 350 USD, while Implants (similar to the 2-Rod Implant studied in Kenya) were found to be the most expensive at 503 USD (Sauer and Ann, 1999). This is the only study that shows DMPA dominating the IUCD but it is consistent with other studies that have found Implants to be least cost-effective. The difference with the findings of this study can be explained by differing market dynamics (cost of contraceptive commodities) and determination of effectiveness. Short-term methods are user dependent (Mavranezouli, 2008; Kavanaugh *et al.*, 2013) (Jacobstein and Stanley, 2013) and therefore may be affected by socio-economic differences in the population.

Cost-effectiveness studies in Europe were prospective in nature, tracking cost-effectives over time from the society perspective. A cost modeling study in the UK over a 15 year period found that the IUCD and DMPA dominated the Pills from one year onwards and Implants after 2 years (Mavranezouli, 2008). Among the LARCs, DMPA was the least cost-effective

across all time frames. The findings of the UK study are consistent with the findings of this study in the 2-15 years' time period, where the IUCD is most cost-effective, followed by Implants and DMPA, while the CoC pill is least cost-effective. Another cost modeling study carried out in the UK over a 36 months' period (Lipetz, Phillips and Fleming, 2009) found that Implants dominate CoC Pills across all time which is consistent with the findings of this study.

It may be safe, therefore, to conclude that IUCD is the most cost-effective of the methods studied and that long-term methods are more cost-effective than short-term methods. Domination of pills and DMPA by implants as seen in this study may be explained by the drastic reduction of the cost of Implants for FP2020 countries (Kenya is a member) in 2013 (Jacobstein and Stanley, 2013) (Christofield and Lacoste, 2015). Domination of the Pills by DMPA in this study could also be explained by inclusion of fixed cost as well effects of pooled procurement, which could also explain the picture seen in Uganda.

The conclusion that long-term are more cost-effective is further supported by a plausible explanation. Higher cost-effectiveness for long-term methods when compared to short-term as seen in this study can be attributed to long-term methods having less user effect (Jacobstein and Stanley, 2013) (Mavranouzouli, 2008). This leads to superior effectiveness during typical use, and less interaction with the health system due to longer period of effectiveness. While there is no difference between effectiveness during typical use and during correct and consistent use for IUCD and Implants (> 99%), there is significant difference in the case of DMPA (>99% with correct and consistent use compared to 97% for typical use), and CoC

(>99% with correct and consistent use compared to 92% for typical use). In this study, both length of effectiveness and failure rate (during typical use) were reflected in the CYP conversion factors (Stover *et al.*, 1997). This means that investing in provision of long-term methods, even in the context of Kiambu County Hospital, would be a more efficient use of resources than investing in short-term methods.

These results should be interpreted with caution since they could have been affected by factors such as movement of healthcare providers from facility to facility and around various departments within the same facility. Labour, which accounted for 31% on average for all the methods studied (41% for CoC Pills), was based on time taken to provide various methods. Also, although the difference in cost-effectiveness was significant, only the cost of labour was subject to statistical analysis. Other costs were based on secondary data and actual measurements. Workload was used to distribute cost among the various methods and changes in the workload for various methods would therefore produce different results (Nakhaee, Gorji and Mohammadi, 2002).

This study supports earlier studies that found that long-term methods generally attract higher absolute cost of service delivery when compared to short-term methods (Mavranouzouli, 2008) (Lipetz, Phillips and Fleming, 2009). In this study, long-term methods attracted higher costs in absolute terms; with implants being the most expensive (2-Rod Implant at KeS 2,447.31 and 1 –Rod Implant at KeS 2,489.79), followed by IUCD at KeS 2,310.20, DMPA at KeS 609.86, and finally the CoC Pills at KeS 265.10. The cost of supplies, labour and overheads contributed the most to the cost of providing each method. It is worth noting that the cost of

contraceptive commodities is one of the main reasons for long-term methods attracting higher cost of service delivery than short-term methods. This is especially so for implants (Espey and Ogburn, 2011). Other reasons include cost of labour, training and equipment required to provide the long-term methods (Mavranouzouli, 2008) (Kavanaugh *et al.*, 2013). In almost all the cost-effectiveness studies comparing long-term and short-term methods, long-term methods only dominated short-term methods after about 1 year (Mavranouzouli, 2008) (Lipetz, Phillips and Fleming, 2009), (Henry *et al.*, 2015). Although the long-term methods are more cost-effective than short-term methods, higher initial investments are required to provide the services.

Study limitations

Interpretation of this study should take into consideration the following limitations. Costs were restricted to the perspective of the health facilities. Costs accruing to the clients and the wider society were not subject of this study. Costs associated with user fee, transport, unintended pregnancies and their consequences were not considered (to the clients and the health system). The results, however, still provide useful information on cost-effectiveness of the contraceptive methods studied in the context of Kiambu County Hospital and similar public health facilities.

The study did not consider the costs (from any perspective) associated with failure of contraceptive methods (for example cost of unwanted pregnancies) or treatment of side effects and complications that may result from their use.

Conclusion and Recommendations

Long-term methods were found to be more cost-effective than short-term methods in Kiambu County Hospital. However, the initial cost of providing long-term methods is higher than that of short-term methods. Investing in long-acting methods is an efficient way of using healthcare resources allocated to contraceptive services.

Work Plan

Budget

The study was carried out at a cost of about KeS 72,700 as shown in Table 15. This cost excludes personal expenses in the form of transport to the study site and does not account for the time spent by the researcher on the project.

Table 15: Activities and the Costs of Carrying Out the Project

Item	Units Required	Unit Cost (KeS)	Total Cost (KeS)
Data Collectors	1 for 10 days (10)	2,700	27,000
Data Entry and Processing	2 for 2 days (4)	2,500	10,000
Data Analysis	1	15	15,000
Ethical Review Committee	1	2,000	2,000
Kiambu Hospital Admin	1	5,000	5,000
Miscellaneous	1		13,700
Total			72,700

Work Plan

The study took about 6 months to complete from the time ERC approval was received to the completion of the report Table 16. The process of developing the proposal took about one year and the ERC approval took about 6 months.

Table 16: Milestones and Time Taken to Carry Out the Project.

