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Quality of Post-Abortion Care in Health Facilities in Kenya



By

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This PhD thesis is submitted to the School of Public Health, Faculty of Health Sciences, University of the Witwatersrand (Wits University), Johannesburg, South Africa, as part fulfilment of the requirements for the degree of Doctor of Philosophy.

April, 2019

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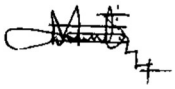
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Declaration

I, Michael Mbithi Mutua, do hereby declare that this thesis is my own unaided work. This thesis is being submitted in fulfilment of requirements of the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg, South Africa, in the School of Public Health. I further declare that this work has not been submitted before any degree or examination at this or any other University.



Signed: _____ **Date: April 6, 2019**

Dedication

To those women who lost their lives at home on their way to hospital or in healthcare facilities following an unsafe abortion. While I am personally not an abortion advocate, no woman should lose her life just because she had an unintended pregnancy.

To my beloved wife Winnie and daughters Amy and Thandiwe, my son Jabulani and my parents Benjamin and Agnes, your love and support was the single most crucial ingredient that I needed in this journey.

List of manuscripts and conference presentations

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All published or submitted manuscripts are appended at the end of this thesis. Each manuscript is formatted in the style and guidelines of individual journals to which they were submitted.

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Author's contributions

Mutua Michael (Student): Conceptualized the study, defined the analysis plan, performed all analysis, drafted and submitted this manuscript. Revised the manuscript following reviewers' comments and led the review process up to final acceptance and publication.

Supervisors: Provided guidance to the student, revised draft manuscripts and provided guidance on appropriate journal for submission of the final draft manuscript.

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2. **Mutua, Michael M**. Based on article (1) above and related research, I participated in an expert interview during the Africa Regional Conference on Abortion: From Research to Policy, November 29 to Friday, December 2, 2016 in Addis Ababa, Ethiopia
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Media appearances and blogs related to this research

1. November 20, 2015- Michael Mutua participated in a TV interview with BBC Africa on "Contraceptives and Condom Use among Catholics" ahead of the Pope's visit to Kenya. This interview featured on BBC
2. February 2018- Michael Mutua participated in a TV interview on Post-abortion in Kenya on K24 TV: https://www.youtube.com/watch?v=HNQBi3hjlsw&t=235s
3. June 30, 2018- Michael Mutua participated in a TV panel interview on "Family Planning: Face The Facts." Under the #FormNiGani campaign to discuss the value of personal planning and family planning for youth in Kenya (https://youtu.be/fmcnQzFnUtU)
4. November 19, 2018- TV interview with NTV Kenya on Abortion in Kenya, in relation to the closure of safe abortion and post abortion care services in all Marie Stopes clinics in Kenya

(https://mail.google.com/mail/u/0/#drafts/FMfcgxvzLhltBtHVHKWqVHxBfFrRGzst?projector=1).

5. Michael Mutua: November 2018: What's Driving High Pregnancy Rates in Kenyan Schools?:http://theconversation.com/whats-driving-high-pregnancy-rates-in-kenyan-schools-107114
6. Michael Mutua: December 2018: Kenya's Marie Stopes Ban May Drive More Women To Unsafe Abortions: https://www.africa.com/kenyas-marie-stopes-ban-may-drive-more-women-to-unsafe-abortions/

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Preface and Acknowledgements

As Martin Luther King Junior wrote in his 1947 Morehouse College Student paper, the *Maroon Tiger*: "Education must enable a man to become more efficient, to achieve with increasing facility the legitimate goals of his life." My PhD journey has been both fulfilling and transformative to my career as a public health researcher. When first I joined the African Population and Health Research Center (APHRC) in 2007, I was already finalizing my Master of Science degree course at the University of Nairobi. I had also accumulated over five years' experience in research, mainly in market research. However, during this five-year stint, I kept the desire to one day apply the statistical skills I had learned in my undergraduate training at the University of Nairobi's School of Mathematics.

After two years at APHRC and exposure to the statistics I was looking for, I realized that I needed a better grounding in a specific field in public health, if I was to make better sense of the odds ratios and coefficients from my fancy statistical models. I therefore began making applications for PhD studentships, focusing on European and American universities. For about three years, I applied and had interviews, which were often either completely unsuccessful, or successful but without funding. As a family person, these offers were hard to accept: I had obligations that required continued financial stability while still undertaking my studies, especially after 2012, when my son Jabulani joined us, with immense expectations from his daddy. But in 2013, I successfully applied to the Consortium for Advanced Research Training in Africa (CARTA). The following year, I applied for PhD admission to the School of Public Health at the University of the Witwatersrand in South Africa, and again, I was successful.

During my time at APHRC, I had developed a specific interest in understanding the health needs of women in resource-limited settings of sub-Saharan Africa, specifically their reproductive health needs. Over this period, I started seeking to understand why maternal mortality in sub-Saharan Africa was still so high, despite many years of financial and technical interventions.

Maternal mortality was a specific target of the Millennium Development Goals (MDGs), but it was increasingly apparent that Kenya, alongside many other African countries, was not poised to experience any meaningful achievements in reducing the number of maternal deaths by three quarters, even as the curtains of the MDG "target periods" were rapidly closing in 2015. By 2014, the maternal mortality ratio in Kenya had declined: from 505 deaths per 100,000 live births over the period 1996-2003 to 362 deaths during the period 2007 to 2014. However, this decline had transitioned through a period of an even higher mortality ratio (520 deaths per 100,000 live births) between 2002 and 2009, and therefore the later decline did not appear to be sustainable [1].

In addition to funding the PhD, CARTA runs a series of Joint Advanced Seminars (JAS) during the PhD cycle, each seminar designed to support PhD students during specific stages of their research, from designing their studies, to data collection, analysis, communicating research findings, and grant making capacity. These trainings were invaluable, especially in building my strength in specific areas, such as qualitative data analysis in which I had no prior experience.

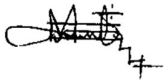
I benefitted immensely from support from Dr. Chimaraoke Izugbara, my mentor and senior colleague at APHRC. Your continued pressure to improve my writing skills and ability to objectively present the academic argument at the core of my research work was what I needed most to keep the research focused. The regular and speedy reviews of my manuscripts and repositioning my research aims and objectives led to this final piece. This area of research was new to me, and I had no expertise in it when I made the initial attempt at the CARTA application in 2013. I am deeply indebted to you for the encouragement, support, and persistence with me to aim higher at every stage of my research.

During the CARTA JAS sessions, I had the privilege to share my work with fellow PhD students and CARTA grantees and senior scholars, among them Dr. Anne Katahoire of Makerere University and Professors Jonathan Levin and Sharon Fonn, both of the School of Public Health, University of the Witwatersrand. Your guidance, especially during JAS 3 at the University of

Ibadan, Nigeria in 2016, formed the basis of my field data collection and propelled me to finalize my second paper soon after.

As I complete this PhD journey and as I transition to greater challenges in my research career, I must convey my special appreciation to my supervisory team – Assoc. Prof. Thomas N.O Achia, Prof. Lenore Manderson and Assoc. Prof. Eustasius Musenge for their dedicated support in guiding me through developing my research project, study design, analysis and writing. Your timely support, guidance and encouragement ensured that I stayed on track and focused on completing my PhD studies despite all challenges.

Special thanks to my family, my dear wife Dr. Winfred Kathenge, who assumed the responsibilities of both father and mother to our three lovely children Amy Ashanti, Thandiwe Shaza and Jabulani Siphiwe, as well as taking charge of our family business and investments, while I used this time to work on my PhD. When I missed those weekly rides to our usual places of worship, and the ensuing family Sunday afternoon outings, and the Saturday evening cycling, this PhD is what the sacrifices were for. To my mom and dad, this is the reason I reduced those regular visits to our village home, and I highly appreciate your understanding, even without you knowing that this is what all my absence was leading to. To all my friends who I failed to visit over the weekends, your support and understanding is appreciated from the depth of my heart. Finally, to the almighty God the Father of Christ, in whom are hidden all the treasures of wisdom and knowledge, thank you.



Michael M. Mutua

April 2019, Johannesburg, South Africa

Abstract

Globally, about 22 million unsafe abortions occur annually, 21 million in developing countries. The World Health Organization (WHO) estimates that 47,000 maternal deaths are due to unsafe abortion, with only 0.2 percent of these in high income countries. Over 62% of these deaths occur in Africa [2]. Post-abortion care (PAC) is a life-saving intervention which reduces the risks of mortality and morbidity from incomplete abortion [3]. In 2002, the post-abortion care consortium (PACC) endorsed the essential elements of the post-abortion care framework, which reflects, from both a provider and a patient perspective, an enhanced vision of improved service quality and sustainable care [4]. The model's five elements use a public health approach to respond to women's broader sexual and reproductive health needs, and include: 1) community and service provider partnerships for the prevention of unwanted pregnancies and unsafe abortion, 2) counselling, 3) treatment, 4) contraception and family planning (FP) services and 5) reproductive and other health services [5]. Post-abortion contraception is an intervention that reduces further abortions and abortion-related deaths. However, family planning and counselling has continually been shelved by service providers [4]. The aim of this study is to examine the quality of PAC services in healthcare facilities, to understand the perspectives of PAC service providers, and to explain care seekers' views about the quality of services in Kenya. Specifically, the research explores the following objectives: 1) to examine the state of PAC in healthcare facilities and analyse the determinants of quality PAC in Kenyan healthcare facilities; 2) to examine the level and determinants of effective contraception among women seeking PAC; 3) to explore PAC service providers' understanding of quality PAC and their challenges in providing PAC services in Kenya; and 4) to explore PAC service seekers' understanding of quality PAC and their experience in seeking PAC services in Kenya.

This study is based on a nationally representative sample of 350 facilities across Kenya in 2012. The study included all Level 2 (dispensaries and health centres), 3 (sub-district hospitals), 4

(district hospitals), 5 (county/provincial and some large district hospitals) and 6 (national referral) facilities. Combined data on health facility characteristics (HFS) and patient management (PMS) were used in this study. Additional data were gathered from a subsample of service providers and patients, selected from Nairobi, Central and Eastern regions. The data mainly focus on understanding the quality of PAC and service providers' challenges when offering PAC. An additional subsample of six facilities were selected for interviews with patients who sought PAC services, with the intent of interviewing five patients at each of these six facilities.

The study modelled the factors associated with quality care, using a stratified mixed-effects ordered probit model. It further compared facilities based on having a separate evacuation room, whether a facility had a specialist obstetrician-gynaecologist (Ob-gyn), offered maternity services, frequency of provider training on PAC, provider perception on PAC load, number of deliveries per month and the number of contraceptive methods available for PAC patients, all stratified by facility level. The model controlled for 15 county-level characteristics obtained from Kenya Demographic and Health Survey 2014 and modelled the effect of the above facility characteristics on the level of care. From the model, while accounting for county variability, the quality of PAC in health facilities depended largely on the availability of a separate evacuation procedure room for PAC services, whether or not the facility offered specialized Ob-gyn services, whether the facility offered maternity services, and regardless of the number of deliveries conducted in the facility, and the variety of contraceptive methods available to PAC patients.

Bivariate and multivariable mixed-effects ordered logit models were also fitted with the three level ordinal outcome, defined as whether a PAC patient received an effective or ineffective method of family planning, or whether patient received any method at all; all patient, facility and county characteristics were shown to be independently associated with the outcome. The first models were fitted within the frequentist/classical (maximum likelihood estimation) approach.

These models were used for identification of final covariates for inclusion in the final models, using a probabilistic Bayesian approach.

Higher-level facilities (Levels 4-6) were less likely to provide quality PAC compared to lower facilities, although the relationship was statistically insignificant. However, public facilities had 0.16 lower quality of care. Similarly, facilities with separate evacuation rooms had 0.33higher quality PAC, while facilities that had Ob-gyn services exhibited 0.24 higher quality PAC. Although in low proportions, facilities with more deliveries and with more FP methods available to PAC patients increased the probability of a facility reporting higher quality PAC.

Patient religion, history of previous abortion and contraceptive use before index pregnancy, and fertility intentions at time of pregnancy, were all significantly associated with the adoption of an effective contraceptive method. At facility level, patient's odds of receiving a more effective contraceptive method largely depended on the level of the facility (inversely), whether the facility had a separate procedure room from where PAC services were offered, , the variety of modern family planning methods available at the facility, and finally, whether the facility also offered maternity service (inversely).

Patients seeking post-abortion care services were influenced by a range of factors including the perceived capacity of service providers (SP) to offer quality services, often driven by prior experiences with health care services. Service providers' confidence in offering PAC is a demonstration of competence. Service providers' skills were hampered by the availability of resources for service delivery, such as MVA kits and procedure rooms where services could be offered with maximum aural and visual privacy.

Quality post-abortion care services by providers was mainly defined by providers perceiving their treatment of PAC patient as "saving lives". Sometime, they would forego other critical short-term benefits of quality care, such as patient satisfaction with services and lower risks

of repeat abortions, as well as future fertility and wellbeing. When services were not available, service providers worried about the need for protracted referrals, which often lead to serious sequelae and poor treatment outcomes [6]. However, for patients, quality PAC refers to those critical "soft skills" such as personalized assistance during care, pain reduction and service providers who showed that they cared about patients' experiences.

In Kenya, the provision of quality PAC in healthcare facilities remains low, and there is clear evidence of high legal and policy bottlenecks that continue to obstruct access to quality care. The national roll-out of abortifacients over the past four years has increased their availability, but the generalized and unregulated access to these drugs continues to pose a safety challenge, owing to undirected and unsupervised self-administration. Within healthcare facilities, the recurrence of service interruptions and inequitable access to care further exacerbates the incidence of unsafe pregnancy terminations. At the same time, lack of services and variable availability of these services in primary healthcare facilities, including dispensaries and health centers, spur delays in receiving care and complications from unsafe abortion through the often non-specific and uncoordinated chain of referrals for common post-abortion cases. At the same time, lack of sufficient skills among service providers to offer quality post-abortion care services persists. Within these facilities, there was also evidence of inefficient infection control measures, exposing women and their caregivers to nosocomial infections.

The first study, reported below, revealed urgent need for improving the capacity of lower level facilities to offer quality PAC services, and equipping service providers with the requisite skills including to offer more effective family planning and counselling. The study also pointed to the need for an inclusive approach to encompass private sector participation in order to reduce the risk of complications attributed to delays in seeking care and lengthy referrals [7].

On effective contraception after PAC, this study demonstrated that improving the reproductive health of PAC patients requires considerable effort at policy, service delivery and

individual levels. These efforts must aim to empower patients to make an informed choice of whether to use contraception and the type of contraceptive method that best suits their sexual context. At a policy level, there is need to focus on service provider skills that are sensitive to patients' needs and ability to make decisions, as well as barriers to informed patient choice. Service provider empowerment through capacity building for PAC, infrastructural improvement and contraceptive commodity options, and their security, are paramount in ensuring that service providers interact better with patients and can deliver quality PAC services. In addition, effective counselling of PAC patients requires understanding of patients' past experiences with contraception and their future fertility intentions and desires in order to meet their specific needs. Family planning integration with PAC will ultimately reduce missed opportunities, while promising improved reproductive health of post-abortion care patients.

Quality PAC, both as seen by the patients and by service providers, therefore has divergent meanings. Service providers see their key role in quality PAC as saving the lives of patients, while patients need more caring services, from providers who seem knowledgeable and confident about the services they offer. The need for guidelines for the provision of safe legal abortion care is urgent, similar to mechanisms to regulate the use of medical abortion for termination of abortion and treatment of incomplete abortion. While there are continued calls for the legalization of abortion, there is an equally urgent need to place emphasis on the prevention of unsafe abortion and improved access to post-abortion care services in healthcare facilities.

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Abbreviations

AMREF	African Medical and Research Foundation
ANC	Antenatal Care
APHRC	African Population and Health Research Center
BTL	Bilateral Tubal Ligation
CARTA	Consortium for Advanced Research Training in Africa
Co-PIs	Co-Principal Investigator
D&C	Dilation and Curettage
DelPHE	Development Partnerships in Higher Education
DFID	Department for International Development
DIC	Deviance Information Criteria
ESRC	Ethical and Scientific Research Council
FP	Family Planning
HFS	Health Facility Survey
HIV	Human Immunodeficiency Virus
HREC	Human Research Ethics Committee
IDI	In-depth Interviews
IMUA	Incidence and Magnitude of Unsafe Abortion
IRB	Institutional Review Board
KEMRI	Kenya Medical Research Institute

KNH	Kenyatta National Hospital
LAPM	Long-Acting and Permanent (Contraceptive) Methods
LARC	Long-Acting and Reversible Contraceptives
MCH	Maternal and Child Health
MVA	Manual Vacuum Aspiration
Ob-gyn	Obstetrics and Gynaecology
PAC	Post-abortion Care
PDS/ PMS	Prospective Data/Morbidity Survey
PI	Principal Investigator
PMTCT	Prevention of Mother to Child Transmission
SIDA	Swedish International Development Agency
SSA	Sub-Saharan Africa
WHO	World Health Organization

1 INTRODUCTION

As I traversed health facilities in Central, Nairobi and Eastern Kenya, collecting data and meeting with post-abortion care (PAC) service providers in some of the country's' leading medical facilities, it was easy to identify certain circumstances and scenarios that would have dire consequences on the quality of services at healthcare facilities. In most instances, I came across service providers who strived to achieve the best treatment outcomes for their patients, with limited resources and with minimal institutional support, in what seemed to be extremely problematic legal and policy environment. I also came across service providers who often made decisions that continued to expose PAC patients to the risks of the long-term sequelae from injuries or infections from unsafe abortion, including death or near-miss complications. While some providers were worried about every PAC patient they managed, because of the illegality of abortion and the strictness of Kenya's law on abortion, others expressed open frustration with the deplorable state of equipment and infrastructure available, which prevented them from delivering quality PAC services. Providers feared treating post-abortion patients on the one hand, and worried about the safety of the procedures on the other. For the patients, discrimination thrived, reflecting attitudes from providers depending on whether the abortion was spontaneous or induced. Patients' age, marital status and schooling status all influenced this; patients were segregated into either induced or spontaneous abortion often on the basis of suspicion alone. Some women, suspected of having induced abortion, were kept at the end of the queue, forced to wait until everyone else had been served. Then they might be seen, towards the end of the shift, just before the attending doctor clocked out from the consultation room. According to some providers, patients make similar choices, waiting until there is no one else to see the doctor. Some of these patients are suspected not of having an unsafe abortion, but of seeking termination from the attending doctor.

Ideally, if the quality of PAC services in these facilities was assured and accessible in these healthcare facilities, they would be patient-centred, and providers would be cognizant of the psychological and physical pain that every PAC patient experiences, whether a pregnancy termination was induced or spontaneous. Service providers would be well trained to handle all patients and to make the right choices of treatment procedures, consistent with global and national recommendations and guidelines. There would be fewer cases of severe complication because the community and the healthcare system would have ensured that people understood the dangers of abortion, and that there was no discrimination against women who had secured or experienced abortion. Women would seek care in a timely manner, ensuring better outcomes of treatment interventions at health facilities. Facilities would be well equipped to offer PAC services that met the minimum medical service standards, had a wide range of options of family planning products for all PAC patients, and ensured proper counselling and guidance for more effective family planning. This would reduce the risk of repeat unintended pregnancies among this group of patients, who are already exposed to unwanted pregnancies.

Between these two diverse worlds, there is a lack of clarity on the legal status of abortion, restrictive abortion laws, and a lack of clarity on the guidelines for the provision of quality PAC services. At the facility level, guidance to service providers is unclear and the majority fear legal repercussions even if they were to provide legal services such as PAC. In addition, abortion is often treated differently from other health conditions, and commonly facilities do not have proper equipment such as manual or electrical vacuum aspiration (MVA/EVA) kits. In other cases, even when the kits are available, the facility management did not make an additional effort to ensure that these tools and equipment were always ready to handle emergencies, through proper disinfection and sterile storage.

In writing about post-abortion care in Kenya, I seek to identify common gaps in the quality of care in the provision of PAC services within healthcare facilities. I identify some of the common drivers to the current state of affairs, and uncover and present patient-provider

views on how these gaps might be addressed. Factually, in Kenya, PAC is neither illegal nor unsafe, but PAC services in health facilities must ensure less risks of maternal mortality from unsafe abortion. Post-abortion care should therefore be considered as an emergency medical intervention, which is legally available to all patients, regardless of the reason or cause of pregnancy termination.

1.1 Background

Unsafe abortion is a leading cause of maternal mortality, despite global advances in technology, healthcare innovations and decades of investment in maternal health [8]. An abortion is termed unsafe if it is performed by medical or non-medical persons without the requisite skills or in an environment that fails to meet predefined minimal medical standards, or both [9,10]. Globally, up to 13 percent of all maternal deaths are attributable to unsafe abortion. Although access to safe abortion services is largely dependent on country-specific policies on abortion care [11,12], inadequate healthcare resources and infrastructure, stigma, and women's lack of agency have been blamed for the majority of abortion-related mortalities [10,13]. In addition, there is growing evidence that unintended pregnancies are a major cause of induced abortion [14,15]; these are associated with low contraceptive use and high unmet need for family planning [16]. From 1990, the concept of post-abortion care (PAC) has emerged as one of the most effective interventions that prevents these deaths, by addressing the interconnections of these outcomes in relation to health care provision and utilization, especially in environments where access to safe abortion is restricted [17,18].

Kenya currently experiences high maternal mortality rates [1,19,20] and high rates of unsafe abortion [21,22]. Hospital-based estimates indicate that up to 40% of maternal deaths could be attributed to unsafe abortion [23], with more women at risk of death from complications especially when adequate and timely care is not sought once the first signs of complications are noted [24]. Reluctance to seek medical intervention is partly explained, perhaps, by high abortion restriction [25], stigma [26], and the medical and non-medical costs of post-abortion care [3]. In addition, although Kenya has one of the highest contraceptive prevalence rates (58%) in Sub-Saharan Africa (28%), access to and use of effective modern contraceptives such as implants and intra-uterine contraceptive devices (IUCD) remain low (14%) [27]. In addition, unmet need for contraception among sexually active Kenyan women remains high, especially in rural areas [1], resulting in larger family sizes and unfulfilled fertility

desires. These unfulfilled desires, together with undesired sexual exposures such as rape and other forms of sexual violence, predispose women to unplanned pregnancies. In response, they turn to providers who are willing to provide abortion, often despite medical qualifications and/or appropriate settings, or they resort to home remedies which include traditional service providers or self-administration of these remedies [28].

While maternal deaths from complications related to unsafe abortion are associated with women seeking services from unqualified providers and self-inductions, deaths also occur in hospitals, raising concerns over the process of seeking care and the quality of the care delivered in these healthcare facilities [29]. There is an urgent need for data to understand the quality of PAC services available within the Kenyan healthcare facilities. Past studies on the quality of PAC in healthcare facilities in Kenya have fallen short of rigor and depth of their methods, resulting in the limited generalizability of findings [22,30], which may contribute to the current deficiency of clear policies and guidelines on the provision of quality PAC. Studies have shown how policy development has benefited from robust evidence on abortion and quality of care in healthcare facilities [31]. There is therefore a dire need for a comprehensive assessment of PAC service provision in order to establish quality of care in Kenya, using methods that are sufficient to generalize these findings to the national level for policy action. Towards this goal, this research builds on existing knowledge of the quality of PAC services in Kenya, and seeks to extend it, focusing on known quality of PAC models that have been suggested in past two and half decades since the origin of PAC in 1990.

The aim of this research was to assess the quality of PAC services available in healthcare facilities in Kenya. It focuses on providing evidence on the level of quality and its determinants, understanding key aspects of quality such as post-abortion contraception, interactions between service providers and patients, and the role of legal and policy influence on this interaction and its effect on quality of PAC.

1.2 Significance of study

The Millennium Development Goal 5A aimed to reduce the maternal mortality ratio by three quarters between 2000 and 2015. At the end of 2015, little progress had been achieved. The Sustainable Development Goal 3 sets global targets for the period 2016 and 2030, and focuses on women's access to reproductive health as key to achieving sustainable development [32]. The goal aims to reduce maternal mortality to under 70 deaths per 100,000 live births by 2030, while Goal 5 focuses on measures to ensure a more inclusive society for women, and reducing discrimination, including against access to healthcare services [33]. In Kenya, there is an urgent need to address the high rate of maternal mortality by addressing both the causes of unsafe abortion, including a high number of unintended pregnancies, and ensuring quality PAC services to mitigate the missed opportunities to prevent unintended pregnancies. The high unintended pregnancy rates have been linked to a combination of factors including low contraceptive use, contraceptive failure and method discontinuation [34,35].

Treatment of post-abortion complications consumes a substantial amount of healthcare resources including human and infrastructural resources [30,36], leading to significant deterioration of quality of services delivered [14,30,36]. Despite evidence on the high abortion complication rates [37,38], still little is known of the nature of services currently available in our healthcare facilities. There has been minimal effort to evaluate these services for quality improvement and prevention of possible hospital-based or hospital-related deaths from complications. There is also minimal knowledge on how service providers and patients understand quality of care, although this is an essential component of any meaningful intervention to improve the quality of these services.

The centrality of this study is the current status of abortion services in Kenya. The promulgation of a new constitution in August 2010, and the need for legislation to operationalize the bill of rights, created an urgent need for extensive baseline information on

abortion, abortion-related healthcare needs, and care delivery to inform this legislative agenda. The absence of such evidence has seen major challenges including delayed implementation of guidelines to anchor the constitutional provision of safe legal abortion. This legal and policy vacuum continues to expose all abortion patients, including those who experience spontaneous abortion to adverse health effects. Furthermore, the penal code, which criminalizes abortion in Kenya, remains in use, and so far, efforts to provide guidelines for safe legal abortion services have been futile, with guidelines having been developed, launched and withdrawn now for over three years. At the policy level while guidelines for provision of PAC in health facilities have now been implemented, those on the provision of safe legal abortion in these facilities have faced implementation challenges and are yet to be officially launched by the Ministry of Health. The implication of this lack of guidelines is a consequent lack of service standards, which only fuels a higher incidence of unsafe abortions. In 2010, Kenya ratified the 2003 Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa, commonly known as the Maputo Protocol. However, there has been minimal progress, especially on the matter of legal compliance on most of the protocol's provisions of legal compliance on matters of health and reproductive rights in accordance with Chapter 6 of the protocol.

In the following section, the key research questions that form the basis of this study are outlined, and the research objectives that were developed to respond to these specific research questions.

1.3 Research aim

The aim of this study is to examine aspects of the quality of PAC services in healthcare facilities, to understand the perspectives of PAC service providers, and to explain care seekers' notions on quality PAC in Kenya.

1.4 Research questions

1. What are the determinants of post-abortion quality, and how are these reflected in quality of PAC in healthcare in different health facilities in Kenya?
2. How do service providers understand quality PAC and what challenges do they face in offering it?
3. To what extent is post-abortion contraception and contraceptive counseling delivered in Kenyan healthcare facilities?
4. How do patients in Kenya understand quality PAC and what challenges do they face in accessing it?

1.5 Research Objectives

The research on which this thesis is based aimed at responding to the following objectives:

1. To examine facility-level quality of PAC and analyze the determinants of quality PAC in Kenyan healthcare facilities
2. To analyze the level and determinants of post abortion contraception
3. To explore PAC service providers' understanding of quality PAC and their challenges in providing PAC services in Kenya
4. To explore PAC service seekers' understanding of quality PAC and their experience in seeking PAC services in Kenya

The next section presents a detailed review of the theoretical framework on quality of post-abortion care services and some of the existing frameworks for care. This framework is presented in four main parts: abortion care and policy, health care seeking behaviour, abortion complication treatment, and the role of healthcare providers including a focus on post-abortion family planning.

2 LITERATURE REVIEW

Quality of PAC is concerned with providing a timely intervention that reduces the risk of maternal mortality due to unsafe abortion, whether induced or spontaneous, and is often defined at five levels: the patient, service provider, facility of care, policy, and legal environment for care delivery [17]. The intervention focuses on the capacity of the service provider to provide PAC services in an appropriate environment, including the facility, policy and legal environments.

When abortion is highly restricted, women resort to unsafe terminations; they delay seeking care, and when care is sought, the majority require specialized interventions because of complications [16,25,39]. In many countries in sub-Saharan Africa, abortion is illegal or highly restricted, available only when the life of the mother is in danger. A majority of these abortions is performed clandestinely, either self-induced or procured by untrained personnel, in conditions that aggravate the risk of severe complications [25,40,41]. Abortions are underreported, so available figures underrepresent the gravity of problems associated with unsafe abortions, inhibiting effective policy-level interventions. In addition, induced abortion are almost always reported as spontaneous, making it hard to distinguish between spontaneous abortions and induced abortion; as a result, data from surveys and health records are highly unreliable [42]. In Kenya, even with underreporting, unsafe abortion is high compared to other African countries [20,43,44]. According to most recent estimates provided by the Ministry of Health, Kenya's abortion incidence rate was 48 abortions per 1,000 women of reproductive age in 2012, a slight increment from 45 abortions per 1,000 women of reproductive age about 10 years before [22]. This is relatively high compared to other countries: Ethiopia (23/1,000), Rwanda (25/1,000), and Malawi (23/1,000); it is only comparable to Uganda (54/1,000) (see Figure 2:1). The Ministry also identifies high levels of complications, with over 70 percent of women who had abortions being treated for severe complications [22], the majority of which

require specialized treatment and long hospital stays, which overstretch existing resources and result in poor quality of care [45,46].

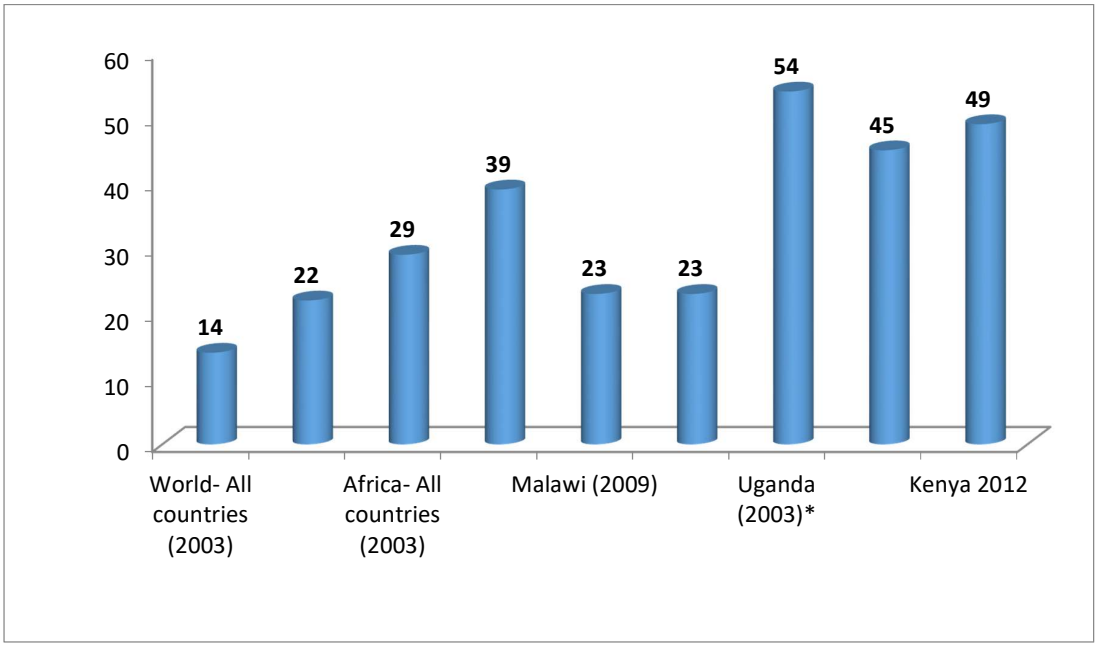


Figure 2:1 Global and regional rates of unsafe abortion

* Calculated as a proportion of women of reproductive ages 15-49 years.

Sources: WHO, 2007; Singh et al., 2010; Singh et al., 2005; IPAS Africa Alliance, 2004.

The term post-abortion care was first introduced in 1991 in a strategic planning document of IPAS International, which aimed to integrate PAC with family planning services [47]. This was mainly in response to the 1973 Helms Amendment and the subsequent 1984 Mexico City Policy, both which restricted the direct use of funds by the United States Agency for International Development (USAID) on abortion-related activities, or to foreign agencies whose other funds from any source were used in any abortion-related activities. The period between 1991 and 1998 saw the evolution of the concept of PAC, from a simple strategic proposition to an elaborate model of care. The original model drew particularly on the original framework on quality of care developed by Bruce [48]. A consultative forum called the Post-Abortion Care Consortium, made up of key stakeholders including EngenderHealth, IPAS

International, International Planned Parenthood Federation (IPPF), JHPIEGO (formerly Johns Hopkins Program for International Education in Gynaecology and Obstetrics), and Pathfinder International, developed the final 1998 PAC model, referred to as the essential elements of PAC (see Figure 2:2); it is still largely used globally to assess quality of PAC services in healthcare facilities [17,48].

The PAC consortium defines post-abortion care as "*an approach for reducing morbidity and mortality from incomplete and unsafe abortion and resulting complications and for improving women's sexual and reproductive health and lives*" [17]. This was composed of five essential elements of post-abortion care namely:

Community and service provider partnerships for prevention (of unwanted pregnancies and unsafe abortion), mobilization of resources (to help women receive appropriate and timely care for complications from abortion), and ensuring that health services reflect and meet community expectations and needs;

Counselling to identify and respond to women's emotional and physical health needs and other concerns;

Treatment of incomplete and unsafe abortion and complications that are potentially life-threatening;

Contraceptive and family planning services to help women prevent an unwanted pregnancy or practice birth spacing; and

Reproductive and other health services that are preferably provided on-site or via referrals to other accessible facilities in providers' networks

Figure 2:2 Essential Elements of Post-Abortion Care

Sources: Essential Elements of Post-Abortion Care [49]

In Kenya, as in most developing countries, access to maternal healthcare services is generally low [50–52], and among those who can access care, improper and inadequate treatment exposes patients to poor health outcomes [53]. The essential elements of the post-abortion care model identified three initial components of quality PAC: links to reproductive and other health care services; clinical management of post-abortion complications to minimize the risk of further complications, extended hospital stays and potential deaths; and post-abortion contraception to prevent repeat abortions [54]. In 2002, following the 2001 United States

presidential clarification memorandum that excluded PAC from the Helms Amendment and the Mexico City Policy, the PAC consortium formed the Post-Abortion Care Community Taskforce. These changes in the 1990s saw the implementation of programs in different countries, mainly in Africa and South America, which aimed at improving the post-abortion care services available in healthcare facilities at a time when most developed countries and a few in Asia were expanding the availability of abortion care services by legalizing abortion, either wholly or conditional on certain consideration such the risk to health or life of the mother and whether or not the pregnancy was wanted.

2.1 Abortion care and policy in Kenya

Healthcare provision and utilization operates within certain principles, governed by laws, by-laws, national constitutions, global statutes and other policy frameworks. These frameworks can be international, but they are operationalised within the legal contexts of specific countries [16]. The quality of PAC service delivery and access is often shaped both by these legal environments and by cultural, social and community factors, as explained further below. Globally, abortion remains an emotive subject and is often seen, in the context of the legal provisions, as either legal or illegal. The majority of proponents of abortion centre their arguments on the need for legalizing abortion, while opponents argue that legalization will increase the incidence of abortion. Experience in African settings such as in Ghana, Ethiopia and South Africa, where abortion is legal and available on demand or on expanded causes, shows that legalizing abortion is not the ultimate solution to maternal deaths resulting from unsafe abortion (see also [40]). According to Payne, the legalization of abortion only works well with improved cultural acceptability, and any intervention to improve maternal health must appreciate its multidimensionality.

As suggested above, in most middle and low income countries, abortion is illegal and only permitted if the health or life of the mother is at risk [36]. In other countries where abortion law

is less restrictive, other challenges emerge, among them the reluctance of service providers to offer services [55,56]. In addition to provider-related barriers, the management of healthcare systems determines service availability and equity. Zere and colleagues [57], for instance, explain that such disparities in the provision of care adversely affect less educated women, rural residents and those women in regions with low development indices and the greatest poverty. Payne and colleagues (2013), in a study among service providers in Ghana, where abortion is largely legalized, assessed the extent of access barriers to legal safe abortion services. They demonstrated that legalizing abortion alone, even with the necessary legal and policy structures to provide abortion care services, did not necessarily reduce maternal mortality due to unsafe abortion because of negative provider attitudes [40]. Similarly in Ethiopia, where abortion is also legal and available on demand, Hailemichael and others [58] found that the cost of care and service providers' lack of awareness of the legal status of abortion prevented access to safe legal abortion. In South Africa, again, abortion in the first trimester especially is legal and available on demand. However Harries and colleagues [59] found common challenges and service access barriers related to the complexity of care and service provider attitudes; Jewkes and colleagues [60] also established that a combination of poor quality of services and lack of awareness, as in Ethiopia, were persistent access barriers. These findings all demonstrate the need for a multifaceted approach to dealing with unsafe abortion.

Studies have also shown the need to complement abortion legal reforms with equipping service providers with the right skills, while also underscoring the complementary role that cultural acceptability plays in making abortions safer for women [56,59]. According to Payne [40], the use of multidimensional approaches in expanding the accessibility of PAC services requires improvements in service providers' awareness of the legal status of abortion. Additional evidence for the need for multifaceted approach is presented by Klick and Stratmann [61] in their work in the United States of America, who argue that while legalizing abortion has

positive impact on incidence and complication rates, it can also lead to risky sexual behaviour, leading to increased incidence of sexually transmitted infections.

Malin Hagman [62] presents an alternative explanation for Ghana's high maternal mortality rate despite the legal status of abortion. She argues that gender inequalities that derive from patriarchal structures and male dominance, low levels of education for women, and lack of empowerment, all hinder women's utilization of existing legal abortion care. The same can be said of Ethiopia, where despite legalization of abortion over the past one decade, poverty, distance to centres of care, and women's incapacity to make decisions on their own in relation to healthcare seeking, continue to deter them from utilizing these services [58]. Legalizing abortion in most cases therefore is a requisite of reducing maternal mortality, but it must also be complemented by other interventions. There is need for a conducive legal environment to support service providers in ensuring that women are protected from unsafe abortion complications. The significance of a more conducive environment despite abortion legalization has also been shown in other contexts, such as in India [63], where poor regulations and unnecessary consent requirements continued to deter access to safe legal abortion services. These four cases in Ghana, Ethiopia, South Africa and India are relevant to this research, and will be revisited when presenting results from this research.

In Kenya, abortion is not generally legal, and in the recent past, several debates have been concerned with this. In August 2010, after 20 years of constitutional review, Kenya promulgated a new constitution, which came into effect immediately. However, its implementation was to be progressive over the five years after promulgation, with changes and amendments in multiple laws to align with the new constitution. In the new constitution, for instance, chapter 4 (Bill of Rights), section 26 (4), specifies that abortion is not legal by stating that: "Abortion is not permitted unless, in the opinion of a trained medical professional, there is need for emergency treatment, or the life or health of the mother is in danger, or if permitted by any other written law" [64]. However, the penal code in Kenya continues to govern the

provision and access to abortion care services in Kenya. This code criminalizes abortion except only if the life of the mother is in danger [65]. Despite the superiority of the constitution, the penal code has been referenced in most litigations on abortion against service providers in the past seven years since the new constitution [66].

Provision of quality PAC requires a proper legal and policy framework that ensures that the fundamental rights of both care seekers and service providers are safeguarded [67]. For Akaba and colleagues [67] in the case of Nigeria, where abortion is equally as restricted as it is in Kenya, quality post-abortion care requires liberal abortion laws combined with preventive measures to improve women's access to effective family planning services and improved service providers' family planning and counselling skills. A similar study in Kenya by Rogo [68] further identified the need to build strong links between community networks and healthcare facilities for the prevention of unsafe abortion, community-based identification of abortion complications, and referral to health facilities for essential care. Rogo's assertions are corroborated by Kavanaugh [69], who recommends a combination of abortion legalization and community awareness of the dangers of unsafe abortion. According to all these researchers, curative measures are necessary, but are insufficient if not properly combined and integrated with preventive services such as the provision of effective contraceptive counselling and services for all sexually active women of reproductive age.

Notwithstanding the above, and despite dissenting opinions, among them Koch and colleagues [70], there is sufficient evidence that legalizing abortion reduces the complication rate [25,71,72] even though it may not reduce its incidence [73]. Earlier studies that compared abortion incidence and complications in countries where abortion had been legalized and where restrictive laws continued to apply, and showed that while complications rates were higher in countries with restrictive laws, they fell as incidence declined or remained stable in countries with legalized abortion [74,75]. According to Gold [75], with abortion legalization, both the

incidence of abortion and the risk of abortion-related death declined. This was so significant that the risk of death from abortion was even lower than that of dying from childbirth [74].

2.2 Abortion complication treatment

Levels of care

Treatment of abortion-related complication can be seen at three main service delivery levels: at the community; at the facility where patients seek treatment; or at a higher-level facility when patients are referred for specialized treatment. At the community level, treatment focuses mainly on the identification of complications and referral to the nearest health facility for care. At the facility of care, the essential elements of the PAC framework identify certain considerations for quality care. These include: recognition of complications; assessment of stage of abortion; vacuum aspiration; treatment of infections, shock, tetanus, and anaemia; and evacuation of the uterus. If these cannot be achieved, referral to first referral or tertiary facilities is recommended. At higher-level facilities, laparotomy or any indicated surgery may be recommended, depending on ability of these facilities to conduct such procedures. Where the referral facility cannot or does not have the capacity for the required procedure, a last referral to tertiary facilities is recommended [17].

Facility and provider preparedness

Quality of PAC services is mainly focused on the manner in which service providers offer these services, and the level of a facility's preparedness to offer them. Healthcare facilities and service providers in both private and public healthcare facilities play a critical role in averting the risk of maternal mortality from unsafe abortion [76]. Treatment for abortion complications underlies the question of facility preparedness to offer quality PAC and is based on the availability and usability of equipment, the availability and usability of supplies and medication, availability and ability of service providers at the facility to use appropriate technologies when managing

PAC patients, and provider's technical performance in diagnosing, treating and referring PAC patients if need be. The preparedness of facilities to offer PAC can be seen in terms of whether the facilities offer PAC services, as well as by assessing the nature of delivery of the available services [17,54,58]. In most cases, while the prevention of future unwanted pregnancies is important, certain barriers to care such as facility-based discriminatory practices reduce the efficacy of interventions such as counselling [77,78], which consequently makes PAC services less accessible [55]. Furthermore, a more efficient PAC delivery through service provider training, improved infrastructure [79] and availing proper medication has been shown to improve the quality of PAC service delivery [54,80,81].

In 2010, Johnston [82], in a South African study, demonstrated that equipping service providers with the requisite skills to offer quality PAC ultimately improves the overall quality of PAC. According to this study, and similar to Harries' study [59], dedicated abortion care clinics are required for the improvement of PAC-specific skills and to meet the needs of abortion patients in a non-discriminatory manner. However, Johnston's study [82] deviates from Harries' study [59] on the need for ensuring patient anonymity. Improving patient anonymity reduces stigmatization against abortion and unwanted pregnancy, but may not be achievable or possible in many dedicated healthcare facilities [83].

Service guidelines and unbiased care

In addressing maternal mortality due to unsafe abortions, the essence of proper guidelines or clear guiding principles for PAC service delivery within any healthcare system is to standardize services and address most provider-based biases, including judgmental attitudes towards women and moralization of sex and sexuality [81]. This must also be accompanied by strong quality assurance of monitoring for adherence, continuous quality improvement and institutionalization of PAC services. According to Billings and colleagues [84], in their study in Bolivia and Mexico, improving capacity of facilities to offer PAC through training of

providers, availing the requisite technologies for service delivery, and guidelines and monitoring, must be accompanied by strengthened political commitment to the improvement of PAC services. In concluding, they state the need to consider these improvements as prerequisites for any legal interventions and policy reforms. Earlier, in the development of the PAC models, Greenslade [85] argued the need for proper guidelines and policies to accompany other interventions such as the integration of PAC and FP, provider training, and the provision of technology such as manual vacuum aspiration (MVA) kits to primary healthcare providers to improve their preparedness to provide quality PAC.

Development and adherence to guidelines for PAC provision ensures uniform and unbiased delivery of quality PAC services, which are devoid of provider biases. Such provider biases lead to preference of counselling to the provision of post-abortion contraception for adolescents. In Uganda, Paul and colleagues [86] argue for clear and practical guidelines to provision of PAC services, rather than retaining policies that leave the service provider caught between the debates of pragmatic approaches and the influences of their own social norms.

According to Paul and colleagues, proper value clarification and attitude transformation, through in-service training, supports service providers' capacity to better handle the sexual and reproductive health needs of young persons in particular. In addition, service providers' misconceptions on abortion and lack of skills to provide post-abortion care restrain access to PAC [87]. Similarly, Bekker [88] and Tabbutt-Henry [55] show that service providers act as a critical link between the facility and the patient, ensuring patient-centred care and improving patient satisfaction by integrating PAC services into routine healthcare in the facilities.

PAC treatment technology

With respect to treatment for complications and appropriateness of technology used in PAC treatment, the adoption and use of safer treatment options such as MVA and medical abortion rather than outdated techniques such as sharp curettage (Dilation and Curettage -- D&C) is a major stride towards ensuring improved quality of PAC services [13]. The use of less invasive methods of treatment for complications from unsafe abortion improves the quality of PAC, as seen through patient satisfaction with services [89]. Use of MVA and medical abortion is recommended for first trimester abortions, while medical abortion and Dilation and Evacuation (D&E) are recommended for second trimester abortion management [16].

In Kenya, quality improvement dates back to the period when the concept of PAC was still under formation, beginning from the mass introduction of MVA by providing MVA kits to gynaecology wards at the national referral hospital in Nairobi. This led to over 200 percent reduction in abortion-related ward bed occupancy. The new technology revolutionized PAC services in the 1990s by allowing outpatient service, and dramatically reducing the need for inpatient care. According to Rogo [90], in addition to reducing the cost of treatment and strain on available health resources, this quality intervention saw an improvement in both patient and service provider satisfaction with services and outcomes, compared to the prior focus on highly specialized and more invasive procedures such as D & C with general anaesthesia. An earlier study [91] also demonstrated significant improvement with vacuum aspiration, compared to treatment with sharp curettage, in the safety of PAC services through the elimination of risks such as uterine perforation, sepsis, and the need for re-evacuation among patients treated. In another study, Bradley [92] took an economics approach, and collected data on the cost of staff time, medication and hospital stay in four large facilities in Kenya. The study demonstrated the cost-effectiveness of MVA over evacuation and curettage, and as a result recommend the expansion of the use of MVA kits in all district hospitals (see also [92]).

Other studies evaluating the quality of services by comparing different PAC treatment models found improved patient satisfaction with services and less treatment-related morbidity when patients were managed using MVA rather than sharp curettage. According to Jacques [93], in the context of a maternal deaths audit in Benin, in addition to patient satisfaction, providers also reported more satisfaction with results by managing patients with MVA rather than more invasive procedures. Women's deaths in hospitals from unsafe abortion were mainly due to deficiencies in service delivery, including medical errors, poor patient handling, improper or inconsistent monitoring of septic abortion, and high costs of services [93].

Medication

The use of antibiotics and other forms of infection management such as tetanus toxoids, together with pain management during and after evacuation procedure, increase the quality of PAC services. Proper medication and pain control increases patients' perception of quality of care, satisfaction with services and, therefore, prospects of future utilization [80,94]. Tavrow and colleagues [95] argue that such levels of satisfaction cause increased community awareness on the risks of unsafe abortion and availability of PAC services (see also [60]. Further, Solo [96] shows that women managed with effective pain control medications were more satisfied with PAC procedures than their counterparts with less effective forms of analgesics. The pain management and counselling processes should go hand in hand before, during, and after the procedure.

2.3 The concept of health care seeking behaviour

Appropriateness of care

A major component of quality of healthcare is that the service must be "appropriate" implying that the service should constitute a timely intervention and that the interventions should be the most ideal at the time and affordable to the patient [97]. This section explores the different components of quality of PAC, while focusing mainly on the interactions between PAC service providers and women who seek abortion-related care at healthcare facilities. The process of seeking care from the onset of complications is considered critical, since it influences the nature and level of complications when women finally present for care [75]. This process, which is commonly referred to as healthcare seeking behaviour, further includes the kinds of interventions at the healthcare facility, the type of facility of care, and the level of qualifications or experience that the service provider must have in order to provide appropriate PAC intervention [98,99]. According to Kerber [99], the appropriateness of PAC services requires the creation of a continuum of care, which ensures there are proper linkages for care at all levels, and rather than focusing only on treatment, offers life-time support to women, reducing their risks of unfavourable health outcomes following an abortion. One component of quality of PAC, as identified by the PAC Consortium and the PAC Community Task Force described above, was the need to improve access to care, including both preventive and curative services, through creating links between patients, the community and service providers. These linkages comprise both delivery of reproductive health services, such as STI/HIV treatment or referrals at the point of PAC treatment, and referral for contraceptive services, and so involves setting up effective links between the community and service providers [100]. In addition, the linkage entails building the capacity of health workers, community-based health practitioners, and community leaders to support women to seek timely post-abortion care [101,102]. Baird and colleagues [101] also present a case for community education and building the capacity of

strategic community gatekeepers, not only to identify danger signs of abortion-related complications but also to strengthen their willingness to identify these signs, and to know where to find appropriate care, hence reducing the risks of complications associated with delayed care seeking. This can be achieved by having a pool of community health workers with clear knowledge and understanding of contraception, who are able to clarify common misconceptions which often result in the non-use of effective family planning services and methods. Olukoya and colleagues [102] argue for special attention to adolescents and young women, who often face special challenges. In showing the need for community involvement at all levels of care, these authors focus on the awareness of the risks of unsafe abortion and the importance of creating an environment where adolescents, young women, and unmarried women in the community can access preventive and curative services, including counselling and contraceptive services. The need to empower adolescents, young women and unmarried women with social and decision-making skills is also emphasized. The argument here is for changing the way PAC is viewed, so that rather than being seen as a facility-based problem, it is regarded as a health services challenge that incorporates the community and is an integral part of the community's public health agenda. This argument was first advocated by the PAC community taskforce, which saw the need to engage the community more, and not to just focus on service provision. The taskforce's PAC agenda, as explained by Hirve [63], further refocuses the management of post-abortion complications, from the treatment of complications as a clinical problem only, to including social and behavioural factors related to the prevention of unwanted pregnancies. Consequently, PAC was extended from medical interventions alone to include women's expanded access to effective family planning services and commodities; it included a call for a mind-set shift to view abortion care as a matter of public health, and for changes in gender relations, especially in highly patriarchal communities.

Perception and satisfaction with care

Understanding the effectiveness of PAC requires consideration of the discourse on unsafe abortion and post-abortion care seeking behaviour. According to Fabamwo [103], in a study in Lagos, Nigeria, healthcare seeking manifests at three main levels: the individual level (both personal and household); immediate community level; and the policy level. At an individual level, certain factors are likely to influence a woman's care seeking behaviour. These factors can be further grouped into either predisposing, enabling or need factors, as reflected in Andersen's model of healthcare utilization [104]. According to the model, predisposing factors include family and social structures and beliefs that influence care seeking and decisions. Enabling factors refer to family and community resources, which act to facilitate care seeking, while need factors are the immediate causes of health utilization such as self-reports of illness, patients' self-efficacy to seek care, patients' locus of control, and their motivation to behaviour [105]. But here is the problem – these kinds of models separate and do not allow for the interplay and complexity of women's lives. This is a major challenge with the original Andersen model, which presented the decision to seek care as familial, and did not take account of individual woman's needs that do not necessarily mirror household needs [106]. These models are discussed in detail below, while exploring the development of the post-abortion care framework.

