



CORVINUS UNIVERSITY OF BUDAPEST

Institute of Economic Studies

Department of public policy and management

Telemedicine adoption in the Kenyan public healthcare system: A focus on access, efficiency, and effectiveness.

Peter Odhiambo Nyandat

A thesis submitted in partial fulfillment of the requirements of a master's degree in public policy and management.

Supervisors: Molnar Gabor Tamas

Peter Balazs

2024

DEDICATION

With the deepest appreciation and heartfelt warmth, I dedicate this thesis to my late mother and father, pillars of strength and reservoirs of wisdom. Their unwavering belief in my abilities and relentless support have been instrumental in navigating the challenges of my educational journey. They have not only instilled in me the value of hard work and perseverance but have also been my constant source of encouragement and love. It is to them that I owe the achievement of this milestone.

ACKNOWLEDGMENT

I extend my sincerest gratitude to my supervisors, Gabor Tamas, and Peter Balazs, for their invaluable guidance, unwavering support, and insightful feedback throughout my thesis work. Their expertise and dedication have been pivotal in shaping not only this research but also my academic and professional growth. Gabor's thorough understanding and Peter's critical insights have significantly contributed to the depth and quality of this study. Their patience and availability to address my queries and concerns have greatly enhanced my learning experience and confidence in my work.

Special thanks go to my family members for their moral, financial and social support. More importantly to God for granting me good health and seeing me through the entire course.

TABLE OF CONTENTS

DEDICATION	2
ACKNOWLEDGMENT	3
LIST OF FIGURES	5
LIST OF TABLES	6
ABSTRACT.....	7
CHAPTER ONE: INTRODUCTION	8
Background to the Study.....	8
Statement of the problem	11
Research questions and objective	12
Relevance of the study	14
Outline of the research	15
CHAPTER TWO: CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW	16
Terminologies associated with telemedicine.....	18
Technology Acceptance Model.....	20
CHAPTER THREE: CASE SELECTION RATIONALE	22
CHAPTER FOUR: METHODOLOGY.....	24
Data collection	24
Measurement tools	24
Statistical Analysis	25
CHAPTER FIVE: DATA ANALYSIS	27
Descriptive statistics	27
Table Distribution of Dependent and Independent Variables.....	32
Utilization Patterns of Telemedicine Forms.....	33
Correlation matrix.....	37
Regression analysis.....	38
CHAPTER SIX: DISCUSSION, LIMITATION AND CONCLUSION	41
Discussion.....	41
Limitation.....	42
Conclusion	42
REFERENCES	44
APPENDIX 1.....	49

LIST OF FIGURES

Figure 1. Preliminary conceptual frame map

Figure 2. Basic concepts underlying user Acceptance model.

Figure 3. Technological acceptance model

Figure 4. Gender pie chart

Figure 5. Histogram of Age distribution per gender

Figure 6. Pie chart for marital status

Figure 7. Forms of Telemedicine bar chart

Figure 8. Clustered bar means forms of telemedicine.

LIST OF TABLES

Table 1. Gender distribution

Table 2. Distribution of variables

Table 3. Utilization patterns

Table 4. Regression analysis table

Table 5. Regression model summary

ABSTRACT

This research investigates the adoption of telemedicine services in Kenya, focusing on the factors influencing its uptake and utilization among healthcare stakeholders. Adopting a positivist research philosophy and employing deductive reasoning, the study utilized a cross-sectional survey design to gather primary data from 160 respondents. A purposive sampling strategy was employed to ensure a diverse representation of individuals who have utilized telemedicine services, facilitating a comprehensive exploration of their experiences, challenges, and perceptions.

Data was collected through a semi-structured questionnaire, encompassing various types of questions to elicit specific responses regarding telemedicine adoption. Likert scales were utilized to measure respondents' perceptions of telemedicine's impact on accessibility, efficiency, and effectiveness, while demographic information was captured for subgroup analyses. Statistical analysis techniques, including multiple linear regression, cross-tabulation, Pearson correlation, and ANOVA, were employed to analyze the data and examine relationships between variables.