	July/Aug 2018				Sep/Oct 2018				Nov/Dec 2018			
Ethical Review Board	x											
Data Collection			x	x	x	x						
Entry and Processing					x	x	x	x				
Analysis							x	x	x			
Report Writing										x	x	x

6.0 Bibliography




- Canning, D. and Schultz, T. P. (2012) 'The economic consequences of reproductive health and family planning', *The Lancet*, 380, pp. 165–171.
- Charan, J. and Biswas, T. (2013) 'How to Calculate Sample Size for Different Study Designs in Medical Research?', *Indian Journal of Psychological Medicine*, 35(2), pp. 121–126. doi: 10.4103/0253-7176.116232.
- Christofield, M. and Lacoste, M. (2015) 'Accessible Contraceptive Implant Removal Services : An Essential Element of Quality Service Delivery and Scale-Up', 4(3), pp. 366–372.
- Cooper, R. and Kaplan, R. S. (1991) 'Profit Priorities from Activity-Based Costing', pp. 130–5. Available at: http://disa.uniroma3.it/wp-content/uploads/2016/09/588_3931.pdf.
- Espey, E. and Ogburn, T. (2011) 'Long-Acting Reversible Contraceptives', *Obstetrics & Gynecology*, 117(3), pp. 705–719. doi: 10.1097/AOG.0b013e31820ce2f0.
- FROST, J. J. . *et al.* (2014) 'Return on Investment: A Fuller Assessment of the Benefits and Cost Savings of the US Publicly Funded Family Planning Program', *The Milbank Quarterly*, 92(4), pp. 667–720. doi: 10.1111/1468-0009.12212.
- Futures Group (2010) *The Cost of Family Planning in Kenya*. Washington, DC. Available at: http://www.healthpolicyinitiative.com/Publications/Documents/1189_1_1189_1_Kenya_Brief_FINAL_7_12_10_acc.pdf.
- Guttmacher Institute (2017) *ADDING IT UP: Investing in Contraception and Maternal and Newborn Health.*, Guttmacher Institute. New York. Available at: <http://www.gatesfoundation.org/What-We-Do/Global-Development/Family-Planning%0Ahttps://www.guttmacher.org/fact-sheet/adding-it-up-contraception-mnh-2017>.
- Henry, N. *et al.* (2015) 'Cost-effectiveness analysis of a low-dose contraceptive levonorgestrel intrauterine system in Sweden', *John Wiley & Sons Ltd (on behalf of Nordic Federation of Societies of Obstetrics and Gynecology (NFOG))*, 94, pp. 884–890. doi: 10.1111/aogs.12679.
- Jacobstein, R. and Stanley, H. (2013) 'Contraceptive implants: providing better choice to meet growing family planning demand.', *Global health, science and practice*, 1(1), pp. 11–7. doi: 10.9745/GHSP-D-12-00003.
- Jayatunga, W. (2018) *Contraception : Economic Analysis Estimation of the Return on Investment (ROI) for publicly funded contraception in England*. London. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730292/contraception_return_on_investment_report.pdf.
- Kaplan, R. S. and Anderson, S. R. (2003) *Time-Driven Activity-Based Costing*. doi: <https://dx.doi.org/10.2139/ssrn.485443>.

- Kavanaugh, M. L. *et al.* (2013) ‘Meeting the contraceptive needs of teens and young adults: Youth-friendly and long-acting reversible contraceptive services in U.S. family planning facilities’, *Journal of Adolescent Health*, 52(3), pp. 284–292. doi: 10.1016/j.jadohealth.2012.10.276.
- Keen, S. *et al.* (2017) ‘Scaling up family planning in Sierra Leone: A prospective cost–benefit analysis’, *Women’s Health*, p. 174550571772461. doi: 10.1177/1745505717724617.
- KEMSA (2018) *Core Business, Sales and Marketing, KEMSA Price List*.
- Kenya National Bureau of Statistics (KNBS) (2014) *KDHS*. Nairobi, Kenya.
- Lafuma, A. *et al.* (2015) ‘Cost-Effectiveness of Nexplanon® (Etonogestrel Implant) Compared to other Reimbursed Contraceptive Methods in France Based on Real Life Data’, *VALUE IN HEALTH* 18, 8, pp. 735–736. doi: 10.1016/j.jval.2015.09.2818.
- Lakha, F. and Glasier, A. F. (2006) ‘Continuation rates of Implanon R in the UK : data from an observational study in a clinical setting’, *Contraception*, 74, pp. 287–289. doi: 10.1016/j.contraception.2006.05.072.
- Lanzona, L. A. J. (2013) ‘Family Planning as an Investment in Human Capital: Cost-Benefit Analysis of the Programme in Malaybalay, Bukidnon, the Philippines’, *Millennial Asia*, Vol 4(Issue 1), pp. 41–66.
- Lipetz, C., Phillips, C. J. and Fleming, C. F. (2009) ‘The cost-effectiveness of a long-acting reversible contraceptive (Implanon ®) relative to oral contraception in a community setting’, *Contraception*. Elsevier Inc., 79(4), pp. 304–309. doi: 10.1016/j.contraception.2008.11.003.
- Mavranzouli, I. (2008) ‘The cost-effectiveness of long-acting reversible contraceptive methods in the UK : analysis based on a decision-analytic model developed for a National Institute for Health and Clinical Excellence (NICE) clinical practice guideline’, *Human Reproduction*, 23(6), pp. 1338–1345. doi: doi:10.1093/humrep/den091.
- Mercy G. Mugo and Muriithi, P. J. (2017) ‘Cost effectiveness analysis of family planning programs.’, *14 Journal of African Development*, (19), pp. 13–22.
- Ministry of Health (2018) *Kenya Master Health Facility List*.
- Ministry of Health (a) (2018) *Kenya Health Information System, DHIS2*. Available at: <https://hiskenya.org/dhis-web-commons/security/login.action;jsessionid=E54DC6FD2379988937FA75DA431E68F0> (Accessed: 15 August 2018).
- MOH (2018) *National Family Planning Costed Implementation Plan 2012-2015*. Nairobi. Available at: <http://familyhealth.go.ke/wp-content/uploads/2018/02/National-FP-Costed-Implementation-Plan-2017-2020.pdf>.
- Nakhaee, N., Gorji, A. M. H. A. and Mohammadi, M. (2002) ‘Assessing the cost-effectiveness of contraceptive methods in Shiraz , Islamic Republic of Iran’, *Eastern Mediterranean Health Journal*, 8(1), pp. 55–63.