A patient's perception on quality of care is an important factor when choosing to seek care, despite lack of technical competence to make informed judgement on the quality of services [107]. Sometimes, these preferences are based on visual assessment, prior experience with services, and level of articulation of patient's needs by the service providers [108,109]. Various studies on women's healthcare seeking decisions have demonstrated how care models that aim at improving women's ability to make decisions about their health is essential in improving women's perception on quality of care and ultimately their decision to seek care.

Rebecca Cook's [110] global health assessment of gender constructs in healthcare provision, together with Aday and colleague's [111] exploration of the dynamics of healthcare access and availability, illustrate the need for shifting focus from factors such as economic considerations in care seeking to non-economic factors which are often driven by patients' perceptions and knowledge of service availability. Coulton and Frost [112] extend this argument further to demonstrate how perception can influence care seeking regardless of patient's age. Becker and colleagues [39] support this argument by presenting the role of the dynamics of the relationship between service providers and patients and how this experience influences future service utilization. The same argument is presented by de Leon and colleagues [113] in a different context in Argentina. For Cook and Aday [110,111], a patient's participation in health determination improves satisfaction with care, while Aday [111] insists on a more rights-centred healthcare approach, which appreciates the patient's desire for care and meets these desires at a personalized level while addressing the patient's basic human rights of access to timely and quality care.

Providing women with adequate knowledge on their reproductive health can greatly improve their choice against unsafe abortion [39,114]. This empowerment is perfected when quality of care is seen from the perspective of patient satisfaction with services. Vuori [115] extends this argument by placing emphasis on the patient's state of mind, rather than the patient's technical ability to make an assessment of quality, as well as the patient's inability to competently assess their own satisfaction with services. Satisfaction with services should not be viewed as one that encompasses the whole range of patient's feelings and views that they express, but rather, as one that considers how care might threaten a patients' personal identity, by leading them to feel loss of power and to feeling devalued when interacting with healthcare service providers and facilities [116]. Malat [117] points to the essence of managing this "social distance" between patients and providers in order to facilitate effective communication between

them, and argues that this ultimately influences treatment outcome and post treatment behaviour including the adoption of and adherence to post abortion contraception.

Service accessibility

Unwanted pregnancy is the leading known cause of unsafe abortion [118–120]. In the case of an unplanned conception, women often must seek an unsafe pregnancy termination because of the lack of availability and access to safer options [13]. Most women resort to unsafe procedures owing to high restriction of abortion services and the fear of criminalization and discrimination [40]. Such fears cause them to delay seeking medical intervention until when they face severe risks of death from complications [18,121]. According to Grimes [18], the manner in which women with complications from these abortions are treated in the society, the healthcare system and policy environments, underlies the known causes of these deaths. The accessibility and availability of PAC services is therefore a major determinant of post-abortion health outcomes. When women are faced with complications from unsafe abortion, the decision and the process of seeking care largely determines their mortality risks. While underscoring the need for community engagement for better awareness of risks of unsafe abortions, abortion care services and their availability, Hord and Wolf [13] have demonstrated that lack of understanding on the availability of these services should itself be of concern. They further argue that even in circumstances where abortion is legal, women's lack of knowledge may deter access to safe services, when a safe abortion or treatment for an unsafe abortion could be life-saving. Poor service utilization, demand for services from unqualified providers, and unavailability of post-abortion care services at primary healthcare facilities have also been blamed for high maternal deaths [6,120]. Creating proper links to increase demand for post-abortion care services, therefore, minimizes the risks of complications from unsafe abortion.

Researchers have also shown that late care seeking for complications from unsafe abortion is strongly associated with higher complications [38], at times resulting in fatality [24,53,103].

These delays are explained by several factors: stigmatization of abortion, financial constraints, awareness levels of women seeking care [122], and the legal grounds within which abortion services can be accessed. Findings from several studies concur that community trust in the availability of services, the service quality, and the costs of available services all influence women's delay in or likelihood of seeking care [123]. Barnes-Josiah [123] and Koenig [122] propose improvement of the availability, scope and quality of services, while Mayi-Tsonga [124] argues that these measures must be combined with effective service delivery at healthcare facilities. In Kenya, healthcare seeking and the uptake of maternal healthcare is low [125,126], and consistent with this, the majority of women with complications from unsafe abortion do not seek prompt medical intervention even after the onset of signs of complication [127,128].

Baker and Khasiani [14] discuss the concept of PAC seeking behaviour and how improving women's ability to make more informed and timely decisions on their health ultimately improves their post-abortion health outcomes. They describe induced abortion as a women's choice when confronted with an unwanted pregnancy. With views similar to Mitchell [129], women's health competency plays a role in actualizing care choices. Ziraba and colleagues [24] also highlight the need for seeking medical intervention for complications from unsafe abortion to reduce the risk of maternal deaths. In addition, Ziraba and colleagues demonstrate the role of enabling factors such as self-efficacy and locus of control in determining care seeking.

In addressing women's healthcare seeking behaviour and designing and developing programs to improve maternal health and reducing the risks of unsafe abortion, it is important to focus on women on one side and their communities on the other [122,125,130,131]. While much of the literature has focused on women's own actions, there has been growing attention to the ways in which community factors determine their uptake of healthcare services [132], as is well established in other areas of healthcare delivery such as antenatal care [126] and other aspects of maternity health and sexual and reproductive health [133]. Household practices, including gender relations, and community beliefs about reproductive health needs and

healthcare seeking influence decisions between seeking care from healthcare facilities or relying on homecare or self-management [125,129]. This choice, in the case for complications from unsafe abortion, determine if and when women seek care [24,124] and often, ultimately, the outcome. A more recent study in Tanzania focused on the alternatives to health facility care seeking, a common phenomenon when access to safe abortion services is legally or financially restrictive. According to Vibeke and colleagues [28], women often resort to traditional service providers for both termination of pregnancy and the management of ensuing complications from these often unsafe procedures. The use of traditional medicines for pregnancy termination increases the risks of complications, however, and increases the delays in care seeking, with patients or their caregivers only attempting to seek appropriate care when these remedies fail to effectively and safely complete a pregnancy termination. In their study, they noted that some of the products used were highly efficacious in inducing uterine contractions, but not as successful in completing the expulsion of the products of conception, leading to patients being admitted in hospitals with incomplete or inevitable abortions. These risks that have also been highlighted by Vandana and colleagues [134].

In Kenya, while maternal mortality remains high, evidence exists on regional heterogeneity in the risks of maternal deaths. In a study to assess the global burden of diseases, Achoki and colleagues [135] demonstrated how this maternal mortality can be so low as to be comparable to developed countries in some regions, yet so high in other regions that it can be compared with some of the least developed countries. While this can be attributed to cultural diversity in the country which drive individual behaviour [136], these disparities can also be viewed as the outcomes of the differential implementation of health sector policies in the country, and the organization of healthcare services [136,137].

Some cultural drivers include moralizing attitudes about sex, especially among young people, and the stigmatization of unintended pregnancies and abortion [103,132]. In Kenya, a discourse analysis of adolescents' social scripts on abortion show that their views were often

abstract and disconnected from their descriptions of personal abortion behaviours, explaining how these adolescents understood abortion and abortion care seeking [129].

Although Kumar [138] has argued that abortion stigma is often exaggerated in contexts where unintended pregnancy is highly stigmatised, with no clarity of the difference, service providers play a role in fuelling stigma at the community level. He argues that the level of interaction between the community and service providers often influences women's care seeking behaviour. Good quality of this interaction would positively influence the community's views on pregnancy especially for young women, on abortion termination, and on women's ability to make decisions on their reproductive health [125,129,132]. In Ghana, Lithur [139] demonstrates the need for going beyond basic debates about the legalization of abortion to reconsider community awareness of the reproductive health benefits of safe abortion, and considers how such awareness influences care seeking, community and family perceptions on ex-nuptial pregnancies, the social and economic costs or benefits of an extra birth, and women's ability to determine their own healthcare outcomes, even in the context of legal abortion. However where there are restrictive abortion laws, Cockrill [132] demonstrates that the interaction of personal beliefs such as self-judgment and community condemnation fuel abortion stigmatization, deterring women from seeking medical interventions for abortion complications.

While legalizing abortion alone has no significant effect on the volumes of safe or unsafe abortion, it has a significant effect on the level of severity from the ensuing complications through eliminating some of the common causes of abortion stigmatisation [18]. In most countries in Sub-Saharan Africa, abortion is illegal and seeking post-abortion care is stigmatized, causing women to eschew medical interventions despite knowledge of the existence of these services. Knowledge alone does not lead women to seek care, and their behaviour is often modified by the community factors above, as well as the legal status of abortion, whether known or perceived.

In Kenya, Osur and colleagues [3] argue the need for eliminating abortion stigma both at the community and within healthcare facilities. Other scholars have highlighted the need for interventions to reduce stigma, even in countries where abortion is legal [132]. These interventions would further include proper management of excessive bleeding, sepsis and other conditions which are as a result of delayed care seeking, often as result of high abortion stigmatization [140]. In addition, such interventions should address the socio-economic and psychological consequences of unsafe abortion such as exposure to catastrophic household health expenditures and the psychological effects of abortion [140,141].

Cultural, social, economic and political pressures can affect women's care seeking when faced with unintended pregnancies [140], supporting arguments for proper community engagement in both preventive and curative post-abortion care strategies, as outlined in the essential elements of post-abortion care framework [49]. The role of community awareness of PAC and detection of early pregnancy bleeding in influencing care seeking has been unclear [142]. More preventive roles at the community involve the penetration of family planning and counselling programs, as well as the reliable availability of family planning methods and service to reduce unintended pregnancies [143]. These intervention should be aimed at reducing unintended pregnancies, a leading cause of unsafe abortions on the grounds of community values which expose women to unwanted pregnancies [144].

Support systems for women in need of PAC are another determinant of quality PAC. For instance, lack of spousal support is a known barrier to access quality PAC. This may also include unavailability of social support from close relatives such as in-laws who prevent women from obtaining quality care [145]. Improving community-level acceptability of abortion therefore plays an integral role in the utilization of safe legal abortion and post-abortion care services, by creating a more supportive environment for women, so reducing their anxiety associated with abortion and improving their decision to seek care [17,40,146]. Lack of family

support, cost of services and religion are common barriers to use of modern contraceptive methods, exposing women to unwanted pregnancies and unsafe abortion [63,147].

The role of religion in precipitating abortion stigma has been described by Hossein-Chavoshi [141] in their study in Iran, where women seeking abortion were found to suffer depression and anxiety at the time of and after termination of pregnancies, which resulted from their beliefs, consistent with those of others in the community that abortion is sinful and that any ensuing misfortunes could be due to supernatural/divine punishment. In most cases, this level of religious disapprobation of abortion deters women from accessing PAC services [145]. Furthermore, healthcare workers' beliefs and religious views of abortion as immoral and sinful often shape their own views on abortion, and lead them to deny emergency services and support to women who need care [141]. In other cases, despite willingness to provide care, a community's religious perceptions on abortion deter service providers from service delivery for fear of being ostracized by the community and because of their desire to fit in. Similar views are not restricted to service providers but are also held by the healthcare facilities' management [59].

The economics of care

The direct and indirect costs of PAC services is another access barrier for quality post-abortion care and a barrier to women presenting for care [148]. Often, service providers prefer to use more invasive post-abortion treatment procedures such as Dilation and Curettage (D&C), sometimes because of the lack of necessary skills or experience in using less invasive procedures such as medical abortion and Manual Vacuum Aspiration (MVA), personal preferences for certain procedures, and preference of more costly procedures when these procedures translate to monetary gains [18]. Jewkes and colleagues [60] argue that in such circumstances, some providers prefer more complicated treatments based on the charges, or deny patients certain services for fear that these patients many not be able to meet out-of-pocket costs of treatment.

Provider preferences for outdated procedures lead to the use of high-level sedation and low task shifting in PAC service provision [82]. Studies have revealed the existence of client preference for medical treatment for incomplete abortion over surgical treatment procedures, sometimes driven by the convenience of medical procedures and other times, their low cost [145,148]. Cost has also been associated with the support of more preventive measures than the treatment of abortion complications: a full year of supplying contraceptive commodities to prevent unwanted pregnancies costs just under 13% of the average cost of treating an abortion complication [149,150]. Therefore, investing in preventive measures to address unsafe abortions outweighs government investment in treating abortion complications. In addition, at the household level, the cost of an induced abortion can be catastrophic, due to loss of income from hospitalization and large expenditures on healthcare when a household member experiences a complication from an unsafe induced abortion [151]. Meeting these costs consumes an enormous amount of household resources and leads households to resort to other kinds of coping mechanisms such as the disposal of family assets.

The quality of provider interactions with patients before and during care is critical in determining patient's satisfaction and future service utilization. Cases of patient mistreatment from judgmental and unethical providers deter other women from seeking care when faced with similar health challenges, or the same PAC patients from seeking care in future [77,152]. In such cases, women lack the space to voice their concerns and are unable to participate fully in decisions on their management. This power imbalance denies women the opportunity to make choices between simpler technology and lower cadre medical personnel, decisions which would drastically reduce their cost of treatments [153].

Generally, quality of care refers to the safety, appropriateness and effectiveness of care [17], but the emphasis in much of this literature focuses on service provision, with women simply as objects of this system. The concern in this thesis is to address quality of PAC services in association with patient's experiences of care and patient-related factors that make these services inaccessible. To be of quality, therefore, PAC services must be seen as essential and trustworthy for the women who use them when faced with complications from unsafe abortions, regardless of the pathway to or cause of the abortion.

2.4 Post-abortion contraception and repeat abortion

Prevention of repeat abortion

In most literature on post-abortion care, post-abortion contraception is a common missing link. Curtis and colleagues [154] argue that in most cases, PAC concentrates on the treatment of complications; they present the need to review this critical component of PAC, with an aim of reducing repeat unintended pregnancy, and achieving individual goals that are associated with the adoption of effective family planning methods, including dual protective methods for HIV prevention. In discussing the provision of contraceptive services to prevent unintended pregnancies among PAC patients, there is need to revisit the knowledge, willingness and capacity of the service provider to offer these services. According to Cheng [155] and Mote

[156], post-abortion contraception prevents the recurrence of unintended pregnancy among an already exposed group. Cheng's and Monte's arguments converge with those of Tietze and Jain [157], that PAC patients who avail themselves of family planning have a reduced risk of another abortion. Preventing unwanted pregnancy reduces abortion and abortion-related deaths, but this role of contraception has not been sufficiently emphasized, and most providers pay greater attention to the treatment of unsafe abortion complications [154]. According to Johnson [158], menstrual regulation averts the cost to health systems associated with PAC, maternal mortality and morbidity. Similarly, from a health systems and resources approach, Henshaw [159] argues that the centralization of contraceptive services as well as PAC and poor task-shifting to lower cadre staff continue to deprive the health system of much needed resources, and deprive PAC patients of critical medical interventions, including effective contraceptive services.

Effectiveness of contraception

Johnson and colleagues [160] argue that women who were provided with family planning services and who used contraception effectively after an abortion had lower risks of repeat abortion. However, they emphasise the importance of the quality of contraception use after an abortion, given that some methods are less efficacious than others in preventing pregnancy [160]. This argument is also presented by Iyengar [153], who demonstrates that post-abortion care patients who did not use any contraceptive method, together with those who used less effective methods, whether modern or traditional, were more exposed to contraceptive failure and mistimed or unwanted pregnancies.

The unpredictability of resumption of menses and the immediate return to sexual activity soon after an abortion makes the case for the inclusion of post-abortion contraception in the quality of care models, with a focus on the provision of contraception before the patient leaves the healthcare facility where she received PAC [161,162]. Studies have called for the continued inclusion of post-abortion contraception for more effective protection against unwanted

pregnancy [154,163]. According to Borges [163], contraceptive administration during PAC, in consultation with a trained service provider, increases the uptake of family planning services within the first six months after an abortion. Lahteenmaki [161] has recommended the adoption of effective contraception before the onset of the first post-abortion menstruation; in support of this, Yabiku [164] recommends at least a six months delay between an abortion or miscarriage and the next pregnancy. With recent advances in technology and the rapid increase in the availability of medical abortifacients such as Mifepristone and Misoprostol, this duration between an abortion and the consecutive pregnancy has been further reduced, especially for women with spontaneous abortions who wish to conceive sooner, leaving those with unwanted pregnancies to depend on the effectiveness of the contraceptive method they adopt after an abortion [165]. Earlier, Solo and colleagues [166] demonstrated the need for further effort to improve the level of service integration of family planning and both safe abortion and post-abortion services in Kenya, in order to address the missed opportunities and risks of repeat unsafe abortions.

Most contraceptive methods available for pregnancy prevention depend on the user's competency, consistency and commitment to adherence. According to Prata [167], inconsistent use of modern family planning methods or non-use of methods were leading determinants of repeat abortions. Keene [168] argues that previous exposure to unintended pregnancy and induced abortion, and number of living children, are important factors that influence the adoption of effective family planning methods after an abortion. She includes as "effective contraception" intrauterine contraceptive devices (IUCD), implants and bilateral tubal ligation (BTL), all of which, according to use effectiveness, reduce risk of pregnancy by up to 99%. Use effectiveness is mainly defined by how well a contraceptive method works typically, irrespective of human error and within non-ideal circumstances. At the population level, Marston and Cleland [169] argue that when fertility is unchanged, increased contraception use and use of more effective contraceptives reduce induced abortion; they demonstrated that

women adopting IUCD after an abortion significantly reduced their risk of a repeat abortion. Emphasis on contraceptive counselling and adoption of a preferred method while the patient is still within the PAC-providing facility improves post-abortion contraceptive uptake and hence, reduces the incidence of a repeat abortion [166].

Gender relations

Post-abortion contraception cannot be left alone as a responsibility of service providers and women. Male involvement in family planning and counselling is critical. Rasch [170], for instance, shows that involving men improves contraceptive use and is an important arm in the prevention of unsafe abortion. However, he points out that this process must acknowledge the particular nature of gender relationships within the communities. In neighbouring Uganda, Kabagenyi [171] shows that involving men in post-abortion contraception, in order to dispel common misconceptions that men hold on contraception, can greatly improve women's access to post-abortion contraception and use of contraceptive commodities and services after treatment for complication from unsafe abortion. However, in addition to the misconceptions that men hold on contraception, gender norms that culturally define the roles of men and women and traditional approaches to the implementation of reproductive health programs have contributed to failures on male inclusion. Tsui [172] argues that the benefit of contraception goes beyond just preventing unwanted pregnancy, and should be seen in the context of protection against mother to child HIV transmission, and maternal morbidity. Beja and Leal [173] take a similar position on male involvement, but caution on the need for greater emphasis on patient-centred care, which recognizes and appreciates when to and when not to involve third parties in any form of abortion care.

Contraceptive competency

The knowledge and awareness of available methods of family planning that best fits one's use is not trivial. According to Biney [174] in Ghana, the majority of the women seeking care did not know much about the different family planning options available for them. This led to low or inconsistent use of family planning, which resulted in unintended pregnancies and

termination. Similarly, Olenick [175] demonstrated that improved exposure to information was linked to increased contraceptive adoption and use.

In Kenya, use of family planning remains low and uptake barriers still persist, among them fear of side effects, lack of social support, myths and misconceptions, religious reasons and method or service cost [1,176]. These barriers to access often lead to missed opportunities for contraception within health facilities for postpartum women, as documented in western Kenya [176]. According to Naanyu [176], the likelihood of postpartum women using contraception varies depending on their knowledge of methods, social support and service provider support. The existence of gaps in these areas is clear evidence of the role that post-abortion contraceptives counselling plays in changing PAC patients' attitudes towards family planning and so influencing the rate of post-abortion contraceptive uptake.

As in other settings, Zhu and colleagues [177], in their study in China demonstrates that this uptake largely depends the comprehensiveness of PAC services. Here, comprehensive PAC does not only include contraceptive counselling, but incorporates the provision of more effective contraceptive methods and involves male partners in management of women's fertility preferences and planning. These interventions have been shown to cause improved uptake of long-acting methods among PAC patients. Similar arguments have been made for patients undergoing termination of pregnancies in environments where abortion is legal [178]. Quality of PAC therefore appreciates the role of post-abortion contraception as a strong component of abortion care and, therefore, its specific consideration in this study.

2.5 Quality post-abortion care: a conceptual framework

In order to situate this post-abortion care study in the larger body of knowledge in healthcare seeking and service delivery, this section explores some of the existing models of health care in general. It then pays specific attention to the development of the post-abortion care concept, and how it has evolved since its origin in 1990. Further, the section discusses several care

models of access, availability and uptake of PAC services. Most PAC models discussed here are embedded in more general healthcare access models, but they were developed and evolved to guide major global, regional and local interventions for improving the health outcomes of PAC patients.

The concept of post-abortion care was developed in 1991 through an IPAS International strategic plan, which recommended the integration of post-abortion care in the healthcare system to prevent repeat unwanted pregnancies that were associated with unsafe abortions and poor health outcomes for women [47]. The essential elements of quality PAC were developed building, and improving, on Judith Bruce's quality of care framework (1990). Bruce had identified six main components of quality of reproductive healthcare. These included choice of contraceptive method, acceptability of services, technical competence, positive client-provider relations, community engagement, and the provision of information to clients. In 1994, Greenslade and colleagues [85] published the first post-abortion care framework, which comprised the original three elements: treatment of complications, post-abortion family planning, and creation of links between abortion treatment and reproductive healthcare services. The essential elements of post-abortion care framework included use of appropriate technology in healthcare facilities as well as ensuring that service providers had the technical knowledge and skill to use the recommended technology to appropriately treat and manage complications from a first trimester or a second trimester abortion.

Since then, a number of improvements have been made to this model to increase women's access to and utilization of post-abortion care services. The first of these initiatives was a study in Western Kenya, which created networks of private healthcare providers and links between these providers and primary healthcare workers [68]. The study involved linking providers with women's groups, with an aim of reducing unintended pregnancies and unsafe abortions by addressing both access and availability barriers to post-abortion care through addressing the three components of PAC at that time: emergency treatment, counselling, and links to other

reproductive health services. The model also included linking service providers with the community to better identify women with complications from abortion or miscarriage in the community and to ensure ease of referral before complications were aggravated. These three components significantly reduced the cycle of unwanted pregnancies and so reduced abortions. A similar study was conducted in Peru in 2000, with an additional component that sought to reorient PAC from inpatient to mainly outpatient service. This operational research demonstrated a significant drop in hospitalization due to the adoption of appropriate technology such as manual vacuum aspiration and medical abortion, and led to the phasing out of obsolete technology such as sharp curettage [179] .

Addressing unsafe abortion requires multidimensional approaches [124]. As already described above, in Kenya, unsafe abortion remains high [22] and its role in causing maternal mortality is significant [30,36]. Despite efforts to reverse this trend, this highly preventable cause of death remains on the rise [1,180,181]. Post-abortion care refers to emergency medical and preventive interventions that reduce the risk of maternal deaths from complications arising from unsafe abortion [17]. The concept of demand and supply of healthcare services has been discussed in many contexts. The Measure Evaluation Family Planning and Reproductive Health program developed the framework presented in Figure 2:3 to show the pathway through which supply and demand side factors interplay to cause changes in maternal mortality. This framework forms the basis of this research. The demand-side is mainly concerned with the processes and experiences of women when managing abortion, such as their general health, gestational age of the pregnancy [127,129], pregnancy planning status and fertility levels, and desired fertility or family size [182]. On the other hand, the supply-side includes health systems, human resources for health, and equipment at primary, secondary, or tertiary health facilities [127]. In this dichotomy, access to services are defined by affordability and availability [183]. Considering the ease of prevention of unsafe abortion or providing PAC services, complications from unsafe abortion are viewed as an unnecessary strain on existing healthcare resources

[46,58]. Unfortunately in Kenya, the rates of complications from unsafe abortion remain high, with over three quarters of all abortions treated in healthcare facilities in 2012 having severe complications [6,22,38].

Post-abortion contraception is one of the most neglected components of quality PAC. Singh and colleagues [184] emphasise the importance of women's access to contraception in reducing maternal mortality and morbidity through lowering the incidence of future unplanned pregnancies. The model in Figure 2:3 identifies key underlying, individual level and systemic factors, which influence demand for services and improve access to these services. The ultimate aim of such improvements is to increase service utilization, which consequently improves health behaviour to achieve a desired health outcome, in this case, to reduce maternal mortality. This framework is developed based on the Andersen's behaviour model for healthcare service utilization [106,185], and is an improvement on the classification of determinants of utilization into predisposing, enabling and need factors. These factors influence post-abortion care service utilization, but they also include psychosocial factors such as locus of control, self-efficacy and risk aversion that create the "need" for women to make decisions to use healthcare services. This model identified three factors which influence family's use of healthcare services: predisposing, enabling, and need. Predisposing factors facilitate use, among them demographic, social and health beliefs. Enabling factors moderate the decision to use and include personal, family, or facility factors. Need factors refer to whether the user feels the essence of the services or not, and these are mainly based on the personal perception of need for healthcare services [104,185]. This model was closely knit with much older assumptions of rationality of behaviour when making decisions on pay-offs and the assumption that all pay-offs can be ordered by the size of their benefit, as shown by Simon [186]. In all these models, focus was made on the process of decision making, assuming the economic law of rationality -- that any rational user's actions are aligned with their beliefs and preferences. However, challenges of intra-family heterogeneity and low model predictive power [105], especially on the measures of

predisposing and enabling factors, have seen the evolution of this model into a more individual based approach which identifies the nature of service delivery, the level of healthcare technology and individual characteristics as major determinants of healthcare utilization [187]. In addition, the weaknesses of these models were consistent when applied to specific subgroups of the population [112].

Bradley and colleagues [106] proposed this model to demonstrate the complex role on long-term care utilization of additional factors, including structural factors such as race and ethnicity.

In improving the quality of PAC, special attention is given to the essential elements of PAC model, set out in Figure 2:4. The model identifies five main pillars for measuring quality of PAC: community and service provider partnerships for prevention of unwanted pregnancies and unsafe abortion; counselling; treatment; contraceptive and family planning services; and linkage with reproductive and other health services.

This framework for post-abortion care quality assessment has been used to characterize healthcare facilities by care quality standard in Ethiopia and Kenya [189,190]. This present study uses these five pillars to assess care delivery and to explore what quality of post-abortion care means to PAC patients and service providers.

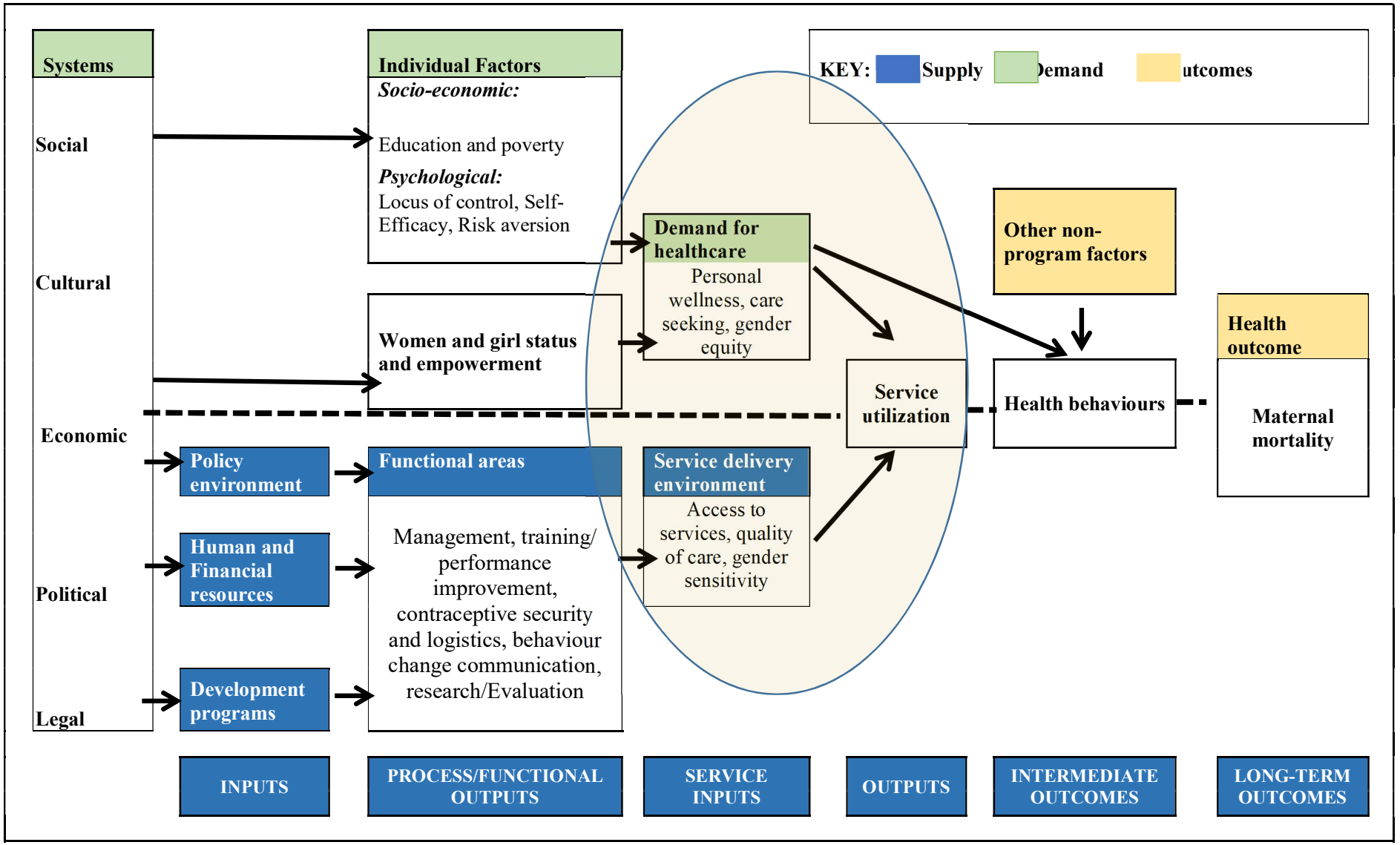


Figure 2:3 Measure Evaluation Model of Healthcare Utilization, adopted from Bradley et al.[188]

To better describe quality of care, according to the PAC framework described above, or by exploring how PAC is understood by patients and providers, it is prudent to first understand the steps between pregnancy and abortion and the various pregnancy-related trajectories to the need for post-abortion care.

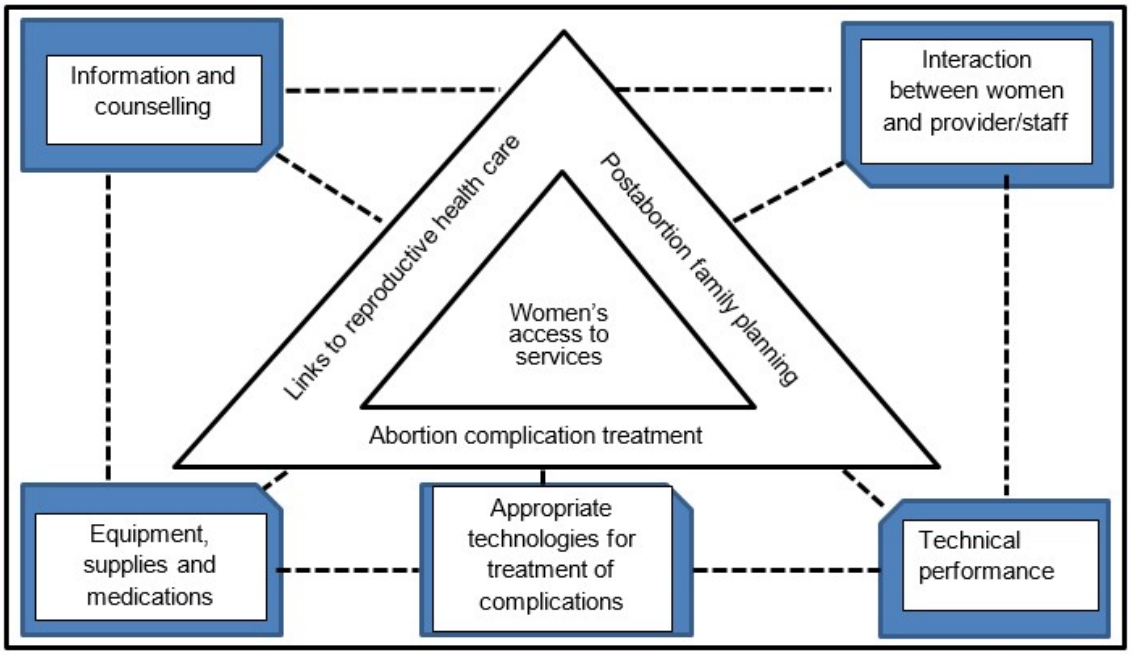


Figure 2:4 PAC framework for quality of care: Adopted from Leonard and Winkler [191]

Following conception, certain health, socio-economic, psychological and environmental factors may influence a woman to the ultimate decision to terminate a pregnancy rather than to proceed to term. Some decisions are based on circumstances surrounding conception, which may lead to unwanted or mistimed pregnancies, such as contraceptive discontinuation, method failure or non-use [192]. Other possible causes of pregnancy termination include fertility preferences, driven by the number and at times also the gender composition of past pregnancies and births, living or dead [144]. During pregnancy, previously wanted/intended pregnancies may also become unwanted [127], with this transition often driven by unprecedented changes in personal circumstances. These factors may be either socio-economic or psychological [141,193]. According to Hosseini and Takahashi [114], this process is often seen as a challenge to the pregnant woman. These authors, with Sambo [194], see the importance of empowering

women to make the ultimate decision in a timely and informed manner, whether they decide to keep a pregnancy or opt for an unsafe abortion or a safe termination, where such services are available. The essential elements of the post-abortion care framework demonstrate how the quality of interaction between service provider and patient through information and counselling supports this decision-making process [17,191].

Additional factors moderate women's choice and access to services. These include the age of the pregnant woman and the gestation age of the index pregnancy. Women are less likely to either die or suffer adverse health consequences if abortion is secured during first trimester, compared to later pregnancy terminations [195]. Education, either as a measure of women's capacity to decide to seek care or as a source of empowerment, increases women's choice of less risky pregnancy termination procedures [114]. Financial constraints may prevent women's timely access to care and so increase risks of severe morbidity and mortality through crude pregnancy termination, induction procedures or delayed emergency care seeking [40,128]. On the other hand, post-abortion contraception plays the critical role of reducing the risk of repeat abortion, hence exposure to unwanted fertility. Therefore, the type and timeliness of intervention is of essence [196].

Healthcare systems play a role in delivering quality post-abortion care to prevent deaths from unsafe abortions [127]. Lack of care structures and the poor quality of existing services [40] are system-related determinants of the risk of maternal mortality due to unsafe abortion. In this case, the safety of abortion is not only due to terminations that occur outside healthcare facilities but includes unsafe abortions that occur within medical facilities but that fail to meet the minimum medical standards [16,67]. These include lack of timely medical and surgical interventions for safe legal abortion, choice of means to procure an abortion, and the management of complications from unsafe abortions [127]. Additional evidence shows that personnel competence [56] and provider-patient power relationships influence the health

outcomes of abortion whether they are procured within or outside healthcare facilities [67,189,195].

As indicated above, improved care for post-abortion patients can significantly reduce the risk of maternal mortality [67,189]. This entails not only quality care delivery by service providers at healthcare facilities but also improved community awareness of the risks of unsafe abortion [40,138] and the enhanced legal and policy environment for care delivery [13,14,36,40]. At the same time, provider biases can further stigmatize post-abortion care seekers through misinterpretation of existing abortion laws and because of personal biases, beliefs and values [40].

Other community-level factors equally impede access or delivery of quality PAC services [197]. These factors are mainly societal pressures that stigmatize abortion services, in addition to the criminalization or illegalization of abortion, which deter women from accessing post-abortion care services. This is evident even in environments where abortion is legal and publicly available [132,198]. Additionally, women undergoing unsafe termination of pregnancies are more likely to experience poor health outcomes in environments where abortion is highly restricted [197]. However, while acknowledging the complexity of abortion stigma, there is need to separate abortion stigma from the stigmatization of unwanted pregnancy, especially in societies that hold strong cultural beliefs against abortion [138]. Therefore, women's socio-cultural contexts cannot be ignored when addressing the role that stigma plays in impeding service access at both the patient and the service provider level [140].

3 METHODOLOGY

3.1 Study design

This study used a mixed methods approach, combining cross-sectional secondary data (quantitative) and primary data (qualitative) to provide evidence on the quality of PAC and provider and patient views on the meaning of quality PAC in Kenyan healthcare facilities.

3.2 Study setting

The study was based on a nationally representative sample of 350 facilities across Kenya. This included facilities from all regions (formerly provinces) in Kenya, namely i) Nairobi and Central, ii) Nyanza and Western, iii) Coast and North Eastern, while iv) Rift valley and v) Eastern provinces were individually considered as regions. According to the original study, these five regions were created by combining two neighbouring provinces, if they shared similar characteristics based on maternal mortality rates and fertility rates, to form the first three regions. Where no clear similarity could be established, the provinces were maintained as unique regions, as in the case of the Eastern and Rift Valley provinces [22]. All facilities with the capacity to provide PAC in Kenya were considered in this survey.

The Ministry of Health (MoH) in Kenya, through the Kenya Essential Package for Health (KEPH), defines six levels of preventive and curative public and private health service provision in Kenya, ranging from level 1-6. Level 1 is the community level, and the foundations of service delivery priorities. This includes Village Health Committees (VHC) organized in each community through households and individuals. Levels 2 and 3 (dispensaries, health centres, and maternity/nursing homes) offer promotive, preventive care, and curative services. Levels 4 and 5 (primary, secondary and tertiary hospitals) facilities mainly undertake curative and rehabilitative service delivery, with a limited number of preventive/promotive care programs. Level 6 is the highest level of care national referral hospitals. There are only three of such hospitals in Kenya, one of which only handles rehabilitative spinal injury conditions,

leaving only two for curative services including obstetric and gynaecological services. (See **Figure *3:1***).

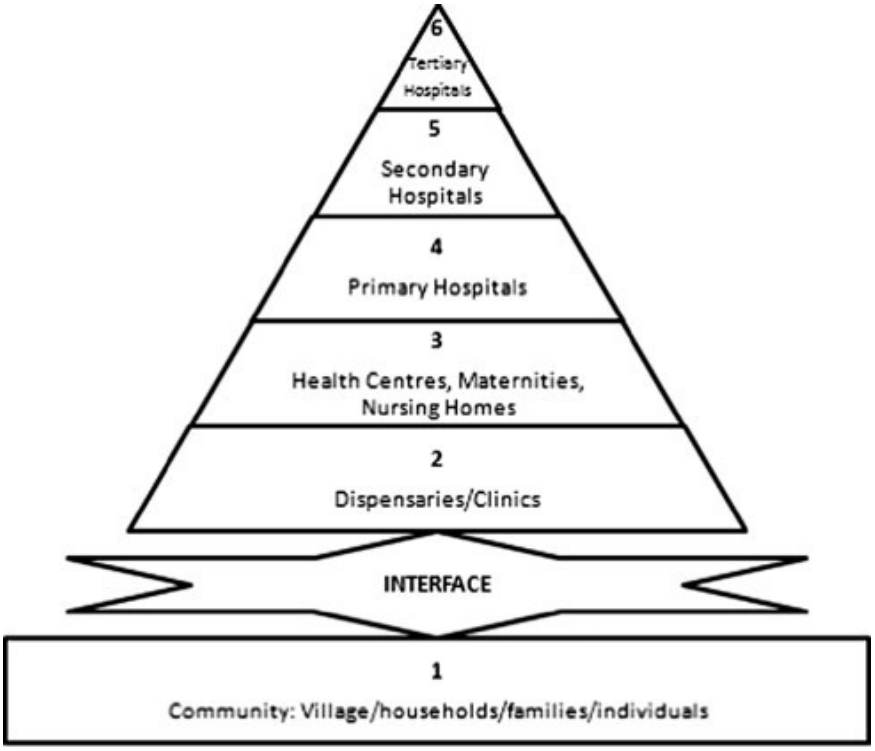


Figure 3:1 Classification of healthcare facilities in Kenya.

Source: Wachira and Martin [199].

This study included relevant level 2 (dispensaries and clinics), level 3 (health centres, maternities and nursing homes, which are mainly sub-district hospitals), level 4 (primary hospitals which are mainly district hospitals), level 5 (secondary hospitals, which are mainly county/provincial and some large district hospitals) and level 6 (tertiary hospitals, which are national referral hospitals) facilities. Smaller level 2 facilities (mainly dispensaries and clinics), which did not have the capacity to offer PAC due to either lack of trained providers or lack of equipment in 2012, were excluded from the sampling frame. For this study's primary qualitative data, additional information was gathered from a sample of PAC providers and patients, all recruited from a sample of these healthcare facilities in Nairobi, Central and Eastern regions, as marked on Figure 3:2 and discussed later in this chapter under a subheading

primary data. The sampling allocation endeavoured to achieve a 50-50 urban-rural split of health facilities.

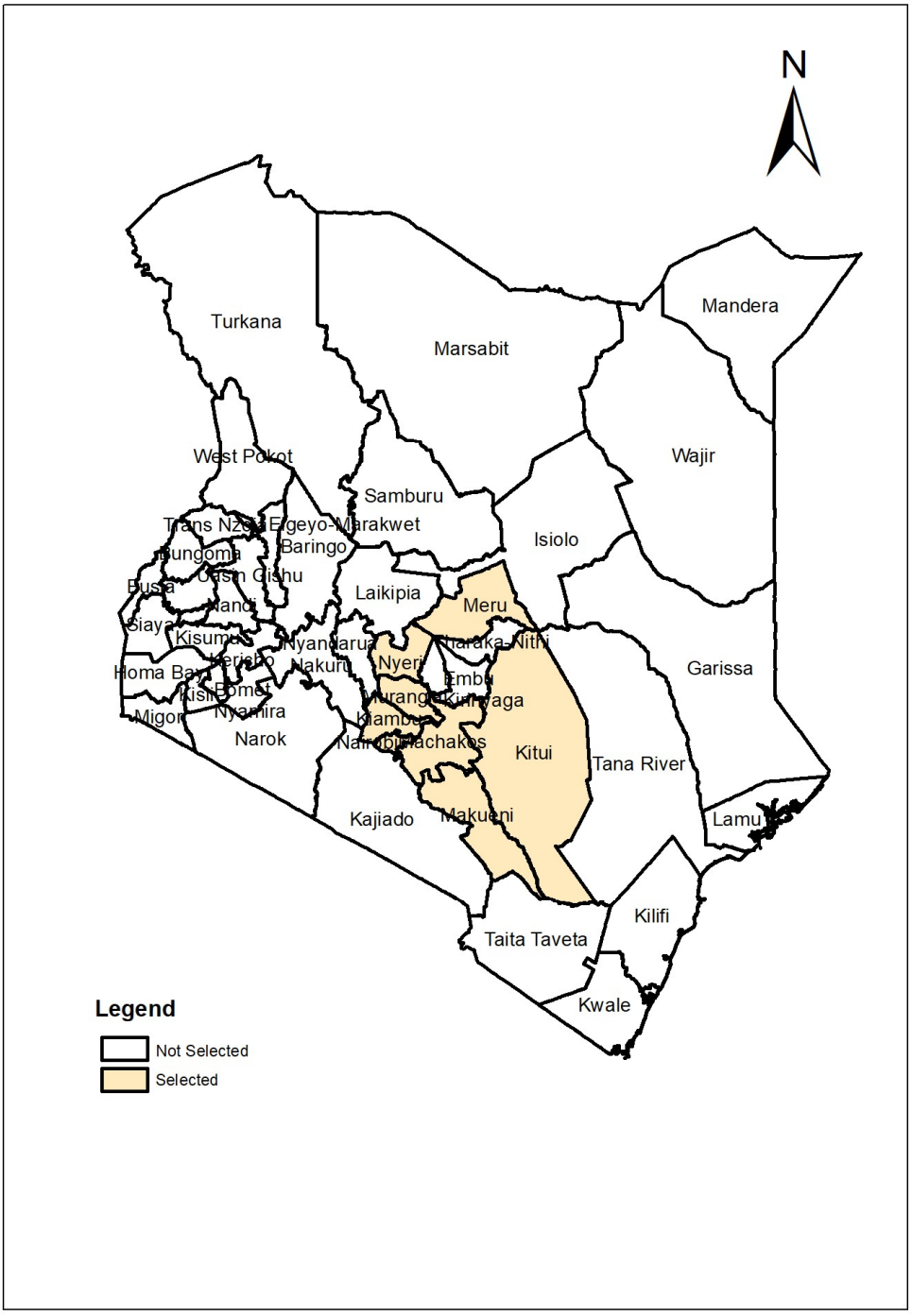


Figure 3:2 A map of Kenya, identifying the county distribution of sampled facilities for this study

3.3 Study data types and sources

The study combined secondary quantitative data with collection of primary qualitative data. Permission to use and analyse the secondary data was obtained from the African Population and Health Research Center and all requisite ethical approvals[1] were obtained for primary data collection.

3.3.1 Secondary data analysed in this study

The secondary data used in this research were collected under the Incidence and Magnitude of Unsafe Abortions (IMUA) study, implemented in Kenya in 2012. The African Population and Health Research Centre conducted the IMUA study in partnership with the Ministry of Health, Guttmacher Institute (USA) and IPAS International (USA), with other in-country partners and collaborators [22]. The study comprised three different types of surveys: the Health Facility Survey (HFS), Health Professional Survey (HPS) and the Prospective Morbidity Survey (PMS). All of these gathered data between April and August 2012. The current study, as reported in this thesis, used data from both the HFS and PMS studies. The HFS involved face-to-face structured interviews with senior healthcare providers and health facility managers who were knowledgeable about PAC services in the sampled facilities. In large facilities, such as hospitals (mainly levels 4, 5 and 6), the HFS was completed by the head of the Obstetrics and Gynaecology Unit, or an obstetrician/gynaecologist or the most senior doctor engaged in PAC services in these facilities or in charge of overseeing PAC services. In lower level facilities, a nurse, midwife, facility in-charge staff member, or any other health worker who was in a position to provide information about abortion and PAC, responded to the HFS tool. The HFS tool collected information on the number of women who presented for abortion-related care, PAC services offered, and the availability of trained providers in the facilities for PAC service delivery among other facility-level characteristics and services.

[1] See Appendix 1- Survey ethical approval

The PMS collected prospective data from all patients who presented in each of these participating facilities for PAC over a 30-day period. Trained facility-based healthcare providers who offer PAC services at the facilities collected the data. The providers were specifically trained to identify target patients, complete questionnaires, administer informed consent to participating patients, and undertake data quality checks. The PMS also collected information on PAC patients' socio-demographic characteristics, reproductive and clinical histories, diagnosis, treatment, and clinical procedures performed in managing complications, post-abortion contraception, and clinical management outcomes.

3.3.2 Primary qualitative data

Primary qualitative data were collected from PAC service providers selected from a sub-sample of 16 level 4-6 facilities in Nairobi (5), Central (5) and Eastern (6) regions. These 16 facilities were sampled from the list of facilities that participated and reported the highest volumes of patients in their category over the 30-day period in the IMUA study. The study further included facilities of diverse size and capacity based on levels of care, to ensure there was information from providers with considerable exposure to PAC service delivery. Key PAC service providers in this sub-sample of facilities were identified with the help of facility in-charges. The data mainly focus on providers' understanding of quality PAC, their challenges when offering PAC, and potential post-abortion contraception bias as sought by objective III (see chapter 1, research objectives). Essentially, the survey sought to establish a nuanced understanding providers' knowledge of quality of PAC, their personal experiences when offering PAC, and the factors that drive the difference between their knowledge and experiences.

To understand women's experiences and their understanding of quality of PAC, additional qualitative data were collected from a sample of 30 patients presenting for services at six of the 16 facilities (five patients per facility). Exit interviews with these women were conducted by trained female qualitative interviewers at the time of discharge. These 30 patients responded to

questions on different measures of quality of care based on their experience of care in the facilities. In addition interviewers focused on women's understanding of quality of PAC, their experiences accessing PAC services, and their intentions to use these services in the future. The guide was structured in a manner to elicit information on their experiences with respect to each of the five components of quality PAC, according to the model from Leonard, Hogan, and Winkler [191], presented in Figure 2:2.

3.4 Sampling frame

The sampling frame for the original study, on which this research is based, consisted of all 2,842 facilities in Kenya, identified by the Ministry of Health to have the potential to offer PAC as at 31 January 2012, according the Department of Health Management and Information Systems (HMIS) and the KEPH. These facilities belong to all levels 2-6. A sample of 350 facilities was selected for the IMUA study, of which 330 facilities participated, while for final analysis, two facilities were excluded for lack of essential metadata to support their inclusion, especially missing facility consent forms leaving a final analytical sample of 328 facilities. For this specific study, as noted above, a sub-sample of 16 Level 4-6 facilities was selected for the service provider and patient exit interviews. One service provider was interviewed in each of the sampled facilities. Participants in the patient exit interviews were sampled progressively over a seven-day period during which time a trained qualitative interviewer was based at the selected facility. Participants in the patient exit interviews were recruited with the help of the participating service provider to identify eligible patients for the exit interviews.

3.5 Sample size and sampling

The IMUA study sampled all relevant level 5 and 6 facilities (16 and two respectively, 100%), with an additional stratified sample of 332 level 2-4 facilities (with facility level and region as the strata). This yielded a total sample of 350 facilities. For the level 2-4 facilities, sampling fractions varied as follows, depending on the region: level 4 health facilities were sampled at

between 18% and 36%; level 3 health facilities at between 10% and 16%; while level 2 facilities were represented at between 5% and 19% of all facilities in the above frame.

As Table 3:1 shows, of these 350 facilities, HFS data was obtained from 328 facilities, and 326 facilities provided PMS data. Reasons for non-response included inaccessibility by the interviewers due to insecurity, facility's closure between sampling and the time of field visit, duplicate listing of facilities, and declined participation in the study by facility officials or, in the case of private services, by the owners. Within each stratum, both the sampling fractions and the response rates were used to compute survey weights, which would be used in analysis to adjust statistical estimates for this survey design. The PDS component collected data from all PAC patients who presented at these facilities over a 30-day period. Of the 3,034 women recorded in all facilities, 2,568 sought PAC while 466 sought termination of pregnancy. The current study analyses were based on the 2,568 PAC patients and 281 facilities. Some facilities were dropped from the sample since they only reported patients who sought termination of pregnancy and no PAC patients were reported.