- Palomba, S. *et al.* (2012) ‘Nexplanon : the new implant for long-term contraception . A comprehensive descriptive review Nexplanon : the new implant for long-term contraception . A comprehensive descriptive review’, *Gynecological Endocrinology*, 3590(August 2017), pp. 710–721. doi: 10.3109/09513590.2011.652247.
- Sauer, D. L. H. and Ann, K. (1999) ‘Estimating the Relative Cost Effectiveness of Four Contraceptive Methods in the Prevention of Unwanted Pregnancies within Department of Defense Active-Duty Women’, *Journal of Managed Care Pharmacy* 131, 5(2), pp. 131–136.
- Ssewanyana, S. and Kasirye, I. (2017) ‘The Cost Effectiveness of Family Planning Services in Uganda’, *Journal of African Development*, (19), pp. 1–11.
- State, P. (2010) ‘One-Year Experience With Implanon Sub-Dermal Implants In Jos , Nigeria’, 13(March), pp. 28–31.
- Stover, J. *et al.* (1997) *Empirically Based Conversion Factors for Calculating Couple-Years of Protection*.
- Sweileh, W. M. and Barham, A. M. (2003) ‘Contraceptive Methods: Cost/Effectiveness Ratio from a Customer’s Perspective in Palestine’, *An-Najah Univ. J. Res. (N. Sc)*, 17(1), pp. 43–51.
- Trussell, J. (2004) ‘Contraceptive efficacy’, in Hatcher RA; Trussell J; Srewart F; Nelson A; Cates W; Guest F; Kowal D (ed.) *Contraceptive Technology*. Eighteenth. New York: Ardent Media, pp. 773–845.
- Trussell, J. and Shochet, T. (2003) ‘Cost-effectiveness of emergency contraceptive pills in the public sector in the USA’, *Expert Review of Pharmacoeconomics & Outcomes Research*, 3(4), pp. 433–440. doi: 10.1586/14737167.3.4.433.
- Udeh, B., Losch, M. and Spies, E. (2009) *The Cost of Unintended Pregnancy in Iowa: A Benefit-Cost Analysis of Public Funded Family Planning Services*, *Iowa Research Online*. Available at: http://ir.uiowa.edu/cgi/viewcontent.cgi?article=1047&context=ppc_health.
- UNFPA (2018) *UNFPA Procurement Services, UNFPA Product Catalog: Register or log-in for full product details*.
- USAID (2014) *USAID Website, COUPLE YEARS OF PROTECTION (CYP)*. Available at: <https://www.usaid.gov/what-we-do/global-health/family-planning/couple-years-protection-cyp> (Accessed: 5 August 2017).
- WHO (2011) *Family Planning: A Global Handbook for Providers (2011 Update)*. Baltimore and Geneva. Available at: http://apps.who.int/iris/bitstream/10665/44028/1/9780978856373_eng.pdf.
- Wilson, S. *et al.* (2014) ‘Immediate postpartum etonogestrel implant : a contraception option with’, *Contraception*. Elsevier Inc., 90(3), pp. 259–264. doi: 10.1016/j.contraception.2014.05.006.

7.0 Appendices

Appendix I: ERC Approval

		
UNIVERSITY OF NAIROBI COLLEGE OF HEALTH SCIENCES P O BOX 19676 Code 00202 Telegrams: varsity Tel:(254-020) 2726300 Ext 44355	KNH-UON ERC Email: uonknh_erc@uonbi.ac.ke Website: http://www.erc.uonbi.ac.ke Facebook: https://www.facebook.com/uonknh.erc Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC	KENYATTA NATIONAL HOSPITAL P O BOX 20723 Code 00202 Tel: 726300-9 Fax: 725272 Telegrams: MEDSUP, Nairobi
Ref: KNH-ERC/A/210		June 13, 2018
James Kiragu Reg. No. H70/80667/2015 School of Public Health College of Health Sciences <u>University of Nairobi</u>		
Dear James		
RESEARCH PROPOSAL – DETERMINE THE COST-EFFECTIVENESS OF CONTRACEPTIVE METHODS OFFERED IN KIAMBU COUNTY HOSPITAL IN THE REPUBLIC OF KENYA (P74/02/2018)		
This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and <u>approved</u> your above research proposal. The approval period is from 13 th June 2018 – 12 th June 2019.		
This approval is subject to compliance with the following requirements:		
<ul style="list-style-type: none">a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (<i>Attach a comprehensive progress report to support the renewal</i>).f) Submission of an <i>executive summary</i> report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.		
Protect to discover		

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,



PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
 The Deputy Director, CS, KNH
 The Chairperson, KNH-UON ERC
 The Assistant Director, Health Information, KNH
 The Director, School of Public Health, UON
 Supervisor: Dr. Richard Ayah, School of Public Health, UON

Protect to discover

Appendix II: Informed Consent

KNH-UoN/ERC/FORM/IC01



UNIVERSITY OF NAIROBI (UoN)
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

KNH-UoN ERC

Email: uonknh_erc@uonbi.ac.ke
Website: <http://www.erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: [@UONKNH_ERC](https://twitter.com/UONKNH_ERC) https://twitter.com/UONKNH_ERC



KENYATTA NATIONAL HOSPITAL (KNH)
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

PARTICIPANT INFORMATION AND CONSENT FORM

SAMPLE ADULT CONSENT

FOR ENROLLMENT IN THE STUDY

(To be administered in English or any other appropriate language e.g Kiswahili translation)

Title of Study: Determine the cost-effectiveness of contraceptive methods offered in Kiambu

County Hospital, in The Republic of Kenya

Principal Investigator\and institutional affiliation: _

James Kiragu Ngacha
Phone; +254 722 792 537.
Email; jngacha@yahoo.com
School of Public Health, University of Nairobi
P.O. Box 19676, Nairobi – 00200, Kenya.
Telephone: +254-020-2726300 - Ext: 43481, 2724639,
Mobile: +254-775179512, Fax: +254-020-2720509,
E-mail: director-sph@uonbi.ac.ke

Co-Investigators and institutional affiliation: Supervised by Dr. Richard Ayah, University of Nairobi, School of Public Health

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research: i) Your decision to participate is entirely voluntary ii) You

may withdraw from the study at any time without necessarily giving a reason for your withdrawal
 iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? YES / NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No. P74/02/2018

WHAT IS THIS STUDY ABOUT?

The researchers listed above are interviewing individuals who Consent. The purpose of the interview is to find out how cost-effective the various contraceptive methods are within Kiambu County Hospital. Participants in this research study will be asked questions about how fast they provide various contraceptive methods and, the material and equipment they use. Participants will also have the choice to undergo test such as timing of the time taken to provide various methods.

There will be approximately 15 participants in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

You will be interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 30 minutes. The interview will cover topics such as estimated time taken to provide various contraceptive methods and the material and equipment used.

After the interview has finished, researchers will directly observe the pathway taken by clients from the time they enter the facility to the time they leave and record the time taken in each step.

We will ask for a telephone number where we can contact you if necessary. If you agree to provide your contact information, it will be used only by people working for this study and will never be shared with others. The reasons why we may need to contact you include: to help us clarify any information that may still remain unclear after the interview.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will keep all of our paper records in a locked file cabinet. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview.

It may be embarrassing for you to have [someone observe and record the time you spend with various clients](#). We will do everything we can to ensure that this is done in private. Furthermore, all study staff and interviewers are professionals with special training in these examinations/interviews. Also, [recalling how much time you spend with various type of clients](#) may be stressful (e.g event recalls).

You may feel some discomfort when [N/A](#) and you may have a small bruise or swelling in your [N/A](#). In case of an injury, illness or complications related to this study, contact the study staff right away at the number provided at the end of this document. The study staff will treat you for minor conditions or refer you when necessary.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

You may benefit by receiving free [N/A](#) testing. (list e.g. Counselling, health information etc). We will refer you to a hospital for care and support where necessary. Also, the information you provide will help us better understand how to [improve efficiency in delivering contraceptive services](#). This information is a contribution to science and [may be used to improve how you deliver services to clients in future](#).

WILL BEING IN THIS STUDY COST YOU ANYTHING?

[Participating in this study will indirectly cost you in the form of taking your free time to respond to the questionnaire.](#)

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

[Participants will not be compensated for the time spent answering the questionnaire](#)

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice or loss of any benefits.

Appendix III: Consent form

KNH-UoN/ERC/FORM/IC01		
CONSENT FORM (STATEMENT OF CONSENT)		
Participant's statement		
I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.		
I understand that all efforts will be made to keep information regarding my personal identity confidential.		
By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.		
I agree to participate in this research study:	Yes No	
I agree to have (define specimen) preserved for later study:	Yes No	
I agree to provide contact information for follow-up:	Yes No	
Participant printed name: _____		
Participant signature / Thumb stamp _____ Date _____		
Researcher's statement		
I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.		
Researcher's Name: _____	Date: _____	
Signature _____		
Role in the study: _____ <i>[i.e. study staff who explained informed consent form.]</i>		
For more information contact Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke at KNH Complex from Monday to Friday during working hours		
Version 1.1	Page 4 of 5	April 2016

Witness Printed Name *(If witness is necessary, A witness is a person mutually acceptable to both the researcher and participant)*

Name _____ Contact information _____

Signature /Thumb stamp: _____ Date: _____

Appendix IV – County Government Approval

COUNTY GOVERNMENT OF KIAMBU DEPARTMENT OF HEALTH SERVICES

All correspondence should be addressed to
HEAD HRDU – HEALTH DEPARTMENT
Email address: mdiritu@gmail.com
mkwasa@live.com
Mobile: 0721641516
0721974633



HEALTH RESEARCH AND DEVELOPMENT
UNIT
P. O. BOX 2344 - 00900
KIAMBU

Ref. No: KIAMBU/HRDU/AUTHO/2018/06/21/Kiragu J

Date: 21 Jun 2018

TO WHOM IT MAY CONCERN,

RE: CLEARANCE TO CONDUCT RESEARCH IN KIAMBU COUNTY

Kindly note that we have received a request by **Dr. James Kiragu** of **University Of Nairobi** to carry out research in Kiambu County, the research topic being on ***“Determine The Cost-Effectiveness Of Contraceptive Methods Offered In Kiambu County Hospital In The Republic Of Kenya”***.

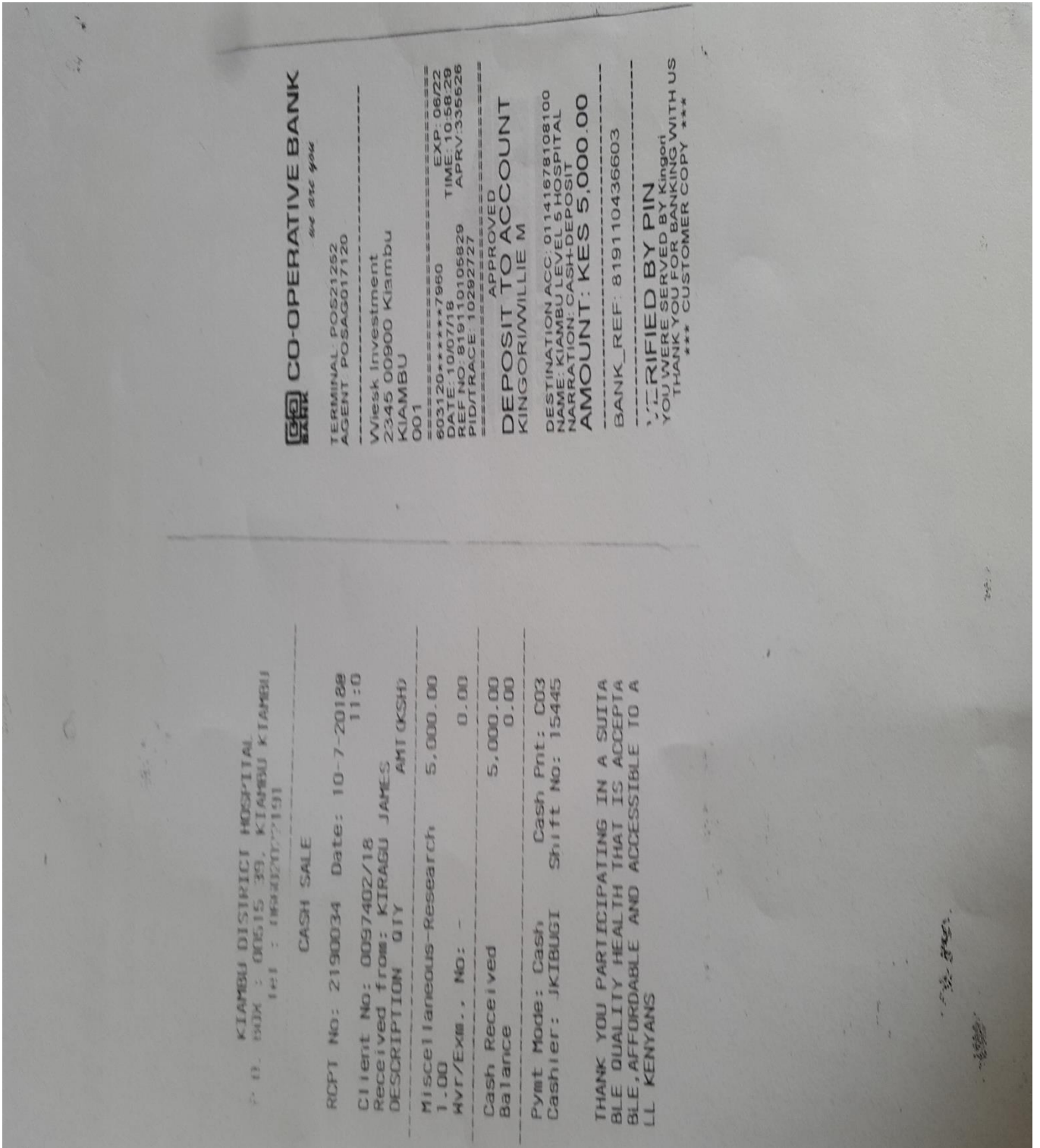
We have duly inspected his documents and found that he has been cleared by **Knh-Uon Erc** until **12 Jun 2019**. He thus does not need any further clearance with another regulatory body in order to conduct research within the county of Kiambu.