Table 3:1 IMUA sampling frame, sample, sampling fractions, and facility response rates

	Level 2	Level 3	Level 4	Level 5	Level 6	TOTAL
Frame (From health facility list, 31 January 2012)						
Nairobi & Central	108	211	70	5	1	395
Coast & North Eastern	335	150	63	2	0	550
Eastern	156	136	56	3	0	351
Nyanza & Western	387	272	110	4	0	773
Rift valley	426	258	86	2	1	773
Total	**1412**	**1027**	**385**	**16**	**2**	**2842**
Sampled facilities						
Nairobi & Central	20	33	20	5	1	79
Coast & North Eastern	19	24	20	2	0	65
Eastern	20	22	20	3	0	65
Nyanza & Western	20	26	20	4	0	70
Rift valley	20	28	20	2	1	71
Total	**99**	**133**	**100**	**16**	**2**	**350**
Sampling fractions						
Nairobi & Central	18.5%	15.6%	28.6%	100.0%	100.0%	20.0%
Coast & North Eastern	5.7%	16.0%	31.7%	100.0%	-	11.8%
Eastern	12.8%	16.2%	35.7%	100.0%	-	18.5%
Nyanza & Western	5.2%	9.6%	18.2%	100.0%	-	9.1%

Table 3:1 IMUA sampling frame, sample, sampling fractions, and facility response rates

	Level 2	Level 3	Level 4	Level 5	Level 6	TOTAL
Rift valley	4.7%	10.9%	23.3%	100.0%	100.0%	9.2%
Total	7.0%	13.0%	26.0%	100.0%	100.0%	12.3%
Participating facilities						
Nairobi & Central	20	29	19	4	1	73
Coast & North Eastern	17	23	19	2	0	61
Eastern	20	22	19	3	0	64
Nyanza & Western	20	25	20	3	0	68
Rift valley	20	25	17	1	1	64
Total	**97**	**124**	**94**	**13**	**2**	**330**
Survey response rate						
Nairobi & Central	18.5%	13.7%	27.1%	80.0%	100.0%	18.5%
Coast & North Eastern	5.1%	15.3%	30.2%	100.0%	-	11.1%
Eastern	12.8%	16.2%	33.9%	100.0%	-	18.2%
Nyanza & Western	5.2%	9.2%	18.2%	75.0%	-	8.8%
Rift valley	4.7%	9.7%	19.8%	50.0%	100.0%	8.3%
Total	**6.9%**	**12.1%**	**24.4%**	**81.3%**	**100.0%**	**11.6%**

A sample of 16 facilities was drawn randomly to participate in this study based on the willingness to participate and the investigators' previous knowledge of the quality of PAC provided by these facilities (See Table 3:2). This prior information was based on the first analysis, as presented below as Paper 1 [190], and was used for the purpose of stratifying the sample in order to attain representation of facilities based on the existing level of quality of care in these facilities. Quality of care was measured in three levels: low, medium or high. This classification, based on data from the IMUA study [21,38], generated a measure of quality based on 18 quality indicators according to the essential elements of post-abortion care framework [190]. The indicators were grouped according to four of the five pillars of the above PAC framework: use of appropriate technologies, technical performance, equipment and supplies, and information and counselling (see [17,191]). The sample was stratified by region, KEPH level, and the level of quality of care, and included a proportionate to size stratification by public or private facilities.

From these 16 participating facilities, as indicated above, a further purposive (non-random) sub-sample of six facilities was drawn to participate in the patient exit interviews.

This sub-sample was selected to conveniently ensure inclusion of only high-volume facilities. To achieve this, a cut off was defined, identifying facilities that reported at least two PAC patients per day in the IMUA study. Two facilities per region were identified, ensuring that there was sufficient representation of each of the three quality levels defined above. Where two or more facilities qualified in the inclusion criteria, the facility with the highest PAC traffic and the one that was nearest to Nairobi was conveniently preferred. Within these six facilities, five interviews were conducted in each facility, to yield a sample of 30 IDIs with PAC patients. Figure 3:3 shows the sampling steps described above.

Table 3:2 List of participating facilities by strata

ID[¥]	Care	Region	Level	Ownership	No. of Providers	No. of client Exits
001	Good	Central & Nairobi	Level 4	Private for-profit	1	
002	Good	Central & Nairobi	Level 5	Public	1	
003	Good	Central & Nairobi	Level 4	Public	1	5
004	Good	Central & Nairobi	Level 6	Public	1	5
005	Medium	Central & Nairobi	Level 4	NGO/FBO	1	
006	Medium	Central & Nairobi	Level 5	Private for-profit	1	5
007	Low	Central & Nairobi	Level 4	Public	1	5
008	Medium	Central & Nairobi	Level 4	NGO/FBO	1	
009	Good	Central & Nairobi	Level 4	Public	1	
010	Good	Central & Nairobi	Level 4	Private for-profit	1	
011	Low	Eastern	Level 4	Public	1	
012	Medium	Eastern	Level 4	Public	1	
013	Low	Eastern	Level 4	NGO/FBO	1	5
014	Medium	Eastern	Level 4	Public	1	
015	Good	Eastern	Level 5	Public	1	5
016	Low	Eastern	Level 4	NGO/FBO	1	
Total					**16**	**30**

[¥] Facility names withheld for confidentiality

To minimize the risk of bias in the sample, facility selection bias was tested, by fitting Zero-inflated Poisson model on a sampling outcome variable. The variable was binary, identifying whether a facility was sampled for the qualitative study or not. Table 3:3 shows the results from this regression analysis to compare sampled and non-sampled facilities based on the sample stratifications as covariates in the model.

Table 3:3 Log odds of a facility being sampled for qualitative data collection

	Log Odds	Std. Err.	p-value	[95% Conf. Interval] Lower C.I	Upper C.I
Quality of care index	-0.005	0.009	0.560	-0.024	0.013
Region: Eastern (Ref: Nairobi & Central)	-0.285	0.363	0.433	-0.996	0.427
Facility ownership: Private (Ref: Public)	-0.425	0.938	0.651	-2.263	1.414
Constant Term	2.714	2.497	0.277	-2.179	7.607

There was no statistical significance between sampled facilities and non-sampled facilities with respect to their level of quality of PAC, while controlling for facility ownership and region.

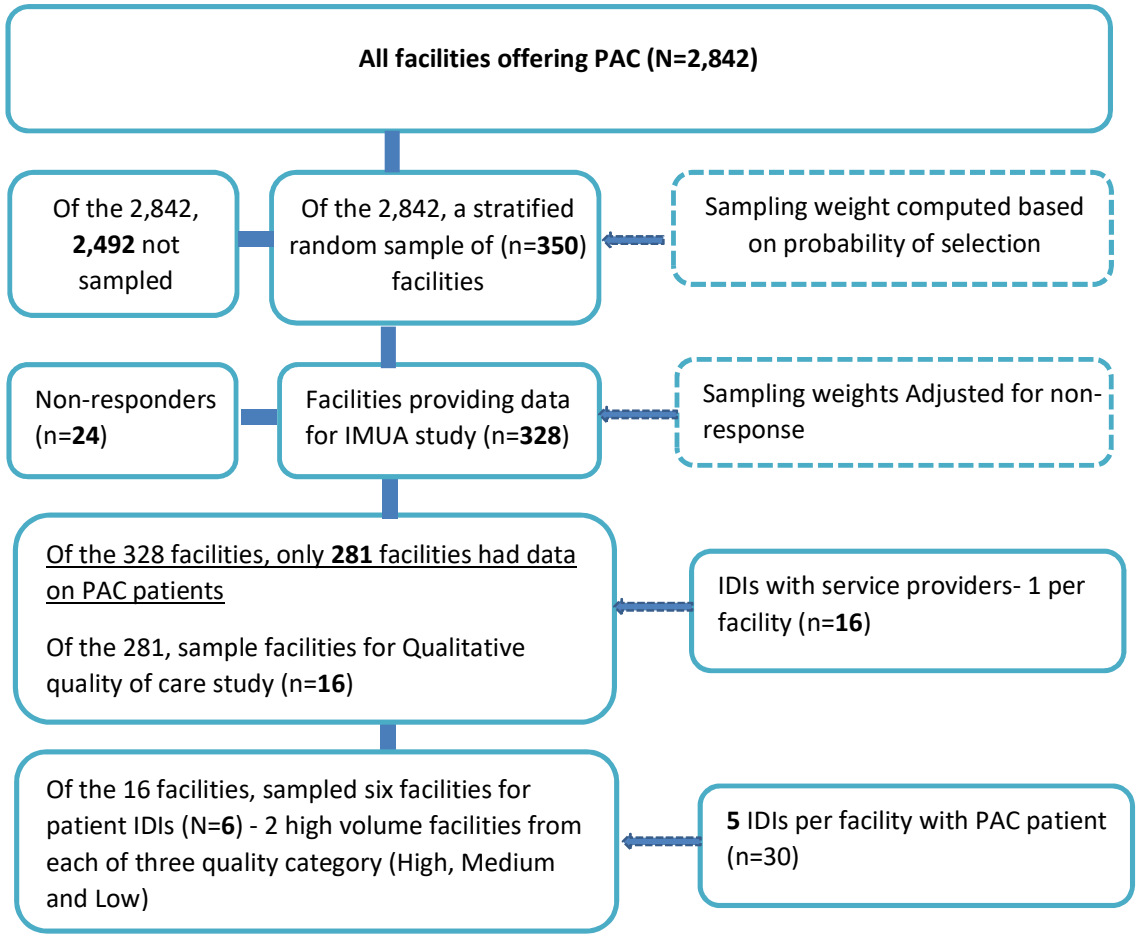


Figure 3:3 Sampling frame, sample size and sampling plan

3.6 Outcome specifications

Table 3:4 specifies the outcome variables used to assess each of the four study objectives, how the outcomes were measured, and the structure of the variables.

3.7 Survey sampling weights

Data weights were computed in the IMUA study, based on stratified simple random sampling as described above. Assuming that each healthcare facility had P_i , probability of selection in to the sample of 350 facilities from a population of 2,838 PAC-providing facilities, which can be approximated as; $P = \frac{350}{2{,}838} \approx 0.123326$. However, this probability varies between strata, and the reciprocal of the probability of a facility in stratum i being selected into the sample, is the sampling weight $w_i = 1/P_i$. In some cases during implementation, some sampled duplicate facilities as well as closed facilities were discovered and these sampling weights above were adjusted to account for these duplicates. Assuming that a sampled facility i has *j-1* duplicates each with a sampling probability $p_{i1}, p_{i2}, p_{i3}, \dots, p_{ij-1}$, then the adjusted probability of selection is defined as; $P_i = (1 - p_{i1})\,(1 - p_{i2})\,(1 - p_{i3}) \dots (1 - p_{ij})$ and the sample weight is defined as $w_i = 1/P_i$. Finally, the sampling weights were adjusted for non-response. Assuming a stratum response rate of $r_i = Q_i/n_i$ where Q_i denotes the facilities in the i^{th} stratum that responded in the survey and n_i, the number of sampled facilities in the i^{th} stratum. The final sampling weight used in these analyses is described as the inverse of the product of these two probabilities of selection and participating in the study; $W_i^* = \frac{1}{W_i * r_i}$. Table 3:5 shows the distribution of facilities in the frame and in the final sample, which determined the above sampling weights.

Table 3:4 Outcome variables description and measurement

Paper	Outcome variable	Nature of outcome	Measurement	Variable structure
1.	Quality of care at facility	Ordinal outcome	The outcome is a facility-level composite measure of quality of PAC. It was generated from eighteen (18) indicators, both continuous and discreet similar to Larson and colleagues, 2014 [200]. The indicators are on facilities available for PAC management, availability of trained PAC providers, and types and variety of procedures a facility can provide. Further, this outcome was ordered and categorized into a three-equal parts (tertiles). However, for this analysis, the index here is treated as a continuous outcome variable.	• High score represents better quality, low scores represents poor quality of PAC, using Multiple Correspondence Analysis (MCA). • Further, reduced into a three-level measure of quality- 0=Poor/Low quality care; 1=Average/Medium quality care; 2=Good/High quality.
2.	Determinants of effective post-abortion contraception and counselling among patients treated for PAC	Ordinal outcome (A measure of effectiveness of contraception method given to PAC patients)	Ordinal indicator of whether a patient who was treated for PAC in any of the sampled healthcare facilities received a modern contraceptive method that's known to reduce pregnancy risk by 99%, or whether a patient received any other method (modern short-acting method or traditional methods) or whether the patient did not receive any method at all (See [168]). Analysis conducted using unstructured Bayesian mixed-effects ordered logit models, with "County" and "facility of care" as source of random variance Results compared to both a structured and convolution (Mixture of both unstructured and structured) Bayesian model and selection of model with best fit using deviance information criterion (DIC) - Lowest DIC was considered as the best fit model.	2= Yes, patient received a long-acting or permanent contraceptive method-(effective) 1=Yes, patient received either a modern, but short-acting method or a traditional method (ineffective) 0= No, patient did not receive any method of FP

3.	Provider-patient relations, legal frameworks on abortion and quality post-abortion care in healthcare facilities in Kenya	Qualitative non-random in-depth interviews (IDIs) with service providers and PAC patients	Opinions of providers and patients on the role of service provider-patient interactions in quality of PAC Provider narratives on challenges in offering quality PAC and those of patients' challenges in seeking/accessing quality PAC	PAC service provider and seekers scripts coded inductively with themes and subthemes identified as they emerge from data
4.	Facility level quality of care and policy on PAC	Qualitative non-random in-depth interviews (IDIs) with service providers and PAC patients	Opinions of providers and patients on the impact of prevailing legal and policy framework on quality of PAC Provider narratives of experiences and challenges in quality PAC delivery and those of patient narratives on experience and challenges in seeking PAC in the context of legal and policy framework in Kenya	PAC service provider and seekers scripts coded inductively with themes and subthemes identified as they emerge from data

3.8 Data collection and survey tools

The IMUA study collected HFS and PMS data concurrently using structured questionnaires on facility and care seekers' attributes respectively. Among key data collected in the HFS study and used in this research are measures of quality of care as described in the essential elements of PAC model (see Table 3:5). The PMS data included some of the indicators of quality of care, with questions on pain management, post-abortion contraception, and client counselling. Other data collected in the HFS component, useful to this study, included information on facility level patient management procedures and some of the existing facility structural and human resource capacity to offer PAC**.** Data on client-provider interactions were however not sufficiently covered in both the PMS and HFS surveys, and instead were covered comprehensively in the qualitative component.

In-depth interviews with service providers identified in a sub-sample of 16 facilities and exit interviews from a further sample of patients in 6 facilities collected data on service providers and patients' experiences and their views on the quality of PAC services using interview guides. These guides covered the provider and patient side of the quality PAC framework.

All interviews were conducted in privacy within the health facility, preferably in the counselling room where and when available, or in another secluded area, which the field interviewer identified with the help of the service provider and which assured patients and providers of both visual and aural privacy throughout the interview.

All data were collected and recorded on digital tape recorders, with additional notes on the interviews and interviewer's assessments of the interview were collected in paper format. To ensure confidentiality, all data (both verbal and written) were remitted to a central point in Nairobi for safety. Digitally recorded data were uploaded on a computer system with

controlled access only to the principal investigator (PI). After all transcriptions were completed, all audio records were deleted from the digital recorders. Paper data were also stored under lock and key, only accessible to the project PI. All identification information including names of patients and facilities was removed from all data prior to backing up.

3.9 Data processing and quality control measures

All data collected in the IMUA were under a well-defined quality assessment program for each stage of data handling, including in relation to formulation, collection, transmission to centralized location, entry, management and analysis. These criteria were in the custody of the IMUA study principal investigator (Chimaraoke Izugbara) and were designed to ensure data consistency. In the case of any inconsistencies, they were corrected in the field by revisiting providers or facilities.

Cases with missing data were also revisited by the field workers where possible, and corrected. Where not possible, data were reported as missing and were treated as such in this analysis. For missing data on variables that were not critical to this analysis, for example, missing indicators used for generation of composite scores, either list-wise deletion or mean substitution was used to address this [201]. However, for missing data for critical variables in this analysis, multiple regression-based imputation was used by regressing the variable with missing data on the non-missing covariates, and replacing the missing value with the model predicted mean of the variables, based on the non-missing data [202,203]. Quality assurance measures implemented in the field and at data entry ensured that there were minimal cases of missing data as much as was possible.

While implementing field data collection for the IMUA study, field and office data quality control system required 100 percent data checks by all data collectors, field-based data editors, supervisors and office-based data editors. In addition, field supervisors implemented five

percent back-checks, additional five percent spot checks, and five percent of interviews were accompanied for data quality assurance. These processes were applied across all teams and the sample checks were randomized across all fieldworkers' interviews for objectivity. Data entry systems were developed in CsPro® [204] and were designed to capture data inconsistencies and other errors such as missingness before final data were exported to data management software. During data entry, all questionnaires with errors were corrected by phone calls to data providers or by returning questionnaires to the field for corrections. The final data were then exported to Stata® 14 [205] for further management where all data were labelled, coded and described in easy-to-use formats.

For the primary qualitative data, all field data collectors were trained on respondent identification, on how to secure an interview, and on the actual interview process. Data quality assurance was also covered, and data quality check guidelines were developed to ensure that data were collected from eligible respondents as accurately and comprehensively as possible. Given the nature of the study, the interviewers were required to have some basic skills in counselling in case of any adverse emotional effects of the interview on a patient. They were also required by the in-country Ethical Review Board guidance to be female. However, the PI also participated in the provider interviews. A survey guide for the IDIs was developed to guide the interviewer, although interviewers were able to digress and seek amplification of responses. Three highly qualified qualitative data interviewers were used to gather these data, supervised by qualitative research supervisors with training in psychosocial support and counselling. During field data collection, all recorded interviews were reviewed by the PI for quality, and feedback was provided to the respective interviewer. Continuous and regular meetings ensured that all data quality issues were identified immediately and corrected for the benefit of subsequent interviews.

3.10 Data analysis

Different types of analyses were conducted in response to each of the four research objectives. Objective I examined facility-level quality of PAC and analyzed the determinants of quality PAC in Kenyan healthcare facilities. For this objective, data already collected from both facilities and patients on quality of PAC were analyzed quantitatively; the results are presented in Paper 1. This objective maps the current clinical practices of PAC in all facilities, in relation to the essential elements of the PAC framework, which identifies certain practices as comprising good quality care and others, poor quality. The outcome variable here was a composite indicator of quality and was categorized into three levels, representing a latent measure of quality. A set of outcomes, each measuring certain components as shown in Table 3:5, were combined into one indicator variable using Multiple Joint Correspondence Analysis (MCA) in Stata® 14 to reduce the data into one measure of quality of PAC. The data had 18 variables, grouped into five categories as presented in Table 3:5, yielding a maximum of 13 dimension. This translates to a calculated inertia of 0.72, which represents the maximum number of dimensions (15) as a fraction of the total number of variables (18). We used two dimensions, with dimension 1 accounting for 19.7% of variance and dimension 2 accounting for 10.9%. Therefore, the total variance was 30.6%.

Reliability tests were used to examine the preferred component to best capture the highest variability in the data, using Cronbach's alpha statistic. The outcome of this data reduction process was a continuous index that represented an ordinal form of quality with higher values representing facilities with better care and lower values, facilities with low quality of PAC. This final index was categorized into three groups of "High," "Medium" and "Low" quality.

Likelihood based (classical) mixed-effects ordered probit models were used to analyze the data with the ordinal outcome, based on a latent linear response. Before conducting final analyses, the appropriateness of these models was tested on this data. Comparisons were made

with alternative approaches such as linear regression, and on data loss due to the reduction of outcome measure from continuous to ordinal outcome. These mixed effects models, with facilities clustered within counties, were useful in taking into account the correlation effects in the data within and between counties, where facilities in the same county were more likely to have similar characteristics compared to facilities in different counties.

Objective II analysed the level and determinants of effective contraception among post-abortion care patients in healthcare facilities in Kenya. To achieve this objective, secondary quantitative data from the 2012 IMUA study were used. Since the outcome here was ordinal, data were analyzed using Bayesian hierarchical models for ordered categorical data. The outcome was a measure of whether a PAC patient treated at a facility also received an effective, ineffective or no contraceptive method at all, as described in Table 3:4.

Table 3:5 Indicators for the elements of quality of PAC services

Indicators of quality of care	**Description of indicators**
1. Use of Appropriate Technology (Data source- PMS) PAC cases that were treated with appropriate technology.	• This indicator measures the number of PAC cases with less than 13 weeks gestation treated with MVA or • MA & cases >12 weeks gestation treated with curettage and MA. *Any other treatment is considered inappropriate.*
2. Technical Performance (Data source- HFS) This indicator of the technical capacity of staff in each facility is described in two (2) different forms; • Average number of providers with training in PAC available at facility • Percentage of facilities with at least two providers trained in PAC	• Availability of providers that have received training in PAC at the facility • Facilities that have at least two providers with training in PAC
3. Information and Counselling (Data source- HFS) This indicator is measured in four parts. *Among facilities that offer FP counselling , proportion of these facilities that:* • Gives information on available FP methods • Gives instruction on correct use of methods • Talks about advantages and disadvantages of each method	Among facilities that reported offering FP counselling , • how many gives information on FP methods available,

Indicators of quality of care	Description of indicators
• Gives information on what to do in case of method failure or forgetting to take pills	• gives instructions on correct use of methods, • how many gives information on advantages and disadvantages of each method • Gives information on what to do in case of method failure or forgetting to take pills
4. **Supplies and Medications** (Data source -PMS) *This indicator is based on two main types of measurements, clients as observed and recorded by the care providers or facilities as reported by key informant in these facilities.* • Per cent of PAC clients that were given pain medication • Per cent of PAC clients that were given antibiotics • Average number of FP methods commonly offered to PAC clients • Per cent of abortion clients that were given modern FP methods on discharge • Per cent of facilities that offer a barrier method (condom) to PAC client (HFS)	• Whether clients that reported that they were given pain medications for their procedure (yes or no) • Whether clients were given antibiotics for their procedure (yes or no) • Whether clients were given modern contraceptive on discharge or not (yes or no) • Number of FP methods that facilities offer to clients (out of 11) • Whether facilities offer a barrier method of FP to clients (yes or no)
5. Client-provider interaction (Data source-HFS and PDS) *This indicator is based on facilities information as reported by key informants in these facilities.* • Per cent of all facilities that reported ALWAYS giving contraceptive counselling to all clients • Percent of clients counselled on contraception upon discharge • Percent of clients given a modern contraceptive or referred to another facility for FP upon discharge	• Facilities that reported always giving FP counselling to all clients • Whether clients were counselled for modern FP • Whether client received modern FP or was referred to other facilities for FP
PMS= Prospective Morbidity Survey; **HFS**= Health Facility Survey	

3.10.1 Linear regression models for clustered data

The original outcome variable used in the re-analysis of quality of care as presented in paper 1 is a continuous indicator. The hierarchical structure used in the analysis accounts for the within county (cluster) correlation between healthcare facilities (subjects), where unlike in

ordinary regression analysis, facilities in a cluster are not assumed to be independent but with some degree of dependence [206]. The model considers a two-level hierarchical structure. In this outcome measure, higher values represent higher-level of quality while lower outcome values represent a lower measure of quality. In this model, facility-level characteristics are considered as fixed effects, while characteristics that are specific to the county are considered as random effects. Generally, this model takes the following structure:

$$\boldsymbol{Y}_{ij} = \boldsymbol{X}_{ij}^{t}\beta + \mu_{ij}^{t}\gamma_i + \epsilon_{ij} \ldots\ldots\ldots\

$$\boldsymbol{Y}_{ij} = \boldsymbol{X}_{ij}\boldsymbol{\beta} + \boldsymbol{U}_{\gamma} + \epsilon_{ij} \quad [206] \quad \text{……...……... (3)}$$

Where $\begin{pmatrix}\gamma\\ \epsilon\end{pmatrix} \sim N_{mq+n}\left(\begin{pmatrix}0\\0\end{pmatrix}, \begin{pmatrix} G & 0_{mq\times n}\\ 0_{n\times mq} & R\end{pmatrix}\right)$

Assuming that $\boldsymbol{U}_{\boldsymbol{\gamma}} + \epsilon = \epsilon^{*}$=$(U \quad I_{n\times n}\begin{pmatrix}\gamma\\ \epsilon\end{pmatrix}$ where $\epsilon^{*} \sim N_n(0, V)$ and $= (U \quad I_{n\times n})$, then;

$$V = A\begin{pmatrix}G & 0\\ 0 & R\end{pmatrix}A^t = (U \quad I_{n\times n})\begin{pmatrix}G & 0\\ 0 & R\end{pmatrix}\begin{pmatrix}U^t\\ I_{n\times n}\end{pmatrix} = (UG \quad R)\begin{pmatrix}U^t\\ I_{n\times n}\end{pmatrix} = UGU^t + R$$

Therefore;

$$\boldsymbol{Y}_{ij} = \boldsymbol{X}_{ij}\boldsymbol{\beta} + {\epsilon_{ij}}^{*} \text{ for } {\epsilon_{ij}}^{*} \sim N_n(O, V) \text{ ……..…….. (4)}$$

The likelihood estimation for the least square estimator of model parameters $\boldsymbol{\beta}$ and that of the empirical best linear unbiased predictor of $\boldsymbol{\gamma}$ for known parameters G and R ($\widetilde{\boldsymbol{\beta}}$ and $\widetilde{\boldsymbol{\gamma}}$ respectively) can be defined as models (6) and (8) and are the parameter estimates presented in the mixed effects models for quality PAC in healthcare facilities in Kenya as presented in Table 4:1.

Since $\boldsymbol{Y}_{ij} = \boldsymbol{X}_{ij}\boldsymbol{\beta}_{ij} + \boldsymbol{\epsilon}_{ij}$, $\boldsymbol{\epsilon}_{ij} \sim N_n(0, \sum)$, $\sum$ is unknown, $\sum = \sum^{1/2}(\sum^{1/2})^{t}$, the solving for $\boldsymbol{\beta}$ gives;

$$\sum^{-1/2}\boldsymbol{Y}_{ij} = \sum^{-1/2}\boldsymbol{X}_{ij}\boldsymbol{\beta}_{ij} + \sum^{-1/2}\epsilon \text{ ……..…….. (5)}$$

Where $\sum^{-1/2}\boldsymbol{Y}_{ij} \sim N_n\left(0, \sum^{-1/2}\sum\sum^{-1/2\mathrm{t}}\right)$ for $\sum^{-1/2}\sum\sum^{-1/2\mathrm{t}} = I_n$, hence,

the least square estimator (LSE) of $\boldsymbol{\beta}$, $\widehat{\boldsymbol{\beta}}$=$\left(\boldsymbol{X}^t \sum^{-1/2\mathrm{t}}\sum^{-1/2} X\right)^{-1} X\sum^{-1/2\mathrm{t}}\sum^{-1/2} Y$. Therefore,

$$\widehat{\boldsymbol{\beta}} = (X^tV^{-1}X)^{-1}X^tV^{-1}Y \text{……..…….. (6)}$$

3.10.2 Bayesian models for ordered categorical data

One of the main outcome variables in this study which is analysed in paper 2 is ordered categorical, with three categories as described in Table 3:4. In addition, hierarchical models are assumed to account for the data structure. As described in paper 2, the outcome variable y_{ij} is defined as whether a PAC patient received an effective contraceptive method (order level 2), or an ineffective contraceptive method (order level 1), or whether the patient did not receive any method at all (order level 0), and is ordinal in nature. In addition, patients treated at a facility in a particular county are more likely to be like each other, compared to patients treated in facilities in other counties. Similarly, proximal counties (e.g. adjacent counties) are more likely to exhibit similar characteristics than distal (far apart) counties. Hierarchical ordered logit models were used in this analysis, with one level of random variation by county. The ordinal logit model was developed from the general form of the binomial models, whose probability density function can be stated as:

$$Pr\left(X_{ij}, Y_{ij}|p_{ij}\right) = Pr\left\{Y_{ij} = y_{ij}\right\} = \binom{r_{ij}}{y_{ij}} p_{ij}^{y_{ij}} (1 - p_{ij})^{r_{ij} - y_{ij}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

In ordinal logit regression, the event of interest is observing a particular contraceptive use or less (y_{ij}). Suppose $k = 0,1,2$ are the ordered categories of contraceptive use, generally, the odds of being in one category k in reference to the other possible outcomes can be described in the form;

$$p_k = \frac{Pr(contraceptive\ adoption \leq\ )}{Pr(contraceptive\ adoption > k)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\

$$Pr(\boldsymbol{y_{ij}} > k \mid \boldsymbol{X_{ij}}, k, \mu_j) = H\left(\boldsymbol{X_{ij}\beta} + \boldsymbol{z_{ij}\mu_j} - k_k\right) \quad (9)$$

Where $j = 1,2,3, \ldots, 47$ are the counties consisting of $i = 1,2,3, \ldots, n_j$ patient observations in county j. The cut points k are labelled $k_1, k_2, k_3, \ldots, k_{k-1}$ for k possible outcomes. $\boldsymbol{X_{ij}}$ are the fixed predictors in the model with regression coefficients $\boldsymbol{\beta}$. These $\boldsymbol{X_{ij}}$ predictors do not contain the constant term since the cut-off points absorb the effects of the constant term. The random effects μ_j are assumed to have a multivariate normal distribution.

Without loss of generality, the probability of an observation for an ordered logit model with county- level random effects μ_j can be defined as follows with the error term included;

$$p_{ij} = Pr(\boldsymbol{y_{ij}} > k \mid \boldsymbol{X_{ij}}, k, \mu_j) = Pr(k_{k-1} < n_j + \epsilon_{ij} \leq k_k) \text{[209]} \quad (10)$$

Rearranging the terms in the above model gives;

$$p_{ij} = prob(k_{k-1} - n_j < \epsilon_{ij} \leq k_k - n_j) = prob\left(\epsilon_{ij} \leq k_k - n_j\right) - prob\left(\epsilon_{ij} \leq k_{k-1} - n_j\right)$$

Replacing the $Pr\left(y_{ij} > k\right)$ part in the above equation gives;

$$Pr\left(y_{ij} = k \mid k, \mu_j\right) = H(k_k - \boldsymbol{X_{ij}\beta} - z_{ij}\mu_j) - H(k_{k-1} - \boldsymbol{X_{ij}\beta} - z_{ij}\mu_j) \quad (11)$$

The above probability function can also be written in terms of latent linear response as;

$y_{ij}^{*} = \boldsymbol{X_{ij}\beta} + z_{ij}\mu_j + \epsilon_{ij}$ and

$$y_{ij} = \begin{cases} 1 & if\ y^*_{ij} \leq k_1 \\ 2 & if\ k_1 \leq y^*_{ij} \leq k_2 \\ 3 & if\ k_2 \leq y^*_{ij} \leq k_3 \\ & \vdots \\ K & if\ k_{K-1} \leq y^*_{ij} \end{cases}$$

Where the errors ϵ_{ij} follow a logistic distribution, gives the ordered logit model and are independent of the random effects. Thus in terms of the binomial distribution and logit model can be written as;

$$Pr(y_{ij} = k \mid k, \mu_j) = \frac{1}{1+exp(-k_k+n_{ij})} - \frac{1}{1+exp(-k_{k-1}+n_{ij})} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(12)$$

Where $n_{ij} = x_{ij}\beta + z_{ij}\mu_j$, k_0 is defined as $-\infty$ and k_k is defined as $+\infty$.

Within the j counties, $j = 1,2,3, \ldots, m = 47$ the outcome variable has a conditional distribution of $y_{ij} = \left(y_{j1}, y_{j2}, y_{j3}, \ldots, y_{jn_j}\right)'$ given the county random effects μ_j , which is defined as;

$$L(y_j \mid k, u_j) = \prod_{i=1}^{n_j} p_{ij}^{I_k(y_{ij})} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(13)$$

And taking the natural logarithms and replacing p_{ij} with its likelihood is expressed as follows'

$$\text{Log}\left\{L\left(y_j \mid k, u_j\right)\right\} = \exp \sum_{i=1}^{n_j} \left\{I_k(y_{ij}) \ln(p_{ij})\right\}$$

$$= exp \sum_{i=1}^{n_j} \left\{I_k(y_{ij})\ ln\ \left[\frac{1}{1+exp(-k_k+n_{ij})} - \frac{1}{1+exp(-k_{k-1}+n_{ij})}\right]\right\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(14)$$

Where;

$I_k(y_{ij}) = \begin{cases} 1 & if\ y_{ij} = k \\ 0 & otherwise \end{cases}$ and $n_{ij} = \boldsymbol{X_{ij}\beta} + z_{ij}\mu_j$

The full log-likelihood function is defined as;

$$\text{Log}\left\{L(y_{ij} \mid k, u_j)\right\} = exp \sum_{i=1}^{n_j} \left\{I_k(y_{ij})\ ln\ \left[\frac{1}{1+\exp(-k_k+n_{ij})} - \frac{1}{1+\exp(-k_{k-1}+n_{ij})}\right]\right\} \ldots\ldots\ldots\ldots(15)$$

The prior distribution of μ_j is multivariate normal with mean zero and a 47 by 47 variance matrix $\sum_{47\times47}$. Thus the likelihood contribution for each county is obtained by integrating out the random effects μ_j from the joint density $L\left(y_j|k,\mu_j\right)$ and can be given as;

$$L_j(\beta,k,\sum) = (2\pi)^{-q/2}\,|\sum|^{-1/2}\int L\left(y_j\,|k,\mu_j\right)\exp\left(-\frac{u_j'\sum^{-1}\mu_j}{2}\right)d\mu_j$$

$$= (2\pi)^{-q/2}\,|\sum|^{-1/2}\int exp\{h(\boldsymbol{\beta},k,\sum,\mu_j)\}\,d\mu_j \quad \text{……..…..……..……..(16)}$$

Where

$$h\left(\boldsymbol{\beta},k,\sum,\mu_j\right) = \sum_{i=1}^{n_j}\{I_k(y_{ij})\ln(p_{ij})\} - \frac{\mu_j'\sum^{-1}\mu_j}{2}$$

The above equation has no closed form. It can therefore be approximated for the maximum likelihood estimation using mean–variance adaptive Gauss–Hermite quadrature and Laplacian approximation crossed random-effects models

The initial Bayesian models were fitted within Stata® 14, but Stata does not cater for spatial random effects. Therefore, this is extended to the Bayesian framework such that the link function predictor n_{ij} is extended such that;

$n_{ij}^{*} = \boldsymbol{X_{ij}\beta} + z_{ij}\mu_j + \epsilon_{ij}$, letting $z_{ij}\mu_j = \vartheta_j + \emptyset_j$

The spatial Bayesian model is defined as follows;

$$Posterior[p(parameters\,|data)]\alpha\; Likelihood\;\times\; Priors$$

The full conditional distribution for our model can be expressed as

$$p\left(\Phi \equiv \{\boldsymbol{\beta},\phi,\boldsymbol{v},\boldsymbol{X_{ij}}\}|y_{ij}\right)\;\propto\; p(\Phi\,|y_{ij}) = L\left(y_{ij},\boldsymbol{X_{ij}}\,|\Phi\right)\times p(\boldsymbol{\beta_k})\times p\left(\phi_j\,|\tau_c\right)\times p(\vartheta_j\,|\,\tau_h)$$

$$= L\left(y_{ij}|\Phi\right)\times\; p(\boldsymbol{\beta_k})\times\; p\left(\phi_j\,|\tau_c\right)\times p(\tau_c)\times p(\vartheta_j\,|\,\tau_h)\times p(\tau_h) \quad \text{…….……..(17)}$$

The prior for the beta coefficients in the model is $\beta_k \underset{\sim}{iid} N(\mu_\beta, \sigma_\beta^2)$, thus

$$p(\beta_k) = \frac{1}{\sqrt{2\pi\sigma_\beta^2}} exp\left[-\frac{1}{2}\left[\frac{\beta_k - \mu_\beta}{\sigma_\beta}\right]^2\right]$$

The unstructured random effects $p(\vartheta_j|\tau_h)$, where $\vartheta_j \underset{\sim}{iid} N\left[0, \frac{1}{\tau_h}\right]$ with a Gamma function prior used $\tau_h \sim Gamma(\alpha_h, \beta_h)$ as shown by Banerjee [210]

With a Gamma function prior used $\tau_h \sim Gamma(\alpha_h, \beta_h)$, then

$p(\tau_h) = \frac{{\beta_h}^{\alpha_h}}{\Gamma(\alpha_h)} \tau_h^{\alpha_h - 1} \exp(-\beta_h \tau_h)$ for $\alpha_h > 0; \beta_h > 0$

Therefore $p(\vartheta_j|\tau_h) = \frac{1}{\sqrt{\frac{2\pi}{\tau_h}}} exp\left[-\frac{1}{2}\left[\frac{\vartheta_j - 0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right]$

$$p(\vartheta_j|\tau_h) \times p(\tau_h) \propto \tau_h^{\alpha_h - 1} \exp(-\beta_h \tau_h) \times exp\left[-\frac{1}{2}\left[\frac{\vartheta_j - 0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right] \text{.....(18)}$$

A Continuous Autoregressive (CAR) prior is used for the structured spatial random effects $\vartheta_j \sim CAR(\tau_c)$. The CAR prior is given as $\phi_j|\phi_i \neq i, \tau_c \sim N\left[\frac{\phi_j}{\bar{\phi}_j}, \frac{1}{\tau_c m_j}\right]$ and a conjugate hyper prior of $\tau_c \sim Gamma(\alpha_c, \beta_c)$ was assumed. Thus, as shown in Banerjee and Lawson [211,212] ;

$$p(\phi_j|\tau_c) = \frac{1}{\sqrt{\frac{2\pi}{\tau_c m_j}}} exp\left[-\frac{1}{2}\left[\frac{\phi_j - \frac{\phi_j}{\bar{\phi}_j}}{\frac{1}{\sqrt{\tau_c m_j}}}\right]^2\right] \text{.....(19)}$$

Within the spatial random effects model, it was considered that as much as facilities within one county are more similar to each other than to facilities in other counties, counties

near each other are likely to have higher correlations than counties that are far away from each other. The likelihood of the neighbouring counties is therefore given as;

$P(\phi_j|\tau_c) \propto \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\}$ where w_{ij} denotes the adjacency matrix and the subscript ij shows that the county j is a neighbour of county i and m_j is the number of neighbours for county j. A Gamma distribution of the conjugate hyper prior $\tau_c \sim Gamma(\alpha_c, \beta_c)$ is used and whose distribution function can be shown as;

$P(\tau_c) = \frac{(\beta_c)^{\alpha_c}}{\Gamma(\alpha_c)}\tau_c^{\alpha_c - 1}\exp(-\beta_c\tau_c)$, for $\alpha_c > 0;\ \beta_c > 0$, thus;

Since $p(\phi_j|\tau_c) \propto \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\}$, then

$$p(\phi_j|\tau_c) \times p(\tau_c) \ \propto\ \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\} \quad \text{.....(20)}$$

Combining the equations above, a full conditional likelihood function for the spatial structured and unstructured model can be given as;

$$P(\Phi|y_{ij}) = L(y_{ij}, x_{ij}\,|\Phi) \times p(\beta_k) \times p(\phi_j|\tau_c) \times p(\vartheta_j|\tau_h)$$

$$P(\Phi|y_{ij}) = exp\sum_{i=1}^{n_j} I_k\,(y_{ij})\ln\left[\frac{1}{1+\exp(-k_k+n_j)} - \frac{1}{1+\mathrm{e}\quad(-k_{k-1}+n_j)}\right] \times$$

$$\frac{1}{\sqrt{2\pi\sigma_\beta^2}}\exp\left[-\frac{1}{2}\left[\frac{\beta_k-\mu_\beta}{\sigma_\beta}\right]^2\right] \times \tau_r^{\alpha_{r-1}}\exp(-\beta_r\tau_r) \times \tau_h^{\alpha_{h-1}}\exp\,(-\beta_h\tau_h) \times$$

$$exp\left[\frac{1}{2}\left[\frac{\vartheta_j - 0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right] \times \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n} w_{ij}\left(\phi_j - \phi_i\right)^2\right\}\tau_c^{\alpha_{c-1}}\exp(-\beta_c\tau_c) \quad \text{.....} \ (21)$$

The above equation has no closed form and has to be approximated. The approximation of the parameters was done using Markov Chain Monte-Carlo (MCMC) with Metropolis-Hastings algorithms approach. For the bivariate models in Stata, a *burnin* and thinning of 1000

and 10 respectively were used. Using WINBUGS, we fitted a spatially structured model with a CAR prior, and a spatial unstructured model with a Gaussian prior and a gamma hyper prior as shown above. The structured components adjust and account for the neighbouring effect in the spatial structures, which represent the counties in this study. Finally, we fitted a final model with both unstructured and structured random effects. In this algorithm, *burnin* removes unstable values while *thinning* reduces the autocorrelation.

3.10.3 Model goodness of fit and adequacy

Goodness of fit for all ordered logit models presented in this study was evaluated by comparing the Deviance Information Criteria (DIC) value for each model as defined in Belitz [213]. $DIC = D(\bar{u}) + p_D$ where $D(\bar{u})$ is the posterior deviance expectation with p_D effective parameters. The model that produced the smallest DIC value was considered to be a better fit than its comparators with higher DIC. This post estimation procedure was used both to inform the decision on selection of mixed effects model over fixed effects models, and to inform the selection of variables to be excluded or included in the final model using the backward selection of model covariates.

It is common for large models to have one or more predictors that are linear combinations of each other (collinearity). When more than two variables are involved the model has multicollinearity and its estimates may not be uniquely computed due to overinflated standard errors. In all models presented here, multicollinearity was tested for all predictors using the variance inflation factor (*vif*) command in Stata.

3.11 Qualitative components (Objective III and IV)

Objective III: To explore PAC service providers' understanding of quality PAC and their challenges in providing PAC services in Kenya

To understand the service provider's understanding of quality of PAC, this study explored the role of provider-patient relations as influenced by legal frameworks on quality post-abortion care in healthcare facilities in Kenya. Qualitative data on service provider patient's understanding of quality of PAC were collected using IDIs. Scripts were coded inductively with themes and subthemes identified as they emerged from data, in order to gain a provider and patient standpoint on the role of service providers in quality care delivery and the convergence or divergence of these two positions.

Objective IV: To explore PAC service seekers' understanding of quality PAC and their experience in seeking PAC services in Kenya

Under this objective, the study sought to explore post-abortion care service provision, abortion policy framework and quality of care in healthcare facilities in Kenya, understanding how existing policies influence the quality of PAC and the preparedness of facilities to offer PAC. Similar to objective III above, qualitative data on providers' and patients' perceptions and understandings of quality PAC were explored in conjunction with the facility-level quality perception, to understand the extent of policy and legal frameworks' influence on the delivery of quality PAC services.

For both objectives III and IV, data were transcribed and coded concurrently with continued data collection. A coder and the PI first coded the data independently, then met to decide on the final and most congruent code list, based on the themes that emerged from the data. Afterwards, all data were coded and analysed inductively, with data sorting and organization implemented in NVIVO® 11 using the final agreed themes. The analysis mainly focused on identifying groups and subgroups of themes as they emerged from the data in order to develop distinct narratives on the interaction of providers and patients, as well as those on the interaction between facility, provider and patient, and on how these interactions were influenced by existing policy and legal frameworks in the delivery of quality PAC services.

All these relationships were built drawing on Leonard's model of post-abortion care [191] and updates on this model by Greenslade and colleagues [17]. These coding steps were mainly to ensure full engagement with the data, interrogating the data over different levels, dimensions, and depths to establish links between themes [214,215].

3.12 Survey ethical consideration

The IMUA study in which this research is nested received ethical approval from the Ethical Review Boards of: Kenya Medical Research Institute (KEMRI) (No. RES/7/3/1) Kenyatta National Hospital (KNH) and University of Nairobi (No. P20/01/2017), the Guttmacher Institute and the Aga Khan University Hospital Ethical Review Boards. In addition to the ethical approval, all study participants signed consent forms to participate in the study, both at the facility level data (HFS) and the individual women participants (PMS). Furthermore, the study obtained all requisite authorization from the National Commission for Science, Technology and Innovation (NACOSTI) (No. NACOSTI/P/17/46177/15809) and the Ministry of Health. The study also collaborated with the Ministry of Health at different levels of its implementation (No. MOPHS/ADM/2/1).

Ethical approval for the primary data component was obtained locally from the African Medical and Research Foundation (AMREF) Ethical and Scientific Research Council (ESRC) (No. P185/2015) as well as the University of Nairobi and Kenyatta National Hospital Ethical Review Committee (No. P33/01/2017). Further approval was obtained from the University of the Witwatersrand's Human Research Ethics Committee (HREC) (No. M150760). An additional institutional approval was obtained from the African Population and Health Research Center's IRB. Participating service providers and patients were also required to sign consent forms for the survey to be conducted. Confidentiality of survey data and information were also stressed in the consenting process.

All data collected in the IMUA study is restricted to access according to the above ESRC approval of 2012. A data request for use of this data was made and approved by the APHRC Data, Measurement and Evaluation unit. New data collected were stored in password-controlled computer, only accessible by the PI and the co-PIs.

Ethical principles governing the implementation of this survey were compulsory for each interviewer. Each interviewer was required to sign a binding agreement for adhering to these principles. Interviewers were also required to have taken or to take online ethics training on research on human participants, and certificates were used as part of admission to this data collection exercise.

4 RESULTS

The results presented in this section highlight the key findings in Papers 1, 2, 3 and 4 (see appendices). This section thus explores all the thematic areas related to the quality of PAC, as discussed in chapter 2. The section draws on the findings from the four articles submitted for publication, in an overarching manner, in order to present the significance of this research in relation to the existing body of knowledge on quality of PAC. Special emphasis is placed on the Kenyan context on access to and the delivery of PAC service. The following thematic areas are explored:

1) Abortion care policy in Kenya (papers 3 and 4)
2) Post-abortion care seeking (papers 3 and 4),
3) Abortion complication treatment (papers 1, 2, 3, and 4) and
4) Post-abortion contraception and repeat abortion (papers 2, 3 and 4)

4.1 Abortion care and policy in Kenya

As discussed in the literature review section above, abortion is illegal in Kenya and highly restricted. The findings presented in paper 1 demonstrate how such restrictions impede access to quality PAC, while paper 2 outlines the specific restriction on access to post-abortion contraception, an essential element of quality post-abortion care. Paper 3 extends this discussion to the effect of restrictive abortion services on the interaction between service providers and patients, which is yet another PAC quality of dimension. Building trust between PAC service providers and patients creates an environment that allows patients to open up and to discuss their experiences with pregnancy and abortion, which consequently reduces exposure to future abortion after an effective counselling by a well-trained service provider.

With high levels of mistrust between patients and service providers, the quality of service provision deteriorates, as providers cannot obtain a full and complete picture of the nature of complication and sometimes, impedes delivery of the right services, such as the choice of the correct evacuation procedure when patients are unable to disclose the stage of their pregnancy at the time of inducement. Certain procedures, as presented in Paper 1, require prior knowledge of the gestation stage before they can be conducted, information which patients often withhold from service providers for fear of legal consequences. Notably, as presented in papers 3 and 4, the majority of facilities lack the necessary equipment to facilitate this decision by service providers and only rely on reported patient's medical history: "Most of the time the patient comes and they don't give the whole history that is required so that you can be able to know what to give them in terms of the health messages and how to deal with the patient." (Provider, level 4, medium quality).

Often, service providers restrict PAC services from patients for fear of legal implications of care. They resort to the use of patients' guardians or relatives as well as other providers as witnesses before they are willing to treat any PAC patient, especially when handling adolescents and young women, as shown in paper 3; "Sometimes when I want to do the procedure, I call the relative or the guardian and explain to them what is happening to this patient, what should be done, and what I'm doing, and then they give me a go ahead" (Provider, level 4, high quality).

For patients, the fear of legal action against them for an illegally induced abortion often led them to use private facilities as conduits to access care in public facilities, especially when seeking pregnancy termination services. They reported having sought termination of pregnancy in a private facility and then proceeded to a public facility for PAC. In addition, the patients sought private providers to get more information on where they could get PAC services in public facilities, due to fear that presenting at certain public facilities might lead to

arrest by the police for procuring an illegal abortion. This multi-stage care seeking only exposes patients to delays in care and hence, severe complications. Adolescents and young women appear to be the most affected by these restriction, since their access to post-abortion contraception was equally restricted by service providers and facilities, exposing them to future unwanted pregnancies, as was demonstrated in paper 3: “Most of them, you do not give them the family planning because they are still young and when you give family planning you will not be helping them to be able to conceive later in life” (Provider, level 5, low quality).

Service providers also blamed the availability of medical abortifacients on the increased cases of induced abortions. They felt that these medical products used to induce abortion were responsible for the increased rates of abortion termination and complications, even though it can also be argued that the availability of medical abortifacients led to a reduction in the use of crude ways of pregnancy termination and hence reduced the severity of complications, as evidenced in paper 4:

> Not really about the PAC issue, but some of the causes of these increased incomplete abortions. You find that abortifacients could not be sold in chemists without a doctor's prescription, nowadays they are very available, even a standard 8 girl can go to town and purchase the abortifacients, then come here bleeding in shock and the regulations has caused majority of people to lose their life because the drug is now over the counter drug. (Provider, level 5, good quality).

In addition to provider-related and legal restrictions, there were evident restrictions to PAC access by facility-specific policies that opposed both abortion and access to contraceptive methods for adolescents and young girls. Service providers executed these restrictive policies, since they were bound to, at the facility level, even though as individuals, they had different and often dissenting views on such restrictions: “The counsellor has to explain to the patient

that we don't offer contraceptives here, but it is very important to go home with them." (Provider, level 4, medium quality).

In some of these facilities, the responsibility of procuring products was vested with persons who did not have a clear understanding of how some of the commodities were critical components of care. Providers expressed concerns over the manner in which healthcare was organized in their facilities, where PAC service providers' role in the procurement process was not well-defined: "But, in terms of procurement, you are dealing with someone who is not a medical person in the procurement department. You are dealing with a matron that is not interested maybe." (Provider, level 4, medium quality).

There was also evidence of lack of clear guidelines on the provision of PAC and on abortion care, which often reduced the confidence of service providers who failed to offer PAC services for fear of legal retribution or lack of clear legal position on PAC and abortion care service provision. These service providers argued the need for guidelines for abortion care, just as there were guidelines in other areas of healthcare such as child health and HIV prevention and control. They expressed the need to refocus the public healthcare provision on PAC or at least the inclusion of PAC services as an essential component or package of reproductive healthcare for women. This was expressed by one service provider, who in comparing the legal and policy situation in PAC and abortion care to other healthcare services, noted that: "Just like they come up with guidelines of management of any other thing in medicine like antenatal or PMTCT guidelines" (Provider, level 4, good quality).

Establishment of stronger linkages between public healthcare PAC service provision and other actors, such as non-governmental stakeholders, was seen as one of the ways through which the public health sector could benefit from the strengths of these other sector players from their years of experience, research and updates in care delivery: "Because the partners come with more package. If they came to my facility here and they wanted to support post-

abortion care, I'm very sure they will train staff, they may provide MVA, and they may provide drugs" (Provider, level 4, low quality).

4.2 Post-abortion care seeking behaviour

This section draws on findings mainly from paper 3 and 4 to discuss care seeking behaviour among women with complications from unsafe abortion. In facilities that participated in this study, especially level 4, some PAC service components, especially diagnostic services, were unavailable, either at the time of seeking care (for example at night) or completely, especially in faith-based facilities. These facilities tended to refer patients for the missing services and patients would return for completion of PAC treatment, especially radiological examinations. In other facilities, patients were referred to chemists and pharmacy stores to purchase certain medications that were not available in the treating facilities: these included pain medications, antibiotics and family planning commodities. Often, these partial or full referrals were associated with longer delays in treatment [6], which in turn were a leading cause of severe complications such as trauma of the cervix, vagina, uterus and other abdominal organs [18]. These delays were not only found in lower level facilities (level 2 and 3) as described in Mutua and colleagues [6], but also in level 4 facilities where patients often did not receive family planning services because these services were only available on certain days and not others, as demonstrated in paper 3: "In our MCH as I have told you, all the FP methods are currently available, the drugs, the coils, the condoms, everything. Except for the BTLs (bilateral tubal ligations), they are usually done here routinely" (Provider, level 4 low quality). The challenge of service availability is also presented in paper 4: the inequitable availability of service is sometimes due to the unavailability of service providers, and other times due to service disruptions from industrial action by service providers' trade unions: "I had mentioned the strike earlier, because even when I left home I wasn't sure I would find anyone, was just taking

a chance, and didn't think I would get treatment since most doctors are on strike" (Patient, level 4, low quality).