However, it is incumbent upon the facility in which the research is being carried out to ensure that they are conversant with the remit of the study and operate in line with their institutional norms on conducting research. This note also accords him the duty to provide feedback on his research to the county at the conclusion of his research.

A handwritten signature in black ink, appearing to read 'M. Ndiritu Ndirangu'.

DR. M. NDIRITU NDIRANGU
COUNTY HEALTH RESEARCH DEVELOPMENT UNIT
KIAMBU COUNTY

Appendix V - Payment to Kiambu County Hospital



Appendix VI – CPR by Counties

Table 3.10. Current use of contraception by county

Percent distribution of currently married women age 15-49, by contraceptive method currently used, according to county, Kenya 2014

County	Modern method										Any traditional method				Total	Number of women		
	Any modern method	Female sterilisation	Male sterilisation	IUD	Implants	Injectables	Pill	Male condom	Female condom	LAM	Other	Rhythm	Withdrawal	Other			Not currently using	
Coast	43.9	38.3	1.6	0.0	2.2	9.4	18.7	4.7	1.5	0.0	0.1	5.6	4.2	1.4	0.1	56.1	100.0	1,821
Mombasa	55.0	43.6	0.2	0.0	3.2	12.6	17.7	6.5	2.9	0.0	0.4	11.4	9.0	2.4	0.0	45.0	100.0	537
Kwale	41.5	38.2	3.0	0.0	1.6	6.8	21.6	4.3	0.8	0.0	0.0	3.3	2.2	1.1	0.0	58.5	100.0	357
Kilifi	34.1	32.8	2.8	0.0	1.1	10.0	15.9	2.7	0.3	0.0	0.0	1.3	0.9	0.3	0.0	65.9	100.0	600
Tana River	28.7	20.5	0.2	0.0	0.4	2.7	13.1	1.1	3.0	0.0	0.0	8.2	3.9	4.3	0.0	71.3	100.0	144
Lamu	42.2	39.5	1.2	0.0	1.0	6.4	19.0	10.2	1.2	0.0	0.5	6.6	5.4	0.5	0.0	57.8	100.0	55
Taita Taveta	68.0	61.3	0.4	0.0	6.9	8.6	34.1	10.0	1.5	0.0	0.0	6.6	5.4	0.5	0.0	32.0	100.0	128
North Eastern	3.4	3.4	0.0	0.0	0.1	0.6	1.9	0.6	0.1	0.0	0.1	0.0	0.0	0.0	0.0	96.6	100.0	451
Garissa	5.5	5.5	0.0	0.0	0.2	1.5	2.4	1.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	94.5	100.0	165
Wajir	2.3	2.3	0.0	0.0	0.0	0.2	1.6	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	97.7	100.0	158
Mandera	1.9	1.9	0.0	0.0	0.0	0.0	1.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.1	100.0	128
Eastern	70.4	63.9	4.8	0.0	2.9	7.8	37.9	8.9	1.5	0.0	0.0	6.5	5.6	0.5	0.3	29.6	100.0	2,667
Marsabit	11.7	10.9	0.4	0.0	0.3	2.7	6.3	1.1	0.0	0.0	0.0	0.8	0.8	0.0	0.0	88.3	100.0	76
Isiolo	27.0	26.3	0.8	0.0	1.4	3.3	13.2	7.2	0.4	0.0	0.0	0.7	0.6	0.1	0.0	73.0	100.0	65
Meru	78.2	73.2	4.3	0.0	5.4	3.5	44.8	12.3	2.8	0.0	0.0	5.0	4.3	0.7	0.0	21.8	100.0	690
Tharaka-Nithi	74.0	67.2	1.8	0.0	7.2	5.5	44.1	7.0	1.3	0.2	0.0	6.8	4.3	0.6	1.9	26.0	100.0	169
Embu	70.6	67.2	3.8	0.0	4.6	11.0	31.2	15.2	1.5	0.0	0.0	3.2	3.2	0.2	0.0	29.4	100.0	266
Kitui	57.3	55.1	3.0	0.0	1.1	9.5	36.9	4.5	0.0	0.0	0.0	2.2	2.0	0.0	0.2	42.7	100.0	445
Machakos	75.9	67.5	5.5	0.0	0.5	10.4	41.6	9.1	0.5	0.0	0.0	8.3	7.5	0.5	0.3	24.1	100.0	553
Makueni	80.3	65.0	10.2	0.0	1.8	10.3	33.8	5.9	2.9	0.0	0.0	15.3	13.4	1.1	0.8	19.7	100.0	404
Central	72.8	66.9	3.5	0.0	9.0	10.7	21.6	19.5	2.4	0.0	0.2	5.9	4.9	0.7	0.3	27.2	100.0	2,323
Nyandarua	65.6	60.4	2.8	0.0	8.0	10.8	22.9	13.8	0.9	0.0	1.3	5.2	5.0	0.2	0.0	34.4	100.0	273
Nyeri	73.1	67.1	7.3	0.0	10.0	9.2	22.3	16.7	1.6	0.0	0.0	6.0	5.3	0.6	0.2	26.9	100.0	356
Kirinyaga	81.0	75.6	0.9	0.0	13.2	13.0	20.4	26.0	2.0	0.0	0.0	5.4	4.3	1.1	0.0	19.0	100.0	281
Murang'a	68.9	63.4	4.0	0.0	6.3	7.8	20.6	22.1	2.5	0.0	0.0	5.5	4.3	0.0	1.2	31.1	100.0	444
Kiambu	74.0	67.8	2.7	0.0	8.9	12.0	21.9	19.2	3.1	0.0	0.0	6.3	5.3	1.0	0.0	26.0	100.0	967
Rift Valley	52.8	46.8	2.2	0.0	2.9	7.2	26.8	5.5	1.9	0.0	0.2	6.0	4.7	1.0	0.3	47.2	100.0	4,696
Turkana	10.4	10.1	0.0	0.0	0.5	3.0	5.7	0.5	0.4	0.0	0.0	0.3	0.3	0.0	0.0	89.6	100.0	214
West Pokot	14.2	13.3	0.4	0.0	0.2	3.1	9.0	0.7	0.0	0.0	0.0	0.9	0.2	0.0	0.7	85.8	100.0	197
Samburu	22.7	20.0	0.5	0.0	0.6	4.4	10.9	2.9	0.8	0.0	0.0	2.7	2.4	0.3	0.0	77.3	100.0	83
Trans-Nzoia	63.9	56.4	4.0	0.0	0.7	4.6	38.7	4.9	3.2	0.1	0.2	7.5	5.9	1.1	0.4	36.1	100.0	467
Uasin Gishu	62.6	56.0	1.8	0.0	2.7	12.9	28.7	7.4	2.4	0.0	0.0	6.6	5.3	0.8	0.5	37.4	100.0	460
Elgeyo Marakwet	55.2	43.6	1.1	0.0	1.3	8.7	28.5	1.6	2.1	0.3	0.0	11.6	10.6	1.0	0.0	44.8	100.0	139
Nandi	64.5	59.2	1.8	0.0	0.9	9.1	40.3	5.5	1.6	0.0	0.0	5.4	3.9	1.5	0.0	35.5	100.0	335
Baringo	41.4	33.1	0.7	0.0	3.2	5.5	16.2	4.6	2.3	0.0	0.6	8.3	6.5	1.4	0.4	58.6	100.0	190
Lakipia	59.1	51.3	5.0	0.0	5.1	4.5	20.8	12.5	3.1	0.0	0.0	7.8	6.6	0.6	0.7	40.9	100.0	207
Nakuru	56.8	53.5	1.4	0.2	6.7	7.6	25.4	10.4	1.4	0.0	0.4	3.2	2.6	0.4	0.2	43.2	100.0	851
Narok	47.8	38.1	1.9	0.0	1.1	3.8	25.3	3.7	2.2	0.0	0.0	1.9	6.9	2.4	0.4	52.2	100.0	446
Kajiado	54.5	45.2	1.5	0.0	5.9	8.9	20.0	6.5	2.2	0.0	0.2	9.3	6.7	2.1	0.6	45.5	100.0	387
Kericho	62.9	56.9	3.5	0.0	2.1	9.9	35.8	3.2	1.9	0.0	0.3	6.1	5.1	1.0	0.0	37.1	100.0	327
Bomet	54.8	50.4	4.9	0.0	1.7	7.5	33.9	0.4	2.0	0.0	0.0	4.4	3.5	0.6	0.4	45.2	100.0	394

Continued

Table 3.10—Continued

Country	Modern method										Traditional method				Number of women				
	Any method	Any modern method	Female sterilisation	Male sterilisation	IUD	Implants	Injectables	Pill	Male condom	Female condom	LAM	Other	Any traditional method	Rhythm		Withdrawal	Other	Not currently using	Total
Western	58.6	56.9	5.9	0.0	1.3	15.2	27.5	4.6	2.5	0.0	0.0	0.0	1.7	1.1	0.3	0.3	41.4	100.0	1,950
Kakamega	62.1	60.3	6.9	0.0	1.0	14.1	30.4	5.4	2.6	0.0	0.0	0.0	1.7	1.0	0.5	0.3	37.9	100.0	697
Vihiga	59.5	56.6	3.9	0.0	3.3	16.2	25.3	4.8	3.1	0.0	0.0	0.0	2.9	2.9	0.0	0.0	40.5	100.0	212
Bungoma	55.5	53.9	5.1	0.0	0.8	11.8	29.0	4.4	2.9	0.0	0.0	0.0	1.6	0.9	0.2	0.5	44.5	100.0	696
Busia	57.5	56.5	6.5	0.0	1.8	23.6	20.2	3.5	1.0	0.0	0.0	0.0	0.9	0.9	0.1	0.0	42.5	100.0	345
Nyanza	56.4	53.9	3.6	0.0	2.0	12.4	29.3	3.4	2.9	0.0	0.1	0.1	2.5	2.0	0.3	0.2	43.6	100.0	2,525
Siaya	55.0	51.0	3.2	0.0	1.8	15.3	19.3	5.8	5.7	0.0	0.0	0.0	4.0	3.3	0.7	0.0	45.0	100.0	326
Kisumu	62.4	59.3	5.2	0.0	1.5	21.1	24.3	3.7	3.5	0.0	0.0	0.0	3.1	3.1	0.0	0.0	37.6	100.0	500
Homa Bay	46.7	45.5	3.8	0.0	1.1	8.6	26.1	2.1	3.5	0.0	0.0	0.3	1.2	1.2	0.0	0.0	53.3	100.0	520
Migori	44.6	43.9	1.9	0.0	1.1	10.6	24.6	2.3	3.1	0.3	0.0	0.0	0.7	0.2	0.3	0.3	55.4	100.0	432
Kisii	66.1	62.8	3.2	0.0	3.5	9.2	41.8	4.0	0.8	0.0	0.3	0.0	3.4	2.2	0.7	0.4	33.9	100.0	531
Nyamira	67.9	64.2	4.2	0.0	3.9	8.2	42.6	3.5	1.2	0.0	0.3	0.3	3.7	3.0	0.3	0.3	32.1	100.0	216
Nairobi	62.6	58.3	2.0	0.1	4.5	12.1	23.6	12.5	3.3	0.0	0.0	0.0	4.4	3.2	0.3	0.9	37.4	100.0	2,117
Total	58.0	53.2	3.2	0.0	3.4	9.9	26.4	8.0	2.2	0.0	0.1	0.0	4.8	3.8	0.7	0.3	42.0	100.0	18,549

Note: If more than one method is used, only the most effective method is considered in this tabulation.

LAM = Lactational amenorrhoea method

Appendix VII – Tally Sheet for Time Taken to Provide Contraceptive Methods

S. No.	Start Time <i>Hr & Min</i>	End Time	Method <i>(e.g. IUCD)</i>	Initiation	Continuation	Follow up Visit	Insertion	Removal
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

Appendix VIII – Questionnaire

Section 1 - General information

1. Please provide us with your name
(Any identification e.g. first name or nickname for the purposes of seeking clarification latter, if necessary)
2. What is your designation/specialty as a healthcare professional? (Mark in appropriate box)

Nurse <input type="checkbox"/> Midwife <input type="checkbox"/> CO <input type="checkbox"/> Dr.(MO) <input type="checkbox"/>
Other <input type="checkbox"/> specify.....