Lack of clear emergency response actions and plans by facilities further restrict access to PAC services within healthcare facilities. Patients were often left to navigate their way through health facilities with minimal assistance, while in some cases, support medical staff such as nurses would partly abdicate their roles to patients or their caregivers: "Yes. Then we came with the stretcher, they send us back and told us that it wasn't the stretcher for casualty, but by good luck there was a patient that was being discharged and that is when we took the stretcher, it was just by chance" (Patient, level 6, good quality).

4.2.1 Poor infrastructure

Paper 1 presented the state of facility preparedness and demonstrated how facilities used inappropriate technologies when managing post-abortion care patients. Patients treated for complications from a first trimester abortion were more likely to be treated using inappropriate technology compared to those treated for a second trimester abortion, especially those treated in higher level facilities (level 4 and 5), especially in public facilities. This was also demonstrated in a previous study, showing that almost all cases of dilation and curettage (D&C) services were conducted in level 4 and 5 facilities [22]. Paper 4 also established how these facilities, including higher-level facilities, referred patients to private facilities for radiological scans and other examination procedures, only for the patients to be returned to these referring facilities to complete their treatment. Other patients were referred for these procedures and completion of treatment:

> Our nearest referral hospital is [name of facility] level 5, where they usually can go and first do the scanning, if they wish to complete their procedures there they can but some of them due to the workload in [name of facility], after scanning they usually come

> back here, so we still do the MVAs here. If it is septic we have the wards and thus we admit them (Provider, level 4, good quality).

Lack or insufficiency of sterilization facilities and delays in sterilization exposed patients to poor services, with some patients being referred to other facilities for manual vacuum aspiration (MVA), because facilities only had a few MVA kits. Having only one or two MVA kits in these high-volume facilities was inadequate because of the time required for the sterilization of the kits:

> Maybe one challenge you may encounter which that one would tend to occur in any facility is when you have many cases as admissions but you do not have enough instruments or equipment at that time because of sterilization because they have to have a timeline for sterilization (Provider, level 5, good quality).

4.2.2 Cost of services

In addition to lack or insufficiency of proper equipment for PAC management was the cost of services, which was always perceived to be high to the patients whenever they were referred from their facilities of choice to other facilities, especially from public to private facilities. Other patients would also be referred to other facilities and drug stores to purchase certain medications such as antibiotics and painkillers, while still in admission. With the cost implications of these referrals, patients opted to went home and resorted to home remedies, whose quality cannot be assured: “Apart from where you have to get a scan and spend money, I can say inside there I was okay. The only thing is having to go out to get your scan done, maybe if they did the scans themselves, I might not have spent the amount of money I spent out there” (Patient, level 4, low quality).

The process of making payments for services within facilities, including the mode of payment presented an additional financial challenge to patients, even among those patients with reportedly reasonable purchasing power for PAC service. Some of these patients were unable to make these payments owing to lack of flexible service payment options. In some cases, patients were only able to make payments for services through mobile money payments (commonly referred as M-Pesa), yet the facilities' payment policies restricted these payments to cash only. In some other cases, patients complained about the restriction of payment to mobile money, irrespective of the amount payable, yet these mobile money payments had daily transaction limits: "Apart from where you have to get a scan and spend money, I can say inside there I was okay. The only thing is having to go out to get your scan done, maybe if they did the scans themselves, I might not have spent the amount of money I spent out there" (Patient, level 4, low quality).

Other facilities only accepted M-Pesa payments, even when patients only had cash for payments. In addition, in some instances women were asked to pay for services before procedures: this was the case even for patients with severe conditions, and with challenges moving around, especially in large facilities due to long distance between the different locations of treatment and payments stations.

4.2.3 Service provider attitudes towards abortion and PAC patients

The capacity of service providers to offer PAC does not only refer to the service skill, but also their attitudes, which often determine how these providers treat their patients. Cases of patients being scared away from services, especially in public facilities, was evident and has been presented in detail in paper 4. Service providers in private facilities took note of this quality of care concern as evidenced by this provider in a level 4 private facility, from their interaction with patients: "In Kenya, I don't think most facilities offer quality. Also, the attitude in the

health facilities scares people away. They choose to go to the chemist and they end up... some even end up bleeding to death in the houses" (Provider, level 4, good quality).

This fear of seeking care in some facilities was also expressed by patients, who, for fear of service providers' attitudes, would opt for home remedies and self-medication, which only exposed them to greater risks of severe abortion complications: "They explained to me very nicely. Initially I was afraid to go to the public facilities for the family planning because I knew they would ask me a lot of questions. So, I used to rush to the private clinics where it could be done very fast" (Patient, level 4, good quality).

The consequences of PAC patient discrimination is further presented in paper 4. The lack of patient-focused care was evident from reports on how patients were mistreated by their service providers. Similar findings on low training of PAC service providers and poor distribution of these trained providers across the facility levels, as presented in paper 1, also show that the majority of the trained providers were situated in larger facilities. Previous studies have also demonstrated the role that level 2 and 3 facilities play in provision of PAC services [6,190]: "There are some nurses that rush patients, for example since I was pregnant and still a student, when I was brought here there are some nurses that talked to me in a bad way" (Patient, level 4, good quality).

4.3 Abortion complication treatment

This section examines the quality of PAC as currently offered in healthcare facilities in Kenya. As defined in the methods section, the characteristics of health facilities were assessed according to individual quality of care items descriptively, then generated a single measure of quality from all items.

As discussed in paper 1, there were no major differences by level and ownership of facilities with regards to how facilities provided information and counselling to PAC patients.

However, most counselling focused on giving women information on available contraceptive methods, instructions on how to use them, and explanations of the advantages and disadvantages of each method. All facilities scored poorly on giving patients information on recourse for method failure, despite that this was a common scenario with most short-acting contraceptive methods. This low rate of information on method failure was problematic, despite the evidence presented in paper 2, given that a large proportion of the PAC patients treated in these facilities received short-acting (less effective) contraceptive methods (45.6%). Effective contraception was, in Paper 2, defined as any PAC patient receiving any modern method of family planning which reduced the risk of pregnancy by at least 99 percent, which in most cases included either a long-acting or a permanent method of contraception. The reliance of these methods on user-compliance and adherence made them more prone to failure. Of all patients treated in these facilities, only 9.1 percent received an effective contraceptive method, and this was lowest level 5 and 6 facilities. Further, 45.3 percent of all the patients in this study did not receive any method.

Paper 1 assessed the level of quality of PAC services in healthcare facilities, according to the post-abortion care framework, as suggested by the post-abortion care community taskforce and later updates by Greenslade and Jansen [17,49]. Four of the five quality of care components were assessed by single indicator measures, then all indicators were used to generate a quality of care index, which was used for the regression analysis.

Use of appropriate technology in the management of PAC patients was defined as first trimester PAC patients treated using either medical abortion or manual vacuum aspiration, or second trimester patients treated with either medical abortion or with dilation and evacuation. Use of appropriate medical technology to manage second trimester abortions was reasonably high (82.6 %), but there was relatively poor use of appropriate technology to manage first-trimester abortions (41.8 %). Larger facilities were least likely to use appropriate technology

when managing first-trimester abortions (25.4%) compared to smaller facilities (50.6%). In addition, public facilities scored higher on the use of appropriate technology for first-trimester abortions (47.5%) compared to private facilities (33.1%). According to findings presented in paper 1, trained providers were concentrated in larger facilities, both public and private, with an average of six providers per facility in level 4-6 facilities compared to only one provider in level 2 and 3 facilities.

To assess the relationship between facility or county characteristics and the level of quality, paper 1 generated a continuous variable measure of facility-based quality if care, using multiple joint corresponded analysis (MCA) to reduce all 18 indicators of quality into one measure. This composite measure was tested for reliability using Cronbach's Alpha ($\propto$) to test the lower bound reliability of this measure. The indicator gave a reliability of $\propto = 0.54$. Finally, paper 1 used an ordinal outcome to measure quality that was generated by ranking a continuous quality of care index and categorizing it in to three equal parts, such that every quality of care category level had 33.3 percent of all facilities. These categories were labelled as high, medium and low quality. However, this form of data reduction was shown to be prone to information loss due to the choice of cut off points, hence losing the continuity of the original measure [216]. Table 4:1 presents a re-analysis of the results of paper 1, treating the outcome variable as a continuous measure of quality of PAC, as computed from a multiple joint corresponded analysis data reduction technique. The models presented in Table 4:1 consist of bivariate and multivariable linear mixed effects models with a continuous outcome measure of quality of PAC in healthcare facilities in Kenya.

According to Table 4:1**Error! Reference source not found.**, quality of care at the health facilities was mainly associated with type of facility ownership (whether government or privately owned), availability of an evacuation procedure room, facility having or offering specific obstetrics and gynaecology services, average monthly number of deliveries conducted

in the facility, and number of contraceptive methods available for PAC patients. In addition, county-level characteristics that are associated with quality of PAC included the county proportion of women reporting facility-based delivery, county proportion of deliveries conducted by a healthcare provider, and the county average household size.

At the facility level, in relation to overall quality, public facilities had 0.16 lower quality of care compared to private facilities. As presented in paper 4, the majority of the patients who reported dissatisfaction with PAC services at public facilities pointed out a number of challenges, which would explain the poor quality presented in Table 4:1. These included frequent service disruptions due to industrial strikes, lack of qualified service providers during certain times of the day such at night and during public holidays, and discriminatory treatment of patients, especially based on their age, marital status or on suspicion that the abortion had been induced.

Facilities with a separate evacuation procedure room and facilities with specialized obstetrics and gynaecology services were 0.33 and 0.24 higher quality PAC services respectively. According to paper 4, those facilities with separate evacuation procedure rooms improved the level of privacy for patients, and can be seen to further create a space for strong patient-provider interaction which would lead to better treatment outcome for the patients, as one service provider in a level 4 facilities explained: “I think in terms of the physical space we have to give them privacy. We can't keep the mother who has lost her child with other mothers who have children. It will continue to traumatize her” (Provider, level 4, medium quality).

Table 4:1 Multivariable linear mixed-effects coefficients of quality of PAC among PAC-providing healthcare facilities in Kenya, 2012

	MODEL 0 [Bivariate facility and county level characteristics]	**MODEL 1 [Multivariable facility level characteristics]**	**MODEL 2 [Multivariable facility and county-level characteristics]**	**MODEL 3 [Multivariable county and facility level characteristics]**
	Coef (β)(S. Error(β)); C.I [Lower C.I , Upper CI]			
Facility characteristics				
Level of facility 4-5 Ref: Level 2-3)	-0.44(0.064); C.I [-0.567,-0.314]	-0.256(0.046); C.I [-0.346,-0.166]	0.006(0.036); C.I [-0.040,0.052]	-0.013(0.037); C.I [-0.086,0.060]
Public facility ownership (Ref: private)	-0.548(0.061); C.I [-0.668,-0.428]	-0.363(0.038); C.I [-0.437,-0.289]	-0.143(0.034); C.I [-0.187,-0.099]	**-0.158(0.035); C.I [-0.227,-0.089]**
Facility has evacuation room	-0.271(0.065); C.I [-0.398,-0.144]	0.378(0.048); C.I [0.285,0.472]	0.316(0.034); C.I [0.273,0.359]	**0.332(0.035); C.I [0.263,0.400]**
Facility provides specialized Oby-gyn	-0.246(0.075); C.I [-0.394,-0.098]	0.431(0.052); C.I [0.328,0.533]	0.244(0.040); C.I [0.193,0.295]	**0.235(0.041); C.I [0.155,0.314]**
Facility has maternity services	-0.588(0.031); C.I [-0.648,-0.528]	-0.269(0.069); C.I [-0.405,-0.133]	0.109(0.057); C.I [0.036,0.183]	0.063(0.057); C.I [-0.049,0.175]
Perceives PAC a significant load	-0.483(0.061); C.I [-0.602,-0.363]	0.026(0.042); C.I [-0.057,0.110]	0.055(0.031); C.I [0.016,0.095]	-
Providers always trained for PAC	-0.5(0.043); C.I [-0.585,-0.415]	0.017(0.043); C.I [-0.067,0.102]	-0.023(0.033); C.I [-0.019,0.064]	0.019(0.032); C.I [-0.044,0.082]
Log of monthly number of deliveries	-0.139(0.012); C.I [-0.162,-0.116]	0.026(0.018); C.I [-0.009,0.061]	0.018(0.013); C.I [0.002,0.035]	**0.027(0.013); C.I [0.001,0.053]**
Number of FP methods available	-0.084(0.006); C.I [-0.096,-0.072]	0.03(0.009); C.I [0.012,0.048]	0.068(0.007); C.I [0.059,0.077]	**0.070(0.008); C.I [0.055,0.084]**

County characteristics				
Total unmet need for FP	-0.029(0.001); C.I [-0.032,-0.027]		0.002(0.003); C.I [-0.001,0.006]	-
% wants to have another child	-0.011(0.001); C.I [-0.012,-0.01]		0.001(0.002); C.I [-0.002,0.004]	-
3 months heard of FP on radio	-0.008(0.000); C.I [-0.009,-0.007]		0.001(0.001); C.I [0.000,0.002]	-0.001(0.001); C.I [-0.002,0.000]
3 months heard of FP on TV	-0.009(0.001); C.I [-0.011,-0.008]		-0.001(0.002); C.I [-0.003,0.002]	-
3 months heard of FP on newspaper	-0.017(0.001); C.I [-0.019,-0.014]		-0.001(0.002); C.I [-0.005,0.002]	-
% husband knows wife using FP	-0.006(0.000); C.I [-0.007,-0.006]		-0.004(0.004); C.I [-0.008,0.001]	-
Percentage receiving antenatal care from skilled provider	-0.006(0.000); C.I [-0.007,-0.006]		-0.004(0.005); C.I [-0.011,0.003]	-
%age of women with births in last 5 years and had more than 4 visits to ANC	-0.009(0.000); C.I [-0.01,-0.009]		0.009(0.003); C.I [0.006,0.013]	0.003(0.002); C.I [0.000,0.006]
%age of mothers with live births in past 5 years who received at least 2 TTs during pregnancy	-0.011(0.001); C.I [-0.012,-0.01]		-0.002(0.002); C.I [-0.005,0.000]	-
% of women with births in last 5 years whose last birth was at a healthcare facility	-0.008(0); C.I [-0.008,-0.007]		-0.005(0.002); C.I [-0.008,-0.003]	**-0.008(0.002); C.I [-0.011,-0.005]**
Percentage delivered by a skilled provider	-0.007(0.000); C.I [-0.008,-0.007]		0.004(0.001); C.I [0.002,0.005]	**0.002(0.001); C.I [0.000,0.004]**
Natural log of county budget allocation to health	-0.032(0.001); C.I [-0.034,-0.029]		-0.002(0.030); C.I [-0.041,0.037]	-
Percentage that is Christian	-0.006(0.000); C.I [-0.007,-0.006]		-0.001(0.002); C.I [-0.003,0.001]	-

Percentage of households reporting lack of food or money for food in last 7 days	-0.015(0.001); C.I [-0.016,-0.013]		0.000(0.001); C.I [-0.002,0.001]	-
Mean household size	-0.144(0.006); C.I [-0.155,-0.133]		-0.183(0.064); C.I [-0.265,-0.101]	**-0.193(0.016); C.I [-0.223,-0.162]**

¥ Variables selected for final model at p<0.20 significance level. Facility level maintained in the model for contextual importance

ξ Final model, significance at p<0.05

Evidently, having specialists, including obstetricians, gynaecologists and radiologists, increased the quality of PAC services delivered. This assertion of quality care by specialists was also corroborated by patients, based on their expectations of quality of care. Specialized service providers improved the quality of treatment by their skills in evacuation and availability in the facilities. Patients see availability of such specialized service providers as the solution to poor PAC evacuation outcomes which often led to the need for additional evacuation procedures, often referred to as "revacuation": "The miscarriage had initially happened like date 3 this month then I was cleaned in some other hospital but the person did not do the right job, then the complications started on Friday that is when I came here to seek more attention" (Patient, level 4, low quality) . There was additional evidence of high rates of complication, which were life-threatening to patients any time they could not access specialized treatment. This was especially the case in the management of patients with perforated uterus, who would always require a gynaecologist's review before evacuation could be completed: "Maybe the patient has developed a uterine rapture, that patient now might need theatre or a gynaecological review, but you might find that you have a hard time to get to that specialist, so you might end up losing the patient. So I will recommend that we have more trained specialist and more improved health facilities" (Provider, level 4, medium quality).

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In any given facility, every additional unit in the number of deliveries and the number of contraceptive methods available for PAC patients increased the quality of PAC services by 0.03 and 0.07 respectively. This evidence is also presented in paper 2, which further shows that each additional family planning method available for PAC patients to choose from increase their odds of a patient receiving a highly effective contraceptive method by 19.1 percent.

At the county level, facilities within counties with higher rates of facility-based deliveries had 0.008 lower quality PAC, similar to facilities in counties that had higher average household size (0.19), a potential indication of strained public health resources in these counties. However, facilities within counties that had a higher rate of skilled provider delivery were had 0.002 higher quality PAC.

4.4 Post-abortion contraception and repeat abortion

Paper 2 assessed the level of post-abortion contraception among patients treated with complications from unsafe abortion in healthcare facilities in Kenya. By exploring the type of contraceptive method that patients received after PAC treatment, methods were classified according to their level of effectiveness (as described by Hatcher and Nelson [217] and updates by Keene and colleagues [168]). Accordingly, only 9.1 percent of all PAC patients received an effective contraceptive method, compared to 45.6 percent and 45.3 percent who received an ineffective method or no method at all respectively.

There were clear differences between facility levels, with patients treated in lower-level facilities (level 2 and 3) having the highest rates of effective contraceptive method adoption compared to level 4, 5 and 6 facilities. Larger facilities suffered loss of patient follow-up, with most of the PAC patients referred to MCH clinics for FP services; this finding was corroborated in Paper 4. Public facilities lagged behind private facilities, with only 7.3 percent of patients treated in public facilities receiving an effective contraceptive method compared to 13.2 percent of patients treated in private-for-profit and 10.2 percent of patients treated in private not-for-profit facilities as shown in Table 4:2.

Using Bayesian mixed-effects ordered logit models, thethe effect of patient, facility and county characteristics on adoption of an effective contraceptive method were assessed. Table 4:3 presents the results of four models used in this analysis.

Table 4:2 Description of patients treated for PAC in healthcare facilities according to type of contraceptive method received, by facility characteristics, 2012

	% No method [C.I]	% Non-effective [C.I]	% Effective [C.I]	% Total	Chi^2; Design-based F*; p value	Number of women
Health facility Characteristics						
Overall	45.3 [40-50.8]	45.6 [40.9-50.4]	9.1 [6.6-12.2]	100		2,568
Facility level						
Level 2	38.9 [29.8-48.9]	51.2 [42.9-59.3]	10 [5.2-18.3]	38.9 [29.8-48.9]		231
Level 3	49.1 [40.6-57.6]	40.5 [33.7-47.8]	10.4 [7-15.1]	49.1 [40.6-57.6]		796
Level 4	49.2 [38.7-59.8]	42.6 [33.2-52.6]	8.2 [4.4-14.7]	49.2 [38.7-59.8]	48.7; 1.06; p>0.1	835
Level 5	39.8 [24.8-57]	58.5 [41.2-73.9]	1.7 [0.6-4.3]	39.8 [24.8-57]		530
Level 6	31.3 [3-87.1]	67 [13.5-96.4]	1.7 [0.8-3.4]	31.3 [3-87.1]		176
Region						
Central & Nairobi	46.1 [35.5-57.2]	41.4 [32.6-50.8]	12.5 [8.3-18.3]	100.0		839
Coast & N. Eastern	50.3 [37.1-63.5]	44.9 [34.1-56.3]	4.8 [1-19.8]	100.0	103.0; 2.26; p<0.05	337
Eastern	64 [50-76]	32 [20.8-45.8]	3.9 [1.8-8.5]	100.0		363
Nyanza & Western	33.4 [25-43]	55.3 [46.5-63.7]	11.3 [6.1-20]	100.0		505

Table 4:2 Description of patients treated for PAC in healthcare facilities according to type of contraceptive method received, by facility characteristics, 2012

	% No method [C.I]	% Non-effective [C.I]	% Effective [C.I]	% Total	Chi^2; Design-based F*; p value	Number of women
Rift valley	50.6 [39.7-61.4]	42.9 [33.3-53]	6.6 [3.6-11.6]	100.0		524
Ownership						
Public	42 [35.6-48.7]	50.6 [44.7-56.6]	7.3 [4.7-11.2]	100.0		1,683
Private for Profit	51.6 [38.5-64.4]	35.2 [26.6-45]	13.2 [7-23.5]	100.0	51.0; 1.96; p>0.1	462
Private not for profit	49.8 [37.3-62.2]	40 [28.1-53.2]	10.2 [5.9-17.2]	100.0		423
Facility with FP or Gynae unit						
No Facilities	54.5 [39.6-68.7]	36.0 [26.8-46.4]	9.4 [2.8-27.4]	100.0	15.2; 0.92; p>0.1	219
Facilities	43.9 [38.3-49.7]	47.1 [41.9-52.3]	9 [6.6-12.1]	100.0		2,349
PAC-trained staff always available						
Not always available	44.8 [37.2-52.6]	47.1 [40.1-54.3]	8.1 [4.8-13.3]	100.0	3.6; 0.27; p>0.1	907
Always available	45.8 [38.4-53.4]	44.3 [38-50.8]	9.9 [6.8-14.3]	100.0		1,661
Average No. of staff trained to offer PAC[¥]	4.42 [3.13-5.72]	4.47 [3.14-5.79]	3.06 [1.84-4.28]	4.32 [3.37-5.27]		2,568
No. of women	**1,144**	**1,191**	**233**	**2,568**		**2,568**

[¥] Pr(|T| > |t|) based on student t-test for means. * Rao and Scott second-order corrected Pearson statistic

Model 0 was an unstructured bivariate Bayesian mixed-effects ordered logit model of each explanatory variable used in this analysis. Models 1 and 2 were both unstructured comparison full Bayesian mixed-effects ordered logit models in Stata and WinBugs respectively. Model 3 was a structured Bayesian mixed-effects ordered logit model with county random non-spatial effects while the final model 4 was a convolution Bayesian mixed-effects ordered logit model with county spatial and non-spatial random effects. To ensure that linearity assumptions were met within the models, the *lrm {rms}* function on the *rms* package in R and the *boxtid* function in Stata were utilized. The *lrm* function fits binary and proportional odds ordinal logistic regression models using maximum likelihood estimation or penalized maximum likelihood estimation. On our case, we fitted the association between the log odds and the predicted values. As shown in the Figure 4:3, the continuous predictors met the linearity assumption. For the continuous variables, this was confirmed with the Box-Tidwell model (*boxtid* test in Stata), which transforms a predictor using power transformations and finds the best power for model fit based on maximal likelihood estimate. More precisely, a predictor x is transformed into $B_1 + B_2 xp$ and the best p is found using the maximal likelihood estimation. Besides estimating the power transformation, boxtid also estimates exponential transformations, which can be viewed as power functions on the exponential scale.

Paper 2 discussed the results from the final convolution model which was selected based having the lowest DIC statistic (3793) compared to both the unstructured (3845) and structured (3798) models. Therefore, twas selected as the best fit model. The structured and unstructured model goodness of fit and plots of estimates of uncertainty around the spatial estimated parameters are displayed in Figure 4:1 and Figure 4:2 respectively.

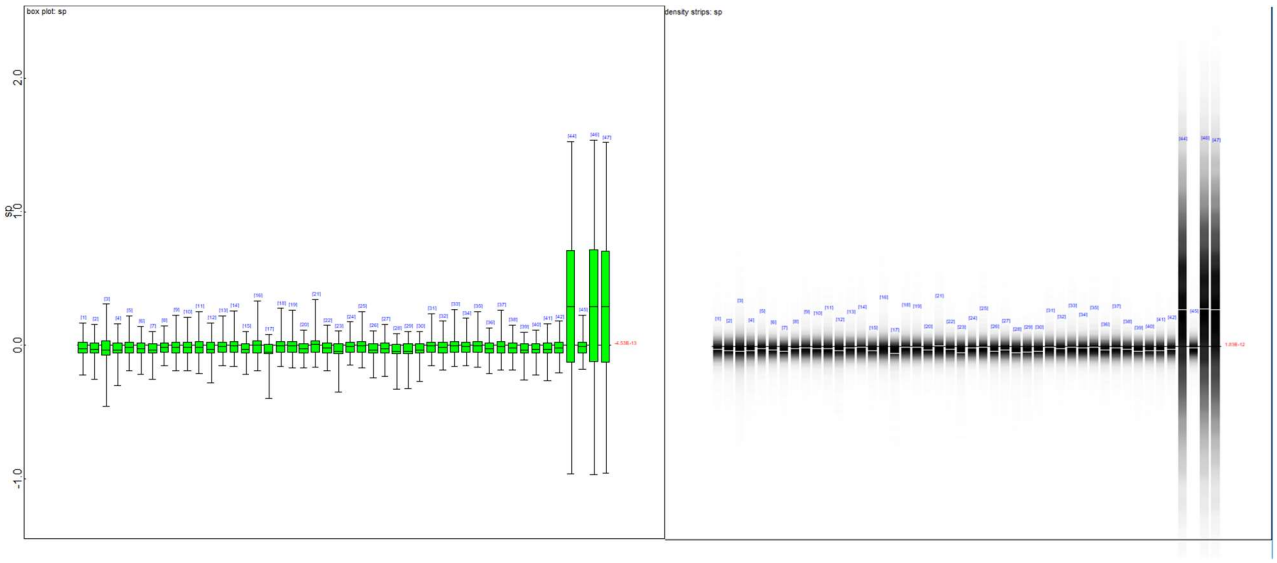


Figure 4:1 Uncertainty around the structured spatial estimates

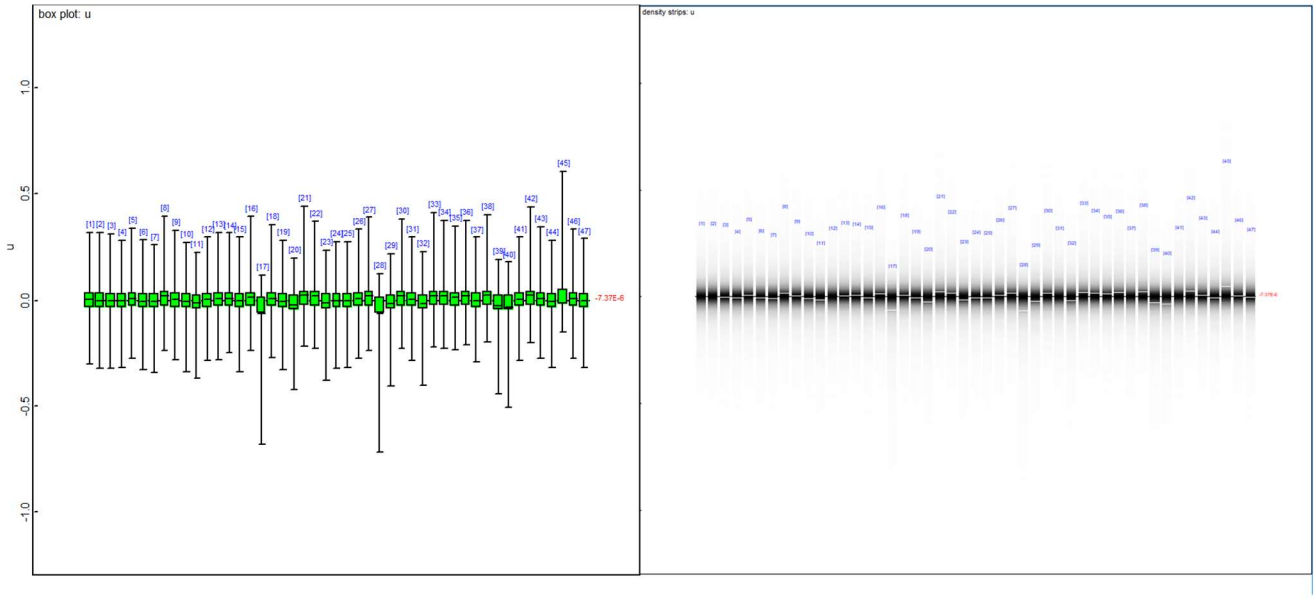


Figure 4:2 Uncertainty around the structured spatial estimates

Using the convolution model, County 44, 46 and 47 had a higher uncertainty as the boxplot shows. In addition, we tested the non-linearity assumptions on all continuous explanatory variables in the convolution model, using the *lrm {rms}* function on the *rms* package in R software.

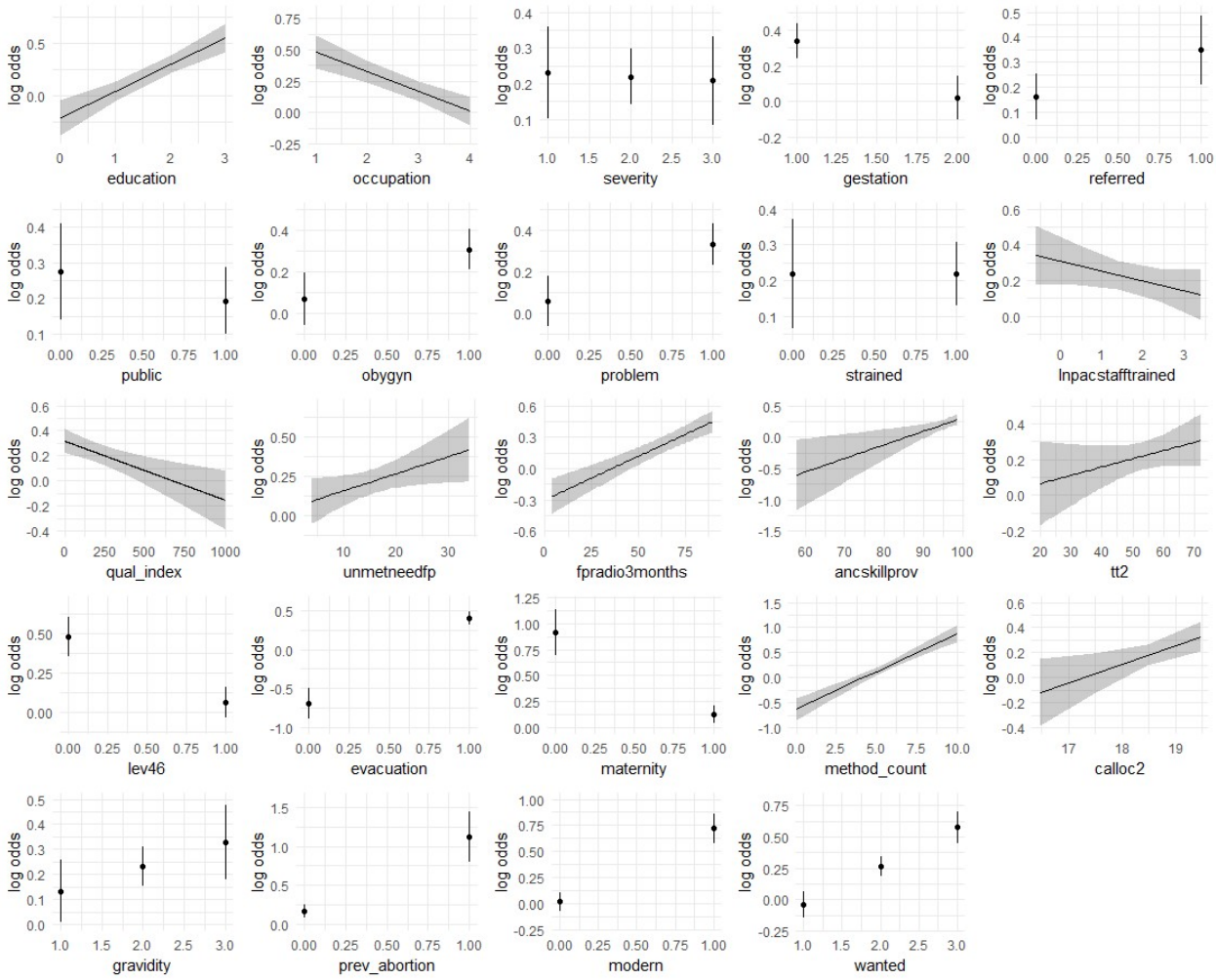


Figure 4:3 Linearity assumption check using lrm function in R

Figure 4:4 shows the density plots for the beta coeficients from fitting the convolution model, while Figure 4:5 shows the density plots for the spatial estimates.

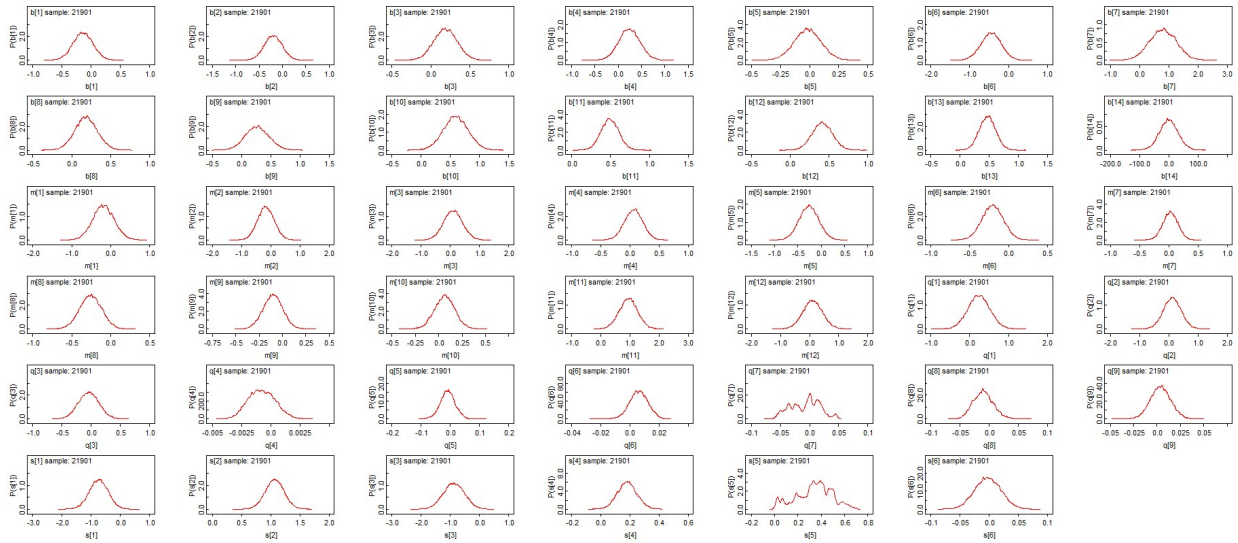


Figure 4:4 Density plots for beta coefficients

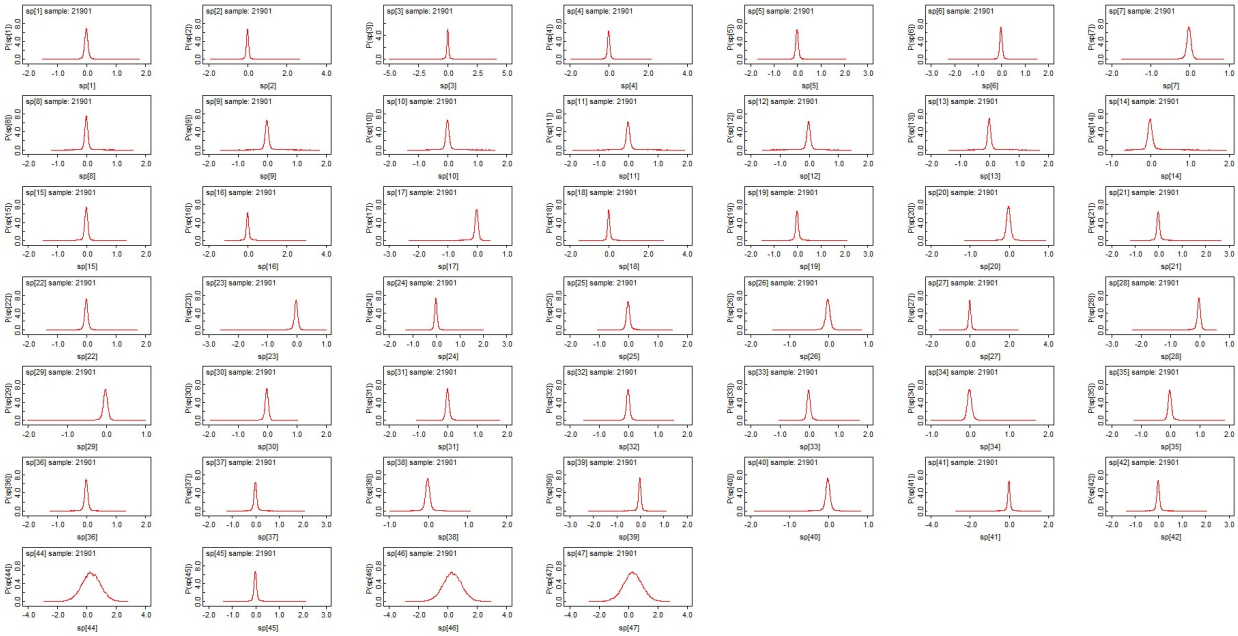


Figure 4:5 Density plots for spatial coefficients

According to this final model, patients with a previous history of an induced abortion had 81.2 percent higher odds of adopting an effective contraceptive method compared with those who had

previously used a modern method of family planning, who were 63.7 percent more likely to adopt an effective method. Similarly, patients who intended to delay or stop future pregnancies were also 51.9 percent and 60.5 percent more likely to adopt an effective contraceptive method after treatment for an abortion complication. According to the findings in paper 4, there was evidence of low knowledge level on resumption of contraception following an abortion among PAC patients and this, when not well managed through proper counselling led to uninformed post-abortion contraception decisions by the PAC patients: "I am not sure on which family planning method to use and when. I don't know if it is after this medication that I am going through or what" (Patient, level 5, good quality).

Patients treated in level 4-6 facilities had 55.0 percent lower odds of adopting an effective contraceptive method compared to patients treated in lower-level facilities. However, patients treated in public facilities were almost thrice as likely to adopt an effective method compared to patients treated in private facilities. While service providers cited loss to follow-up of patients between PAC and FP clinics, the unavailability of contraceptive methods or commodities within the facilities was another concern to many patients interviewed in public facilities.

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
Patient characteristics						
Age category: Ref (10-19yrs)	20-29yrs	0.884(0.086)[0.707-1.098]	**0.907(0.010)[0.886-0.932]**	0.868(0.172) [0.622 -1.214]	0.868 (0.172) [0.622 -1.214]	0.868(0.172) [0.622 -1.214]
	30 +yrs	1.242(0.114)[1.013-1.536]	**0.849(0.024)[0.800-0.908]**	0.822(0.188) [0.571 -1.186]	0.822 (0.188) [0.571 -1.186]	0.822(0.188) [0.571 -1.186]
Marital status: Ref (Never married)	Married/Living together	1.042(0.106)[0.835-1.299]	0.984(0.032)[0.924-1.066]	1.192(0.154) [0.881 -1.599]	1.192 (0.154) [0.881 -1.599]	1.192(0.154) [0.881 -1.599]
	Divorced	1.476(0.277)[0.939-2.197]	**1.225(0.054)[1.133-1.371]**	1.249(0.226) [0.796 -1.942]	1.249 (0.226) [0.796 -1.942]	1.249(0.226) [0.796 -1.942]
Education: Ref (No education)	Primary	0.955(0.094)[0.773-1.175]	0.831(0.086)[0.687-1.053]	0.881(0.274) [0.519 -1.506]	0.881 (0.274) [0.519 -1.506]	0.881(0.274) [0.519 -1.506]
	Secondary	0.916(0.086)[0.732-1.114]	0.939(0.086)[0.795-1.186]	0.897(0.289) [0.508 -1.558]	0.897 (0.289) [0.508 -1.558]	0.897(0.289) [0.508 -1.558]
	Post-secondary	1.308(0.166)[0.981-1.743]	1.158(0.089)[0.983-1.385]	1.155(0.324) [0.607 -2.135]	1.155 (0.324) [0.607 -2.135]	1.155(0.324) [0.607 -2.135]

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
Occupation: Ref (Farmer/unskilled)	Skilled/clerical	1.388(0.142)[1.105-1.733]	**0.915(0.021)[0.87-0.960]**	1.072(0.155) [0.791 -1.448]	1.072 (0.155) [0.791 -1.448]	1.072(0.155) [0.791 -1.448]
	Student	0.814(0.106)[0.602-1.066]	**0.718(0.038)[0.633-0.807]**	0.775(0.209) [0.513 -1.168]	0.775 (0.209) [0.513 -1.168]	0.775(0.209) [0.513 -1.168]
	Unemployed/housewife	0.779(0.081)[0.619-0.985]	**0.793(0.034)[0.714-0.857]**	0.823(0.134) [0.633 -1.064]	0.823 (0.134) [0.633 -1.064]	0.823(0.134) [0.633 -1.064]
Religion: Ref (Roman Catholic)	Other Christian	1.020(0.105)[0.807-1.278]	0.936(0.034)[0.870-1.024]	0.985(0.115) [0.786 -1.239]	0.985 (0.115) [0.786 -1.239]	0.985(0.115) [0.786 -1.239]
	Muslim	0.563(0.127)[0.342-0.917]	**0.599(0.02)[0.559-0.650]**	0.609(0.256) [0.369 -1.014]	0.609 (0.256) [0.369 -1.014]	0.609(0.256) [0.369 -1.014]
	Other religion	2.464(1.113)[0.842-5.718]	**1.745(0.066)[1.612-1.896]**	2.17(0.448) [0.91 -5.165]	2.17 (0.448) [0.91 -5.165]	2.17(0.448) [0.91 -5.165]
Severity level$^{\beta}$:: Ref (Mild)	Moderate	1.125(0.112)[0.896-1.408]	**1.268(0.048)[1.175-1.373]**	1.029(0.127) [0.801 -1.321]	1.029 (0.127) [0.801 -1.321]	1.029(0.127) [0.801 -1.321]
	Severe	0.840(0.091)[0.654-1.044]	0.975(0.073)[0.814-1.139]	0.777(0.14) [0.587 -1.023]	0.777 (0.14) [0.587 -1.023]	0.777(0.14) [0.587 -1.023]

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
Gestational age: Ref (First trimester)	Second trimester	0.827(0.083)[0.664-1.050]	**0.861(0.049)[0.759-0.977]**	0.904(0.104) [0.737 -1.11]	0.904 (0.104) [0.737 -1.11]	0.904(0.104) [0.737 -1.11]
Gravidity :Ref (Paragravida) §	Multigravida	1.224(0.109)[1.017-1.501]	**1.213(0.076)[1.049-1.395]**	1.202(0.142) [0.906 -1.587]	1.202 (0.142) [0.906 -1.587]	1.202(0.142) [0.906 -1.587]
	Grand multigravida	1.245(0.151)[0.940-1.656]	**1.266(0.057)[1.143-1.369]**	1.311(0.199) [0.884 -1.94]	1.311 (0.199) [0.884 -1.94]	1.311(0.199) [0.884 -1.94]
Previous abortions: Ref (None)	One or more	2.154(0.420)[1.329-3.212]	**1.950(0.100)[1.712-2.161]**	**1.818(0.209) [1.206 -2.748]**	1.818 (0.209) [1.206 -2.748]	**1.818(0.209) [1.206 -2.748]**
Contraception :Ref (Not using modern)	Using modern	1.898(0.202)[1.503-2.386]	**1.756(0.067)[1.613-1.912]**	**1.637(0.113) [1.312 -2.042]**	1.637 (0.113) [1.312 -2.042]	**1.637(0.113) [1.312 -2.042]**
Pregnancy wantedness: Ref (Wanted then)	Wanted later	1.343(0.143)[1.054-1.700]	**1.358(0.050)[1.252-1.478]**	**1.519(0.131) [1.169 -1.961]**	1.519 (0.131) [1.169 -1.961]	**1.519(0.131) [1.169 -1.961]**

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
Referred: Ref (Not referred)	Did not want	1.285(0.131)[1.004-1.608]	**1.314(0.025)[1.259-1.371]**	**1.605(0.142) [1.22 -2.124]**	1.605 (0.142) [1.22 -2.124]	**1.605(0.142) [1.22 -2.124]**
	Referred	1.130(0.114)[0.889-1.406]	1.062(0.033)[0.99-1.136]	1.064(0.107) [0.864 -1.314]	1.064 (0.107) [0.864 -1.314]	1.064(0.107) [0.864 -1.314]
Facility characteristics						
	Level of facility 4-5 (Ref: Level 2-3)	0.572(0.150)[0.323-0.967]	**0.430(0.023)[0.375-0.466]**	**0.45(0.317) [0.246 -0.847]**	0.45 (0.317) [0.246 -0.847]	**0.45(0.317) [0.246 -0.847]**
	Public (Ref: Private)	1.231(0.359)[0.628-2.188]	**2.784(0.148)[2.428-3.078]**	**2.604(0.295) [1.456 -4.591]**	2.604 (0.295) [1.456 -4.591]	**2.604(0.295) [1.456 -4.591]**
	Facility has evacuation room	2.911(0.440)[2.051-4.111]	**3.340(0.106)[3.106-3.582]**	**2.921(0.161) [2.144 -4.035]**	2.921 (0.161) [2.144 -4.035]	**2.921(0.161) [2.144 -4.035]**
	Ob-gyn (Ref: None)	1.044(0.306)[0.498-1.918]	**1.672(0.039)[1.581-1.75]**	1.125(0.32) [0.608 -2.136]	1.125 (0.32) [0.608 -2.136]	1.125(0.32) [0.608 -2.136]
	Facility has maternity services	0.384(0.159)[0.159-0.783]	**0.613(0.019)[0.577-0.656]**	**0.423(0.364) [0.205 -0.869]**	0.423 (0.364) [0.205 -0.869]	**0.423(0.364) [0.205 -0.869]**

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
	Burden of PAC to facility (Ref: Not burden)	1.588(0.377)[0.983-2.629]	**1.362(0.095)[1.182-1.595]**	1.456(0.274) [0.839 -2.522]	1.456 (0.274) [0.839 -2.522]	1.456(0.274) [0.839 -2.522]
	No. of PAC trained providers	-	-	1.007(0.173) [0.715 -1.433]	1.007 (0.173) [0.715 -1.433]	1.007(0.173) [0.715 -1.433]
	Trained PAC SP always available (Ref: Not)	1.375(0.462)[0.687-2.666]	1.052(0.053)[0.940-1.164]	1.039(0.307) [0.571 -1.912]	1.039 (0.307) [0.571 -1.912]	1.039(0.307) [0.571 -1.912]
	Number of FP methods available	1.247(0.065)[1.098-1.379]	**1.130(0.020)[1.086-1.175]**	**1.191(0.071) [1.041 -1.378]**	1.191 (0.071) [1.041 -1.378]	**1.191(0.071) [1.041 -1.378]**
	Quality of PAC at facility	1.000(0.001)[0.998-1.001]	0.998(0.001)[0.996-1.000]	0.999(0.001) [0.997 -1.001]	0.999 (0.001) [0.997 -1.001]	0.999(0.001) [0.997 -1.001]
County characteristics						
	Level of unmet need for FP	1.005(0.023)[0.970-1.063]	1.004(0.018)[0.965-1.046]	1.007(0.026) [0.959 -1.06]	1.007 (0.026) [0.959 -1.06]	1.007(0.026) [0.959 -1.06]
	% of exposure to FP on radio	1.006(0.005)[0.996-1.016]	1.005(0.004)[0.996-1.014]	1.007(0.005) [0.996 -1.017]	1.007 (0.005) [0.996 -1.017]	1.007(0.005) [0.996 -1.017]

Table 4:3 Mixed-effects odds of PAC patients adopting effective contraceptive methods in healthcare facilities in Kenya

		STATA MODEL 0 Bivariate women, facility and county level characteristics	**STATA MODEL 1 Unstructured women, facility and county-level characteristics**	**BUGS MODEL 2: Unstructured Ordered Logit Model**	**BUGS MODEL 3: Structured Ordered Logit Model**	**BUGS MODEL 4: Convolution model**
		OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]	OR (SD) [2.5% - 97.5% Cr. I]
	% of ANC attended by skilled SP	1.027(0.009)[1.010-1.047]	0.981(0.014)[0.950-1.011]	**0.962(0.012) [0.943 -0.993]**	0.962 (0.012) [0.943 -0.993]	**0.962(0.012) [0.943 -0.993]**
	% tetanus vaccine	1.016(0.009)[1.001-1.039]	1.007(0.011)[0.982-1.032]	1.015(0.018) [0.984 -1.048]	1.015 (0.018) [0.984 -1.048]	1.015(0.018) [0.984 -1.048]
	Natural log of county budget allocation to health	1.136(0.041)[1.050-1.218]	1.050(0.057)[0.958-1.190]	1.114(0.077) [0.939 -1.237]	1.114 (0.077) [0.939 -1.237]	1.114(0.077) [0.939 -1.237]
	% reporting lack of food in last 7 days	1.000(0.008)[0.985-1.020]	0.995(0.008)[0.977-1.013]	0.995(0.009) [0.978 -1.013]	0.995 (0.009) [0.978 -1.013]	0.995(0.009) [0.978 -1.013]
Model DIC				3845 (193.6)	3798 (187.6)	3793 (190.8)

Most facilities did not maintain stocks of equipment requisite fo administration of long-acting and permanent methods. In most facilities, patients reported receiving only short-acting methods, such as pills and condoms. To some, traveling back to the facilities for either injectable contraceptives or for pills was undesirable, and hence, they left the facility without a family planning method: "After I had been treated, she sat me down, but I never wanted it. I saw that it would be very far for me to come from Kibera up to here because of family planning" (Patient, level 4, good quality). Similarly, in facilities that had a separate evacuation procedure room used for PAC services, and those that also offered maternity services, patients were three times as likely and 57.7 percent less likely to adopt an effective method respectively.

The availability of a wide variety of contraceptive methods at facilities increased the chance of a patient adopting an effective method by 19.1 percent. Most county-level covariates did not show any significant association with adoption of effective contraceptive methods. However, patients receiving PAC services in counties with higher rates of provider-attended ANC services were interestingly less likely to adopt an effective contraceptive method. Notably, counties in the Lake Victoria basin showed significantly higher rates of adoption of effective contraceptive methods compared to other counties in the country, as shown in Figure 4:6 (A) and (B).