3. What is your job group (A, B, C...)?

Section 2 - Work experience

4. How long have you worked as a Health Care Professional? (Mark in appropriate box)

- i. Less than 1 year
- ii. 1-5 years
- iii. More than 5 years
- iv.

5. How long have you worked in the family planning clinic of this facility? (Mark in appropriate box)

- i. Less than 1 year
- ii. 1-5 years
- iii. More than 5 years

6. Have you ever received LARC training? (Y/N) If yes, was the last one within the last 12 months (Y/N).....

7. Have you provided the following FP methods/services in the last 12 months (Y/N)?

Method/service	Ever provided (Y or N)
IUCD Insertion	
IUCD Removal	
Implants insertion	
Implants Removal	
DMPA injection (Depo)	
CoC pills (Chaguo Langu)	

Section 3 - Estimated time spent providing various methods/services

8. In your estimation, how much time did you spend with your client the last time you provided the following FP Methods/Services (minutes)

Method	Time in Minutes	
IUCD Insertion		
IUCD Removal		
IUCD Related follow up visits (<i>e.g. checkup</i>)		
Implants insertion (LN- 2 rods / Eto - 1 rod)		
Implants Removal (LN- 2 rods/ Eto - 1 rod)		
Implants Related follow up visit (<i>e.g. checkup</i>)		
DMPA injection		
DMPA injection Related follow up visit (<i>e.g. checkup</i>)		
CoC - 3 cycle pack (other specify.....)		
CoC pills Related follow up visit (<i>e.g. checkup</i>)		

Section 4 - Estimated number of follow up visits

9. In your opinion/estimation, what is the number of follow up visits do your clients make after they have received each of the following FP methods (*out of 10 e.g. x out 10 clients receiving pills come back for checkup*)

Method	Average number of follow up visits (out of 10 services)	
IUCD Insertion		
IUCD Removal		
Implants insertion (LN- 2 rods / Eto - 1 rod)		
Implants Removal (LN- 2 rods/ Eto - 1 rod)		
DMPA injection		
CoC - 3 cycle pack (other specify.....)		

Section 5 – Supplies and Equipment Required to provide various FP Methods/Services

10. What supplies (what is used up during service delivery) did you use the last time you provided the following services;
- i. Implants insertion – LN 2 Rods (*Quantity or tick where appropriate*)
 - ii. Implants removal – LN 2 Rods (*Quantity or tick where appropriate*)
 - iii. Implants follow up/ checkup visits (*Quantity or tick where appropriate*)

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc)	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Implant (specify)			
Surgical blade			
Lignocaine			
Scalpel holder			
Paracetamol			
Iodine/Povidone			
Dispensing cups			
Gauze			
HIV Test Kits			
Gloves			
Syringes (2ml and 10ml)			
Needles and Gauze			
Dry swab			
Spirit swab			
Elastoplast			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			

11. What equipment (Not used is used up during service delivery but dedicated to FP clinic/clients/services) did you use the last time you provided the following services;
- i. Implants insertion – LN 2 Rods (*Quantity or tick where appropriate*)
 - ii. Implants removal – LN 2 Rods (*Quantity or tick where appropriate*)
 - iii. Implants follow up/ checkup visits (*Quantity or tick where appropriate*)

Equipment	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Artery forceps			
Toothed dissecting forceps			
Small galipot			
Large kidney dish			
Mackintosh (1 metre ² thick			

Equipment	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
plastic/rubber)			
Blood pressure machine			
Stethoscope			
Thermometer			
Weighing scale			
Bucket with lid to put used instruments in			
Torch and batteries			
Trocar			
Surgical Scissors - curved			
Gallipot 2 stainless steel			
Small kidney dish 2 stainless steel			
4 Green towel			
Bags			
Other (specify)			
Other (specify)			
Other (specify)			
Other (specify)			
Other (specify)			
Other (specify)			
Other (specify)			

12. What supplies (what is used up during service delivery) did you use the last time you provided the following services;
- i. Implants insertion – Eto 1 Rod *Quantity or tick where appropriate*)
 - ii. Implants removal – Eto 1Rod (*Quantity or tick where appropriate*)
 - iii. Implants Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc.)	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Implant (specify)			
Surgical blade			
Lignocaine			
Scalpel holder			

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc.)	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Paracetamol			
Iodine			
Dispensing cups			
Gauze			
HIV Test Kits			
Gloves			
Syringes (2ml and 10ml)			
Needle (21G)			
Dry swab			
Spirit swab			
Elastoplast			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			

13. What equipment (Not used is used up during service delivery but dedicated to FP clinic/clients/services) did you use the last time you provided the following services;
- i. Implants insertion – Eto 1 Rod (*Quantity or tick where appropriate*)
 - ii. Implants removal – Eto 1 Rod (*Quantity or tick where appropriate*)
 - iii. Implants follow up/ checkup visits (*Quantity or tick where appropriate*)

Equipment	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Artery forceps			
Toothed dissecting forceps			
Small galipot			
Large kidney dish			
Mackintosh (1 metre ² thick plastic/rubber)			
Blood pressure machine			
Stethoscope			
Thermometer			
Weighing scale			
Bucket with lid to put used instruments in			

Equipment	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Torch and batteries			
Trocar			
Surgical Scissors - curved			
Gallipot 2 stainless steel			
Small kidney dish 2 stainless steel			
4 Green towel			
Bags			
Mosquito forceps curved/Straight			
Scalpel holder			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			

14. What supplies (what is used up during service delivery) did you use the last time you provided the following services;
- i. IUCD insertion (*Quantity or tick where appropriate*)
 - ii. IUCD removal (*Quantity or tick where appropriate*)
 - iii. IUCD Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc.)	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
IUD (specify)			
Gauze			
HIV Test Kits			
Gloves			
Dry swab			
Spirit swab			
Disposal bags			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc.)	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Other (Specify)			

15. What equipment (Not used is used up during service delivery but dedicated to FP clinic/clients/services) did you use the last time you provided the following services;
- i. IUCD insertion (*Quantity or tick where appropriate*)
 - ii. IUCD removal (*Quantity or tick where appropriate*)
 - iii. IUCD follow up/ checkup visits (*Quantity or tick where appropriate*)

Equipment	Insertion	Follow up	Removal
	Total quantity or Tick	Total quantity or Tick	Total quantity or Tick
Blood pressure machine			
Stethoscope			
Thermometer			
Weighing scale			
Bucket with lid to put used instruments in			
Torch and batteries			
Tenaculum			
Speculum			
Gallipot 2 stainless steel			
Small kidney dish 2 stainless steel			
4 Green towel			
Disposal Bags			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			
Other (Specify)			

16. What supplies (what is used up during service delivery) did you use the last time you provided the following services;
- i. DMPA Service Provision (*Quantity or tick where appropriate*)
 - ii. DMPA Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc.)	Service Provision	Follow up Visits
	Total quantity or Tick	Total quantity or Tick
Injectable (specify)		
Water for injection		
HIV TEST KITS		
Gloves		
Syringes (2ml and 10ml)		
Needle (21G)		
Dry swab		
Spirit swab		
Savlon		
Other (Specify)		
Other (Specify)		
Other (Specify)		
Other (Specify)		
Other (Specify)		
Other (Specify)		

17. What equipment (Not used is used up during service delivery but dedicated to FP clinic/clients/services) did you use the last time you provided the following services;
- i. DMPA Service Provision (*Quantity or tick where appropriate*)
 - ii. DMPA Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Equipment	Insertion	Follow up
	Total quantity or Tick	Total quantity or Tick
Small galipot		
Large kidney dish		
Mackintosh (1 metre ² thick plastic/rubber)		
Blood pressure machine		
Stethoscope		
Thermometer		
Weighing scale		
Bucket with lid to put used instruments in		
Gallipot 2 stainless steel		
Small kidney dish 2 stainless steel		

Equipment	Insertion	Follow up
	Total quantity or Tick	Total quantity or Tick
4 Green towel		
Bags		
Safety boxes		
Gauze		
Other (Specify)		
Other (Specify)		
Other (Specify)		
Other (Specify)		

18. What supplies (what is used up during service delivery) did you use the last time you provided the following services;
- i. CoC Pills Service Provision (*Quantity or tick where appropriate*)
 - ii. CoC Pills Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Name of drug/Medical Supply (drugs, gloves, needles, syringes, giving set, blood, swabs, etc)	Provision	Follow up visits
	Total quantity or Tick	Total quantity or Tick
Pills (specify)		
dispensing cups		
HIV Test Kits		
Gloves		
Dry swab		
Spirit swab		
Other (Specify)		
Other (Specify)		
Other (Specify)		
Other (Specify)		

19. What equipment (Not used is used up during service delivery but dedicated to FP clinic/clients/services) did you use the last time you provided the following services;
- i. CoC Pills Service Provision (*Quantity or tick where appropriate*)
 - ii. CoC Pills Related follow up/ checkup visits (*Quantity or tick where appropriate*)

Equipment	Provision	Follow up visits
	Total quantity or Tick	Total quantity or Tick
Small galipot		
Large kidney dish		

Equipment	Provision	Follow up visits
	Total quantity or Tick	Total quantity or Tick
Blood pressure machine		
Stethoscope		
Thermometer		
Weighing scale		
Bucket with lid to put used instruments in		
4 Green towel		
Disposal Bags		
Other (Specify)		
Other (Specify)		

Appendix IX - Secondary Data Abstraction Tables

Staff designation and salary

Staff designation (fill one by one) for FP Clinic only	Total (gross) pay per month = sum of all salaries, allowances, all other benefits
Total monthly bill	

Breakdown of overhead recurrent costs

Expenditure	Total Annual expenditure (2016)
Property Expenses	
Rent and rates	
Electricity	
Fuel and Oil	
Oxygen/Gas	
Water	
Waste Management (garbage collection, etc)	
Other (Specify)	
Other (Specify)	
Other (Specify)	
Maintenance Expenses	
Maintenance of Equipment	
Maintenance of Buildings	
Cleaning Expenses	
Laundry costs	
Bedding and Linen Supplies	
Catering Crockery	
Others(specify)	
Others(specify)	
Others(specify)	
Transportation and travel expenses	
Travelling and Transportation expenses	
Motor Vehicle (Motor-cycle, Bicycle, etc.) Maintenance & Licenses	
Insurance	
Others (specify)	
Others (specify)	
Others (specify)	

Expenditure	Total Annual expenditure (2016)
<u>Communications:</u>	
Telephone Expenses	
Internet/Other communications	
Printing and stationery	
Others (specify)	
Others (specify)	
Others (specify)	

Fixed assets used for family planning service provision during the last year

Land and Building/ vehicles/motor cycles/ bicycles/Furniture/Electronics etc.

Specify type (list one by one)	Model	Year of purchase or donated	Purchase price

Cost of various supplies from KEMSA and MEDS or Facility Records

	KEMSA	MEDS	Average
Artery forceps			
Blood pressure machine			
Bucket with lid to put used instruments in			
Dispensing cups			
Dry swab			
Elastoplast			
Gallipot 2 stainless steel			
Gauze			
Gloves			
Green towel			
HIV Test Kits			
Iodine			
Large kidney dish			
Lignocaine			
Mackintosh (1 metre ² thick plastic/rubber)			
Needle (21G)			
Paracetamol			
Scalpel holder			
Small galipot			
Small kidney dish 2 stainless steel			
Speculum			
Spirit swab			
Stethoscope			
Surgical blade			
Surgical Scissors - curved			
Syringes (2ml and 10ml)			
Tenaculum			
Thermometer			
Toothed dissecting forceps			
Torch and batteries			
Torch and batteries			
Trocar			
Waste Disposal Bags			
Weighing scale			

The cost of various contraceptive methods (from KEMSA and FP CIP or Facility Records

	KEMSA	FP CIP (2017-2020)	Average
CoCs			
DMPA			
Eto - 1 Rod Implant			
LN - 2 Rods Implants			
IUCDs			

Workload Data for 2016- from DHIS2

	CoC Pills Provision	CoC Follow up	DMP A Provision	DMP A Follow up	Implants Insertion	Implants Follow up	Implants Removal	IUCD Insertions	IUCD Follow Up	IUCD Removal	OTHERS (SPECIFY)
JAN											
FEB											
MARCH											
APRIL											
MAY											
JUNE											
JULY											
AUGUST											
SEP											
OCT											
NOV											
DEC											
TOTAL											

Appendix X – Plagiarism Screening Report

Turnitin Originality Report

DETERMINATION OF THE COST-EFFECTIVENESS OF CONTRACEPTIVE METHODS OFFERED IN KIAMBU COUNTY HOSPITAL, IN THE REPUBLIC OF KENYA by James Kiragu

From Health Systems Management (Public Health)

- Processed on 06-Dec-2018 14:20 EAT
- ID: 1051861056
- Word Count: 11480


Similarity Index
11%

Similarity by Source

Internet Sources:
9%

Publications:
4%

Student Papers:
5%



Dr. Richard Ayah:

Signature..... Date