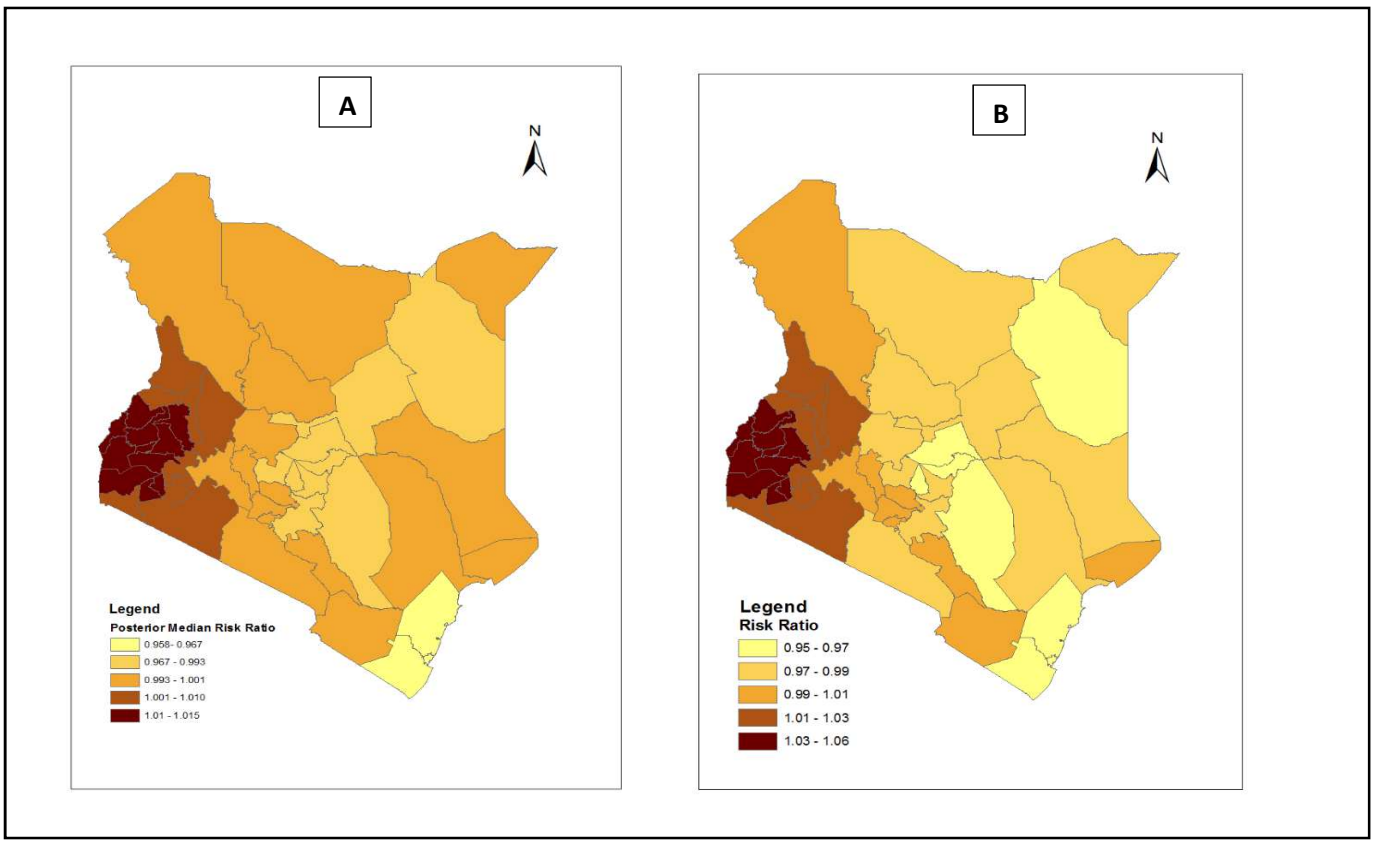


Figure 4:6 Structured and unstructured (Convolution) spatial effect on odds of adoption of an effective contraceptive method

5 DISCUSSION

The results discussed above present a complete case of the nature and form of PAC service delivery, in healthcare facilities in Kenya. In this study, we established that quality of PAC is health facilities varies according to the level of health facility. Larger hospitals were less likely to provide quality PAC compared to lower level facilities, although the relationship was statistically insignificant. Public facilities lagged behind their private counterparts in the provision of quality of care. However, certain facility characteristics were associated with quality PAC, among them, having a separate evacuation rooms, having or providing specialized Ob-gyn services, having a wider range of contraceptive commodities as well as having a facility offering maternity services. Similarly, on adoption of an effective contraceptive method by PAC patients, this study unveils certain facility and patient characteristics that placed these patients at a better stead of adopting an effective contraceptive method following PAC. At the facility level, similar to general quality of PAC, the odds of a PAC patient adopting an effective contraceptive method is highly associated with the facility level: patients treated for PAC in larger hospitals were less likely to adopt an effective contraceptive method. Having a separate PAC procedure room and having a variety of contraceptive commodities and services increased the odds of adoption. However, unlike quality of care, PAC patients in facilities that also had maternity services had lower odds of adopting an effective contraceptive method. At the patient level, the odds of adopting an effective contraceptive method was associated with patient's religion, having a previous abortion, previous contraceptive use, and patient's fertility intentions. From the qualitative exploration of patients' and provider perceptions of quality PAC, patients perceived quality PAC as demonstrated by the service provider's confidence and the level of privacy during service delivery. For service providers, quality is mainly demonstrated through the availability equipment and tools, and the readiness of providers to offer PAC services. While service providers perceive quality as a matter of saving

lives and reducing the need for referral through empowering the facility of first contact to provide quality PAC services, for patients, quality PAC is depicted by strong interpersonal skills among service providers to provide a supportive environment to the patient. These mainly include showing care to the patients, empathising with patients, and providing personalized services.

Finally, this study explored the policy and legal environment in Kenya and its effect on provision of quality PAC. Lack of trust between patients and service providers as well as lack of clear guidelines for the provision of safe legal abortion in health facilities dominated these discussions. In addition to trust, service providers reported inadequacy of training on PAC provision and general lack of proper infection control mechanisms in their facilities as a factor leading to delayed care, the need for referral, and exposure of patients to nosocomial infections.

In interpreting these findings, there is a need to be cognizant of certain limitations, among them its reliance on data from health facilities. Access to healthcare in Kenya is not universal, and specifically, there are problems in this regard in rural areas [1,19,20,181]. Given this, there are possibilities of selection bias, and patient-level findings may not necessarily be a true reflection of the community from where patients are drawn. However, PAC services in Kenya are mainly accessed at healthcare facilities and the number of women accessing services from elsewhere would probably be negligible. In addition, although some data were observational, some of the questions asked in the different surveys were based on either patient or provider recall and this could have resulted in recall biases. Furthermore, abortion is illegal in Kenya and any PAC survey is likely to result in under-reporting of induced abortion and over-reporting of spontaneous abortions. In this study, effort was made to ensure the provider had the best chance to identify each patient as having had either a spontaneous or intentional miscarriage. In addition, the PDS data were collected by service providers as they served PAC patients; given the illegality of abortions,

there could be pockets of incorrect capturing of information. Because of these reporting limitations, exit interviews were conducted with discharged PAC clients, providing a unique complementary data source on their perceptions of quality of care in these healthcare facilities. Finally, the study combined data from the 2012 national survey with a 2016-2017 subsample of facilities. The four-year time lapse may not be negligible, and policy shifts during this period in Kenya may have significantly improved the level of quality of care in healthcare facilities or affected its determinants.

This section further discusses these results, reflecting on existing evidence on quality of PAC in Kenya, and identifying key programmatic and policy implications of the above finding. There is a dearth of evidence on quality of PAC in Kenya, and not much emphasis has been placed in recent past on assessing these services against existing global quality of care frameworks for provision of post-abortion care.

These results present interesting relationships among healthcare facilities according to different measures of quality, including whether quality is viewed as a single item measure or a collection of measures. The common determinants of quality of PAC give an indication of the need for service provision that responds to the needs of patients, and is centred on the patient, rather than centred on the provider or the facility, without diminishing the role that the provider and the facilities play in influencing quality.

5.1 Abortion complication treatment

In July 2002, the Post-Abortion Care Consortium community taskforce recommended the treatment and management of abortion complications as one of the pillars of quality post-abortion care. As presented in the above results, treatment of abortion complications is often impeded by

several structural, institutional and organisational factors, as well as logistic and human capital challenges. These include the relationship/interaction between service providers and patients, inadequacy and unavailability of equipment, inadequate provider skills, and lack of clear policy guidelines for abortion care.

Among the key measures of post-abortion care quality at the health facility level is the use of appropriate technology in managing PAC patients. Use of inappropriate technology in the management of PAC patients was high, as reported by healthcare providers and patients, especially in higher-level facilities; this has been shown to be a risk factor for patients treated in these large hospitals [214]. These findings corroborate those of an earlier study in Kenya, which found that use of D & C, an outdated post-abortion care management procedure, was common in Level 4,5 and 6 facilities, despite a visible concentration of trained service providers in these facilities [22]. While the quality of care may not depend on provider training alone, the availability of trained service providers for actual service delivery could be responsible for the quality shortfall [59]. This gap is also demonstrated in this study findings: in most cases, patients were left overnight in the care of less qualified service providers, who could only provide primary care such as pain management and administration of fluids to patients.

The availability of a procedure room specifically for PAC procedures increased the level of patient privacy and confidence with services. Both service providers and patients agree on the role played by this privacy in building trust between patients and providers for more effective counselling and treatment, especially one that guaranteed adoption of effective contraceptive methods for prevention of repeat abortion, as demonstrated in two Mexican studies by Langer et al. [218,219]. In Kenya, a more recent study also demonstrated how improved privacy increases contraceptive uptake [196].

In addition to providers and equipment in quality PAC services, service integration increases quality of PAC: it ensures that all PAC-related services were available on the same location of evacuation, with clear linkages between facilities where full integration was impracticable.

5.2 Post-abortion contraception and repeat abortion

Supporting the above need for service integration, a Myanmar study [220] demonstrated the need for increasing and sustaining contraceptive commodities for PAC patients in order to improve quality of PAC. Such an improvement, coupled with strong provider training, increased the patient's choice of methods and chance for contraceptive adoption. As demonstrated when assessing quality of PAC, higher-level facilities were seen as a deterrent to post-abortion contraception, with more patients having been reached with effective contraception in smaller facilities compared to large hospitals. Lack of proper service integration and loss to follow-up for patients after PAC treatment were possible contributions to the low rates of contraceptive uptake. This was especially so in cases where facilities were less likely to offer PAC and contraception on the same location, requiring patients to move between departments to access contraception following a PAC treatment. A similar study demonstrated these missed opportunities, which were higher in stand-alone facilities and in facilities which lacked clear referral mechanisms for post-abortion contraception, especially referral for effective contraceptive methods [221]. The autonomy of patients in decision making for contraception was also shown to increase the uptake of more effective methods of contraception. This could be achieved through the combined efforts to improve the capacity of service providers to offer quality PAC, while ensuring the availability of commodities in the facilities at all times.

Regional variations in the adoption of effective contraception were also demonstrated using geo-spatial analyses, to demonstrate how different and may be unrelated county-level interventions may have impacted the adoption of more effective family planning methods. Regions in the western parts of Kenya depicted higher rates of effective contraceptive adoption compared to other regions. Interestingly, these regions have higher rates of HIV prevalence and the patterns identified in this study relating to contraception could reflect some of the positive unintended outcomes of HIV interventions, which have improved levels of knowledge and triggered positive attitudes towards contraception. This influence on contraceptive behaviour was also demonstrated in a study in the western Kenya region [222]. There is in addition evidence that this region has seen a specific concentration of family planning interventions, which target increasingly the preference and adoption of long-acting contraceptive methods [223,224]. These interventions were mainly driven by the need to reverse the stall in fertility decline which was witnessed in this region between 1998 and 2009 [181]. Furthermore, recent national estimates have corroborated these findings, demonstrating the increased uptake of long-acting reversible contraceptive methods in this region compared to other regions, especially the adoption of implants as a preferred form of pregnancy prevention in the Western Kenya region [1].

5.3 Post-abortion care seeking behaviour

The manner in which patients seek PAC services is dictated by their previous exposure to these services and knowledge of the existence and quality of services available in healthcare facilities. However, the exposure to care which was reported in some of the facilities was not supportive of future service PAC service utilization. Patients were often referred to other facilities for certain services that were unavailable in their facilities of choice, either due to lack of equipment, unavailability of qualified service providers, or the prohibitive cost of services. In some cases,

patients were fully referred to other facilities, while in other cases, patients would be partially referred with the intent that they return to the referring facility for completion of treatment. A previous study also demonstrated the need for minimizing the delays in care, which was attributable to these long, and sometimes, unnecessary or avoidable referrals [6]. The size of the facility was not always the determinant of referral, as would be the case if only smaller facilities referred patients to larger facilities. However, there were instances of patient referral between two or more higher-level facilities, and between public and private facilities for certain procedures, especially when those specific procedures were restricted or unavailable in some facilities. Of concern was the common referral of patients to other facilities or other departments for family planning, as well as referrals to other facilities for obstetric or abdominal scans and medications. For family planning, long-acting and permanent methods were the most affected, with most of the patients referred for these methods. Paper 2 provides evidence on the need for availing contraceptive methods to PAC patients and how the variety of these methods increased the likelihood of patients adopting more effective family planning methods, similar to findings of a 2010 research conducted in the United States [221]. According to Thompson, higher contraceptive coverage increased patient use of family planning. However, other studies have also shown the need for improving the effectiveness of contraceptive methods to PAC patients for prevention of repeat abortions.

Integrating PAC and family planning is also seen as a way of reducing the loss to follow-up for patients, especially for patients treated in larger hospitals where PAC service and family planning are likely to be offered at different locations, with inefficient linkages between these departments to ensure completeness of PAC treatment [225].

The role of service providers was also emphasized in paper 3. The critical link that they provide in establishing trust and assurance of confidentiality to patients was discussed; this has also been shown elsewhere as an essential element of care which PAC patients seek in healthcare facilities [18].

Another service provider characteristic of interest in healthcare seeking is their confidence and professionalism, which patients consider when making a choice between facilities or even between seeking PAC service from healthcare facilities and whether to opt for self-medication or home remedies. Service providers who presented with confidence to patients often built trust by the patients over the services, and improved satisfaction and hence, adoption of family planning among PAC patients [226]. In addition to confidence of service providers, their attitudes towards abortion and abortion care led to various levels of discrimination in PAC service delivery. As presented in Paper 3, providers formed opinions about patients based on their own beliefs or perceptions, which often led to moralization of abortion among service providers. These providers perceived some patients as undeserving of care, and in the case of young women and adolescents, they often denied them contraceptive methods. Puri and colleagues [227] had similar findings in Nepal, where service providers believed that post-abortion contraception would only increase patients' sexual risks leading to further unintended pregnancies. These trends of stereotypic and moralistic opinions on patients continue to thrive in healthcare facilities despite evidence that comprehensive PAC, including post-abortion contraception, reduces the risks of repeat abortion [189,228].

The cost of PAC in healthcare facilities is still a deterrent to service access for women seeking post-abortion care. This high cost is not only in private facilities, but also in public facilities where services are presumed to be free. Indirect cost such as transport to the facilities is

compounded by additional costs associated with lack of certain services and referrals between facilities. Patients often faced unanticipated costs, especially when complications worsened in the process of seeking care. Even for patients who could still pay for the services, however, additional challenges such as mode of payment due to strict payment options for services either made services inaccessible or delayed access. Billings and colleagues [84] demonstrated the need for better financial inclusivity in PAC service delivery, to include health systems access and financial impact institutionalization. This can be achieved through improved internal processes, especially within public healthcare, to reduce delays in service delivery, while ensuring that availability of PAC services to many, and improving service uptake. According to Grimes and colleagues (2006), expansion of service access can be achieved through reduction of both direct and indirect costs of care, which are known to drain health systems while straining patients of their incomes by diversion of family incomes to healthcare. Adoption of low-technology PAC services that demand less skills and task-shifting from specialized care can lead to improved service availability by cost-reduction, though this must be complemented with more awareness and less community stigmatization of abortion, for timely care seeking [18].

5.4 Abortion care and policy in Kenya

Access to abortion care remains restricted in Kenya. Women faced with unwanted pregnancies often resort to unsafe terminations and only seek care in healthcare facilities when faced with complications from these procedures. While the entry of a wider range of abortifacients in the Kenyan pharmaceutical market may have reduced the use of crude methods of termination, a decline in the rate of abortion complications may not be guaranteed by the current availability and unregulated access to these medications [3]. However, proper guidelines and regulations can reap maximum benefits of these abortifacients, leading to a decrease in abortion complications though

improved efficiency, reduced side-effects and better acceptability. Although these benefits may not be fully realized in settings where abortion is still illegal, it can be argued that streamlining access to medical abortifacients is as good as legalizing abortion [229].

For quality PAC services, communication and building trust between the patient and service provider encourages openness and strict adherence to treatment procedures where these procedures are available. As presented in papers 2, 3 and 4 in this study, trust building, as established by the essential elements of PAC model [49], facilitates the provider with full history of the patient's condition and supports the use of appropriate technology while managing specific cases of post-abortion complication. With the prevailing abortion restrictions, and as indicated by participants in this study, patients withhold information on the timing of their abortion. It is also evident that most facilities lack proper diagnostic equipment, especially ultrasound and x-ray facilities that would otherwise provide more accurate information on gestation, even without full and accurate patient disclosure.

The consequences of abortion restrictions affect adolescents and young women disproportionately, though other unmarried women are also vulnerable [102]. Service providers develop personal techniques of handling incomplete disclosure, which can knowingly or otherwise lead to discrimination against certain patients based on their age or marital status. Recent studies have also shown that young women in Kenya are adversely affected by poor access and availability of safe abortion services, and are more likely to have an unsafe abortion. They are also more likely to suffer longer delays in seeking care and hence, present in health facilities with more severe complications. This form of discrimination within healthcare facilities may not be limited to PAC, but also to access to contraception, which exposes these young women to future unwanted pregnancies and further abortion [21,22,38].

In most facilities, post-abortion care services are offered within obstetric and gynaecological wards, although some of the PAC cases are managed in the outpatients care departments. The organization of healthcare services in health facilities, especially in public facilities, pose additional challenges, with some providers expressing their frustration with the unavailability of equipment, medication and essential consumables. Even when the necessary equipment is available, their readiness for use is often limited due to the large numbers of patients and limited equipment, or the longer processes of preparing this equipment, especially sterilization prior to reuse. Even with well-trained personnel, with such delayed availability of equipment, patients may miss certain procedures or the procedure may be delayed, leading to severe complications, even while patients are within healthcare facilities. In other cases, the decision to purchase equipment and to stock the facilities with commodities is vested in procurement officers who are less likely to comprehend or are not well informed on the role of timely intervention for PAC patients.

There are currently no clear guidelines for abortion care in Kenya [196]. The effect of such inadequacy in healthcare management is that providers lack confidence in their ability to offer PAC services and are fearful because of the lack of professional indemnity. Patients too, expressed that their choice of services and providers is largely informed by the providers' confidence. Service providers fear handling certain patients for lack of legal backing, and the fear of exposure to litigations. Such providers are always quick to refer patients, in order to reduce their risks, and this can adversely affect the timeliness of care.

The need for institutionalization and collaboration between healthcare services and international public health institutions has been seen as one way of ensuring access to quality post-abortion care [84]. As presented in this study, service providers acknowledge the role of such

collaborative initiatives on service quality, by facilitation of knowledge sharing and improving the community's awareness of the risks of unsafe abortion [218]. A similar study in Argentina, seeking to enquire on patient handling by service providers, also detailed how training providers on specific areas of PAC patient management caused them to replace denial with self-assessment, which ultimately improved the quality of services they offered [77].

6 CONCLUSION

Post-abortion care is a critical component of emergency obstetric care, for women suffering from complications from unsafe abortion. Without emergency care, these complication can lead to death or long-term sequelae including infertility. The current post-abortion care services as offered in healthcare facilities in Kenya are deficient of quality, and there is need to refocus these services to better serve women with complications from unsafe abortion for improved service uptake. Patient-centred care necessitates that these services should be repackaged in order to meet the specific needs of patients, while adhering to guidelines as prescribed in the post-abortion care framework. Treatment of complications requires the transformation of patient care in order to make it more caring and acceptable to the patients, by focusing care on the physical, emotional and psychological needs of patients. It also requires the adoption of treatment technologies that are more responsive to the patient's health and emotional concerns, including use of appropriate technology while managing the complications. Patients are often exposed to excessive interventions, or overuse of available technology, often due to inappropriate provider training. This has been demonstrated to cause service dissatisfaction, discourage future service utilization, and lead to a significant increase in the cost of care.

Failure to establish trust between patients and providers makes it difficult for patients to provide full disclosure of the condition and can lead to delayed healthcare interventions. Full disclosure is vital in ensuring that service providers' choice of treatment intervention is appropriate and acceptable to the patient, while ensuring satisfaction with services and optimal treatment outcomes for the patients.

Equipping service providers with the requisite skills for better management of complications will further ensure that these services are not only of quality, but that the treatment

outcome is also desirable for the service provider and acceptable to the patient. The post-abortion care framework further envisages that such a level of intervention will also require better engagement between service provision and the community to increase the acceptability of post-abortion care to the community, and reduce community-level discrimination of women with complications from unsafe abortions. Abortion is illegal in Kenya, and any such interventions should be seen as a commitment to the community that, irrespective of the form of pregnancy termination, and whether induced or spontaneous, women with abortion complications are able to access emergency treatment. Kenya experiences one of the highest rates of abortion-related mortality in the world [36]. Such a high abortion-related mortality calls for urgent attention by the healthcare system to provide services that respond to community needs, while addressing the woman's specific needs for care in a manner that assures her future service utilization and her continued health and wellbeing. Collaborations with the community will also create better awareness of the risks of unsafe abortion, and reduce the delays in making decisions to seek timely care.

The need for a streamlined and coordinated referral system is evident, with many patients referred between facilities in a manner that delays care. Establishing effective referral systems will assure timely care, while equipping lower-level facilities with appropriate equipment will reduce the need for referrals for services and drastically cut down the duration of care within the healthcare facilities. Lower-level facilities should therefore be equipped with MVA kits and service providers should be trained on the use of these kits. Where necessary, streamlining referrals between facilities should be targeted and made specific, to reduce the occurrence of multiple referrals. There were instances of patients being referred to more than three facilities, a situation that would delay the provision of appropriate services significantly. This could be avoided by ensuring proper

linkages and communication between facilities. Task-shifting from more specialized and scarce service providers can equally reduce the need for referral and the delays in providing care, especially when the initial decision to seek care is timely, and the form of pregnancy termination is not so crude as to cause injury to other body organs, which ultimately requires surgical interventions.

Equipping these facilities with requisite procedure rooms facilitates better patient-provider interaction and should be a consideration geared towards improving the patient experience and supporting better communication between patients and providers, for better treatment outcomes.

There was evidence of the need for specialized counsellors for PAC patients, even though quality improvement can still be achieved by spreading service availability throughout the operational duration of the facilities to reduce backlogs throughout the day. Such service delivery expansion should be coupled with continued equipping of PAC service providers with strong counselling skills that guarantee quality time between a patient and the service provider, by building sufficient trust, providing the woman with support, and assisting her in understanding and deciding on the appropriate surgical procedures. More personalized engagement of patients during care will also play a crucial role in ensuring patient-centred care.

The need for post-abortion contraceptive options was evident in all quality of PAC measures presented in this study. Often, patients have diverse experiences with contraception and hence the need for service providers to understand this experience and to engage the patient better in contraception choice. This understanding and engagement should be coupled with proper counselling, in order to improve the patient's ultimate decision-making capability, while encouraging better compliance. In addition, such interaction should focus on the adoption of more effective contraceptive options such as long-acting and permanent contraceptive methods to reduce

the risk of repeat abortion. However, with the evidence of failed contraception among these patients, there is a need for expanding the reproductive options for women. Such options will include the continued availability of quality post-abortion care, and within the full extent of the law, providing safe abortion care services. Furthermore, the legal environment, as discussed at length in this study, shows clear gaps in guidelines for the operationalization of existing abortion laws and the constitution, both of which make abortion illegal. Assuring abortion patients of universal access to care without appropriate guidelines leaves both patients and service providers in a state of confusion. While such guidelines assure providers and patients of quality of care, they also sustain the confidence of service providers, a factor of care that patients acknowledge in choosing care between facilities or opting to self-medicate.

There is additional evidence on the need for better service integration within facilities, to reduce missed opportunities by providing post-abortion contraception within the same location of PAC, or improving patient follow-up to ensure that all PAC patients receive effective contraception. Involvement of PAC patient's partners in post-abortion contraception should be incorporated in any service improvement endeavour, while ensuring that their engagement serves to improve contraceptive adoption and adherence. Such an intervention should focus on increasing and improving their partners' acceptability of and support for more reliable contraceptive option, in order to reduce the risks of future unwanted pregnancies. Similarly, improving community acceptance of contraception will play an essential role in linking all PAC patients to contraception.

In terms of evidence building, there is a need for further inquiry to better understand the successes in Western Kenya in its adoption of long-acting contraceptive methods and the possibility of adopting similar intervention in other parts of the country, which revealed low adoption of such methods and high rates of induced abortion.

There is also an urgent need for addressing the cost of care, in order to achieve comprehensive quality PAC. While cost of care deters PAC patients from accessing services, additional costs, such as indirect costs necessitated by delayed care within and between healthcare facilities, coupled with other bottlenecks such as facility policies that restrict payments for services, must be addressed if quality PAC is envisaged. Expanding the payment options available may not be seen as central to addressing maternal mortality, but access to care by patients was often delayed or entirely missed, whenever women were unable to pay for services, not for lack of money but due to a facility's bureaucratic procedures on modes of payments. Such simple interventions can greatly expand the service accessibility within both public and private facilities. Expanding access to healthcare insurance, including the national hospital insurance, can momentously support service improvement. Such an intervention would be necessary, since services were often delayed until patients were able to make payments for their services. In private health facilities, such patients were simply referred to public facilities for care.

Studies have also demonstrated the benefits of the expanded availability of abortifacients in the reduction of the number of maternal near-miss cases from induced unsafe abortion. However, this benefit can be better harnessed by improved regulation of the availability and use of these medication products. Such a regulation should aim at minimizing the risks which are attributed to their misuse, when used outside healthcare facilities and without proper prescription.

While abortion remains illegal in Kenya, it is evident that there is need for clear and comprehensive service guidelines in the provision of legal safe abortion. These guidelines will, in addition to building trust and confidence between service providers and patients, pave the way for quality improvement through provider training and improved facility preparedness for care delivery. Improved PAC services can only be guaranteed within an environment of clarity of law

and establishment of service standards that can be assessed for improvement. This can only be assured after all legal and policy encumbrances in all aspects of abortion care have been addressed.

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8 APPENDICES

Appendix 8.1: Plagiarism declaration

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

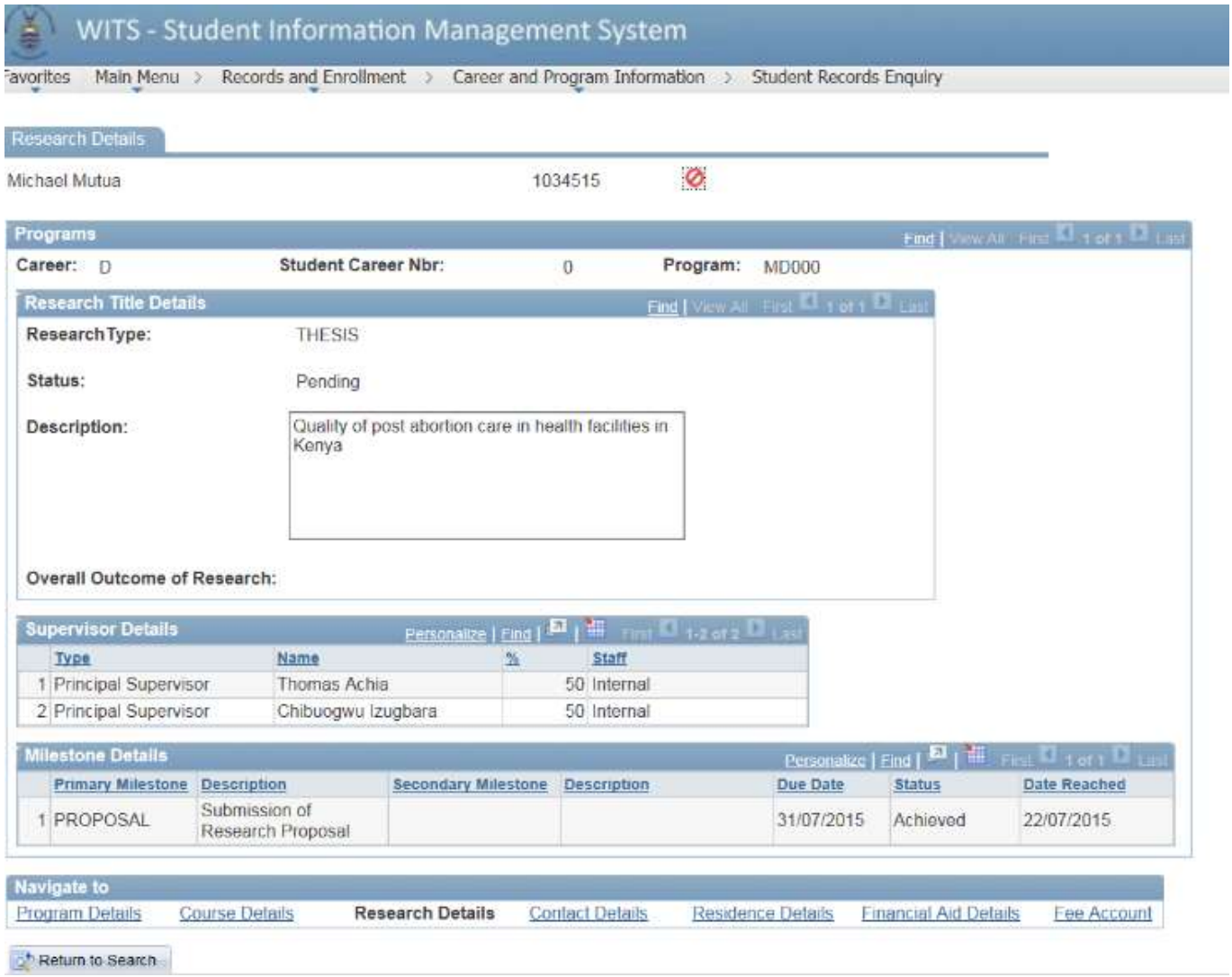
I MICHAEL M. MUTUA (Student number: 1034515) am a student registered for the degree of PHD in the academic year 5.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: APRIL 6, 2019

Appendix 8.2: Faculty of Health Sciences approval



WITS - Student Information Management System

Favorites Main Menu > Records and Enrollment > Career and Program Information > Student Records Enquiry

Research Details

Michael Mutua 1034515

Programs Find | View All First 1 of 1 Last

Career: D **Student Career Nbr:** 0 **Program:** MD000

Research Title Details Find | View All First 1 of 1 Last

Research Type: THESIS

Status: Pending

Description: Quality of post abortion care in health facilities in Kenya

Overall Outcome of Research:

Supervisor Details Personalize | Find | First 1-2 of 2 Last

	Type	Name	%	Staff
1	Principal Supervisor	Thomas Achia	50	Internal
2	Principal Supervisor	Chibuogwu Izugbara	50	Internal

Milestone Details Personalize | Find | First 1 of 1 Last

	Primary Milestone	Description	Secondary Milestone	Description	Due Date	Status	Date Reached
1	PROPOSAL	Submission of Research Proposal			31/07/2015	Achieved	22/07/2015

Navigate to

Program Details | Course Details | **Research Details** | Contact Details | Residence Details | Financial Aid Details | Fee Account

Return to Search

Appendix 8.3: Research Ethical Clearance- AMREF

amref health africa

Amref Health Africa in Kenya

REF: AMREF – ESRC P185/2015

September 25, 2015

Michael Mutua
APHRC/University of Witswatersrand
Email: mmutua@aphrc.org
Phone: 0722365431

Dear Mr. Mutua

RESEARCH PROTOCOL: QUALITY OF POST-ABORTION CARE IN HEALTH FACILITIES IN KENYA

Thank you for submitting your research protocol to the AMREF Ethics and Scientific Review Committee (ESRC).

This is to inform you that the ESRC has approved your protocol. The approval period is from 25th September 2015 to 25th September 2016 and is subject to compliance with the following requirements:

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 AMREF ESRC before implementation.
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the ESRC immediately.
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 AMREF ESRC immediately.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period (attach a comprehensive progress report to support the renewal).
f) Clearance for export of biological specimen or any form of data must be obtained from AMREF ESRC, NACOSTI and Ministry of Health for each batch of shipment/export
g) Submission of an executive summary 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.

Please do not hesitate to contact the ESRC Secretariat (esrc.kenya@amref.org) for any clarification or query.

Yours sincerely,

Prof. Mohamed Karama
Chair, AMREF ESRC

CC: Dr. George Kimathi, WASH Programme Manager, AMREF Kenya and Vice Chair AMREF ESRC
Samuel Muhula, Ag. Monitoring & Evaluation and Research Manager, AMREF Kenya

Appendix 8.4: Research Ethical Clearance- KNH/UoN

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

07 JUN 2017

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
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Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/187

7th June, 2017

Michael Mutua
School of Public Health
University of Witwatersrand
Johannesburg, South Africa

Dear Michael,

REVISED RESEARCH PROPOSAL- QUALITY OF POST ABORTION CARE IN HEALTH FACILITIES IN KENYA (P33/01/2017)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above revised proposal. The approval period is from 7th June, 2017 – 6th June, 2018.

This approval is subject to compliance with the following requirements:

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) 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.
d) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
e) Submission of an *executive summary* 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.

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

Protect to discover

Appendix 8.5: Research Ethical Clearance- University of the Witwatersrand

R14/49 Mr Micheal Mutua

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150760

NAME: (Principal Investigator)	Mr Micheal Mutua
DEPARTMENT:	Public Health Three Regions In Kenya
PROJECT TITLE:	Quality of Post-Abortion Care in Health Facilities in Kenya
DATE CONSIDERED:	31/07/2015
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Thomas Achia
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	25/11/2015

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 8.6: Paper 1

Received: 18 December 2016 | Revised: 25 April 2017 | Accepted: 14 June 2017 | First published online: 6 July 2017

DOI: 10.1002/ijgo.12239

CLINICAL ARTICLE

Gynecology

WILEY International Journal of Gynecology & Obstetrics

A cross-sectional analysis of Kenyan postabortion care services using a nationally representative sample

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Funding Information
Consortium for Advanced Research Training in Africa; Consortium for Research on Unsafe Abortion in Africa; UK Department for International Development; Safe Abortion Action Fund; Rockefeller Foundation; Swedish International Development Cooperation Agency; William and Flora Hewlett Foundation

Abstract

Objective: To assess quality of postabortion care (PAC) offered by Kenyan healthcare facilities.

Methods: A cross-sectional survey was conducted using data from the Incidence and Magnitude of Unsafe Abortions study, conducted among 326 PAC-providing healthcare facilities throughout Kenya from March 13 to June 30, 2012. Descriptive results with weighted proportions and an ordered probit model were used.

Results: Overall, 408 (41.8%) first-trimester PAC cases were treated using appropriate technology versus 826 (82.6%) second-trimester cases. Private healthcare facilities lagged behind public healthcare facilities on the use of appropriate technology: 264 (47.5%) public and 144 (33.1%) private facilities used such technology for first-trimester abortion, and 664 (89.6%) public versus 162 (68.8%) private for second-trimester abortions). Most healthcare facilities (251, 70.7%) had at least one provider trained in PAC. A total of 273 (80.7%) healthcare facilities reported offering contraception to all PAC patients, mainly short-acting methods. Delivery of PAC services depended on the availability of separate evacuation room (public level 2–3: odds ratio [OR] 22.93; public level 4–6: OR 77.14), and the number of family planning methods offered within the facility (public level 2–3: OR 1.38; public level 4–6 OR 1.57; private level 2–3: OR 2.27; private level 4–5: 4.89).

Conclusion: Effective monitoring of PAC services, particularly among private healthcare facilities, might improve overall quality of services.

KEYWORDS

Healthcare facilities; Kenya; Maternal mortality; Postabortion care; Quality of care; Unsafe induced abortion

1 | INTRODUCTION

Estimates suggest that greater than 20 million unsafe induced abortions occur worldwide each year.[1] Such procedures are responsible for up to 13% of all maternal deaths; however, the majority of these deaths are easily preventable.[2] Postabortion care (PAC) is a life-saving intervention that reduces the risks of mortality and morbidity from incomplete induced abortion.[3]

In 2003, the PAC Consortium endorsed a framework that identified the essential elements of care, with the aim of improved PAC

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service quality and sustainability from the perspective of both patients and healthcare providers.[4] The five-point PAC Consortium framework takes a public-health approach to respond to women's broad sexual and reproductive health needs. These five elements include community and service provider partnerships to prevent unwanted pregnancies and unsafe induced abortion, counseling, treatment, contraceptive and family planning (FP) services, and links to reproductive and other health services.[4]

A high proportion of women who undergo unsafe induced abortion will require medical care[5]; however, access to quality PAC remains a challenge, especially among low-income countries.[6] Furthermore, induced abortion is illegal in many low-income countries, and women often fail to seek intervention owing to a fear of legal repercussions.[7] Conversely, many patients who actively seek PAC do not receive immediate and adequate treatment at healthcare facilities, mainly due to too many patients in healthcare facilities and other access restrictions such as cost.[8] Such delays to provision of PAC can lead to severe complications such as sepsis, perforated uterus, and obstetric hemorrhage,[9] which can all cause death if advanced medical or surgical intervention is not provided in time. Together with stigma, cultural, socioeconomic, and religious factors minimize any conversations on induced abortion.[9] Although complications from unsafe induced abortion can be life-threatening, many women fail to seek PAC because they fear reprimand from medical personnel, whereas others do not seek care due to poverty and cultural practices,[9] even among countries where PAC is highly subsidized.[10]

The leading known cause of unsafe induced abortion is unintended pregnancy,[11] which is associated with unmet need for FP services. Contraceptive interventions are therefore an important pathway to prevent unsafe induced abortions through reducing the risk of unwanted or mistimed pregnancies before and after induced abortion. The PAC Consortium model advocates the provision of FP counseling and services to increase contraceptive uptake and so reduce repeat unintended pregnancies.[12]

In Kenya, maternal mortality remains high.[13] The majority of such deaths are associated with the type of care sought once women are faced with pregnancy complications.[14] The PAC Consortium framework provides fundamental elements of quality of care and is generally accepted as the standard approach to estimating facility-based quality of care.[15] Nonetheless, little research has been conducted to date on the quality of PAC in Kenya.

The aim of the present study was to evaluate PAC services among Kenyan healthcare facilities.

2 | MATERIALS AND METHODS

An analysis was conducted using cross-sectional data derived from the Incidence and Magnitude of Unsafe Abortions (IMUA) study, which was conducted among PAC-providing Kenyan healthcare facilities from March 13 to June 30, 2012.[16] Approval was obtained from the ethical review committees of the Kenya Medical Research Institute, the University of Nairobi, and Kenyatta National Hospital (all in Nairobi, Kenya). Service providers and patients signed informed consent forms before participating in the interview.

The present analysis used data from two components of the IMUA study: the retrospective health facility survey and the prospective morbidity survey. Data for the health facility survey were collected from healthcare managers and senior staff by trained field workers. The prospective morbidity survey collected data from 2631 (83.2%) of the 3161 patients who presented for PAC services at a participating healthcare facility in a 30-day period. The remaining 530 patients did not provide consent and so were excluded, as were those who sought a pregnancy termination. Trained providers who offered PAC services at the sampled healthcare facilities collected prospective morbidity survey data, including sociodemographic characteristics, reproductive and clinical histories, diagnosis, treatment, contraception, and clinical outcomes.

The Kenya Essential Package for Health classifies all healthcare facilities into six levels of preventive and curative services, based mainly on functionality.[17] Level 1 refers to preventive approaches in the community; therefore, level 2 was considered to be the lowest level of care (e.g. dispensaries and clinics), whereas level 6 was the highest level of care (e.g. national referral hospitals).[17] The IMUA study sampled 350 (12.3%) of 2838 nationally representative level-2–6 healthcare facilities, and 326 (93.1%) participated in the study. All level-1, and some level-2, healthcare facilities were excluded from the IMUA study as they did not offer PAC services. A stratified random sample was drawn, with the geographic region and level of care used as the strata. All level-5 and level-6 healthcare facilities were included, as were all non-governmental facilities known to provide induced abortions and PAC services. A representative sample was drawn for the level-2–4 healthcare facilities.

The present analysis assessed the quality of PAC services offered at the level-2–6 Kenyan healthcare facilities by using the PAC Consortium model.[4] The indicators for each component of PAC assessment are presented in Table 1. These indicators focused on the use of appropriate technologies, provider technical performance, information and counseling, and equipment, supplies, and medications.

All data were captured on paper forms and then entered into computer systems using Census and Survey Processing System (CSPro) version 5.0 (United States Census Bureau, Suitland, MD, USA), before being exported to Stata 13.1 (Stata, College Station, TX, USA) for cleaning and analysis. Survey data weights were computed as the inverse of the product of the probabilities of any facility being sampled (350/2838) and the probability of a sampled facility participating in the interview (326/350).

Bivariate analysis was conducted using χ^2 tests of association, with a 5% significance level for inclusion in the final model. Multiple correspondence analysis was used to reduce the data to a single indicator of quality. The internal reliability of this indicator was tested using the Cronbach α value. This indicator was categorized into three levels of quality (high, medium, and low). A mixed-effects ordered probit model was fitted on the ordinal outcome, controlling for healthcare facility level and ownership (public or private). Healthcare facilities were compared using the following variables: having a separate evacuation

TABLE 1 Elements underpinning the quality of postabortion care services.

Indicator of quality care[a]	Description
Use of appropriate technology[b]	This indicator measures the number of PAC cases treated with appropriate technology, which was defined as: • Manual vacuum aspiration or medical abortion in 1st trimester of pregnancy • Curettage and medical abortion in 2nd trimester of pregnancy Any other treatment approach was considered to be inappropriate technology
Technical performance[c]	This indicator assesses the technical capacity of staff in each healthcare facility as follows: • The availability of providers at the facility who have received training in PAC (given as the mean number of providers) • Healthcare facilities with at least two providers trained in PAC (given as the percentage of facilities)
Information and counseling[c]	This indicator focuses on healthcare facilities that offer FP counseling to assess the proportion that: • Give information on the available FP methods • Give instruction on correct use of these FP methods • Explains the advantages and disadvantages of each FP method Give information about what to do in the case of FP method failure or when patients forget to take oral contraceptive pills
Supplies and medications[b]	This indicator is based on two main types of measurements: patients (as observed and recorded by the healthcare providers) or healthcare facilities (as reported by a key informant within each center). Values for the following measures are given as the percentage: • Whether patients reported that they were given pain medications for their procedure (yes or no) • Whether patients were given antibiotics for their procedure (yes or no) • Whether patients were given modern FP methods on discharge from the facility (yes or no) • Whether facilities offer a barrier method of FP (condom) to patients (yes or no)[c] • The mean number of FP methods that facilities offer to patients (out of 11) was also assessed

Abbreviations: PAC, postabortion care; FP, family planning.
[a]The four indicators listed were sourced from Greenslade and Jansen.[15]
[b]Sourced from the prospective morbidity survey component of the Incidence and Magnitude of Unsafe Abortions study.[16] All prospective morbidity survey data were collected by trained service providers (predominantly the main providers of PAC in the sampled healthcare facilities).
[c]Sourced from the health facility survey component of the Incidence and Magnitude of Unsafe Abortions study.[16] All health facility survey data were collected by trained field workers using paper questionnaires, which were administered to health managers and senior hospital management staff.

room, having specialist obstetrics and gynecology services, offering maternity services, frequency of provider training on PAC, provider perception of the number of PAC cases in a defined period, the number of deliveries per month, and the number of FP methods available for PAC patients. A natural logarithm was used to transform the monthly deliveries per facility. Counties were used as the source of clustering to account for such effects. In all, 15 county level characteristics were obtained from the 2014 Kenya Demographic and Health Survey,[13] including unmet need for FP and the proportion of women who reported having heard an FP message on the radio or reading one in a newspaper. These county-level characteristics were modeled to assess the effect of facility characteristics on the quality of PAC. Random effects reflected the county level. Kenya comprises 47 counties, of which 45 (95.7%) provided data from at least one healthcare facility.

3 | RESULTS

Characteristics of the healthcare facilities and patients included in the present analysis are outlined in Table 2. Most of the healthcare facilities sampled were level 2–3, and most were publically owned. The median age of the patients was 26 years; 1700 (64.4%) were married or living with their partner; 952 (35.5%) had received secondary education; and 908 (34.6%) were nulliparous.

Only 408 (41.8%) of all first-trimester PAC cases were treated using appropriate technology (as defined in Table 1). In all, appropriate technology for second-trimester PAC was used in 826 (82.6%) of all healthcare facilities used. Use of appropriate technology for first-trimester PAC was higher among public healthcare facilities than among private facilities (Table 3).

Approximately two staff members per healthcare facility had received in-service or preservice training in PAC (Table 3). A substantial proportion of the healthcare facilities reported that at least one staff member had received PAC training (Table 3). For both public and private healthcare facilities, there was a marked difference between the mean number of staff trained at level 2–3 versus level 4–6 (Table 3). Additionally, 154 (67.6%) of the public healthcare facilities had at least one provider trained in PAC compared with 97 (78.0%) of the private healthcare facilities.

Patients were given information on the available FP methods in 187 (86.0%) public healthcare facilities and 92 (72.4%) private facilities. By contrast, patients were given instructions on the correct use of FP methods in only 215 (62.6%) of all healthcare facilities (Table 3). Only 61 (19.4%) healthcare facilities gave patients information about what to do should the FP method fail or if they forgot to take their oral contraceptive pills. Among all public healthcare facilities, 143 (66.2%) reported giving instructions on the correct use of contraceptive methods, compared with 72 (53.9%) of all private healthcare facilities.

TABLE 2 Characteristics of the Kenyan healthcare facilities and patients surveyed.

Characteristic	Value[a]
Healthcare facilities that provided postabortion care (n=326)	
Facility level	
2	92 (49.4)
3	124 (36.2)
4	94 (13.7)
5	14 (0.6)
6	2 (0.1)
Ownership	
Public	210 (70.0)
Private for-profit	55 (14.4)
Non-governmental or faith-based organization	51 (11.5)
Other	10 (4.1)
Services offered	
Obstetrics and gynecology	90 (15.1)
Maternity and delivery	271 (86.1)
Postabortion care and counseling	319 (97.9)
Postabortion contraception and counseling	313 (95.8)
Mean no. of deliveries per mo	19.0
Facilities where procedures were performed in the evacuation room	119 (24.3)
Facilities with an evacuation room where postabortion care services are offered	72 (14.4)
Patients who sought postabortion care (n=2631)	
Median age, y	26.0
Marital status[b]	
Never married	761 (27.8)
Married or living together	1700 (64.4)
Separated, divorced, or widowed	162 (7.5)
Educational status[c]	
None	158 (9.3)
Primary	963 (40.1)
Secondary	952 (35.5)
Post-secondary	543 (14.8)
Parity[b]	
0	908 (34.6)
1–2	1081 (38.0)
3–5	535 (21.8)
≥6	99 (5.6)
Level of complication	
Low	723 (22.8)
Moderate	1135 (40.0)
Severe	773 (37.2)

[a]Values are given as number (weighted percentage), unless otherwise indicated.
[b]Eight cases excluded from tabulation because of missing data.
[c]Fifteen cases excluded from tabulation because of missing data.

A total of 1890 (83.5%) patients who underwent an evacuation procedure received some form of pain management: 1263 (84.8%) in public healthcare facilities and 627 (81.5%) in private healthcare facilities.

Among all facilities, 273 (80.7%) reported always offering contraceptive counseling to all PAC patients on discharge, with public healthcare facilities higher (172, 79.2%) than private healthcare facilities (101, 84.0%). A higher proportion of patients treated in level-4–6 public healthcare facilities (1348, 94.2%) were issued with a modern FP method or referred for such services than those attending level-2–3 public healthcare facilities (276, 88.0%).

The quality of PAC provided at a healthcare facility depended on availability of a separate evacuation room, specialized obstetrics and gynecology services, and the number of family planning methods offered within the healthcare facility (Table 4). Among level-2–3 public healthcare facilities, having a separate evacuation room and the availability of specialized obstetrics and gynecology services increased the odds of high-quality PAC services by 22.93 and 12.28 times, respectively. Within private healthcare facilities, the availability of a separate evacuation room did not affect the quality of PAC services, regardless of level. However, having specialized obstetrics and gynecology services increased the odds of high-quality PAC services by 59.02 times among level-4–5 private facilities.

Across all healthcare facility levels and ownership, the number of FP methods available remained a statistically significant factor in determining the quality of PAC. Within public healthcare facilities, each additional method increased the odds of quality PAC by 1.38 times in level-2–3 facilities and 1.57 times in level-4–6 facilities. The effect was higher among private healthcare facilities, with each additional FP method available increasing the odds of high-quality care by 2.27 times in level-2–3 and 4.89 times in level-4–5 facilities.

4 | DISCUSSION

The present study found a low level of adherence to the predefined PAC service standards among all healthcare facilities sampled. Notably, the use of appropriate technology was low, especially among private healthcare facilities. In providing the technology, a broad approach should ensure support in contraception and pregnancy testing, improvement in assessment of gestational age, supply of manual vacuum aspiration kits, and improved availability and ease of access to medical abortion.[18] The use of invasive methods such as dilation and curettage (especially for first-trimester evacuation procedures) raises concern over the adherence to guidelines, as well as the process through which service providers decide on treatment and the factors that inform the decision. The present finding differs from past studies, which showed that dilation and curettage equipment were available in healthcare facilities yet remained unused.[19] Interestingly, almost all dilation and curettage cases recorded in the IMUA study occurred at level-4–5 private facilities.[16] Use of appropriate technology for PAC in the first and second trimesters can be seen against the backdrop of high cost of some of the highly invasive and inappropriate procedures

TABLE 3 Quality of PAC among Kenyan healthcare facilities.[a]

	Public healthcare facilities				Private healthcare facilities				All healthcare facilities			
	Level				Level				Level			
Indicator of quality for PAC services	2–3	4–6	*P* value[b]	Total	2–3	4–6	*P* value[b]	Total	2–3	4–6	*P* value[b]	Total
Use of appropriate technology												
1st-trimester cases appropriately treated	132 (74.7)	132 (19.6)	<0.001	264 (47.5)	78 (29.1)	66 (58.8)	<0.001	144 (33.1)	210 (50.6)	198 (25.4)	<0.001	408 (41.8)
2nd-trimester cases appropriately treated	136 (96.3)	528 (82.7)	0.001	664 (89.6)	132 (72.1)	30 (46.7)	<0.001	162 (68.8)	268 (85.1)	558 (78.5)	0.072	826 (82.6)
Technical performance												
Mean no. of providers with training in PAC available at the facility	1.1	5.5	<0.001[c]	1.7	2.1	5.7	0.001[c]	2.6	1.4	5.6	<0.001[c]	2.0
Facilities with ≥1 provider trained in PAC	86 (64.3)	68 (87.7)	<0.001	154 (67.6)	67 (76.4)	30 (87.0)	0.008	97 (78.0)	153 (67.9)	98 (87.5)	<0.001	251 (70.7)
Facilities with ≥2 providers trained in PAC	43 (28.1)	59 (74.3)	<0.001	102 (34.6)	53 (48.8)	21 (58.8)	<0.001	74 (50.2)	96 (34.3)	80 (69.4)	<0.001	176 (39.3)
Information and counseling												
Facilities that reported always giving contraceptive counseling to all patients on discharge	106 (78.0)	66 (87.0)	0.148	172 (79.2)	73 (84.7)	28 (80.3)	0.634	101 (84.0)	179 (80.0)	94 (84.9)	0.335	273 (80.7)
Gives information on the available FP methods[d]	120 (85.6)	67 (88.0)	0.66	187 (86.0)	65 (70.9)	27 (80.2)	0.358	92 (72.4)	185 (81.4)	94 (85.6)	0.401	279 (82.0)
Gives instruction on the correct use of FP methods[d]	89 (66.1)	54 (66.6)	0.952	143 (66.2)	50 (52.2)	22 (62.6)	0.378	72 (53.9)	139 (62.2)	76 (65.3)	0.619	215 (62.6)
Talks about the advantages and disadvantages of each FP method[d]	104 (77.2)	67 (86.3)	0.157	171 (78.5)	65 (78.2)	25 (76.0)	0.818	90 (77.9)	169 (77.5)	92 (83.1)	0.292	261 (78.3)
Gives information on what to do in case of FP method failure or forgetting to take oral contraceptive pills[d]	23 (19.8)	15 (18.0)	0.784	38 (19.5)	19 (20.6)	4 (10.8)	0.241	23 (19.1)	42 (20.0)	19 (15.8)	0.401	61 (19.4)
Supplies and medications												
Patients given pain medication	119 (81.4)	1144 (86.7)	<0.001	1263 (84.8)	506 (80.3)	121 (89.2)	0.246	627 (81.5)	625 (80.7)	1265 (87.0)	<0.001	1890 (83.5)
Patients given antibiotics	287 (91.5)	1369 (96.1)	0.002	1656 (93.8)	655 (92.2)	151 (92.4)	0.027	806 (92.2)	942 (91.9)	1520 (95.6)	0.003	2462 (93.2)
Mean no. of FP methods commonly offered to patients (out of 11)	4.4	5.5	<0.001[c]	4.6	4	4.1	0.067[c]	4.1	4.3	5	0.220[c]	4.4
Patients offered a barrier method (condom)	108 (80.7)	61 (79.6)	0.953	169 (80.6)	59 (68.4)	16 (48.7)	0.011	75 (65.5)	167 (77.1)	77 (70.0)	0.15	244 (76.1)
Given modern FP methods on discharge from the facility	276 (88.0)	1348 (94.2)	<0.001	1624 (91.1)	659 (89.1)	145 (84.1)	<0.001	804 (88.5)	935 (88.6)	1493 (92.9)	0.056	2428 (90.1)

Abbreviations: PAC, postabortion care; FP, family planning.

[a]Values are given as number (weighted percentage) unless indicated otherwise.

[b]*P* values calculated from bivariate χ^2 tests of association unless indicated otherwise.

[c]*F* value. Probability (F_t>*F*); significance was cutoff at 0.05, meaning any *F* value below 0.05 was considered to represent a significant difference between the means.

[d]Data given for healthcare facilities that always offer FP counseling.

TABLE 4 Factors associated with quality of care among Kenyan healthcare facilities offering PAC services.[a,b]

Facility characteristic	Model 1 (public facility; level 2–3)	Model 2 (public facility; level 4–6)	Model 3 (private facility; level 2–3)	Model 4 (private facility; level 4–5)[c]
Has an evacuation room[d]	22.93 (4.16–126.42)[e]	77.14 (13.36–445.32)[e]	8.8 (0.91–84.84)	4.69 (0.25–87.71)
Offers specialist obstetrics and gynecology services[d]	12.28 (1.10–137.38)[f]	1.50 (0.31–7.25)	302.59 (8.68–10 552.10)[e]	59.02 (0.99–3518.46)
Offers maternity services	0.65 (0.16–2.65)	0.64 (0.01–47.53)	2.41 (0.01–759.93)	[g]
Providers always trained for PAC	0.66 (0.20–2.17)	1.85 (0.52–6.60)	3.67 (0.40–33.77)	0.34 (0.02–5.48)
Provider reported that PAC a significant load	0.49 (0.15–1.54)	0.49 (0.12–2.08)	1.86 (0.24–14.62)	0.22 (0.01–3.50)
No. of deliveries per month are logged	1.59 (0.95–2.64)	1.78 (0.84–3.79)	2.09 (0.78–5.57)	1.73 (0.45–6.67)
No. of family methods available	1.38 (1.00–1.89)	1.57 (1.08–2.29)[f]	2.27 (1.22–4.22)[f]	4.89 (1.68–14.24)[e]

Abbreviation: PAC, postabortion care.
[a]Values are given as odds ratio (95% confidence interval).
[b]Odds ratios and their confidence intervals are generated from fitting a mixed-effects ordered logit model for the ordinal outcome variable "use of an effective family planning method." A covariate on the model was considered to be significant if $P<0.05$.
[c]No level 6 private facilities.
[d]Of the level 2–3 public facilities, only 14 had evacuation rooms and four offered specialized obstetrics and gynecology services; therefore, the associated odds ratios should be interpreted with caution.
[e]$P<0.001$.
[f]$P<0.05$.
[g]Missing variables dropped owing to multicollinearity.

such as dilation and curettage. Some providers are thought to have shown a preference for these inappropriate methods for financial gain rather than as patient-centered treatment choices.[6]

Unwanted pregnancies are a leading cause of unsafe induced abortion, the majority of which can be attributed to an unmet need for contraception.[20] The number of PAC patients who receive modern FP methods is therefore a critical component of the PAC quality framework and remained high in the present study (9 of 10 patients), although seven of these nine cases received only a barrier method (male condom). The findings indicated the need for effective contraception skills improvement and objective treatment of PAC patients by service providers. This role of effective contraception is in line with studies showing high rates of repeat induced abortion among women across all age groups.[21,22]

The capacity of the care provider is of prime importance when offering PAC services.[1] This capacity is mainly in reference to the nature of PAC training and continuous quality improvement through enhanced and regular in-service education of medical service providers. Of note, one-third of the facilities sampled in the present study did not have any medical personnel trained in PAC, yet these facilities still offered PAC services. This discrepancy represents a capacity gap according to the PAC Consortium framework. Currently, only obstetricians, gynecologists, general practitioners, and midwives are trained in the use of medical vacuum aspiration and medical abortion in Kenya.

The PAC Consortium model recognizes safe and effective treatment, which includes standard infection prevention and appropriate pain management. Nonetheless, few of the patients in the present study received pain management and antibiotics, similar to the investigation of Renner et al.[23]

All PAC patients must receive FP services to enable them to space or limit future pregnancies, and so prevent further unwanted pregnancies. Therefore, a need exists to equip healthcare facilities with adequate and variant FP methods, as well as creating a pool of PAC providers who are knowledgeable about appropriate contraceptive options. That most healthcare facilities in the present study offered approximately four different types of contraceptive methods (mainly barrier methods) shows how these facilities are not prepared to offer quality PAC, especially in level-2–3 healthcare facilities where primary contact with the patients occurs. The need for service improvement is particularly evident among level-2–3 healthcare facilities to safeguard women's health. Improving the quality of PAC services should focus not only on availing contraceptive services, but also on ensuring that these services have the potential to reach the intended users.

Enhanced community involvement in PAC increases awareness of the dangers of unsafe induced abortions and improves utilization.[24] Additional evidence[25] demonstrates that healthcare facilities with specialized obstetrics and gynecology services have increased odds of improved PAC. This evidence preempts the need for increased service provision and improvement in low-level healthcare facilities. Having a separate evacuation room for all PAC cases is also vital for quality improvement and enhanced patient satisfaction with services.[25]

Potential limitations of the present study pertinent to interpretation of the results included the patient selection, provider recall bias, and the inability to assess all five elements of the PAC Consortium model.[4]

In conclusion, the present study revealed an urgent need to improve the capacity of level-2–3 healthcare facilities to offer quality PAC services, by equipping service providers with the requisite skills to offer effective FP and counseling. Although these efforts could easily

focus on public healthcare facilities (which deliver the bulk of PAC in Kenya), an inclusive approach that promotes private-sector participation will reduce the risk of complications attributable to delays in seeking care, often owing to lengthy referral times.[14]

AUTHOR CONTRIBUTIONS

MMM conceptualized the present study; led the data analysis; and wrote the first draft of the manuscript. TNOA and BWM reviewed the manuscript drafts. COI conceptualized the present study; was the Principal Investigator of the Incidence and Magnitude of Unsafe Abortion study (which provided data for the present analysis); and reviewed the manuscript drafts. All authors read and approved the final manuscript before submission.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

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Appendix 8.7: Paper 2

PLOS ONE

RESEARCH ARTICLE

Spatial and socio-economic correlates of effective contraception among women seeking post-abortion care in healthcare facilities in Kenya

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Data Availability Statement: The data used in these analyses were obtained from the African Population and Health Research Center (APHRC) upon request, for this analyses. As a recipient, the institution's Institutional Review Board (IRB) restricts sharing of these data but allows interested researchers to obtain the data upon completion of a data request form, which is available online at http://microdataportal.aphrc.org/index.php/contact-us. Notably, the data used in this manuscript is health facility based and there are certain instances where information in the data can

Abstract

Introduction

Information, counseling, availability of contraceptives, and their adoption by post-abortion care (PAC) patients are central to the quality of PAC in healthcare facilities. Effective contraceptive adoption by these patients reduces the risks of unintended pregnancy and repeat abortion.

Methods

This study uses data from the Incidence and Magnitude of Unsafe Abortion Study of 2012 to assess the level and determinants of highly effective contraception among patients treated with complications from an unsafe abortion in healthcare facilities in Kenya. Highly effective contraception was defined as any method adopted by a PAC patient that reduces pregnancy rate by over 99%.

Results

Generally, contraceptive counseling was high among all PAC patients (90%). However, only 54% of them received a modern family planning method—45% a short-acting method and 9% a long-acting and permanent method. Adoption of highly effective contraception was determined by patient's previous exposure to unintended pregnancies, induced abortion and modern family planning (FP). Facility level factors associated with the uptake of highly effective contraceptives included: facility ownership, availability of evacuation procedure room, whether the facility had a specialized obstetric-gynecologist, a facility that also had maternity services and the number of FP methods available for PAC patients.

be used to link the data to specific health facilities, since some facility types only had one or two facilities in the country (e.g. national referral hospitals). To protect the anonymity of these facilities and their participants, it is imperative that the data, when publicly available can only be used by specific users upon committing to maintain the same levels of confidentiality, as provided by the ethical and scientific research committee at AMREF.

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Competing interests: The authors have declared that no competing interests exist.

Discussion and conclusion

For better adoption of highly effective FP, counseling of PAC patients requires an understanding of the patient's past experience with contraception and their future fertility intentions and desires in order to meet their reproductive needs more specifically. Family planning integration with PAC can increase contraceptive uptake and improve the reproductive health of post-abortion care patients.

Introduction

Globally, about 22 million unsafe abortions occur annually, 21 million in low and middle income countries. The World Health Organization (WHO) estimates that 47,000 cases of maternal deaths are due to unsafe abortion, with only 0.2% of these in high-income countries [1]. Over 62% of these deaths occur in Africa, primarily in eastern Africa [2].

Women who have had an abortion may resume sexual activity soon after abortion, around the same time as ovulation resumption. Post-abortion contraception is therefore a necessary intervention to reduce the risk of unintended pregnancies. In consequence, the timing of menses after resumption of ovulation provides a further justification for providing post-abortion contraception with post-abortion care [3,4] to avert further unwanted pregnancies [5] and reduce abortions and abortion-related deaths.

Although post-abortion contraception is a component of all post-abortion care (PAC) models, service providers have focused on the treatment of complications and family planning and counseling have continually been overlooked [4]. The provision of contraception in consultation with a trained service provider increases the rate of use of family planning (FP) in the first six months post-abortion [5], consistent with WHO recommendations for a pregnancy after an abortion or miscarriage [6]. This duration of adoption of a family planning method is shorter when abortion or post-abortion treatment involves a medical abortion with Mifepristone and Misoprostol [3]. This points to the necessity of integrating FP with safe legal abortion and post-abortion care services to address missed opportunities and to reduce the risks of repeat unsafe abortions [7].

In a study conducted on contraceptive knowledge and use among women treated for unsafe abortions in Accra, Ghana, the majority of women seeking care had little knowledge of contraceptive methods. This low knowledge contributed to low uptake of contraception after securing treatment for complications resulting from unsafe abortions [8]. In another cross-country study in India, Pakistan and Bangladesh, better exposure to information was linked to higher contraceptive use among patients [9]. In addition, women seeking multiple abortions are more likely to choose and have used short-acting family planning methods [10]. In similar low-income and high-risk settings, choosing a more effective method was mostly associated with a history of previous abortions and number of living children, a proxy for fertility intentions [11]. At the population level, when fertility is unchanged, increased contraception use and use of more effective methods have been demonstrated to reduce risks of induced abortion. More specifically, the use of intrauterine contraceptive devices (IUCDs) after abortion significantly reduces the risks of repeat abortion. [12].

In Kenya, despite recent increases in contraceptive prevalence, the acceptance of modern methods of family planning remains below 40% [13] for reasons which include fear of side effects, lack of social support, myths and misconceptions, religious beliefs, and the costs of either the method or consultation with provider [13,14]. In areas such as western Kenya, these barriers also include missed opportunities at health facilities, especially for postpartum women

[14]. Effective post-abortion contraceptive counseling could, therefore, play a significant role in demystifying contraception and increasing uptake.

The relationship between effective contraceptive counseling and adoption of long-acting contraceptive methods has been shown to vary [15,16]. However, through effective contraception counseling, patients treated with post-abortion complications are more likely to adopt an effective contraceptive method on, before or soon after discharge from the facility [7], even in environments with limited resources that could otherwise facilitate lower costs of care and help to deliver patient-centered care [17–19]. For this to happen, PAC services need to be comprehensive and include the provision of effective contraceptives and the involvement of partners, since male involvement increases the rate of acceptance, especially of long-acting methods, by PAC patients [19]. Increasing acceptance and uptake of effective contraceptive methods through better counseling and male involvement has been demonstrated to hold both in environments of legal abortion and in more restrictive abortion environments [18].

Drawing on Marston and Cleland [12] and Keen and colleagues [11], in this article, we seek to investigate levels and types of post-abortion contraception for women seeking PAC in healthcare facilities in Kenya. We examine the determinants of highly effective post-abortion contraception among PAC patients; describe their contraceptive uptake after treatment; assess the health facility's preparedness to offer post-abortion contraception; and analyse the nature of barriers to service and method availability.

Methods

Study setting

The data are drawn from the Incidence and Magnitude of Unsafe Abortion (IMUA) study conducted in 2012 in Kenya, targeting a nationally representative sample of 350 facilities. The Ministry of Health in Kenya classifies public and private healthcare facilities providing preventive and curative services into six categories based on their operational capacity. These classifications are community health services (Level I); primary care facilities (Level II and III) comprised of dispensaries, clinics, health centers and maternity homes; county referral health facilities (Levels IV and V), comprised of district/county hospitals, sub-district/sub-county and provincial hospitals; and Level VI (comprised of national referral and teaching hospitals) [20]. As at January 31, 2012, when sampling was undertaken, there were a total of 2,838 facilities classified as between Level II (the lowest level of healthcare facilities) and Level IV (the highest referral level).

Sampling

According to the IMUA Study whose data is used in this analysis, the sample of 350 facilities allowed for detection of a 10% difference in the severity of complications. Sampling fractions ps = 0.1233 (350 out of 2,828 facilities), together with survey response rate pr = 94% (328 out of 350 facilities), were used to compute sampling weights used in this analysis sw = 1/ (ps*pr) = 8.6279. These sampling weights were then normalized and applied differentially for all facilities in the same strata, according to facility level and geographic location. The study collected data from 328 facilities (94 in Level II, 124 in Level III, 94 in Level IV, 14 in Level V and 2 in Level VI); 22 of the 350 sampled facilities did not participate in the study. The sample was stratified by both facility level and region.

Data

Data were collected from all participating facilities and all PAC patients treated in these facilities over a 30 day period in each facility. Data collection was conducted between April and

August 2012. Field interviewers collected facility information by interviewing facility managers or senior staff informed about PAC service delivery in these facilities. Data collected included facility's infrastructure for PAC, staff training on PAC, number of cases the facilities managed in an average/typical month, common practices of services offered to PAC patients, and information on how these facilities cope with demands for PAC services. One or two PAC service providers in each facility were identified and trained to collect data on all PAC patients who presented in these participating facilities. These service providers collected data from their PAC patients using fully structured questionnaires on women's socio-economic background characteristics, fertility experiences and planning, contraceptive use, and abortion histories, as well as data on the step-by-step management of these patients until they were discharged from their facility. By the end of the data collection period, the study had gathered patient data for 2,568 patients who sought PAC over the 30 days at 281 of the 328 participating facilities, with the other 47 facilities either not reporting any PAC cases during the observation period, or only reporting cases of patients that sought termination of pregnancy. This study focuses on post-abortion care patients only in order to assess the management of patients presenting with complications resulting unsafe abortions. Consequently, an additional 466 patients (15.4%) who sought termination of pregnancies were excluded from this analysis.

Variables

The primary outcome variable, contraceptive use, was based on responses to three questions on whether a patient treated for PAC received a modern contraceptive method: 1) whether the patient was counseled for FP before leaving the health facility: 2) whether the patient was given a modern method of FP before leaving the health facility; and 3) type of contraceptive method the patient received. The outcome variable is defined as a patient who was counseled for and given a highly effective method of FP. All other patients were classified into those who received a "less effective" method or no method at all. According to Hatcher's classification of contraceptives based on use or actual effectiveness rather than theoretical effectiveness [21], highly effective contraceptive methods include methods that, irrespective of user's compliance or consistency, reduce pregnancy risk by 99%. These include only long-acting and reversible contraceptives (LARCs) or long-acting and permanent methods (LAPM) that guarantee high efficacy for pregnancy prevention in typical use scenario. These include contraceptive implants, IUCD, and female sterilization [11,22]. These methods all address user challenges related to human error, distance to health facility, and inconsistent use. This outcome variable is considered ordinal, measuring a latent continuum of the efficacy of a contraceptive method in preventing unintended or unwanted pregnancy. A patient discharged on a highly effective method is therefore considered at the lowest risk of repeat abortion, while one who received a less effective method is at moderate risk. A patient who did not receive any method was considered to be at the highest risk of unintended pregnancy and hence at risk of repeat abortion. Since data collection was completed by service providers, who were integral in determining whether a patient received a highly effective contraceptive method or not, we measured certain provider and facility characteristics that we hypothesized influenced this outcome of interest. These include facility level, ownership, whether a facility had a gynecological or FP unit, number of staff trained to offer PAC, and whether or not such trained providers were always available to attend to PAC patients. We also considered demographic information of the main service provider at the facility: gender, age, and duration of service in the facility.

At the county-level, data were collected on three main categories. Proximate determinants of contraceptive use measures of health care seeking behavior and socio-economic determinants of contraceptive use were both considered. Among these variables were measures such

as county level of unmet need for contraception, fertility intention, and exposure to contraceptive information. We also included a measure of women's agency in decision-making for contraceptive use and community-level measures of access to healthcare, such as the percent of deliveries conducted by a skilled provider and the number of pregnant women in the past five years who received a tetanus toxoid injection. Finally, to account for any socio-economic variability among the counties, a measure of county level religious affiliation was considered, by including the percentage of Christians (the main religion in the country), a relative self-reported measure of food security, household size, and a measure of county-level of investment in health through county budgetary allocation to health. These measures were first tested for serial correlation and then selected based on the level of correlation between each other, using a 0.7 correlation coefficient cutoff with any other variable within the above three subcategories.

Survey ethics considerations

The parent study on which this analysis is based was reviewed and approved by the Ethical Review Boards of the Kenya Medical Research Institute, the University of Nairobi/ Kenyatta National Hospital, Moi University Teaching and Referral Hospital, Kenya, and Aga Khan University, Kenya.

In addition to these ethics reviews, the Ministries of Public Health and Sanitation and Ministry of Medical Services (now both under Ministry of Health) in Kenya and the Institutional Review Board of the Guttmacher Institute also reviewed and approved the study. During the collection of field data, verbal consent was obtained from all women presenting for care prior to data collection, while written consents were obtained from all facility managers who were interviewed for the facility component. As per the requirements of the ethics boards, all verbal consents were recorded in the data collection tool by reading the consent statement and allowing the respondent to confirm their consent to participate. The interviewer then signed on the data collection tool that consent had been obtained. In this study, minors were considered as emancipated by virtue of having been pregnant, as per the Kenya adolescent research guidelines. Data collectors and service providers were all taken through the research ethics in human participant surveys, with attention to the key elements of respect, beneficence, and justice in research on human subjects. All participants were assured of strict confidentiality.

Data management and analysis

All data were obtained for analysis in the form of Stata datasets. Initial consistency checks and data re-coding were conducted in Stata 13 [23]. All new variables were generated, tested for consistency with original variable, and stored as new variables while maintaining the original variables. Descriptive statistics of the facility and service provider characteristics were computed and are presented in Table 1 (below). All analysis conducted to produce descriptive statistics were weighted using the survey weights in order to account for the survey design.

Statistical modeling was first conducted in Stata 15 using bivariate and multivariable mixed-effects ordered logit models in the Bayesian framework using Stata and OpenBUGS software [24]. Bayesian statistics have in the recent past demonstrated critical advantages over maximum likelihood estimation procedures [25]. This includes Bayesian ability to assign prior information to data, without overreliance on available data alone.

The outcome variable is ordinal, and use of ordered logit models extends the logistic regression models to allow for modeling data which assumes an underlying sequentially incremental nature of a rather categorical outcome. We further considered the use of mixed effects models because theoretically, women treated in one facility (women nested in facilities), as well as

Table 1. Description of healthcare facilities according to facility and service provider characteristics, 2012.

	% of sample/ Mean	Number of facilities/Main service providers
Health facility Characteristics		
Facility level		
Level 2	47.6	71
Level 3	36.0	105
Level 4	15.6	89
Level 5	0.7	14
Level 6	0.1	2
Region		
Central & Nairobi	14.1	65
Coast & N. Eastern	16.6	48
Eastern	10.7	50
Nyanza & Western	30.0	63
Rift valley	28.5	55
Ownership		
Public	68.5	176
Private for Profit	16.5	52
Private not for profit	15.1	53
Facility with FP or Gynecology unit		
No	18.0	43
Yes	82.0	238
PAC-trained staff always available		
Not always available	57.6	137
Always available	42.4	144
Average No. of staff trained to offer PAC	Mean = 2.13	281
Service Provider Characteristics		
Cadre of main PAC service provider	**%**	**N**
Doctor	26.9	87
Nurse	68.2	187
Other	4.9	7
Age of main PAC provider		
<30 yrs	27.7	70
30–39 yrs	33.3	94
>40 yrs	39.1	117
Gender of main PAC provider		
Male	52.3	138
Female	45.7	141
Missing	2.0	2
Average Duration of service in current facility	Mean = 4.99	281
Total	**100.0**	**281**

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those treated in facilities that are in the same county (facilities nested in counties) have more similar treatment experiences than women treated elsewhere. In this analysis, the second level of nesting of facilities in counties was ignored because there were too few facilities in some counties to provide any meaningful structural variability at that level. The final models therefore considered only two levels of women nested in counties, while assuming constant variability between and within facilities.

To account for the multilevel nature of these data, we introduced unstructured random effects in order to capture unobserved non-spatial heterogeneity [25]. Subsequently, we fitted an ordered logit model with structured random effects, using a conditional autoregressive (CAR) model to account for the spatial dependency between counties that are close to each other than those that are far apart [26,27]. Finally, we fitted a convoluted model, combining both the above unstructured and structured spatial random effects in our final model, a special flexibility provided within the framework of Bayesian estimation models [28]. All covariates were first tested for inclusion at 85.0% credibility interval, where initial bivariate models were fitted and all variables that were significant at this more relaxed credibility interval (85%) were considered for inclusion in the final model. Only facility ownership (public/private) failed to meet this inclusion criterion, but we still included this due to its contextual importance to this study.

Within each model, deviance information criterion (DIC) was used to compare models based on goodness of fit, with models with the lowest DIC value having the best fit. Posterior estimates from these models were plotted on county maps in ArcGIS software [29] to visualize the geographical or regional variability in the adoption of highly effective contraceptive methods by PAC patients in health care facilities.

Results

The survey sample consisted mainly of Level II and Level III facilities (83.6% of the sample). Although most facilities were publicly owned and managed, 105 facilities were owned either by private individuals or non-governmental organizations.

On average, there are about two service providers in each facility with training in PAC, with only 42.4% of the facilities reporting that these trained providers were always available to offer PAC whenever the facilities were operational. For the service providers who were interviewed, 68.2% were nurses and 27.7% were doctors involved in PAC provision in their facilities. The majority was aged 30 years and above (72.4%), with slightly more men (52.3%), with an average of five years of continuous PAC service delivery in the sampled facilities.

Although these facilities offered PAC, 18.0% did not have gynecology or FP units. This was particularly the case in Level II (22.7%) and for-profit (26.3%) facilities in central and Nairobi regions (30.0%), although these differences were not statistically significant. On average, there were two trained PAC providers per facility, with major differences according to facility level. Level II facilities on average had less than one provider, while Level VI had more than 35 providers trained to offer PAC. Nyanza, Western and Rift valley regions had the lowest number of providers with in-service training on PAC compared to other regions. For-profit facilities reported a higher number of trained providers, but providers were not always available for PAC service provision, and availability varied by facility level and region. Level II facilities reported the lowest rates of availability (33.6%), then Level IV (47.1%) and Level III (51.0%). Level V and VI had the highest rates of availability (79.6% and 100% respectively), as shown in Table 2.

Almost two-thirds of all facilities reported that they stocked and offered highly effective family planning methods to PAC patients. An additional 27.9% of facilities offered only short-acting (less effective) methods to PAC patients, with a small proportion of facilities offering no FP methods. Level III, IV and V facilities had the highest rate of reported availability of highly effective FP methods for PAC patients. Nairobi &Central as well as Nyanza & Western regions reported the highest rates (92.0% and 75.0% respectively), with the highest proportion of facilities offering only less effective methods reported in Coast and North-Eastern, Eastern and Rift Valley regions. There was some evidence of facility-based barriers to FP access among PAC

Table 2. Description of healthcare facilities by contraceptive characteristics according to level, region and ownership, Kenya 2012.

	Overall	Facility Level						Region						Ownership				
	% and Mean	Level 2	Level 3	Level 4	Level 5	Level 6	*Chi²; Design-based F*; p value*	Central & Nairobi	Coast & N. Eastern	Eastern	Nyanza & Western	Rift valley	*Chi2; Design-based F*; p value*	Public	Private for Profit	Private not for profit	*Chi2; Design-based F*; p value*	Number of facilities
Facility with FP or Gynaecology unit	82.0	77.3	85.3	88.0	100.0	100.0	4.28; 1.79; p>0.1	70.0	82.7	88.1	83.7	83.6	4.96; 0.79; p>0.1	84.6	79.1	73.7	3.12; 0.89; p>0.1	238
Average No. of staff trained to offer PAC¥	2.129 (1.853–2.404)	0.982 (0.706,1.259)	2.101 (1.711,2.491)	4.954 (3.794,6.114)	14.716 (8.04,21.392)	35 (25.157,44.843)	F = 823.95; Prob > F = 0.0000	2.853 (2.13,3.577)	2.513 (1.679,3.348)	2.954 (1.678,4.231)	1.779 (1.27,2.288)	1.604 (1.093,2.115)	F = 70.30; Prob > F = 0.0000	1.915 (1.598,2.231)	2.944 (2.113,3.776)	2.21 (1.358,3.061)	F = 133.37; p< = 0.001	281
PAC-trained staff always available	42.4	33.6	51.0	47.1	79.6	100.0	9.10; 3.39; p<0.05	65.2	47.2	50.1	31.0	37.3	14.92; 2.70; p<0.05	40.8	53.7	36.9	3.13; 1.05; p>0.1	144
FP availability																		
Offers effective FP and non-effective methods	70.0	54.0	85.2	82.7	93.8	50.0	34.99; 5.88; p<0.001	92.0	59.9	64.1	75.0	61.9	18.62;1.72; p>0.1	71.1	77.3	57.2	35.92; 5.28; p<0.001	218
Offers non-effective methods only	27.9	44.1	13.2	12.9	6.2	50.0		8.0	34.7	33.6	25.0	34.6		28.9	22.7	28.6		57
No methods offered	2.1	1.9	1.6	4.4	0.0	0.0		0.0	5.4	2.3	0.0	3.5		0.0	0.0	14.2		6
To whom FP counselling is offered ALWAYS																		
Everyone	80.6	75.1	85.9	84.9	87.7	100.0	5.05; 1.95; p>0.1	80.2	99.2	80.8	87.9	62.3	30.41; 6.96; p<0.001	78.5	93.8	76.0	6.27; 2.23; p>0.1	236
Those who have many children	82.6	79.3	85.9	84.9	87.7	100.0	2.00; 0.77; p>0.1	80.2	99.2	80.8	87.9	69.4	20.62; 4.69; p<0.005	81.4	93.8	76.0	5.50; 1.98; p>0.1	238
Those who are married	83.8	79.3	89.0	84.9	87.7	100.0	4.09; 1.62; p>0.1	80.2	99.2	80.8	87.9	73.3	16.24; 3.64; p<0.05	82.2	93.8	79.7	4.24; 1.49; p>0.1	240
Those who are of an older age	80.6	75.1	85.9	84.9	87.7	100.0	5.04; 1.95; p>0.1	80.2	99.2	80.8	87.9	62.3	30.41; 6.96; p<0.001	78.5	93.8	76.0	6.27; 2.23; p>0.1	236
Topics covered in FP counselling																		
Instructions on correct use of all methods	64.6	62.4	67.3	63.4	85.8	100.0	1.15; 0.42; p>0.1	74.7	85.3	67.8	51.3	59.9	18.15; 3.45; p<0.05	69.1	68.4	38.2	14.25; 4.62; p<0.05	189
Instructions on available methods	82.9	78.0	88.2	84.4	93.8	100.0	4.53; 1.68; p>0.1	87.9	86.3	86.9	88.6	70.0	12.30; 1.99; p>0.1	85.7	84.3	67.9	7.45; 2.03; p>0.1	242
Instructions on traditional methods only	8.4	10.7	4.9	9.6	6.2	0.0	2.63; 0.99; p>0.1	2.2	12.7	8.5	12.8	3.8	7.43; 1.19; p>0.1	8.4	0.0	18.1	9.24; 2.77; p<0.1	20
Advantages & disadvantages of each	78.3	75.9	79.6	81.6	93.8	100.0	1.18; 0.45; p>0.1	86.9	75.5	71.6	75.5	81.4	3.60; 0.63; p>0.1	77.0	87.5	73.6	3.03; 1.19; p>0.1	226
What to do with method failure or forgetting pills	19.7	22.1	19.0	13.7	32.7	0.0	1.79; 0.663; p>0.1	22.1	32.0	1.2	7.7	31.8	25.99; 4.97; p<0.005	20.1	21.2	16.3	0.38; 0.11; p>0.1	53
Abstinence	8.3	3.9	11.1	14.3	20.4	0.0	6.88; 2.09; p>0.1	7.8	7.3	3.1	16.4	2.1	12.30; 2.84; p<0.05	6.1	1.3	27.1	22.83; 12.05; p<0.001	25
General FP	8	5.1	9.9	12.4	0.0	0.0	3.30; 1.11; p>0.1	9.8	0.8	2.7	9.2	12.3	6.72; 1.65; p>0.1	6.7	7.2	15.1	3.22; 0.97; p>0.1	24
Dangers of abortion	6.7	6.3	9.2	1.5	24.7	0.0	3.96; 1.30; p>0.1	3.3	0.0	6.1	7.7	11.9	7.50; 1.27; p>0.1	7.5	2.3	8.0	1.81; 0.74; p>0.1	16
Need for follow up visits	4.5	8.9	0.4	1.4	0.0	50.0	12.04; 7.60; p<0.001	0.0	0.3	0.0	0.1	16.4	33.73; 9.96; p<0.001	6.1	0.3	2.2	3.54; 4.38; p<0.05	9
Duo-approach for FP/STI/HIV	9.5	8.6	11.1	8.7	0.0	0.0	0.69; 0.24; p>0.1	5.5	0.8	0.0	20.7	8.2	20.74; 5.14; p<0.005	12.6	0.0	5.9	7.63; 2.59; p<0.1	21
Total	100	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0		281

¥ Pr(|T| > |t|) based on student t-test for means.

* Rao and Scott second-order corrected Pearson statistic.

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patients: about 80.6% of facilities reported always offering FP to all PAC patients, but only 62.3% reported doing so in the Rift Valley.

On topics covered when counseling PAC patients for FP, the majority of the facilities (82.6%) reported covering instructions on available methods of FP, while only 19.7% of facilities reported coverage of patient remedy in case of method failures.

Among all 2,568 patients managed for post-abortion complication in health facilities, 91.8% (2,358) reported receiving counseling on family planning. However, only about 55.5% (1,424) received a modern method of family planning, while, 46.4% received short-acting methods, among them pills (18.2%), injectable contraceptives (22.5%), and condoms (6.6%). Further, only 9.1% (233) received a highly effective method of family planning. As shown in Table 3, 45.3% of all patients did not receive any contraceptive method after treatment for complications from unsafe abortion.

Table 3. Description of patients treated for PAC in healthcare facilities according to type of contraceptive method received, by facility characteristics, 2012.

	% No method	% Less-effective	% Highly effective	% Total	Chi^2; Design-based F*; p value	Number of women
Health facility Characteristics						
Overall	45.3	45.6	9.1	100		2,568
Facility level						
Level 2	38.9	51.2	10.0	100.0	48.7; 1.06; p>0.1	231
Level 3	49.1	40.5	10.4	100.0		796
Level 4	49.2	42.6	8.2	100.0		835
Level 5	39.8	58.5	1.7	100.0		530
Level 6	31.3	67.0	1.7	100.0		176
Region						
Central & Nairobi	46.1	41.4	12.5	100.0	103.0; 2.26; p<0.05	839
Coast & N. Eastern	50.3	44.9	4.8	100.0		337
Eastern	64.0	32.0	3.9	100.0		363
Nyanza & Western	33.4	55.3	11.3	100.0		505
Rift valley	50.6	42.9	6.6	100.0		524
Ownership						
Public	42.0	50.6	7.3	100.0	51.0; 1.96; p>0.1	1,683
Private for Profit	51.6	35.2	13.2	100.0		462
Private not for profit	49.8	40.0	10.2	100.0		423
Facility with FP or Gynae unit						
No Facilities	54.5	36.0	9.4	100.0	15.2; 0.92; p>0.1	219
Facilities	43.9	47.1	9.0	100.0		2,349
PAC-trained staff always available						
Not always available	44.8	47.1	8.1	100.0	3.6; 0.27; p>0.1	907
Always available	45.8	44.3	9.9	100.0		1,661
Average No. of staff trained to offer PAC¥	4.42 (3.13–5.72)	4.47 (3.14–5.79)	3.06 (1.84–4.28)	4.32 (3.37–5.27)		2,568
No. of women	**1,144**	**1,191**	**233**	**2,568**		**2,568**

¥ Pr(|T| > |t|) based on student t-test for means.

* Rao and Scott second-order corrected Pearson statistic

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The use of highly effective contraception was most common in Level II and III facilities (10.0% and 10.4% respectively), followed closely by level IV facilities (8.2%). Slightly under two percent of PAC patients treated at level V and VI facilities received a highly effective contraceptive method. Use of highly effective contraceptive methods was higher in Nairobi/Central and Nyanza/ Western regions (12.5% and 11.3% respectively) than elsewhere. Private for-profit facilities and private not-for-profit facilities had higher rates of highly effective contraception (13.2% and 10.2% respectively).

In order to explore the factors that influenced uptake of highly effective contraception, we fitted multilevel (mixed-effects) model, with two levels of variability; at woman and facility level and county level [30]. The results are presented in four models in Table 4. Model 0 presents results from a bivariate Bayesian mixed-effects ordered logit model of the three-level outcome defined as whether a PAC patient received a highly effective contraceptive method of, a less effective method or whether a patient did not receive any method at all on each patient, facility and county characteristics covariates. Models 1 and 2 present results from an unstructured Bayesian multivariable mixed-effects ordered logit model of the outcome on all covariates, fitted in Stata and BUGs environments respectively. Model 3 was structured, including the county spatial random effects, with conditional autoregressive structure. The final model (Model 4), the results of which are discussed in this article, was a convolution model, with both county non-spatial random effects in model 2 and spatial random effects in model 3 [24]. The model exhibited the lowest DIC value of 3797.0.

At the patient level, age, marital status, occupation, religion, the severity of complications following abortion, gestational age of pregnancy, gravidity, history of previous abortion, contraceptive use before index pregnancy, and fertility intentions at the time of pregnancy, were all significant factors associated with adoption of a highly effective contraceptive method.

Older women exhibited lower odds of adoption, while those who were previously married but were not married at the time of the interview had higher odds of adoption. Compared to farmer or unskilled employment, women who were engaged in skilled income-generating activities, students, and unemployed women had lower odds of adoption. Muslims and Catholics had lower odds than non-religious women or women from other Christian denominations. Women who presented with moderately severe complications had higher odds of adoption while women with severe complications and those who presented with second-trimester abortions had lower odds of adoption of a highly effective contraceptive method. When we controlled for spatial random effects, the above patient-level characteristics did not show significant influence on the outcome. However, the odds of adoption were higher for patients with previous abortions and past experience with modern contraceptives (81.8% and 63.7%). Patients who wanted to delay or prevent future pregnancies had about 51.9% and 60.5% higher odds respectively of receiving a highly effective method.

At the facility level, women receiving PAC services in hospitals designated at Levels IV-VI had about 55.0% lower odds of receiving a highly effective contraceptive method compared to those treated for PAC in health centers and clinics (Levels II-III). For a facility with a separate procedure room where PAC services were managed for evacuation, PAC patients were 2.9 times as likely to receive a highly effective method compared with patients treated in facilities without such a procedure room, while patients treated in public facilities were 2.6 times as likely to receive a highly effective method compared to their counterparts in private facilities. Being treated in facilities with obstetrics/gynecology specialists increased the odds of receiving a highly effective method by 67.2%, while patients treated in facilities that perceived PAC services as a burden to their healthcare provision had 36.2% higher odds of adoption. These two relationships were insignificant upon inclusion of spatial effects in the model.

Table 4. Mixed-effects odds of PAC patients adopting a highly effective contraceptive method in healthcare facilities in Kenya.

		STATA MODEL 0 Bivariate women, facility and county level characteristics	STATA MODEL 1 Unstructured women, facility and county-level characteristics	BUGS MODEL 2: Unstructured Ordered Logit Model	BUGS MODEL 3: Structured Ordered Logit Model	BUGS MODEL 4: Convolution model
		OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]
Patient characteristics						
Age category: Ref (10-19yrs)	20-29yrs	0.884(0.086) [0.707–1.098]	**0.907(0.010) [0.886–0.932]**	0.868(0.172) [0.622–1.214]	0.868 (0.172) [0.622–1.214]	0.868(0.172) [0.622–1.214]
	30 +yrs	1.242(0.114) [1.013–1.536]	**0.849(0.024) [0.800–0.908]**	0.822(0.188) [0.571–1.186]	0.822 (0.188) [0.571–1.186]	0.822(0.188) [0.571–1.186]
Marital status: Ref (Never married)	Married/Living together	1.042(0.106) [0.835–1.299]	0.984(0.032) [0.924–1.066]	1.192(0.154) [0.881–1.599]	1.192 (0.154) [0.881–1.599]	1.192(0.154) [0.881–1.599]
	Divorced	1.476(0.277) [0.939–2.197]	**1.225(0.054) [1.133–1.371]**	1.249(0.226) [0.796–1.942]	1.249 (0.226) [0.796–1.942]	1.249(0.226) [0.796–1.942]
Education: Ref (No education)	Primary	0.955(0.094) [0.773–1.175]	0.831(0.086) [0.687–1.053]	0.881(0.274) [0.519–1.506]	0.881 (0.274) [0.519–1.506]	0.881(0.274) [0.519–1.506]
	Secondary	0.916(0.086) [0.732–1.114]	0.939(0.086) [0.795–1.186]	0.897(0.289) [0.508–1.558]	0.897 (0.289) [0.508–1.558]	0.897(0.289) [0.508–1.558]
	Post-secondary	1.308(0.166) [0.981–1.743]	1.158(0.089) [0.983–1.385]	1.155(0.324) [0.607–2.135]	1.155 (0.324) [0.607–2.135]	1.155(0.324) [0.607–2.135]
Occupation: Ref (Farmer/unskilled)	Skilled/clerical	1.388(0.142) [1.105–1.733]	**0.915(0.021) [0.87–0.960]**	1.072(0.155) [0.791–1.448]	1.072 (0.155) [0.791–1.448]	1.072(0.155) [0.791–1.448]
	Student	0.814(0.106) [0.602–1.066]	**0.718(0.038) [0.633–0.807]**	0.775(0.209) [0.513–1.168]	0.775 (0.209) [0.513–1.168]	0.775(0.209) [0.513–1.168]
	Unemployed/ housewife	0.779(0.081) [0.619–0.985]	**0.793(0.034) [0.714–0.857]**	0.823(0.134) [0.633–1.064]	0.823 (0.134) [0.633–1.064]	0.823(0.134) [0.633–1.064]
Religion: Ref (Roman Catholic)	Other Christian	1.020(0.105) [0.807–1.278]	0.936(0.034) [0.870–1.024]	0.985(0.115) [0.786–1.239]	0.985 (0.115) [0.786–1.239]	0.985(0.115) [0.786–1.239]
	Muslim	0.563(0.127) [0.342–0.917]	**0.599(0.02) [0.559–0.650]**	0.609(0.256) [0.369–1.014]	0.609 (0.256) [0.369–1.014]	0.609(0.256) [0.369–1.014]
	Other religion	2.464(1.113) [0.842–5.718]	**1.745(0.066) [1.612–1.896]**	2.17(0.448) [0.91–5.165]	2.17 (0.448) [0.91–5.165]	2.17(0.448) [0.91–5.165]
Severity level[β]:: Ref (Mild)	Moderate	1.125(0.112) [0.896–1.408]	**1.268(0.048) [1.175–1.373]**	1.029(0.127) [0.801–1.321]	1.029 (0.127) [0.801–1.321]	1.029(0.127) [0.801–1.321]
	Severe	0.840(0.091) [0.654–1.044]	0.975(0.073) [0.814–1.139]	0.777(0.14) [0.587–1.023]	0.777 (0.14) [0.587–1.023]	0.777(0.14) [0.587–1.023]
Gestational age: Ref (First trimester)	Second trimester	0.827(0.083) [0.664–1.050]	**0.861(0.049) [0.759–0.977]**	0.904(0.104) [0.737–1.11]	0.904 (0.104) [0.737–1.11]	0.904(0.104) [0.737–1.11]
Gravidity: Ref (Paragravida) [§]	Multigravida	1.224(0.109) [1.017–1.501]	**1.213(0.076) [1.049–1.395]**	1.202(0.142) [0.906–1.587]	1.202 (0.142) [0.906–1.587]	1.202(0.142) [0.906–1.587]
	Grand multigravida	1.245(0.151) [0.940–1.656]	**1.266(0.057) [1.143–1.369]**	1.311(0.199) [0.884–1.94]	1.311 (0.199) [0.884–1.94]	1.311(0.199) [0.884–1.94]
Previous abortions: Ref (None)	One or more	2.154(0.420) [1.329–3.212]	**1.950(0.100) [1.712–2.161]**	**1.818(0.209) [1.206–2.748]**	1.818 (0.209) [1.206–2.748]	**1.818(0.209) [1.206–2.748]**
Contraception: Ref (Not using modern)	Using modern	1.898(0.202) [1.503–2.386]	**1.756(0.067) [1.613–1.912]**	**1.637(0.113) [1.312–2.042]**	1.637 (0.113) [1.312–2.042]	**1.637(0.113) [1.312–2.042]**
Pregnancy wantedness: Ref (Wanted then)	Wanted later	1.343(0.143) [1.054–1.700]	**1.358(0.050) [1.252–1.478]**	**1.519(0.131) [1.169–1.961]**	1.519 (0.131) [1.169–1.961]	**1.519(0.131) [1.169–1.961]**
	Did not want	1.285(0.131) [1.004–1.608]	**1.314(0.025) [1.259–1.371]**	**1.605(0.142) [1.22–2.124]**	1.605 (0.142) [1.22–2.124]	**1.605(0.142) [1.22–2.124]**
Referred: Ref (Not referred)	Referred	1.130(0.114) [0.889–1.406]	1.062(0.033) [0.99–1.136]	1.064(0.107) [0.864–1.314]	1.064 (0.107) [0.864–1.314]	1.064(0.107) [0.864–1.314]

(*Continued*)

Table 4. (Continued)

		STATA MODEL 0 Bivariate women, facility and county level characteristics	STATA MODEL 1 Unstructured women, facility and county-level characteristics	BUGS MODEL 2: Unstructured Ordered Logit Model	BUGS MODEL 3: Structured Ordered Logit Model	BUGS MODEL 4: Convolution model
		OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]	OR (SD) [2.5%–97.5% Cr. I]
Facility characteristics						
	Level of facility 4–5 (Ref: Level 2–3)	0.572(0.150) [0.323–0.967]	**0.430(0.023) [0.375–0.466]**	**0.45(0.317) [0.246–0.847]**	0.45 (0.317) [0.246–0.847]	**0.45(0.317) [0.246–0.847]**
	Public (Ref: Private)	1.231(0.359) [0.628–2.188]	**2.784(0.148) [2.428–3.078]**	**2.604(0.295) [1.456–4.591]**	2.604 (0.295) [1.456–4.591]	**2.604(0.295) [1.456–4.591]**
	Facility has evacuation room	2.911(0.440) [2.051–4.111]	**3.340(0.106) [3.106–3.582]**	**2.921(0.161) [2.144–4.035]**	2.921 (0.161) [2.144–4.035]	**2.921(0.161) [2.144–4.035]**
	Ob-gyn (Ref: None)	1.044(0.306) [0.498–1.918]	**1.672(0.039) [1.581–1.75]**	1.125(0.32) [0.608–2.136]	1.125 (0.32) [0.608–2.136]	1.125(0.32) [0.608–2.136]
	Facility has maternity services	0.384(0.159) [0.159–0.783]	**0.613(0.019) [0.577–0.656]**	**0.423(0.364) [0.205–0.869]**	0.423 (0.364) [0.205–0.869]	**0.423(0.364) [0.205–0.869]**
	Burden of PAC to facility (Ref: Not burden)	1.588(0.377) [0.983–2.629]	**1.362(0.095) [1.182–1.595]**	1.456(0.274) [0.839–2.522]	1.456 (0.274) [0.839–2.522]	1.456(0.274) [0.839–2.522]
	No. of PAC trained providers	-	-	1.007(0.173) [0.715–1.433]	1.007 (0.173) [0.715–1.433]	1.007(0.173) [0.715–1.433]
	Trained PAC SP always available (Ref: Not)	1.375(0.462) [0.687–2.666]	1.052(0.053) [0.940–1.164]	1.039(0.307) [0.571–1.912]	1.039 (0.307) [0.571–1.912]	1.039(0.307) [0.571–1.912]
	Number of FP methods available	1.247(0.065) [1.098–1.379]	**1.130(0.020) [1.086–1.175]**	**1.191(0.071) [1.041–1.378]**	1.191 (0.071) [1.041–1.378]	**1.191(0.071) [1.041–1.378]**
	Quality of PAC at facility	1.000(0.001) [0.998–1.001]	0.998(0.001) [0.996–1.000]	0.999(0.001) [0.997–1.001]	0.999 (0.001) [0.997–1.001]	0.999(0.001) [0.997–1.001]
County characteristics						
	Level of unmet need for FP	1.005(0.023) [0.970–1.063]	1.004(0.018) [0.965–1.046]	1.007(0.026) [0.959–1.06]	1.007 (0.026) [0.959–1.06]	1.007(0.026) [0.959–1.06]
	% of exposure to FP on radio	1.006(0.005) [0.996–1.016]	1.005(0.004) [0.996–1.014]	1.007(0.005) [0.996–1.017]	1.007 (0.005) [0.996–1.017]	1.007(0.005) [0.996–1.017]
	% of ANC attended by skilled SP	1.027(0.009) [1.010–1.047]	0.981(0.014) [0.950–1.011]	**0.962(0.012) [0.943–0.993]**	0.962 (0.012) [0.943–0.993]	**0.962(0.012) [0.943–0.993]**
	% tetanus vaccine	1.016(0.009) [1.001–1.039]	1.007(0.011) [0.982–1.032]	1.015(0.018) [0.984–1.048]	1.015 (0.018) [0.984–1.048]	1.015(0.018) [0.984–1.048]
	Natural log of county budget allocation to health	1.136(0.041) [1.050–1.218]	1.050(0.057) [0.958–1.190]	1.114(0.077) [0.939–1.237]	1.114 (0.077) [0.939–1.237]	1.114(0.077) [0.939–1.237]
	% reporting lack of food in last 7 days	1.000(0.008) [0.985–1.020]	0.995(0.008) [0.977–1.013]	0.995(0.009) [0.978–1.013]	0.995 (0.009) [0.978–1.013]	0.995(0.009) [0.978–1.013]

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For patients treated at facilities that offered maternity services in addition to PAC, the odds of adopting a highly effective method were lower by 57.7%. In all facilities, every additional modern contraceptive method available increased PAC patients' odds of receiving a highly effective method by 19.1%.

Figs 1 and 2 show the spatial distribution of the posterior means and medians respectively, of the odds of receiving a highly effective method overlaid on a map showing all counties in Kenya. The aim was to identify any geographical patterns in the county level effects on adoption of a highly effective contraceptive method.

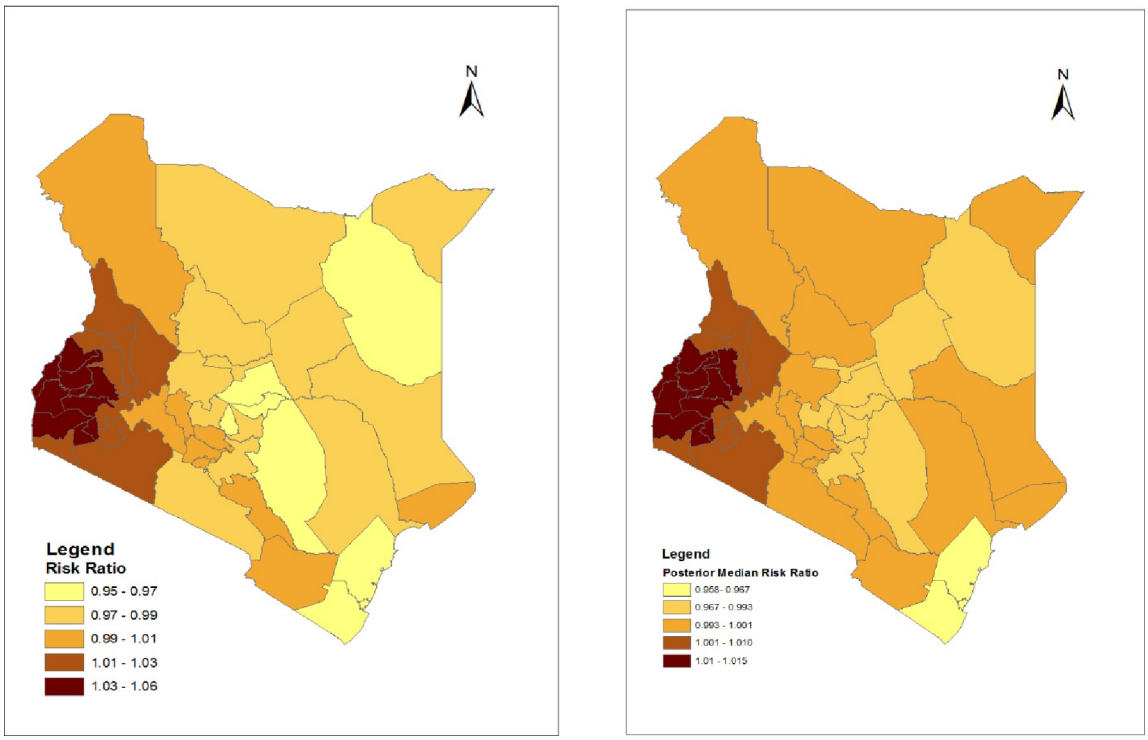


Fig 1. Structured and unstructured (convolution) spatial effect on odds of adoption of a highly effective contraceptive method-Posterior mean risk ratios.

https://doi.org/10.1371/journal.pone.0214049.g001

The county posterior means and medians from the convolution model show that adoption of highly effective family planning for PAC patients was highest in the lake basin counties of Siaya, Homa Bay, Kisumu, Nyamira, Busia and Bungoma. Counties neighboring these also showed relatively high rates of adoption of highly effective contraception, and this holds for both the posterior means and the medians.

Discussion

Post-abortion contraception plays a critical role in the provision of quality PAC services. This role is often compromised by not offering contraceptive methods that are highly effective in preventing unwanted and unintended pregnancies [5]. Although most studies have differed substantially, there is compelling evidence that effective post-abortion contraception can drastically reduce the risks of repeat abortions [17,31].

A significant number of patients observed during this study were treated in Level II facilities (37.6% in dispensaries). The majority (68.5%) of these patients were treated in government-owned facilities, signifying the role that the public healthcare system could play in providing quality PAC services in Kenya. As Thompson and colleagues [32] show, it is imperative that government policies on contraception have an impact on the level of quality for PAC services offered. Among these are policies that restrict access to certain services through certain regulatory requirements for training of service providers and the costs of service. At time of writing, only medical doctors, gynecology specialists, clinicians or registered comprehensive nurses are permitted to offer PAC service. This restricts access to quality PAC services in Level II facilities [33], even though a significant proportion of women receiving PAC were treated in these lower-level facilities. In our case, private facilities lagged behind public facilities in the provision of highly effective contraception.

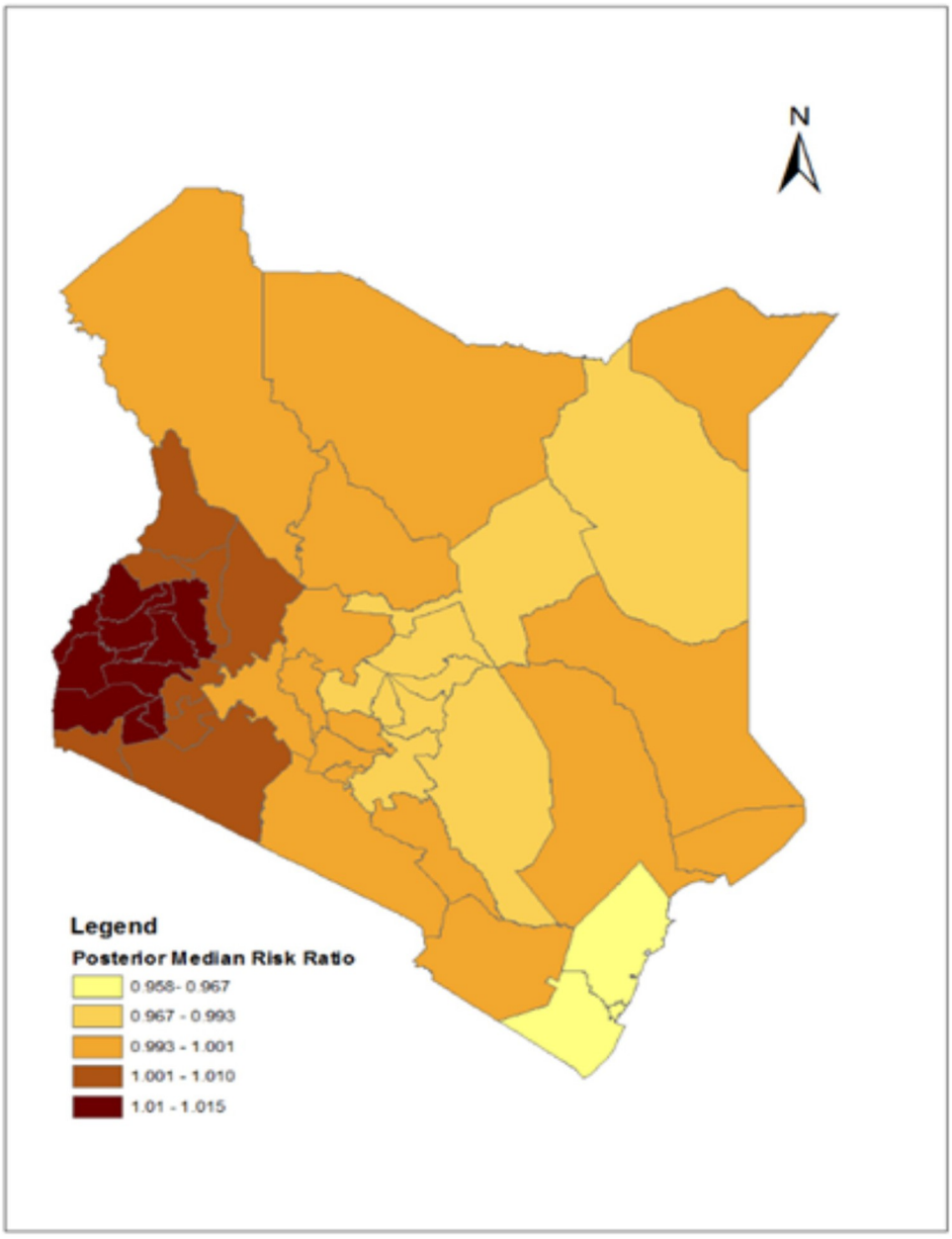


Fig 2. Structured and unstructured (convolution) spatial effect on odds of adoption of a highly effective contraceptive method- Posterior median risk ratios.

https://doi.org/10.1371/journal.pone.0214049.g002

The capacity of service providers to offer PAC including effective contraceptive counseling is essential in adhering to the principles of quality PAC. The average duration of service of the main PAC provider in the facility was reasonably high, with signs that could translate to more women adopting long-acting contraceptive methods post-care, even though this was not significant. We established that PAC trained staff were not always available to offer PAC services, indicating that effective contraception does not necessarily depend on the training of healthcare providers, but also ensuring their availability for actual PAC service delivery in these facilities. In addition, specialist service providers play a relatively important role in the adoption of

highly effective contraception [16]. The adoption of long-acting reversible and permanent contraceptive methods is dependent on the service provider's capacity to offer these methods during PAC [34].

Service integration is a way to increase the adoption of contraceptive services, by providing these services to PAC patients in a manner that minimizes loss to follow-up [4]. In this study, we established low uptake of highly effective family planning methods in facilities that offered maternity services, indicating the need to identify areas of operational synergy between PAC, family planning and maternity care [35]. Similarly, we established that patients treated in larger hospitals (Level IV-VI) were less likely to receive effective contraceptive methods after PAC. It has been demonstrated elsewhere that integrating PAC services with family planning reduces unsafe abortion by eliminating the risk of repeat abortion and increasing adoption of more effective contraceptives [36], and this has been a particular challenge in large hospitals, mainly due to poor patient follow-up especially when PAC and FP services are not offered under the same roof [37]. At a more contextual level, this call for service, including maternity care, is demonstrated further by the negative association between the community level of ANC service utilization and individual's likelihood of adopting a highly effective contraceptive method.

We demonstrated that improving the contraceptive options available for PAC patients was positively associated with the likelihood of women adopting highly effective contraceptive methods. The level of integration must be one that ensures that PAC patients are provided with contraceptives of their informed choice, and under the same roof, avoiding missed opportunities that occur when PAC and FP clinics are separate. This explains why PAC patients in larger hospitals were less likely to adopt highly effective contraceptives, compared to those served in lower-level facilities where these services are more likely collocated [36]. This was also demonstrated through the higher adoption of highly effective contraception in facilities with evacuation procedure rooms, where all PAC cases are managed, by improving the quality of service provider and patient interaction prior to, during and after the procedure [38].

Despite high adoption of contraception soon after treatment for PAC, methods such as condoms and pills, compared to longer-acting methods, fail on effectiveness and expose women to future unwanted pregnancies [39,40]. Together with the wide range of services available for PAC patient [41], women with improved decision-making capacity or independence, such as previous exposure to contraception, increased their adoption of highly effective family planning methods. Certain patient-related characteristics also influence this uptake, pointing to the importance of effective post-abortion contraceptive counseling that supports patients in making informed decisions on appropriate contraceptive methods. Religious affiliation, past exposure to contraceptive methods, and patient's fertility desires all play important roles in contraceptive decision-making and should be considered during post-abortion contraceptive counseling. The adoption of a highly effective family planning method begs for a concerted effort to improve the quality of interaction between the service provider and the patient, in a manner that ensures the final decision made by the patient is informed and reduces future exposure to unintended and unwanted pregnancies.

The maps present some interesting findings on spatial effects on highly effective contraception. Recent national estimates of contraceptive prevalence have shown significant increases in the use of long-acting reversible contraceptives and this is corroborated by our findings. According to the Kenya Demographic and Health Survey 2014, Western and Nyanza regions had the highest rates of use of highly effective family planning, especially implants (15.2% and 12.4% respectively reported that they were using implants), higher than all other regions. These counties do not have the highest rates of IUCD prevalence, pointing to the key role of implants in the prevention of unwanted pregnancy [13]. There has been a major investment in

FP programs in Western and Nyanza regions of Kenya, leading to improved contraceptive uptake [42–44]. In addition, these regions have experienced substantial investments in HIV/AIDS prevention and treatment in the past decade [45]. HIV/AIDS and FP services are being integrated in the region [46], explaining in part the high uptake of highly effective contraception.

The main limitation of this study relates to the design of the parent study on which the data are based. This study was facility-based and in most of the cases, data are not representative of the general population. This negatively affects the ability to generalize its findings to the general population of women with post-abortion complications, given the low utilization of healthcare services in Kenya.

The availability of abortifacients which have become more readily available in the drugs market [47] may have reduced the number of patients seeking care for induced abortion. At analysis, we could not establish the actual placement of patients' place of residence and the role of distance to care in the relationship between patient and facility characteristics on one side, and the adoption of highly effective contraceptive methods on the other. Finally, data used in this study were collected by trained service providers during and after treatment for complications and responses may have been subject to provider bias, and to Hawthorne effects on service providers' participation in the study, with service providers acting correctly because they knew that they were being observed.

Conclusion

Improving the reproductive health of PAC patients requires considerable efforts at policy, service delivery, and individual levels. These efforts must aim to empower patients to make an informed choice of whether to use contraception and to choose the type of contraception which best suits their reproductive needs. At the policy level, there is a need to focus on service provider skills that are sensitive to patients' needs and ability to make decisions, and on barriers that influence choice. Widespread service provider empowerment through capacity building for PAC, infrastructural improvement, and contraceptive commodity options, and their secured availability, are paramount in ensuring that they can interact better with patients and can deliver quality PAC services. Together with their availability to offer PAC, service providers can achieve these desirable contraceptive outcomes through effective counseling and contraception to reduce the risks of method failure. This can be attained by opting for methods whose effectiveness are less dependent on patient compliance, such as pills, condoms and injectable contraceptives, and focusing on methods with guaranteed effectiveness soon after a PAC procedure. At the patient level, effective counseling of PAC patients requires understanding the patient's past experience with contraception and future fertility intentions and desires, in order to meet their needs more specifically. Finally, family planning integration with PAC will ultimately reduce missed opportunities, while promising improved reproductive health outcomes of post-abortion care patients. The potential relationship between the spatial effects on uptake of effective contraception, showing a higher uptake in regions with more health interventions in HIV/AIDS treatment and prevention presents an opportunity for further investigation.

Appendix A: Model specification

Appendix A1: A Model specification for ordered categorical data

Our outcome variable is defined as whether a PAC patient received a highly effective contraceptive method (2), or a less effective contraceptive method (1), or whether they did not receive any method at all (0), and is ordinal in nature. In addition, patients treated in a

particular facility are more likely to have more similar characteristics compared to patients treated in other facilities. Similarly, facilities in one county are likely to have certain characteristics that make them more similar than facilities in other counties while counties close by are likely to exhibit similar characteristics compared to counties that are far apart. We use hierarchical ordered logit models in our analysis, with two levels of random variation by facility and county. The ordinal logit model is developed from the general form of the binomial models given as;

$$L(x_{ifj}, y_{ifj}|p_{ifj}) = L\{Y_{ifj} = y_{ifj}\} = \binom{r_{ifj}}{y_{ifj}} p_{ifj}^{y_{ifj}}(1-p_{ifj})^{r_{ifj}-y_{ifj}} \quad (1)$$

In ordinal logit regression, the event of interest is observing a particular contraceptive use or less.

Suppose $k = 0, 1, 2$ are the ordered categories of contraceptive use, the odds for each category are defined as follows;

$$p_1 = \text{prob(contraceptive adoption } 0)/\text{prob(contraceptive adoption} > 0)$$

$$p_2 = \text{prob(contraceptive adoption or } 1)/\text{prob(contraceptive adoption} > 1)$$

$$p_3 = \text{prob(contraceptive adoption or or } 2)/\text{prob(contraceptive adoption} > 2)$$

In general, this can be described in the form

$$p_k = \text{prob(contraceptive adoption} \leq k)/\text{prob(contraceptive adoption} > \text{k}) \quad (2)$$

Let $\boldsymbol{y_{ij}}$ denote the ordinal contraceptive use for patient i from a facility in county j. In general, the probability that a patient response will fall in a category higher than k is;

$$Pr(\boldsymbol{y_{ij}} > k \mid \boldsymbol{X_{ij}}, k, \mu_j) = H(\boldsymbol{X_{ij}\beta} + \boldsymbol{z_{ij}\mu_j} - k_k) \quad (3)$$

Where $j = 1, 2, 3, \ldots, 47$ are the counties consisting of $i = 1, 2, 3, \ldots, n_j$ patient observations in county j. The cut points k are labelled $k_1, k_2, k_3, \ldots, k_{k-1}$ for k possible outcomes. $\boldsymbol{X_{ij}}$ are the fixed predictors in the model with regression coefficients $\boldsymbol{\beta}$. These $\boldsymbol{X_{ij}}$ predictors do not contain the constant term since the cut-off points absorb the effects of the constant term. The random effects μ_j are assumed to have a multivariate normal distribution.

Without loss of generality, the probability of an observation for an ordered logit model with county- level random effects μ_j can be defined as follows with the error term included;[48]

$$p_{ij} = Pr(\boldsymbol{y_{ij}} > k \mid \boldsymbol{X_{ij}}, k, \mu_j) = Pr(k_{k-1} < n_j + \epsilon_{ij} \leq k_k) \quad (4)$$

Rearranging the terms in the above model gives;

$$p_{ij} = prob(k_{k-1} - n_j < \epsilon_{ij} \leq k_k - n_j) = prob\ (\epsilon_{ij} \leq k_k - n_j) - prob\ (\epsilon_{ij} \leq k_{k-1} - n_j)$$

Replacing the $Pr\left(y_{ij} > k\right)$ part in the above equation gives;

$$Pr\ (y_{ij} = k \mid k, \mu_j) = H(k_k - \boldsymbol{X_{ij}\beta} - z_{ij}\mu_j) - H(k_{k-1} - \boldsymbol{X_{ij}\beta} - z_{ij}\mu_j) \quad (5)$$

The above probability function can also be written in terms of latent linear response as;

$$y_{ij}^{*} = \boldsymbol{X_{ij}\beta} + z_{ij}\mu_j + \epsilon_{ij} \text{ and}$$

$$y_{ij} = \begin{cases} 1 & if\ y^{*}_{ij} \leq k_1 \\ 2 & if\ k_1 \leq y^{*}_{ij} \leq k_2 \\ 3 & if\ k_2 \leq y^{*}_{ij} \leq k_3 \\ & . \\ & . \\ & . \\ K & if\ k_{K-1} \leq y^{*}_{ij} \end{cases}$$

Where the errors ϵ_{ij} follow a logistic distribution, gives the ordered logit model and are independent of the random effects. Thus in terms of the binomial distribution and logit model can be written as;

$$Pr(y_{ij} = k \mid k,\ \mu_j) = \frac{1}{1 + exp(-k_k + n_{ij})} - \frac{1}{1 + exp(-k_{k-1} + n_{ij})} \tag{6}$$

Where $n_{ij} = x_{ij}\beta + z_{ij}\mu_j$, k_0 is defined as $-\infty$ and k_k is defined as $+\infty$.

Within the j counties, $j = 1, 2, 3, \ldots, m = 47$ the outcome variable has a conditional distribution of $y_{ij} = \left(y_{j1},\ y_{j2}, y_{j3},\ \ldots, y_{jn_j}\right)'$ given the county random effects μ_j, which is defined as;

$$L(y_j \mid k, u_j) = \prod_{i=1}^{n_j} p_{ij}^{I_k(y_{ij})} \tag{7}$$

And taking the natural logarithms and replacing p_{ij} with its likelihood is expressed as follows'

$$\text{Log}\ \{L\ (y_j \mid k, u_j)\} = \exp \sum_{i=1}^{n_j} \{I_k(y_{ij}) \ln(p_{ij})\}$$

$$= exp \sum\nolimits_{i=1}^{n_j} \left\{ I_k(y_{ij})\ ln\ \left[\frac{1}{1 + exp(-k_k + n_{ij})} - \frac{1}{1 + exp(-k_{k-1} + n_{ij})} \right] \right\} \tag{8}$$

Where;

$$I_k(y_{ij}) = \begin{cases} 1 & if\ y_{ij} = k \\ 0 & otherwise \end{cases} \text{ and } n_{ij} = \boldsymbol{X_{ij}\beta} + z_{ij}\mu_j$$

The full log-likelihood function is defined as;

$$\text{Log}\ \{L(y_{ij} \mid k, u_j)\} = exp \sum\nolimits_{i=1}^{n_j} \left\{ I_k(y_{ij})\ ln\ \left[\frac{1}{1 + \exp(-k_k + n_{ij})} - \frac{1}{1 + \exp(-k_{k-1} + n_{ij})} \right] \right\} \tag{9}$$

The prior distribution of μ_j is multivariate normal with mean zero and a 47 by 47 variance matrix $\sum_{47\times47}$. Thus the likelihood contribution for each county is obtained by integrating out

the random effects μ_j from the joint density $L\left(y_j|k,\mu_j\right)$ and can be given as;

$$L_j(\beta,k,\Sigma)=(2\pi)^{-q/2}\,|\Sigma|^{-1/2}\int L\,(y_j\,|k,\mu_j)\exp\left(-\frac{u_j'\Sigma^{-1}\mu_j}{2}\right)d\mu_j$$

$$=(2\pi)^{-q/2}|\Sigma|^{-1/2}\int exp\{h(\boldsymbol{\beta},k,\Sigma,\mu_j)\}d\mu_j \tag{10}$$

Where

$$h(\boldsymbol{\beta},k,\Sigma,\mu_j)=\sum_{i=1}^{n_j}\{I_k(y_{ij})\ln(p_{ij})\}-\frac{\mu_j'\Sigma^{-1}\mu_j}{2}$$

The above equation has no closed form. It can therefore be approximated for the maximum likelihood estimation using mean–variance adaptive Gauss–Hermite quadrature and Laplacian approximation crossed random-effects models.

The initial Bayesian models were fitted within Stata 14, but Stata does not cater for spatial random effects. Therefore, this is extended to the Bayesian framework such that the link function predictor n_{ij} is extended such that;

$$n_{ij}^{*}=\boldsymbol{X_{ij}\beta}+z_{ij}\mu_j+\epsilon_{ij},\text{letting } z_{ij}\vartheta_j=\upsilon_j+\phi_j$$

The spatial Bayesian model is defined as follows;

$$Posterior[p(parameters\,|data)]\alpha\ Likelihood\ \times\ Priors$$

The full conditional distribution for our model can be expressed as

$$p(\Phi\equiv\{\boldsymbol{\beta},\phi,\boldsymbol{v},\boldsymbol{X_{ij}}\}|y_{ij})\ \propto\ p(\Phi\,|y_{ij})=L(y_{ij},\boldsymbol{X_{ij}}\,|\Phi)\times p(\boldsymbol{\beta_k})\times p(\phi_j\,|\tau_c)\times p(\vartheta_j\mid\tau_h)$$

$$=L(y_{ij}|\Phi)\times p(\boldsymbol{\beta_k})\times\ p(\phi_j\,|\tau_c)\times p(\tau_c)\times p(\vartheta_j\mid\tau_h)\times p(\tau_h) \tag{11}$$

The prior for the beta coefficients in the model is $\beta_k\overset{iid}{\sim}N(\mu_\beta,\sigma_\beta^2)$, thus

$$p(\beta_k)=\frac{1}{\sqrt{2\pi\sigma_\beta^2}}exp\left[-\frac{1}{2}\left[\frac{\beta_k-\mu_\beta}{\sigma_\beta}\right]^2\right]$$

The unstructured random effects $p\left(\vartheta_j|\tau_h\right)$, where $\vartheta_j\overset{iid}{\sim}N\left[0,\ \frac{1}{\tau_h}\right]$ with a Gamma function prior used $\tau_h\sim Gamma(\alpha_h,\ \beta_h)$ as shown by Banerjee [49]

With a Gamma function prior used $\tau_h \sim Gamma(\alpha_h,\ \beta_h)$, then

$$p(\tau_h) = \frac{\beta_h^{\alpha_h}}{\Gamma(\alpha_h)}\tau_h^{\alpha_h - 1}\exp(-\beta_h\tau_h) \text{ for } \alpha_h > 0; \beta_h > 0$$

$$\text{Therefore } p(\vartheta_j|\tau_h) = \frac{1}{\sqrt{\frac{2\pi}{\tau_h}}} exp\left[-\frac{1}{2}\left[\frac{\vartheta_j - 0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right]$$

$$p(\vartheta_j|\tau_h) \times p(\tau_h) \propto \tau_h^{\alpha_h - 1}\exp(-\beta_h\tau_h) \times exp\left[-\frac{1}{2}\left[\frac{\vartheta_j - 0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right] \quad (12)$$

A Continuous Autoregressive (CAR) prior is used for the structured spatial random effects $\vartheta_j \sim CAR(\tau_c)$. The CAR prior is given as $\phi_j|\phi_i \neq i, \tau_c \sim N\left[\frac{\phi_j}{\phi_j},\ \frac{1}{\tau_c m_j}\right]$ and a conjugate hyper prior of $\tau_c \sim Gamma(\alpha_c, \beta_c)$ was assumed. Thus, as shown in Banerjee and Lawson [27,50];

$$p(\phi_j|\tau_c) = \frac{1}{\sqrt{\frac{2\pi}{\tau_c m_j}}} exp\left[-\frac{1}{2}\left[\frac{\phi_j - \frac{\phi_j}{\phi_j}}{\sqrt{\tau_c m_j}}\right]^2\right] \quad (13)$$

Within the spatial random effects model, it was considered that as much as facilities within one county are more similar to each other than to facilities in other counties, counties near each other are likely to have higher correlations than counties that are far away from each other. The likelihood of the neighbouring counties is therefore given as;

$P(\phi_j|\tau_c) \propto \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\}$ where w_{ij} denotes the adjacency matrix and the subscript ij shows that the county j is a neighbour of county i and m_j is the number of neighbours for county j. A Gamma distribution of the conjugate hyper prior $\tau_c \sim Gamma(\alpha_c, \beta_c)$ is used and whose distribution function can be shown as;

$$P(\tau_c) = \frac{(\beta_c)^{\alpha_c}}{\Gamma(\alpha_c)}\tau_c^{\alpha_c - 1}\exp(-\beta_c\tau_c),\ \text{for } \alpha > 0; \beta_h > 0,\ \text{thus;}$$

$$\text{since } p(\phi_j|\tau_c) \propto \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\},\ \text{then}$$

$$p(\phi_j|\tau_c) \times p(\tau_c) \ \propto\ \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n_j} w_{ij}(\phi_j - \phi_i)^2\right\} \quad (14)$$

Combining the equations above, a full conditional likelihood function for the spatial structured and unstructured model can be given as;

$$P(\Phi|y_{ij}) = L(y_{ij},\ x_{ij}\ |\Phi) \times p(\beta_k) \times p(\phi_j|\tau_c) \times p(\vartheta_j|\tau_h)$$

$$P(\Phi|y_{ij}) = exp\sum_{i=1}^{n_j} I_k(y_{ij}) \ln\left[\frac{1}{1+\exp(-k_k+n_j)} - \frac{1}{1+\exp(-k_{k-1}+n_j)}\right] \times \frac{1}{\sqrt{2\pi\sigma_\beta^2}} \exp\left[-\frac{1}{2}\left[\frac{\beta_k-\mu_\beta}{\sigma_\beta}\right]^2\right] \times \tau_r^{\alpha_{r-1}} \exp(-\beta_r\tau_r) \times \tau_h^{\alpha_{h-1}} \exp(-\beta_h\tau_h) \times exp\left[\frac{1}{2}\left[\frac{\vartheta_j-0}{\frac{1}{\sqrt{\tau_h}}}\right]^2\right] \times \exp\left\{-\frac{\tau_c}{2}\sum_{i=1}^{n} w_{ij}(\phi_j-\phi_i)^2\right\} \tau_c^{\alpha_{c-1}} \exp(-\beta_c\tau_c) \quad (15)$$

The above equation has no closed form and has to be approximated. The approximation of the parameters was done using Markov Chain Monte-Carlo (MCMC) with Metropolis-Hastings algorithms approach. For the bivariate models in Stata, a *burnin* and thinning of 1000 and 10 respectively were used, while the multivariable model as well as the structured and spatial models were fitted in WINBUGS. In this algorithm, *burnin* removes unstable values while *thinning* reduces the autocorrelation.

Goodness of fit

Goodness of fit for all ordered logit models presented in this paper was evaluated by comparing the Deviance Information Criteria (DIC) value for each model as defined in [24]

$DIC = D(\bar{u}) + p_D$ where $D(\bar{u})$ is the posterior deviance expectation with p_D effective parameters. The model that produced the smallest DIC value was considered to be better than its comparators with higher DIC.

Appendix B: Codes for the different analysis methods used in this study

Appendix B1:- STATA Bayesian MEOLOGIT models

B11. Bivariate patient level characteristics.

```
foreach x in age4_2 age4_3 marital_2 marital_3 education_2 education_3
education_4 occupation_2 occupation_3 occupation_4 religion_2 reli-
gion_3 religion_4 severity_2 severity_3 gestation_2 gravidity_2 gra-
vidity_3 prev_abortion_2 modern_2 wanted_2 wanted_3 referred_2
lev46_2 public_2 evacuation_2 obygyn_2 maternity_2 problem_2
strained_2 method_count qual_index unmetneedfp fpradio3months
ancskillprov tt2 calloc2 lackf7days {
set seed 1234
bayes, mcmcsize(1000) burnin(1000) thinning(10): meologit contr2 `x'
|| county: || facility:, level(97.5) or
bayesgraph diagnostics _all, saving(diagnostics_`x')
}
```

Appendix B12. Multivariable model.

```
bayes, mcmcsize(10000) burnin(1000) thinning(100): meologit contr2
age4_2 age4_3 marital_2 marital_3 education_2 education_3 education_4
occupation_2 occupation_3 occupation_4 religion_2 religion_3 reli-
gion_4 severity_2 severity_3 gestation_2 gravidity_2 gravidity_3 pre-
v_abortion_2 modern_2 wanted_2 wanted_3 referred_2 lev46_2 public_2
evacuation_2 obygyn_2 maternity_2 problem_2 strained_2 method_count
```

```
qual_index unmetneedfp fpradio3months ancskillprov tt2 calloc2
lackf7days || county: || facility:, level(97.5) or
bayesgraph diagnostics _all, saving("D:\PhD\PhD Paper II- Postabor-
tion Contraception\Data and analysis\September 2017\Graphs
\full_model_diagnostics")
```

Appendix B2:- Unstructured random effects model

```
model {
for (i in 1:N) {# open the loop
      contra_n[i] ~ dcat (p[i,])
     p[i, 1] <- 1/(1 + exp(-cA[1]+ mu[i]))
     p[i, 2] <- 1/(1 + exp(-cA[2]+ mu[i])) - 1/(1 + exp(-cA[1] + mu[i]))
     p[i, 3] <- 1-1/(1 + exp(-cA[2] + mu[i]))
D[i] <- m[1]*equals(education[i],1) + m[2]*equals(education[i],2) + m[3]*
equals(education[i],3) +m[4]*equals(occupation[i],2) + m[5]*equals(occu-
pation[i],3) + m[6]*equals(occupation[i],4) +
m[7]*equals(severity[i],2) + m[8]*equals(severity[i],3) + m[9]*equals
(gestation[i],2) + m[10]*(referred[i]) + m[11]*(public[i]) + m[12]*(oby-
gyn[i])
E[i] <- q[1]*(problem[i]) + q[2]*(strained[i]) + q[3]*(lnpacstafftrained
[i]) + q[4]*(qual_index[i]) + q[5]*(unmetneedfp[i]) + q[6]*(fpradio3-
months[i]) + q[7]*(ancskillprov[i]) + q[8]*(tt2[i]) + q[9]*(lackf7days
[i])
A[i] <- s[1]*(lev46[i]) + s[2]*(evacuation[i]) + s[3]*(maternity[i]) +s
[4]*(method_count[i]) + s[5]*(calloc2[i])
mu[i] <- b[1]*equals(age4[i],2) + b[2]*equals(age4[i],3) + b[3]*equals
(marital[i],2) +b[4]*equals(marital[i],3) +b[5]*equals(religion[i],2) + b
[6]*equals(religion[i],3) +b[7]*equals(religion[i],4) +b[8]*equals(gra-
vidity[i],2) + b[9]*equals(gravidity[i],3) + b[10]*(prev_abortion[i]) +b
[11]*equals(modern[i],1) + b[12]*equals(wanted[i],2) + b[13]*equals
(wanted[i],3) + b[14]*equals(wanted[i],9) + A[i] + D[i] +E[i] +u[county
[i]]+ f[facility[i]]
      }
for (k in 1:47) {
u[k] ~ dnorm(0, tau.h)
         }
for (i in 1:14) {
b[i]~dnorm(0,0.001)
            }
for (i in 1:5) {
s[i]~dnorm(0,1.0E-6)
            }
for (i in 1:9) {
q[i]~dnorm(0,1.0E-6)
            }
for (i in 1:12) {
m[i]~dnorm(0,1.0E-6)
            }
tau.b ~ dgamma(0.5, 0.0005)
sigma.b <- sqrt(1/tau.b)
tau.h ~ dgamma(0.5, 0.0005)
sigma.h <- sqrt(1/tau.h)
for (j in 1:281) {
   f[j] ~ dnorm(0.0,tauv)
   }
  cA[1] <- g[1]
   cA[2] <- g[1] + g[2]
```

```
   g[1] ~dnorm(0,0.01)
   #g[2] ~dnorm(0,0.01)
   g[2] ~ dgamma(0.001, 0.001)
   tauv ~ dgamma(0.001, 0.001) # prior structured
    }
```

Appendix B3:-Structured random effects model

```
model {
for (i in 1:N) {# open the loop
      contra_n[i] ~ dcat (p[i,])
     p[i, 1] <- 1/(1 + exp(-cA[1] + mu[i]))
     p[i, 2] <- 1/(1 + exp(-cA[2] + mu[i])) - 1/(1 + exp(-cA[1] + mu
[i]))
     p[i, 3] <- 1-1/(1 + exp(-cA[2] + mu[i]))
D[i] <- m[1]*equals(education[i],1) + m[2]*equals(education[i],2) + m[3]*
equals(education[i],3) +m[4]*equals(occupation[i],2) + m[5]*equals(occu-
pation[i],3) + m[6]*equals(occupation[i],4) +
m[7]*equals(severity[i],2) + m[8]*equals(severity[i],3) + m[9]*equals
(gestation[i],2) + m[10]*(referred[i]) + m[11]*(public[i]) + m[12]*(oby-
gyn[i])
E[i] <- q[1]*(problem[i]) + q[2]*(strained[i]) + q[3]*(lnpacstafftrained
[i]) + q[4]*(qual_index[i]) + q[5]*(unmetneedfp[i]) + q[6]*(fpradio3-
months[i]) + q[7]*(ancskillprov[i]) + q[8]*(tt2[i]) + q[9]*(lackf7days
[i])
A[i] <- s[1]*(lev46[i]) + s[2]*(evacuation[i]) + s[3]*(maternity[i]) +s
[4]*(method_count[i]) + s[5]*(calloc2[i])
mu[i] <- b[1]*equals(age4[i],2) + b[2]*equals(age4[i],3) + b[3]*equals
(marital[i],2) +b[4]*equals(marital[i],3) +b[5]*equals(religion[i],2) + b
[6]*equals(religion[i],3) +b[7]*equals(religion[i],4) +b[8]*equals(gra-
vidity[i],2) + b[9]*equals(gravidity[i],3) + b[10]*(prev_abortion[i]) +b
[11]*equals(modern[i],1) + b[12]*equals(wanted[i],2) + b[13]*equals
(wanted[i],3) + b[14]*equals(wanted[i],9) + A[i] + D[i] +E[i] +u[county
[i]]+ f[facility[i]] + sp[county[i]]
   }
for (k in 1:47) {
u[k] ~ dnorm(0, tau.h)
          }
sp[1:47] ~ car.normal(adj[], weights[], num[], tau.b)
for (k in 1:sumNumNeigh)
          {
weights[k] <- 1
          }
for (i in 1:14) {
b[i]~dnorm(0,0.001)
          }
for (i in 1:5) {
s[i]~dnorm(0,1.0E-6)
          }
for (i in 1:9) {
q[i]~dnorm(0,1.0E-6)
          }
for (i in 1:12) {
m[i]~dnorm(0,1.0E-6)
          }
tau.b ~ dgamma(0.5, 0.0005)
sigma.b <- sqrt(1/tau.b)
tau.h ~ dgamma(0.5, 0.0005)
```

```
sigma.h <- sqrt(1/tau.h)
for (j in 1:281) {
    f[j] ~ dnorm(0.0,tauv)
    }
    cA[1] <- g[1]
    cA[2] <- g[1] + g[2]
    g[1] ~dnorm(0,0.01)
    g[2] ~ dgamma(0.001, 0.001)
    tauv ~ dgamma(0.001, 0.001)
      }
```

Appendix B4:-Convolution (Structured and unstructured) random effects model

```
model {#open the model
for (i in 1:N) {
      contra_n[i] ~ dcat (p[i,])
     p[i, 1] <- 1/ (1 + exp(-cA[1] + mu[i]))
     p[i, 2] <- 1/ (1 + exp(-cA[2] + mu[i])) - 1/ (1 + exp(-cA[1] + mu
[i]))
     p[i, 3] <- 1-1/ (1 + exp(-cA[2] + mu[i]))
D[i] <- m[1]*equals(education[i],1) + m[2]*equals(education[i],2) + m[3]*
equals(education[i],3) +m[4]*equals(occupation[i],2) + m[5]*equals(occu-
pation[i],3) + m[6]*equals(occupation[i],4) +
m[7]*equals(severity[i],2) + m[8]*equals(severity[i],3) + m[9]*equals
(gestation[i],2) + m[10]*(referred[i]) + m[11]*(public[i]) + m[12]*(oby-
gyn[i])
E[i] <- q[1]*(problem[i]) + q[2]*(strained[i]) + q[3]*(lnpacstafftrained
[i]) + q[4]*(qual_index[i]) + q[5]*(unmetneedfp[i]) + q[6]*(fpradio3-
months[i]) + q[7]*(ancskillprov[i]) + q[8]*(tt2[i]) + q[9]*(lackf7days
[i])
A[i] <- s[1]*(lev46[i]) + s[2]*(evacuation[i]) + s[3]*(maternity[i]) +s
[4]*(method_count[i]) + s[5]*(calloc2[i])
mu[i] <-b[1]*equals(age4[i],2) + b[2]*equals(age4[i],3) + b[3]*equals
(marital[i],2) +b[4]*equals(marital[i],3) +b[5]*equals(religion[i],2) + b
[6]*equals(religion[i],3) +b[7]*equals(religion[i],4) +b[8]*equals(gra-
vidity[i],2) + b[9]*equals(gravidity[i],3) + b[10]*(prev_abortion[i]) +b
[11]*equals(modern[i],1) + b[12]*equals(wanted[i],2) + b[13]*equals
(wanted[i],3) + b[14]*equals(wanted[i],9) + A[i] + D[i] +E[i] +u[county
[i]]+ f[facility[i]] + sp[county[i]]
    }
for (k in 1:47) {
u[k] ~ dnorm(0, tau.h)
          }
sp[1:47] ~ car.normal(adj[], weights[], num[], tau.b)
for (k in 1:sumNumNeigh)
          {
weights[k] <- 1
          }
# All priors and hyperpriors:
#Priors for beta coefficients
for (i in 1:14) {
b[i]~dnorm(0,0.001)
          }
for (i in 1:5) {
s[i]~dnorm(0,1.0E-6)
         }
```

```
for (i in 1:9) {
q[i]~dnorm(0,1.0E-6)
          }
for (i in 1:12) {
m[i]~dnorm(0,1.0E-6)
          }
tau.b ~ dgamma(0.5, 0.0005)
sigma.b <- sqrt(1/tau.b)
tau.h ~ dgamma(0.5, 0.0005)
sigma.h <- sqrt(1/tau.h)
for (j in 1:281) {
    f[j] ~ dnorm(0.0,tauv)
    }
    cA[1] <- g[1]
    cA[2] <g[1] + g[2]
    g[1] ~dnorm(0,0.01)
    #g[2] ~dnorm(0,0.01)
    g[2] ~ dgamma(0.001, 0.001)
    tauv ~ dgamma(0.001, 0.001) # prior structured
      }
```

Supporting information

S1 File. Supporting information. Authority to use data and questionnaires used to collect the data used in this study.
(ZIP)

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Appendix 8.8: Paper 3

BMC Public Health

Treatment, Care and the Law – Service Providers' and Patients' Discourses on Quality of Post-Abortion Care in Kenya

--Manuscript Draft--

Manuscript Number:	
Full Title:	Treatment, Care and the Law – Service Providers' and Patients' Discourses on Quality of Post-Abortion Care in Kenya
Article Type:	Research article
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Abstract:	Background: Unsafe termination of pregnancy is a leading cause of maternal morbidity and mortality. Post-abortion care (PAC) reduces risks of these poor health outcomes. Our aim in this article is to describe and analyse service providers' and patients' understandings of the quality of PAC services offered in healthcare facilities in Kenya. Methods: Data derived from a cross-sectional qualitative study, using non-random in-depth interviews (IDIs) with PAC service providers (providers) and patients. Results: Patients seeking PAC were influenced by the perceived capacity of providers, but also sensitive and personalized care that met their specific needs. In contrast, providers considered resources for service delivery as key to quality PAC, and saw their role as saving lives, preventing long-term negative health effects of abortion, and satisfaction with the clinical treatment they provided. Fear and trust between providers and patients also defined care; this was influenced by lack of clarity on Kenyan law and policy. Conclusion: Quality PAC is understood by patients as related to interpersonal care and communication, and by providers as reflected by clinical competence and outcomes. At the same time, building trust between providers and patients, and clarity of guidelines to care provision, may resolve many barriers to quality PAC in Kenya.
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Treatment, Care and the Law – Service Providers' and Patients' Discourses on Quality of Post-Abortion Care in Kenya

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Abstract

Background: Unsafe termination of pregnancy is a leading cause of maternal morbidity and mortality. Post-abortion care (PAC) reduces risks of these poor health outcomes. Our aim in this article is to describe and analyse service providers' and patients' understandings of the quality of PAC services offered in healthcare facilities in Kenya.

Methods: Data derived from a cross-sectional qualitative study, using non-random in-depth interviews (IDIs) with PAC service providers (providers) and patients.

Results: Patients seeking PAC were influenced by the perceived capacity of providers, but also sensitive and personalized care that met their specific needs. In contrast, providers considered resources for service delivery as key to quality PAC, and saw their role as saving lives, preventing long-term negative health effects of abortion, and satisfaction with the clinical treatment they provided. Fear and trust between providers and patients also defined care; this was influenced by lack of clarity on Kenyan law and policy.

Conclusion: Quality PAC is understood by patients as related to interpersonal care and communication, and by providers as reflected by clinical competence and outcomes. At the same time, building trust between providers and patients, and clarity of guidelines to care provision, may resolve many barriers to quality PAC in Kenya.

Keywords: Post-abortion care, quality of care, healthcare seeking, healthcare provision, maternal mortality, Kenya.

INTRODUCTION

Unsafe abortions are still a leading cause of maternal morbidity and mortality globally, despite that these outcomes are highly preventable [1–3]. Post-abortion care (PAC) is designed to reduce morbidity and mortality from incomplete and unsafe abortion and related complications, but the impact of PAC on these outcomes is at least partly dependent on quality of services. In assessing quality, the Post Abortion Care Community Taskforce, led by Ipas International, developed a quality PAC framework, which recognizes interactions between patients and providers as key to quality service delivery. The framework identifies four main areas for which providers are responsible to maintain quality: the creation of an atmosphere of trust between staff and women; maintaining and assuring women privacy of their medical information; respecting their right to informed decision-making; and showing concern for their experiences [4]. The taskforce further identified the need for sufficient providers able to understand the challenges patients face while seeking care, provide them with counseling and other services, and advise them on post-abortion contraception [5].

The quality and the intensity of interactions between PAC providers and patients is an imperative component of quality PAC. Together with affordability and the use of less invasive procedures, the quality of the relationship of and contact between the providers and patients improves patient satisfaction with PAC services, with implications for women's health outcomes and future service utilization [6,7].

In most healthcare systems, PAC service delivery is perceived by other healthcare workers as the role of doctors, despite that in primary care settings, care is frequently provided by nurses and midwives. The constant updating of skills to offer PAC, well-defined task-shifting, sharing roles and responsibilities of managing PAC patients by lower-level workers, and helping ensure providers are well-prepared for service delivery. However, training programs tend to be restricted

to doctors and fail to improve the capacity of the actual providers of services [7], and sufficient trained providers are not always available [8]. In addition, clinics often lack access to appropriate technology and may have to use invasive technologies, impacting on patient satisfaction with services [9].

Social norms and personal values, religious and cultural beliefs, legal and policy frameworks, and providers' own views on sex, pregnancy and induced abortion influence choice of treatment [10] and limit women's access to quality care [11,12]. In Kenya, abortion is illegal unless, in the opinion of a qualified medical practitioner, the life or health of the mother is at risk. However, even where a termination of pregnancy would be deemed legal, a woman's choice of procedure is limited. Providers and patients are often confused on the legal provisions for safe abortion and this continues to drive the demand for unsafe abortion, limiting access to legal safe abortion services [13–15]. Other barriers also lead to unsafe abortion: direct costs including treatment and medication; indirect costs such as transport and lost time; and beliefs that stigmatize abortion and unintended pregnancies [16].

Providers often have difficulty distinguishing between personal moral standpoints and their role in providing care, driving their negative attitudes towards PAC seekers. Providers at times react negatively to patients who they believe are not being truthful when reporting on their abortion, and some appear to give preference to women with spontaneous abortion over those with suspected induced abortion, leaving these latter women to wait as punishment for what they perceive to be "self-inflicted pain" [9]. Where they disapprove of abortion, they often also refer patients to other facilities [17], resulting in delays for care and increased complicated outcomes for women [18,19]. As a result of these negative attitudes, women seeking PAC may feel isolated in healthcare facilities [20,21]. In this context, they are likely to report induced abortions as spontaneous, particularly in environments where abortion is illegal. Often, this misreporting leads to unnecessary clinical

investigations, straining available resources [5], especially in public healthcare facilities where most abortion cases are managed [8,19].

To be acceptable, PAC should be responsive to cultural and social expectations of the communities they serve, although contradictory attitudes, as indicated above, suggest that this is difficult to achieve. But additionally, negative attitudes reflect poor training, and community-centered approaches to quality PAC need to address the training of providers of both facility-based and home-based services, as well as healthcare facility infrastructure and equipment [10]. The Quality of Post-Abortion Care model and patient-centered care identifies the need for effective links between patients, the community and service providers to reduce the risks of unintended pregnancies and unsafe abortions. Such care focuses mainly on the appropriateness and acceptability of services, so conforming to the standards and guidelines on PAC and meeting the patient's expectation [22]. This includes ensuring that women have access to all necessary information to prevent unsafe abortion [23], information about the procedure and about contraception, and best practice technical care [24]. Such care also ensures that care is timely, so lowering the risk of complications, repeat abortion, maternal morbidities and mortality. This also increases service satisfaction [25].

METHODOLOGY

The Ministry of Health classifies healthcare facilities into six functional levels according to the Kenya Essential Package for Health (KEPH): community-level preventive approaches (Level 1); dispensaries and primary health care clinics (the lowest level of clinical care, Level 2); health centers (Level 3); nursing homes and small hospitals (Level 4); general hospitals (Level 5); and national referral hospitals (Level 6) [26]. The data on which we draw in this article derive from a cross-sectional, qualitative study conducted in hospitals (Levels 4-6). Facilities selected had

participated in the 2012 Incidence and Magnitude of Unsafe Abortion (IMUA) study [27], and were considered "high volume" facilities, defined as a daily average of two or more PAC cases. All facilities had the capacity to offer PAC and treat severe complications of abortion, including hysterectomy if indicated.

Sampling

The IMUA study sampled 350 facilities, from which 16 hospitals in four regions were sampled for this study: Nairobi (Nairobi county); Central Kenya (Murang'a, Kiambu, and Nyeri counties); Upper Eastern Kenya region (Meru county); and Lower Eastern Kenya region (Makueni, Machakos and Kitui counties). These facilities were all high-volume in order to ensure a meaningful number of PAC cases within 1-2 weeks when trained qualitative data collectors were based in the facilities. The sample was stratified according to KEPH level, as above, region, and on the basis of PAC quality according to an earlier classification as high, low or medium level quality. The classification, derived from the IMUA study [19,27], included 18 indicators of quality of care according to the essential elements of post-abortion care framework [8]. These included the use of appropriate technology to manage PAC complications; technical performance of service providers; equipment and supplies; and information and counseling (see [4,28]). All 16 facilities participated in the service provider interviews. A sub-sample of six facilities was purposively selected, two from each region, from which five patients each were also invited for interviews. In total, 16 provider and 30 patient interviews were conducted. We further tested the sample for selection bias by fitting a logistic regression on a sampling outcome variable. There was no statistical significance between sampled facilities and non-sampled facilities with respect to their level of quality of PAC, controlling for ownership and region.

Data management

All data were collected using electronic recording devices. The principal investigator (lead author, male) trained experienced female interviewers to fully understand the objectives and ethics of the study and on handling any distress that might emerge from interviewing PAC patients. He worked with them on a day-to-day basis, reviewing all completed interviews, discussing the quality of each interview, and developing lessons for progressive quality improvement. Data were transcribed, and translated into English where data were collected in Kiswahili by a trained translator-transcriber recruited to this dual role. The transcripts were reviewed by the principal investigator and checked for quality. Field notes provided by the interviewers were incorporated in the data transcription. At the end of data collection, discussions were held between the principal investigator and the interviewers, the transcriber, and coder to discuss their interactions with respondents.

Analysis

Data transcription and coding were conducted concurrently with data collection, with coding initially undertaken independently by the coder and principal investigator and with regular feedback sessions on thematic developments that needed clarifications or follow-up in subsequent interviews. At the end of coding, the coder and the lead author met to discuss and agreed on a final coding scheme in line with key themes that emerged from the data. With the final codebook, all data were coded in NVIVO® 11 into an agreed thematic structure. Data analysis was then conducted inductively, by comparing and grouping themes to develop a narrative on the interaction of providers and patients before, during and after treatment. The relationship between this interaction and quality of care was explored, drawing on Leonard's model of post-abortion care [28] and updates by Greenslade [4]. These coding steps ensured full understanding of the data and allowed for continued interrogation of data for classification, properties and the establishment of thematic links for the exhaustive establishment of visible and underlying themes [29,30]. Below, we present providers' and patients' perceptions of the quality of PAC and their experiences seeking or providing PAC. Verbatim quotes are used to capture respondents' reflections.

Ethical considerations

All requisite ethical approvals for this study were obtained before the onset of fieldwork.

STUDY FINDINGS

In the following, we discuss provider and patient views of quality of care as they emerged from our data: service provider capacity and experience with care; intended and unintended treatment outcomes; and service accessibility. To understand how these interactions are influenced by the legal context of abortion, we further explored how trust between providers and patients influenced the quality of care.

Service provider capacity and patients expectations

Among many other considerations, patients who sought post-abortion care in Kenya were looking for facilities and providers who they perceived to have the right capacity and skills. Others were interested in services they perceived to be of quality, as driven by past experiences or reported peer experiences. Patients often relied on the perceived professionalism of providers, including their attitude towards their work, as a measure of quality. In most cases, they assumed that the providers desired good patient health outcomes. Within health facilities, however, quality care referred to the speed of response to patient's calls and assurance of provider's availability when needed: "I knew I would receive the right treatment because it is where we have the professionals. I could even have died if I went to someone who wasn't a professional" (Patient, level 4, low quality facility).

When women experiencing a complication from unsafe abortion – such as incomplete miscarriage, pain or continued bleeding – seek health care, they choose between different available and accessible facilities and providers. For some women, distance to place of care and ease of access to care may be critical. For others, past personal experience and the experience of others may be most relevant, not necessarily in relation to PAC, but to any reproductive health services. Patients

also perceive quality in relation to consistency of services as reflected in the number of visits and time in contact with a service provider.

The importance women place on capacity and quality of a facility and its staff is influenced by fear of complications or death at the hands of unqualified providers. At the same time, some patients put trust particularly in their understanding that providers will be as worried about losing patients as patients are of losing their own lives:

> I feel good about them. I haven't seen any problem with them. I feel they know what has brought us here. And they wouldn't also like people to die in their hands. I feel that they like their job. Because if a doctor was on your case, he wouldn't fail to come and see you. They are always there. When you have a problem and call them, they come very quickly. I feel that they are proud of their job (Patient, level 4, low quality facility)

The competence of providers to offer PAC is a key ingredient of the post-abortion care quality framework [4], and women distinguished between doctors and others who they did not consider qualified and who they referred to as "students.", even though some were doctors or nurses. Patients associated quality of PAC with regular visits on the ward by the attending doctor, which provided reassurance: "She kept coming and asking me how I was feeling. I was telling her this is what I feel, and she would bring me drugs which I would take. She really took care of me" (Patient, level 4, low quality facility). Providers' confidence in offering PAC was a demonstration of competence, as some patients explained, and this was defined by their years of experience, despite that this experience was moderated by the availability of resources for service delivery. Providers argued, in contrast, that despite individual aptitude and experience, the facility and context of service delivery, including the competence of their fellow providers, dictated much of what the provider could offer. The availability and quality of medical resources for PAC built and strengthened their capacity and confidence to offer quality services, but infrastructure was also

important. Hence providers mentioned their capacity (or not) to provide visual and aural privacy to their patients, the availability of advanced (and working) technology, and whether these resources were available on a day-to-day basis.

As indicated above, patient follow-up was seen to be important, ensuring completeness of treatment and so reassuring both the provider and patient. Providers emphasised the value of knowing that the health of the patient had improved and that her fertility was preserved. They expressed pride in the health of patients to whom they personally provided PAC, now able to achieve their fertility goals. Poor follow-up was associated with inadequate counselling, and failure or unreliable follow-up impacted women's access to post-abortion contraception, especially where these services were not completely integrated with PAC: "You know for the other department sometimes you are not able to follow-up whether the patient went for FP, and in the counselling department still we are not able to do a good follow up of those patients" (Provider, Level 4, low quality).

Intended and unintended treatment outcomes

We asked providers to state their intended outcome whenever they managed a patient with complications from unsafe abortion. The priority of providers is to save the life of the patient, and in this context, they sometimes overlooked the benefits of patient satisfaction with services leading to fewer repeat abortions. Given their emphasis on quality clinical care, they saw the quality of PAC services as extending to referrals where the management of complications were beyond the capacity of the receiving facility, and so quality of care extended to the services patients received at the next facility. One provider, reflecting on referrals from Level IV to Level V hospitals, remarked: "I think it is good, like here, if we refer those patients to level V, after they get there, they are properly managed. I have never heard a case of mortality" (Provider, level 4, low quality).

For patients, in contrast, quality of PAC services reflected general satisfaction with the services they received from providers and the facility at which they presented. Although they saw the role of the provider as preventing death, they also placed importance on pain relief from complications. Quality of care reflected the urgency with which they were received at the facility, hospital management's response to their medical needs to avert deaths, and the provider's attitudes. For some patients, however, quality combined the speed of the medical response with being treated with dignity and compassion. In this, they emphasised the providers' interpersonal skills and willingness to express care, as well as the capacity to accommodate patients' needs at a personalized level, with minimal disruptions through what they considered to be unnecessary referrals and transfers.

As suggested, patients placed value on the non-medical skills of providers and of other staff within the facility. Although they included pain management as an indicator of quality, this included what providers called "verbocaine" – being talked through the treatment process and being warned about potential pain. They were more likely to be satisfied with services when the providers seemed happy with their work, listened to them and elicited their views, showed personal concern and took time to calm them: "He treated me like someone who was in pain. He just did it gently and even told me it was going to be painful. He injected me twice. So I never felt too much pain" (Patient, level 4, low quality).

Patient satisfaction with the service is a sign of quality, although this is sometimes linked to the end result of treatment rather than the process of achieving that treatment. In certain instances, the desire for the restoration of good health, and survival, determined what women referred to as quality of care. They were typically desperate for medical attention, depending on complications, intensity of pain and how visible the risk was (that is, if there was excessive bleeding). Urgency of care was complicated by service scarcity, which reduced the utilization of available services to chance. This included times when the services provided at facilities were temporarily suspended

due to labor union strikes by providers, as occurred on a number of occasions during this study. Further, where medical emergency moderated expectations for fear of death, patients were more vulnerable to mismanagement, by developing resilience to pain and accepting less satisfactory services: "I feel good. I'm even laughing now. I would have been dead now. I'm happy with the services I have received" (Patient, Level 5, low quality).

Providers saw their primary role as the provision of emergency care, in order to stabilize patients with severe complications. Completeness of treatment might in such cases be limited to ensuring the complete removal of products of conception and infection control: "One, the major one is to stop the bleeding immediately and save this life so that this patient doesn't get anaemia and so that this patient doesn't get any infection out of that" (Provider, level 4, high quality). At the same time, providers generally associated quality PAC service to both patient outcome and self-satisfaction with the services. This was achieved by ensuring patients were engaged in their treatment and aware of the procedures being undertaken**.**

Accessibility of PAC service

Where certain services or components of a procedure are not available at a facility, patients are referred on; once they have been treated, they are returned to the referring facility. However, improperly managed, these partial referrals expose patients to unnecessary complications such as sepsis, haemorrhage, and peritonitis. Delays from lengthy referrals can also lead to trauma of the cervix, vagina, uterus and abdominal organs [2]. Some referrals require patients to return to the first facility for further management, and this delay in continuing treatment is especially problematic for patients who require multiple referrals. In addition, some referrals occur even before any diagnosis for evacuation can be made. PAC patients blamed poor investigations on poor treatment outcomes, and they were especially concerned by the costs of these services when a misdiagnosis was made. Often, misdiagnoses derive from the lack of functional diagnostic equipment, leading to higher

costs of treatment, longer hospital stays and adverse long-term health impacts. Other times, services are available, but are not always under one roof. This is particularly the case for long-acting and permanent contraceptives: "In our MCH as I have told you, all the FP methods are currently available, the drugs, the coils, the condoms, everything. Except for the BTLs (bilateral tubal ligations), they are usually done here routinely" (Provider, level 4 low quality).

Ensuring the availability of PAC to all includes not only the patients but also their social networks and the wider community. Providers see the need to engage the community to handle abortion-related complications to "special needs" groups, among them adolescents and young women. Achieving a community that is well integrated to healthcare service delivery is not the responsibility of providers only, but requires concerted efforts with policymakers and community gatekeepers to reduce the risks of unsafe abortion. Providers see these efforts as critical to prevent the negative health effects of unsafe abortion, and they often see patients as creating a critical mass of change agents in the communities they serve. However, some providers see community integration as the responsibility of hospital management and do not necessarily consider that they have a personal and professional role to play. They do not see themselves or their healthcare facility and practice as part of the larger community they serve. Rather, they regard their roles as purely clinical.

Trust

A critical component of provider and patient relations is trust building. The providers interviewed indicated that it was common to involve parents when managing adolescents for PAC, especially at counselling and/or contraception. In most cases, the involvement of parents precluded the provision of advice on post-abortion contraception to prevent future unintended pregnancies (the leading cause of induced abortion) [12]. However, provider attitudes also contributed to this: "Most of them, you do not give them the family planning because they are still young and when you give

family planning you will not be helping them to be able to conceive later in life" (Provider, level 5, low quality). Providers who appreciated the role of post-abortion contraception suggested that effective contraception could be achieved by establishing youth centres and ensuring proper integration of PAC with FP: "Everything apart from what is done in the ward 10 (reproductive health) clinic is done in the youth centre, although they undergo counselling and those other special things in the youth centre after they stabilise" (Provider, level 5, low quality).

While guardian accompaniment during PAC treatment and withholding contraceptive services can compromise quality PAC, providers justified this as deterring "irresponsible sexuality" that might impact adolescents' future fertility. In most cases, discrimination of patients suspected of inducing abortion was based on providers' personal views and beliefs on abortion, and their fear of legal consequences if they intervened in the case of an illegal abortion. Providers drew conclusions based on whether the patient was an adolescent or an adult, often assuming that an adolescent's abortion was induced while an adult's abortion was spontaneous. Attitudes of providers to young women were influenced not only by their age, but also whether they were still in school, and by their marital status. The result of such segmentation was the discriminatory treatment of certain patients: "Especially for the young girls, if you get deep into the history sometimes it is usually inductions. But for older women above 35 years, those are the ones that mostly come with those spontaneous cases. But for these young ones less than 35 years, most of them if you track your history well sometimes you end up finding from your history, you find that it was something that was induced somewhere" (Provider, level 4 low quality). Patient handling by both medical and non-medical personnel at healthcare facilities presented an additional source of discrimination, reflecting the illegality of abortion and lack of clear policies on abortion management: "Sometimes when I want to do the procedure, I call the relative or the guardian and explain to them what is happening to this patient, what should be done, and what I'm doing, and then they give me a go ahead" (Provider, level 4, high quality).

The high levels of stigmatization of abortion make access to care, even for spontaneous abortion, a challenge. Although medical and general health needs do not vary, many providers regard spontaneous abortions and induced abortions differently and manage PAC patients very differently. This determines the accessibility of PAC services to women who present with abortion-related complications in healthcare facilities: "I wish everyone would be educated on the importance of taking care of ourselves and not involving ourselves in... For the spontaneous; fine. But for the septic (women with septicaemia), I think we still have an issue that needs to be taken care of" (Provider, level 4, high quality).

The majority of providers expressed their concerns about the legal status of abortion and how this influences handling of PAC patients. There is poor understanding of the position of the Kenyan constitution and the law on abortion, and the policy guidelines do not help the providers [31]. Most providers, especially in public facilities, prefer to simply counsel patients who seek termination, and to refer them to private or non-governmental facilities for further counselling and possible termination. In private facilities, on the other hand, providers are concerned about their institution's reputation if it were known that it was assisting women with termination: "What do we expect as service providers on this issue of everyone inducing abortion? We know that the constitution does not allow. But the challenges we are facing here, it is like it is legal" (Provider, level 4, high quality).

Patients, on the other hand, appeared to be concerned about seeking care in public facilities because of concerns about access to termination, and so they used private facilities as conduits to care, with the greater likelihood of being able to have a termination at a private facility. They also sought guidance from private providers on which public facilities to attend for treatment in case of complications. While some expressed fear of discrimination through intimidating questions by adult providers, others were concerned about legal redress and being reported to the police.

DISCUSSION

Service provider capacity and patient expectations

The role of service providers in quality of PAC is emphasized in all PAC quality frameworks. Their central role is a critical link between patients and healthcare facilities that assure patients of trust, confidentiality, and care [2,4,32]. Often, patients build certain perceptions on quality according to the capacity of the provider and the facilities available. These perceptions are determined by previous experience with PAC services at these facilities and from the providers, previous experience at the facility (for any reason), and reported experiences. When positive, these perceptions create a sense of confidence among patients that their health needs are secured. Patients referred to providers' confidence in reassuring them, and their response to and action on patient needs, as measures of trust in services. Trust also includes how providers present themselves to patients [33].

While patients look for confidence in the providers, providers perceive their capacity not as skill-based but as dependent on available resources. Providers perceive healthcare management as the backstop for ensuring quality, and do not see this as their role. This has been demonstrated in lower cadre medical personnel who see quality as the responsibility of senior physicians; the delivery of misoprostol in Zimbabwe is a case in point [7]. Fear is at the heart of these considerations in two respects: fear leads patients to facilities with providers whose skills they feel confident about, and who they believe are committed to providing good care, while on the other hand, the concerns of providers' legal safety when handling patients push them to see their confidence as a collective responsibility with other providers rather than an individual.

In addition to capacity, showing compassion to patients, sympathizing, and managing their pain medically and non-medically, all influence the perception of quality by patients. They often vouch for providers who communicate with them and engage with them during care and show

care. In addition, providers who appear to like what they do reassure patients, providing them with confidence in the resolution of their urgent health needs.

The level of agreement between providers and patients on emergency treatment is also important. The role of providers is demonstrated in their response to emergencies and how they handle patients in emergencies. Service disruptions affect patients' hopes for better health, leading to desperate acts and lowered quality expectations. Further, as illustrated above, patients desire emergency treatment that is sensitive to their unique individual needs, and prefer services where the provider is cognizant of the emotional losses, involve them in treatment, and provide information about their conditions [34].

Intended and unintended treatment outcomes

Service providers aspire for patient satisfaction with services, including those they receive at referral facilities. They desire services that guarantee good health outcomes that might also improve a patient's quality of life and future reproductive health. They achieve this by engaging with their patients during procedures; this appears to assist in pain alleviation. However, some providers focus simply on preventing death from complications, and patients share this perception when in pain. While patients relate quality care to prompt treatment, recovery, feeling better, and tangible health outcomes, the role of the provider is to ensure consistent quality [35].

Achieving such health status is often marred by missed opportunities such as effective contraception. Despite agreement between providers and patients on the role of providers during emergency care, a significant dichotomy persists between the perception of providers' role as saving lives and patients' expectation that they will be treated in an acceptable manner. Again, as emphasized by Geller [34], patient-centred care should not be limited to emergency treatment but throughout treatment and follow-up. Patients' and providers' aspirations converge on the critical role of patient follow-up in PAC treatment. Provider follow-up of patients provide them with

assurance of their own performance, and enable them to assess the impact of treatment on the patient's recovery. While providers use feedback from patients after discharge from facilities to assess their competence, patients perceive this follow-up as evidence of competence, skill and demonstration of quality.

Patients value the assurance of well-being and quicker recovery that comes with each visit while inpatients and following discharge. This is corroborated by Evens [22], that services should be both appropriate and acceptable to patients. From this study, patient follow-up can be seen at three main stages: at the facility, when the patient is still under treatment or on observation; within the facility after the patient is discharged from the PAC clinic/ward; and outside the facility. In larger hospitals, this kind of follow-up is particularly deficient, and some of the critical components of PAC such as contraception are only offered at other locations. In addition, abortion patients prefer more personalized follow-ups that minimize risks of identification and stigmatization [36,37]. Follow-up is often left to the patients through return dates for review, but where this occurs, it must be complemented by effective counselling, to increase patient's ability to make informed choices. Such patients are more likely to make informed decisions for care, even when faced with future unwanted pregnancies [35,38].

Service accessibility

The risks posed by delayed care, either through decisions to seek care, or time lost between referrals when an appropriate intervention is not available, have been established [18]. The referrals not only expose patients to risk of worsening conditions, but patients find them inappropriate. In this study, we established a common referral phenomena - "partial referral" – where patients are referred to other facilities for certain procedures such as radiological and laboratory examinations, after which they are returned to the admitting facilities. These referrals come at early treatment stages, when

timely intervention is needed most. In addition, patients are often referred to facilities that are not their choice and where quality of services is not guaranteed. Some of these are private facilities, which significantly increases treatment cost to patients. The effect of partial referral is worsening condition of the patient, leading to multiple procedures that may not be found in one facility; hence these referrals are made at diverse times. This further diminishes access to care [17].

Patient discrimination and provider biases

PAC focuses on the needs and wellbeing of the patient [4,32,39]. We have demonstrated the key areas of patient discrimination and some of its associated factors. Patients who seek PAC are apprehensive of providers who make moral judgements of their condition. Age of patient was the greatest factor of discrimination, with adolescents and young patients often needing to be accompanied by a parent or guardian in order to access PAC and contraception. This is congruent with previous studies [11], that document provider beliefs that the indiscriminate provision of post-abortion contraception leads to sexual practices that exacerbate the risks of further unintended pregnancies. However, other studies have demonstrated that PAC patients exposed to comprehensive PAC, including effective contraception, had reduced risks of repeat abortions [25,40]. In some cases, reflecting provider's own inaccurate or inadequate information on contraceptives or side effects, services for adolescents and young patients may be restricted to safeguard their future fertility. In other cases, these restrictions are driven by mistrust between providers and patients. Withholding PAC to patients is often based on the fear of legal consequences and providers insist on such restrictions to remain "safe." This often derives from non-existent or unclear policies and guidelines, and providers prefer what they regard as the least risky option [14]. Consequently, young patients especially, in the absence of a parent or a guardian, may be deprived of emergency care, as demonstrated even in less restrictive environments [15]. We further

established that providers insist on having at least one other provider as a witness, which can make services completely inaccessible, especially in smaller facilities with few providers.

We further established how providers insist on distinguishing between spontaneous or induced abortion, even to the extent of making guestimates of patient's age, schooling status, and marriage. Driven by moral perceptions of abortion, religious beliefs and cultural views, some providers presumed that every young PAC patient (under 24 years) or unmarried women had intentionally terminated their pregnancy. These presumptions restrict access to care, denying services to patients who do not present with circumstantial evidence of involuntary pregnancy loss. Consistent with Gómez's findings, this suggests a lack of woman-centred or rights-centred care [24].

We began by noting that abortion is illegal in Kenya and only permitted if, in the opinion of a qualified practitioner, the health or life of the mother is in danger. In contrast, the new constitution (August, 2010) guarantees every Kenyan the right to emergency healthcare, including for reproductive health [41]. Effectively, providers can be accused of breaching constitutional rights by denying patients emergency PAC. However, the penal code in Kenya remains largely in use, and a number of abortion litigations have been prosecuted under the penal code in recent years [42]. The fear of prosecution adds pressure on providers to exercise caution when treating PAC patients [11]. The end result is inaccessible services and increase demand for unsafe abortion services.

In addition to the illegality of abortion, cultural practices both within and outside healthcare systems further restrict access. While community sensitization and empowerment might reverse the effects of these barriers, such interventions depend on clear guidelines on how providers might interact with communities. Improving links between communities and health care services would minimize communication barriers, including in relation to the law, and prevent delayed care for

fear of victimization, both by the providers and patient. Wang [10], writing of Nepal, shows that greater appreciation of the social and cultural factors impacting decisions around pregnancy improve service provision to the community.

CONCLUSION

While providers see their primary role in quality PAC as saving lives, patients associate quality with more caring providers, who are knowledgeable and confident about services and can reassure patients of their future health. PAC patients also associate quality with providers who understand patients' and community needs. In effect, this understanding reduces the adverse effects of abortion stigmatization and improves timely access to healthcare interventions. Fear and urgency of need for medical care compete to influence patients' and providers' perceptions on access to services and on quality, while legal and policy frameworks delineate the nature and form of their relationship. In Kenya, mistrust is driven by unclear guidelines on service provision, and laws that protect neither the interests of providers nor patients. For better interaction between providers and patients that assure of quality PAC, there is a need for the legal protection of providers and clear communication between providers and the community, so assuring patients of confidentiality and protecting the providers. Service provider training will improve their general capacity to offer quality PAC, while value clarification will reduce the stigmatization of and discrimination against PAC patients, and assure patients of treatment centered on the basic rights to care.

DECLARATIONS

Ethics approval and consent to participate

Ethics approval was obtained from the African Medical Research Foundation (AMREF) Ethical Scientific Review Council (ESRC), Human Research Ethics Committee (Medical) at University of the Witwatersrand, and Kenyatta National Hospital and University of Nairobi Ethics and Research Committee. All survey participants signed informed consent forms according to the ESRC requirement.

Consent for publication

Not applicable

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MMM and LM participated in conceptualizing this manuscript. MMM led the survey design, data collection, analysis and writing work and produced the first draft. TOA and EM reviewed the manuscript drafts. All authors have been informed that the manuscript is being submitted to the journal. MMM, LM, TOA, and EM read and approved the final manuscript.

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Cover letter

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Appendix 8.9: Paper 4

PLOS ONE

RESEARCH ARTICLE

Policy, law and post-abortion care services in Kenya

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Data Availability Statement: The African Population and Health Research Center's Institutional Review Board has restricted access to the qualitative data used in this study until two years from the date of collection. After two years from the date of collection, data will be made available at the Center's data sharing committee, accessible through the following portal: http://aphrc.org/catalog/microdata/index.php/catalog. For access to data within the two years from the date of collection, please contact: 1. APHRC IRB Contact, Board Chair, The Institutional Review Board, African Population and Health Research

Abstract

Background

Unsafe abortion is still a leading cause of maternal death in most Sub-Saharan African countries. Post-abortion care (PAC) aims to minimize morbidity and mortality following unsafe abortion, addressing incomplete abortion by treating complications, and reducing possible future unwanted pregnancies by providing contraceptive advice. In this article, we draw on data from PAC service providers and patients in Kenya to illustrate how the quality of PAC in healthcare facilities is impacted by law and government policy.

Methods

A cross-sectional design was used for this study, with in-depth interviews conducted to collect qualitative data from PAC service providers and seekers in healthcare facilities. Data were analyzed both deductively and inductively, with diverse sub-themes related to specific components of PAC quality.

Results

The provision of quality PAC in healthcare facilities in Kenya is still low, with access hindered by restrictions on abortion. Negative attitudes towards abortion result in the continued undirected self-administration of abortifacients. Intermittent service interruptions through industrial strikes and inequitable access to care also drive unsafe terminations. Poor PAC service availability and lack of capacity to manage complications in primary care facilities result in multiple referrals and delays in care following abortion, leading to further complications. Inefficient infection control exposes patients and caregivers to unrelated infections within facilities, and the adequate provision of contraception is a continued challenge.

Discussion

Legal, policy and cultural restrictions to access PAC increase the level of complications. In Kenya, there is limited policy focus on PAC, especially at primary care level, and no guidelines for health providers to provide legal, safe abortion. Discrimination at the point of care

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discourages women from presenting for care, and discourages providers from freely offering post-abortion contraceptive guidance and services. Poor communication between facilities and communities continues to result in delayed care and access-related discrimination.

Conclusion

Greater emphasis should be placed on the prevention of unsafe abortion and improved access to post-abortion care services in healthcare facilities. There is a definite need for service guidelines for this to occur.

Background

Across Africa, one in every ten maternal deaths is from complications related to unsafe abortion [1]. Post-abortion care (PAC) is designed to minimize morbidity and mortality associated with unsafe abortion by addressing incomplete abortion and treating complications, and to prevent recurrence, linking women to other reproductive health services, and providing them with post-abortion contraception [2][3,4].

Kenya's maternal mortality ratio (362 per 100,000) is highest among women of peak reproductive age (25–39) [5], and in this group, up to 17 percent of deaths may be associated with induced abortion [6]. The incidence of unsafe abortion in Kenya is among the highest in Africa [7], with the majority of women presenting at healthcare facilities with between moderate and severe complications as a result. Such cases often require specialized treatment and exert pressure on already stretched human and material resources for health.

Policy and legal contexts shape the quality of services provided; these are international, regional and country-specific in content or implementation [8,9]. Abortion remains an illegal or highly restricted and emotive issue in most countries globally [9,10]. Limited access to safe abortion, both formally and informally, increases women's recourse to unsafe termination procedures, and negative community and facility-based attitudes limit the effectiveness of interventions to provide quality PAC services. Although legalizing abortion alone may not reduce the incidence of abortion, it reduces women's resort to unsafe terminations and delays in seeking care, and increases service provider willingness to provide care [11]. These factors, achieved through improved cultural acceptability of abortion [12], combine to reduce complications associated with unsafe abortion, while also increasing equity in access [13]. Such policy initiatives must be accompanied by proper community involvement to demystify abortion and raise the awareness of services, including post-abortion care. Women are often profoundly reluctant to seek such care, even where abortion is legal, due to cost [14] and lack of information on the law [15]. The legalization of abortion in the recent past, such as in Ghana, South Africa, and Ethiopia, has been pivotal in reducing morbidity and mortality, but the need for complementarity of approach has been underscored [13–15]. Whether or not abortion is legal, women will use available means to terminate unwanted pregnancies and therefore, the delivery of quality PAC services at all levels of care prevents severe morbidity and associated mortality [16].

In Kenya, where this study was conducted, constitutionally, abortion is illegal unless, in the opinion of a qualified medical practitioner, the health or the life of the mother is at risk or unless permitted by any other law [17]. Furthermore, there are conflicts between the constitution, which was passed in 2010 and theoretically allows abortion, and the penal code, which criminalizes abortion [18]. These contradictions discourage women from seeking care, shape service providers' perceptions of abortion, and influence facility capacity to deliver PAC.

Restrictive access to safe abortion care, because of legal prohibitions and cultural barriers, is known to increase the severity of complications from abortion. Under such restrictive policy and legal environments, women resort to abortions performed outside of clinical services in unsafe conditions and by unqualified providers [19].

To ensure quality care, PAC needs to be patient-centered, and the service provider needs to feel protected [20]. In addition, designing healthcare policies that aim at improving the quality of provider-community interactions encourages the early detection of pregnancy complications, regardless of cause, and enables an efficient community referral system to reduce the risks of delayed care seeking [21,22].

The quality of PAC framework was introduced globally over 25 years ago, and focuses on five distinct areas of intervention to ensure quality: equipment, supplies, and medication; use of appropriate technologies in the management of complications; technical performance; interaction between women and service providers or staff; and information and counseling [23]. This framework recognizes the need for correct equipment and medications to ensure safety and effectiveness of recommended PAC procedures [2]. Functional equipment for abortion care, sterilization, maintenance, and resupply are essential to enable facilities to deliver PAC at all times [24,25]. The use of appropriate technology rather than outdated techniques such as sharp curettage (Dilation and Curettage) improves quality PAC [26,27] and patient satisfaction with these services [28,29]. Adopting appropriate technologies can also reduce hospital stay, the cost of treatment and strain on resources, and increase the safety of PAC services [30]. This must be complemented by provider willingness to adopt these technologies [31]. Essential supplies, including pain medication and antibiotics, improve patient experience with care [32], leading to positive perceptions on quality of care, so increasing community trust in services offered and prospects of future utilization [11,33–35]. Contraceptive commodities and their continued availability reduce risks of further unintended pregnancy. Ideally, these interventions should be complemented by infrastructural improvements, such as dedicated abortion care clinics to address abortion patient needs without discrimination [15,36,37]. Such interventions appear to reduce the demand for clandestine abortion terminations, which occur even when abortion is legal [38].

Strong service provider skills are essential in delivering quality PAC at all available levels of care. This includes expanding the roles of different service providers and building the capacity of lower cadres of care, including nurses and midwives [39,40][25][41,42].

To guarantee quality PAC, interactions between service providers and patients must ensure confidentiality by establishing an atmosphere of trust and empathy and respecting the patient's rights [3,43]. Patient-centered care dictates the need to understand the specific needs of individual women, including future fertility intentions, contraceptive preferences and past experiences with care. Information must be provided in a manner that enables the patient to make informed choices, which includes a treatment plan and social support to patients [44,45].

In this article, we consider the contribution of the legal and policy context on quality of PAC in healthcare facilities in Kenya, as described by service providers and patients. We begin by exploring some of the policy-level factors that affect the access to and delivery of quality PAC services, focusing on dimensions of quality care as described in the PAC quality framework [3,23,46–48].

Methods

Study design and setting

The study on which this article is based was cross-sectional, using in-depth interviews to collect qualitative data. Public and private "high volume" healthcare facilities, including general

and referral hospitals at Levels 4, 5 and 6, were selected, based on the number of PAC cases reported in the facilities in the most recent data [7,49,50]. Public facilities are owned and run by the government, and private facilities are managed by individual proprietors, non-governmental organizations or faith-based organizations. In Kenya, the Ministry of Health, under the Kenya Essential Package for Health (KEPH), defines six levels of preventive and curative health services, both for public and private facilities, ranging from level 1–6. Level 1 is the lowest level, and forms the foundations of service delivery at the community level; it includes village health committees and community health units. Levels 2 and 3 (dispensaries, health centres, and maternity/nursing homes) offer promotive, preventive, and curative services. Levels 4 and 5 (primary, secondary and tertiary hospitals) offer curative and rehabilitation services, with a limited number of preventive/promotive care programs, while level 6 is the highest level of care, comprising the national referral hospitals. Sampling for this study was purposive to include only facilities that managed a high number of PAC cases, so allowing us to recruit sufficient cases over a short period (one week for data collection) when trained qualitative interviewers were able to work at each facility.

Sampling

Sixteen hospitals in three regions – Nairobi (5), Central (5) and Eastern (6) – were sampled purposively by regional area, level, and reported quality of care. These facilities were classified into "high," "medium" or "low" quality [37] to ensure representation of facilities at different levels of care and to gain a wide view of provider and patient experiences according to the facility level. This categorization was based on data from an earlier study from which these facilities were sampled. The study used the essential elements of PAC framework to categorize all participating facilities into three categories above (for details, see Mutua et al., 2017)). To achieve greater diversity and in-depth opinions on care from patients we purposively selected patients from a sub-sample of six of the 16 facilities, two from each of the three levels of quality stated above. This selection was mainly based on facility distance from Nairobi and size, with the intention to focus this selection on high-volume facilities able to provide sufficient numbers of interviews within a short period. Five patients in each of the six facilities were recruited and interviewed, together with one service provider at each of the 16 facilities. This yielded a sample of 30 patients and 16 provider interviews. However, due to a low number of patients in some facilities, only 21 patients were interviewed of the targeted 30 patients. All service providers were interviewed: of the 16 interviewed, eight were nurses and eight clinical officers.

Data collection

Two interview guides were developed and reviewed by the lead author and all co-authors. The guides were structured specifically to encourage discussions with service providers and patients on their understanding of the different components of the quality of PAC framework. The service provider interviews lasted on average 34 minutes while patient interviews lasted 21 minutes. Both provider and patient interviews were conducted in a private room in the health facility to ensure maximum privacy of information shared. All interviews were conducted either in English or Kiswahili, and transcribed and translated into English if the interview was conducted in Kiswahili. Field data collection was conducted between May and July, 2017.

Data

The main PAC service providers in selected facilities were recruited and interviewed by one of a team of three experienced and well-trained qualitative field researchers (all female). Women who were treated for PAC in selected healthcare facilities were interviewed after discharge,

prior to their return home. The principal investigator (first author, PI, male) trained and worked with the field researchers to ensure that they had a good understanding of the study objectives and were mindful of its ethics. Interviews were adapted throughout the process through a constant review of data collected. All interviews were audio-recorded, and quality control and improvement were ensured through listening to recordings and discussions for providing feedback to interviewers. Once each interview was completed, it was forwarded electronically to a central office and archived on a password-protected computer, accessible only to the PI. Once all data were received, a transcriber worked with the PI; she was well trained to understand the survey objectives and the ethics of handling sensitive data. All data were transcribed into Microsoft word and as required, translated from Kiswahili into English. All patient and provider identifiers were replaced with codes to minimize the risk of identification of patients during data coding and analysis.

Survey ethical consideration

Ethics approval was obtained from the Ethical and Scientific Review Council of African Medical Research Foundation (AMREF), the Kenyatta National Hospital (KNH) and University of Nairobi (UoN) Ethical Review Committee (ERC), and the Human Research Ethics Committee (Medical) at University of the Witwatersrand. Survey approvals were also obtained from the Kenya National Commission for Science, Technology, and Innovation (NACOSTI) and the Ministry of Health. Written informed consent as approved by AMREF were obtained from each participant before any interview was conducted. All minors who were already securing PAC services were deemed to be independent and able to provide their own informed consent, without parental consent.

Analysis

Data were analyzed deductively, using a predefined set of themes from the essential elements of PAC framework. Additionally, inductive analysis was used by identifying any additional themes on quality of care at the facility as described by the providers and patients. A double coding approach was used to compare independent codes between a trained and experienced coder and the PI, and an agreement was built on the codes before final coding in NVIVO. Final analysis involved in-depth interrogation of the data for both visible and underlying meanings assigned to quality of care from the perspectives of the service providers and patients. Specific verbatim quotes were extracted from the data, which express respondent views concerning certain propositions of quality care. Below, we identify people only by broad class (provider, patient) when we quote them directly.

Results

In this section, we first discuss the legal and policy issues that frame the provision of quality PAC services in healthcare facilities in Kenya, by exploring all issues related to the abortion law in Kenya and the policy environment within which PAC services are sought and offered within healthcare facilities. We then discuss the different components of the essential elements of PAC framework, and how PAC services are sought and delivered in the context of the above legal and policy environment.

The constitution and the law

For fear of legal repercussions, patients often fail to disclose their abortion history, withholding information from providers on the method used to induce an abortion, for instance, and

estimated gestational age. Under such circumstances, especially when physical examination is also misleading, inadequate disclosure can result in inaccurate management and impedes the use of appropriate technologies, with potential risks to the woman:

> In the process of taking the history, there is another challenge because a lady can decide not to tell at which gestation stage the child was. You can say my last menstrual period (LMP) was the previous week yet you find at the expulsion of the fetus you see the fetus was already developed. (Provider, level 4, private, low quality facility)

How policy is derived from law, and how it is translated

In 2016 changes in law led to the registration and inclusion of Misoprostol and Mifepristone as essential drugs for the management of obstetric and gynecological indications, resulting in increased access of these as abortifacients. This significantly reduced the use of crude means of abortion termination (such as the insertion of a sharp object, ingesting concoctions or heavy massage). However, some service providers found challenges with the unregulated access of these drugs, often without proper controls on drug prescription and usage:

> You find that abortifacients could not be sold in chemists without a doctor's prescription. Nowadays they are very available, even a standard 8 girl can go to town, purchase the abortifacients, come here bleeding in shock . . . the drug is now an over-the-counter drug. (Provider, level 5, public, high quality facility)

The organization of healthcare services from national to county to facility level poses additional restrictions to quality PAC access. Processes such as the acquisition of appropriate equipment and medication, integral to quality PAC, are managed by healthcare administrators who often lack requisite medical skills:

> You are dealing with someone who is not a medical person in the procurement department. You are dealing with a matron that is not interested maybe" (Provider, level 4, public, low quality facility).

There was a lack of guidelines on the provision of PAC and legal abortion care in all facilities and at all levels. In the absence of such clarity, some service providers opted to provide safe abortion services at night, but during the day, these cases would be recorded and managed as PAC cases. Service providers emphasized the need for interventions by county and national health management officials to provide effective guidelines for abortion care and PAC; guidelines, they felt, would improve their confidence to provide PAC, because they offer clarity in relation to the law:

> I think in the county we have the RH (Reproductive Health) department. They are doing a good job but mostly they are concentrating on the family planning. In the county government, the RH department should really concentrate on how to reduce cases of aborting and on how to increase awareness on PAC. (Provider, level 4, private, medium quality facility)

Service providers acknowledge the importance of collaboration between different RH actors. Despite the cost implications of such ventures, service providers identified the need for service collaboration between county governments and other RH stakeholders to support identifying and addressing existing quality gaps in PAC services.

Delayed care due to limited facility capacity

Lack of requisite capacity to offer quality PAC in facilities resulted in women receiving "partial referrals" for certain services such as radiological examinations and surgical obstetric or gynecological care. These referrals extended the duration of treatment and increased the risks of excessive bleeding and untreated infections, causing concern among patients and service providers alike. Lack of ultrasound equipment in most level 4 facilities, for example, meant that patients were regularly referred to other facilities for obstetric or abdominal scans, after which they were then to present back to the referring facility for further management. The need to go to a different facility for a scan led to delayed intervention and increased the risk of severe complications. As one service provider in Central Kenya emphasized, less time was lost when patients were referred to a single facility for both the scan and completion of treatment. However, even when this was possible, in some cases patients were asked to return to the referring facility because of heavy workloads and lack of space in the larger facilities:

> Our nearest referral hospital is [Facility A] level 5, where they usually can go and first do the scanning, if they wish to complete their procedures there they can but some of them due to the workload in [Facility A], after scanning they usually come back here, so we do still the MVAs here. If it is septic we have the wards and thus we admit them. (Provider, level 4, public, high quality facility)

Patient referral from smaller facilities was common. In the larger facilities, patients could wait overnight to be seen by a doctor. For example, one patient was referred to a facility, having already expelled one of a twin fetus; the second fetus was only partly expelled. Overnight, this patient remained under ineffective pain killers, awaiting a doctor to perform an evacuation.

In smaller level 4 facilities, patients often needed specialized surgical interventions, which only a specialist gynecologist could perform. Yet a referral was often not feasible, due to the long distance between facilities and transfer costs. Some of these facilities lacked ambulances with advanced life support (ALS) to ensure patients of a seamless transfer to a level 5 hospital. Even for facilities with ALS ambulances, certain complications such as postpartum hemorrhage and ruptured uterus could still result in death of the woman while in transit.

Patient referral and transfer gaps were evident, with providers experiencing difficulties to identify the right facility to which they could refer patients. This caused delays, leading to severe complications and occasionally the death of a patient:

> You might find that when you are referring a patient there could be some difficulties you encounter before the patient can be accepted in the facility where you are referring her. So they should try and harmonize in terms of linking to the system. ~ (Provider, level 4, public, medium quality facility)

Infection control prevents sequelae from unsafe abortions and must be controlled to prevent future pregnancy loss, and pain medication is important to ensure patient-centered care. However, lack of infection-control medications including antibiotics was common, as was the lack of analgesics. Patients were often referred to facilities such as local chemists to purchase these medications; others endured painful procedures without effective analgesics. Other health facilities referred patients because of the lack of blood or blood products, or lack of capacity or equipment to cross-match blood or transfuse. Commonly, there were insufficient instruments and lengthy instrument sterilization procedures, which with high numbers of patients hindered service provision and increased the number of referrals.

Privacy is essential for a conducive environment for patients to openly discuss their condition, for informed management of their complications, and to discuss their reproductive history and aims. However, patient admission facilities were often insufficient, resulting in patients having to share beds, premature patient discharge, and referrals to other facilities. In addition to infringements of patient privacy and right to confidential treatment, there was evidence of lack of capacity by lower level facilities to manage the number of cases that presented for PAC at these facilities. One patient had been admitted to three other facilities before a fourth admission at a level 5 hospital, and by the time she was admitted, she was unconscious. Many facilities also lacked sufficient evacuation procedure rooms, especially when a service provider was required to manage more than one patient at a time. As a result, PAC procedures were often conducted in maternity wards, despite concerns from providers of the potential psychological distress to patients by combining patients who had lost pregnancies with those who had successful births.

Technical performance

Lack of clarity on abortion law, and lack of care guidelines, impacted negatively on the capacity of service providers to provide quality PAC. Some patients were critical of the quality of support they received from staff at health facilities in relation to surgical and medical care, counseling and family planning advice. Repeat procedures, often the result of incomplete evacuation due to inadequate provider skills, were common. According to patients, these "revacuations" were mainly due to provider's inability to make a specific diagnosis, and this increased the costs of care to both the patient and the health system.

Staff turnover, due to transfer of trained personnel between facilities, also impacted on quality PAC. While transfers can improve the capacity of other facilities to offer PAC, within facilities, necessary transfers demotivated other providers and caused confusion among patients. According to service providers, skill improvement lacked a focus on the capacity to prevent patients' risk of repeat abortion:

> To many people, the knowledge is limited to just provide what it takes to take this fetus out and then the other things is not important. The only important thing is that the pregnancy is out. For me, there is that gap. I think it is a real discrepancy because tomorrow they will go get pregnant again and like that. (Provider, level 4, public, low quality facility)

Interactions between women and service providers or staff

Uncertainty around the legality of abortion often led to patient discrimination at healthcare facilities. Service providers often condemned abortion and discriminated against women who secured abortion, and did not always support patients' healthcare needs. In some cases, they designated duties such as within hospital transfers to patients or their caregivers, causing delays in care provision. Providers were often unsupportive and unresponsive to the patients' needs, and failed to treat them with courtesy. According to patients, providers unreasonably withheld guiding them through the facilities. One patient described how two or more patients used one stretcher, without measures to avoid infection, equally exposing patients and caregivers to infections:

> Yes. Then we came with the stretcher, they returned us and told us that it wasn't the stretcher for casualty, but by good luck there was a patient that was being discharged and that is when we took the stretcher; it was just by chance. (Patient, level 6, public, high quality facility)

Some providers also spoke of disrespect to patients (from providers other than themselves) and argued the need for positive attitudes by health providers to encourage timely seeking of PAC services. Young women were particularly affected by negative attitudes, from providers who believed that they should not have been pregnant in the first place. These attitudes have also been associated with the high incidence of unsafe abortion in the country, and severe complications when women opt to self-medicate complications from unsafe terminations. In addition to age, discrimination occurred on the basis of marital status, with service providers likely to conclude that an abortion was induced if a patient was unmarried. Unmarried patients were therefore more likely to lie about their marital status, in order to gain access to the same level of care as provided to married patients.

Women are discouraged from accessing care and delay doing so

Quality care requires the continued availability of PAC services, and any service disruption can lead to life-threatening complications or result in lifetime consequences on patients' reproductive and psychological health. During the study period, however, there were recurrent service disruptions due to industrial disputes: a national doctors' strike lasted over three months; a national nurses' strike for six months; and a clinicians' strike for one month. Holidays and weekends, when the few available providers were off-duty, further increased the number of days when services were unavailable. In addition to delays in seeking care occasioned by legal challenges, as discussed earlier, other forms of service unavailability and stigmatization influenced general patterns of healthcare seeking. Women were aware of service disruptions, and they often presented to public facilities only when their conditions were too grave for further self-management and when they could not afford private facilities. Furthermore, most PAC cases in Kenya are treated in public facilities [7]. Even during the strike period, most public facilities always had nurses on duty, but care was delayed when the nurses were unable to perform a particular procedure or the procedure was not the nurse's responsibility as set out in the service guidelines and Ministry of Health regulations:

> Because if you come here at night, there is no doctor, there were just nurses, there are some things that the nurses can't do like that one of mine they were telling me that I had to wait for the doctor, what if it was something serious that could kill me? (Patient, level 6, public, high quality facility)

Can women afford to access PAC?

The essential elements of the PAC framework do not explicitly clarify cost of care, whether direct or indirect. In Kenya, healthcare services are not free; they are subsidized in public facilities but not in private facilities. In cases of emergencies at night, or during weekends and holidays, most primary care public facilities are closed, and patients travel for long distances to reach an available secondary and tertiary facility. In such cases, these patients would seek care in private facilities, but these services are not generally affordable. Patients who could not pay for the services in private facilities would be referred to public facilities, while those in public facilities would miss certain services or procedures until they can raise funds to pay for these services. Others were discharged without receiving critical treatment procedures, owing to non-payment. This exposed patients to further complications, such as septic abortion when a patient could not afford to pay for antibiotics, or a perforated uterus for a patient who was delayed before and evacuation procedure.

Regardless of ability to pay, the Kenyan constitution guarantees every Kenyan of the right to emergency care. However, patient referrals increase the out-of-pocket cost of treatment,

particularly when referred from public to private facilities. For other patients, the requisite mode of payment for services posed additional challenges. Lack of payment options for patients necessitated the emergence of brokers, who would assist patients to make payments at a fee. Patients were often required to make cash payments for procedures, including large sums of money for surgical procedures. This requirement would restrict services even to patients who could make these payments using an alternative payment mode such as a credit or debit card. In large government hospitals, use of cash was restricted, as facilities favored mobile money transfers (M-Pesa), yet patients were not always able to make such transactions. Consequently, PAC patients were at times required to walk for long distances in search of mobile money services:

> Maybe you have cash and not in M-Pesa [mobile money], when you are sent to buy drugs or pay for something, you are told that you should pay through M-Pesa, now with that it delays because you have to move from there and go to M-Pesa, deposit the money so that you can then come back, and pay. If it was someone in a critical condition, he/she can just die."~ (Patient, level 6, public, high quality facility)

The requirement that patients paid prior to each procedure restricted access to timely care within facilities. Similarly, inability to pay for services led to multiple referrals, with patients typically moving from a private facility near their residence to a public facility, far from their residence. In private facilities, providers reported that patients often could not afford services at all, even after the services had been rendered. In addition to direct treatment costs, even in public facilities where all services are supposedly free, other indirect costs such as toiletries and bathing accessories such as bath basins further increased their out-of-pocket expenses.

Discussion

PAC services in Kenya continue to suffer significant quality drawbacks owing to the legal and policy environment under which both service providers and patients operate, so impacting on access and provision [51]. There is no clarity of law for either the patient or service provider, and there are currently no guidelines to provide legal safe abortion in Kenya. This in effect means that patients and service provider communication is shaped by fear, with each party worried about legal repercussions, as established in other countries with similar restrictive abortion laws [52]. Fear further fuels discrimination against patients by service providers, and community discrimination against service providers. This leads to delays in seeking care on one hand, and provision of care on the other, which ultimately increases the risks of severe complications among PAC patients.

Abortion in Kenya remains restricted, and there is evidence of high incidence of unsafe abortion [19,50]. Lack of clear guidelines on the provision of safe legal abortion and post-abortion care complicates access to quality PAC in healthcare facilities. Where such guidelines are either unavailable or unclear, career security and personal abstraction of social norms, rather than the need for patient-centered care, formed the basis of the decision-making by most service providers we interviewed [53–55]. However, when providers have full legal backing, quality care can be assured across facilities and its implementation can also be assessed for continued quality improvement. Despite a constitution that guarantees every patient of universal access to emergency care, the ambiguity of abortion law in Kenya contributes to the risks of unsafe abortion, through delayed care-seeking and emergency service delivery [52].

Service providers require full disclosure, including pregnancy gestational age, for a proper choice of treatment option. However, the illegality of abortion creates fear among patients,

leading to incomplete disclosures of their history, leading to misdiagnosis and use of inappropriate technology in patient management [24], as has been previously demonstrated [37]. The entry of abortifacients in Kenya has significantly reduced the use of crude means of pregnancy termination, yet this alone cannot solve the challenges of unsafe abortion [51]. These abortifacients have other functions in care, especially in treating post-partum hemorrhage, which necessitate their registration in the country as essential medical drugs. However, as service providers pointed out, their over-the-counter access may not guarantee safer abortions unless coupled with better controls for their administration.

There is compelling evidence that effective post-abortion contraception reduces the risk of repeat abortion among an already exposed group [56–58]. However, facilities owned or managed by faith-based organizations restricted access to contraceptive services. Consequently, patients were referred to other facilities for post-abortion contraceptives, although such referrals are known to be highly ineffective due to low, incomplete or inconsistent follow-up.

Availability of essential drugs and other consumables that are critical to care delivery, such as disinfectants and pain medications, is restricted, and service providers have minimal controls over such decisions [35]. Pain medication and infection control were equally deficient and in most cases, patients complained of either lack of these medications in public facilities or their ineffectiveness. Effective pain management is an essential component of care, which assures patient satisfaction with care and future service utilization. However, providers were rarely involved in procurement processes or in discussions on sanitation and sterilization of surgical facilities.

Government or facility policies on the recruitment and exposure of facility workers to critical procedures such as infection control and procurement decisions further deterred access to quality PAC. When healthcare management guidelines charge such non-medical or insufficiently trained staff with these responsibilities, care decisions are based on reasons other than quality care, such as cost-saving and budgetary controls.

There was evidence of deficient interaction between women and service providers as well as negative attitudes towards women. At some facilities patients were denied services to avoid being branded as "abortion clinics" in the communities. Service providers in such facilities often resorted to quick referral for services, even when they understood the need for timely PAC and the consequences of denying or delaying such services. According to service providers, community engagements geared towards changing the perception on abortion would create a favorable environment for PAC delivery. Patient discrimination and fear of facility-based discrimination resulted from negative attitudes towards abortion from both service providers and community members. While some providers withheld services, especially contraceptives to adolescents and young women, others denied women critical nursing care, forcing them or others caring for them to perform roles that would normally be performed by providers. There were also evident provider training gaps which impacted on patient safety and service quality, as highlighted by some of the providers and patients interviewed (see also [59]).

The treatment of incomplete abortions and complications from abortions rested on the level of healthcare facility preparedness and the capacity of service providers to offer quality PAC. Lack of responsiveness to patients and inadequate patient support significantly affected patients' perception of the quality of PAC services. Emergency care was significantly impeded by the unavailability of the right service providers for certain procedures, especially doctors, and during the night, weekends or public holidays. These capacity gaps were also evident in the number of patients who required multiple evacuations, often leading to longer hospital stays and increased the cost of care to both the patients and the healthcare system. There were also quality gaps in patient counseling services in most facilities, despite evidence of the role of effective counseling on the future contraceptive behavior of PAC patients [60–62]. The need

for strengthening the capacity of lower service provision personnel such as nurses, midwives and clinicians is evident in resource strained countries like Kenya where it is not possible to guarantee a medical doctor or a specialized obstetrician/gynecologist at all times [63]. Similarly, frequent transfer of medical personnel often disrupted services in these facilities.

Timely service delivery minimizes the risks of post-abortion complications. Between facilities, as in other recent studies, long and unspecific referrals delay care, with patients often experiencing multiple referrals due to a shortage of bed space, equipment or technical skill by service providers [64], similar earlier findings on delays in making critical decision to transfer patients [65]. Lack of facility capacity, especially unavailability of the requisite equipment and space, was prevalent and resulted in partial or full referrals. Such patients spent more time seeking care, leading to higher treatment cost [66]. Most patients preferred private facilities over public facilities due to the long waiting time at the latter, although they often could not afford such care [19,65,67].

Cost of care was a major barrier to PAC service access [68–70]. Commonly during treatment, patients incurred unanticipated costs, which either delayed the provision of care or, through extended hospital stay, increased costs. In this study, as illustrated above and described in other studies, patients were at times referred to other public or private facilities for specific procedures [19,71]. Even in public facilities where services were deemed free, hidden costs such as the purchase of toiletries often become apparent to patients upon admission, as also described in a Bangladeshi study [72].

As noted, mode of payments available at facilities was problematic, as some facilities restricted cash payments and insisted on mobile money transfers, while others insisted on cash payments even for large payments such as for theatre procedures. These restrictions reduced service access, even when services were available.

PAC services are not addressed by county or national government health agendas. As a result, there is a lack of integration of PAC and family planning services. According to the PAC framework, there is a clear interrelationship between PAC and contraception. Universal access to effective contraception cannot be attained without ensuring effective contraception for all women treated for PAC [73,74].

For continuous and sustained quality PAC, availability and accessibility, service inequity needs to be addressed. In most cases, service disruptions render access impossible for patients and delays care, especially in public facilities (see also Ziraba et al., 2015). These disruptions due to industrial actions, and the unavailability of services over weekends and on public holidays, expose patients to complications and life-long sequelae. Often, PAC cases present as emergencies and the level of facility preparedness to deal with these conditions determines the patients' post-abortion health outcomes and subsequent quality of life, including their future fertility [47,55].

A number of partnerships are crucial in ensuring quality PAC. Strong public-private partnerships can improve access by creating linkages between public and private facilities, while linkages with other PAC and RH stakeholders can strengthen the quality of service delivery, especially in primary care facilities. Strengthening knowledge sharing between facilities and other non-governmental actors in PAC has been lauded in other settings for the quality of PAC service delivery, and for reducing the risks of unsafe abortions [75–77].

Private facilities, including faith-based facilities, continue to play a complementary role to the public facilities' reproductive health services. However, this role is not as efficient, where barriers such as distance to services, denial of services and the cost of care exist, and public facilities must be more accommodative to PAC patients and refocus care delivery towards patient centeredness.

Conclusion

In Kenya, quality post-abortion care is still deficient in healthcare facilities. Continued restrictive abortion laws inhibit quality improvements that might be possible through provider training and community support for women with unintended pregnancies. Lack of policies and guidelines for the provision of safe and legal abortion care continue to impede service delivery. In addition to availability of well-trained service providers, effective care guidelines have been shown to work well in other aspects of care [78].

Legalizing abortion must be preceded or complemented by quality improvement on existing PAC services and awareness of the risks of unsafe abortion, through the promotion of early management of complications and more responsive emergency care. Ensuring proper regulations on the use of medical abortifacients requires policy intervention geared towards improving usage, without reversing the current gains. The need for improved service delivery is critical, guaranteeing the safety and confidentiality of patients and the consequent confidence of service providers when managing PAC patients.

Continued availability of service providers would not only reduce the illness burden to patients but could be life-saving. Training service providers, together with equipping facilities with radiological capacities for the timely detection of incomplete abortions, could improve the quality of care and reduce costs of services and to patients. The greater involvement of service providers in developing the capacity of support staff could ensure an infection-free healthcare environment and continuous skill improvement through knowledge sharing, especially in smaller facilities, with the aim of reducing the need for long-distance travel for care.

There is need to re-organize PAC service provision for informed decision-making on the availability and readiness of equipment and products for quality PAC, including the maintenance, sterilization and availability of the right drugs. Expanded service delivery, with full PAC at lower-level facilities, can ensure continued and uninterrupted availability of services. Facility-based interventions are also needed to improve women's access to effective contraception and to address religious and cultural concerns about contraceptives as an unacceptable means of managing unintended pregnancies. Better integration of post-abortion care and family planning will increase post-abortion contraception this in turn will improve the disposition of service providers on patient-centered care and counseling for improved contraception, so reducing reliance on unsafe abortion to limit births. While fostering service integration at specific services, combining maternity care and PAC must be done in a manner that minimizes distress for patients who have lost their pregnancies.

A well-defined linkage between facilities will further reduce delays in care delivery and assure patients of favorable treatment outcomes while expanding service delivery to primary care facilities to reduce multiple patient transfers. Further, creating linkages between facilities and communities can help to reduce the strong anti-abortion and anti-contraception views and increase awareness of the risks of unsafe abortion. Stronger partnerships between healthcare providers, public and private actors, and communities to prevent the risks of unsafe abortion may ensure both patients and providers of long-term health improvement and security from legal repercussions.

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