The findings revealed a moderate level of telemedicine adoption among respondents, with telepharmacy emerging as the most utilized service. Effectiveness, efficiency, and access were identified as key factors influencing telemedicine adoption. While effectiveness and efficiency showed strong positive correlations with access, access demonstrated a significant positive effect on the level of adoption, whereas effectiveness and efficiency did not yield statistically significant effects. Access to telemedicine services significantly influenced adoption levels, highlighting the importance of ensuring widespread accessibility to promote adoption.

Overall, this study contributes valuable insights into the complexities surrounding telemedicine adoption in Kenya, offering implications for healthcare policy and practice. Addressing barriers to access and enhancing service effectiveness and efficiency are crucial for fostering greater uptake of telemedicine, ultimately improving healthcare delivery and accessibility in the region.

Keywords: Telemedicine, Telepharmacy, Telenursing, Telemonitoring, mhealth

CHAPTER ONE: INTRODUCTION

Background to the Study

Globally, numerous countries, particularly those that are underdeveloped or developing, are encountering significant difficulties related to the quality, access, efficiency, and effectiveness in addressing current health issues. In an era characterized by rapid technological advancements and increasing demand for accessible healthcare services to bridge distance and support healthcare delivery, it is evident that the healthcare system is undergoing a transformative shift Demiris, (2003).

Across the globe, nations are grappling with the need to enhance healthcare accessibility, efficiency, and effectiveness, particularly in underserved regions. To explain the phenomenon, the term telemedicine was coined by Thomas Bird in the 1970s to mean healing from a distance. The prefix *tele* is a Greek word meaning far or distance (Strehle & Shabde, 2006). Similarly, according to Davis et al., (2016), The American Telemedicine Association defines telemedicine as the use of medical information exchanged from one site to another via electronic communications to improve a patient's clinical health status. The adoption of Information Communication Technology (ICT) in health is increasingly being implemented across the globe to strengthen different components of the health system.

JD Power, (2019) in his study examined national statistics on telemedicine utilization and discovered that people in rural areas were more likely to believe telemedicine will cost more than in-person care. The study also showed that telemedicine was used more frequently in the West than in the Northeast of the United States. It was noted that seniors engaged in telemedicine at the lowest rate, whereas young persons between the ages of 18 and 24 engaged the most. According to the survey conducted 35% of respondents were not aware of the telemedicine services offered, and 75% of consumers believed their insurance and health system did not offer them telemedicine options. Compared to urban areas, this ignorance was more evident in rural and suburban communities.

According to Wang et al., (2016), the introduction of telemedicine in China, linked highly specialized major hospitals (hub) with hundreds of small rural hospitals (spoke).

The implementation of telemedicine has significantly enhanced the quality, efficiency, and cost-effectiveness of healthcare services. It resulted in changes to the treatment of 6,591 patients

(55.0%), including 3,677 (55.8%) alterations not associated with diagnostic changes. This study noted that telemedicine networks led to substantial estimated savings of \$2,364,525 (considering patient travel to the central hub) or \$3,759,014 (if specialists were to travel to peripheral hospitals).

Countries in Sub-Saharan Africa (SSA), including Nigeria, Ghana, and South Africa, have telecommunications densities surpassing 100%, as reported by (GSMA Intelligence, n.d.). The mobile economy report anticipated that mobile phone connections in SSA will grow from 816 million in 2019 to 1.05 billion by 2025, with smartphone connections expected to nearly double in the same period. This growth indicates that an increasing number of Africans will have access to mobile devices, which can be utilized for telemedicine to improve healthcare accessibility.

On the other hand, SSA confronts a significant challenge with a shortage of medical personnel and facilities. The region, which constitutes only 1.3% of the global health workforce, bears 25% of the world's disease burden. The doctor-to-population ratios in SSA vary from 1:5000 to 1:30000, compared to an average of 1:1400 in other developing countries, and 1:300 in developed nations (Meso et al., 2009). This shortage of skilled health workers, compounded by the high burden of diseases and exacerbated by the HIV/AIDS pandemic, which accounts for 19–53% of government staff deaths in some southern African countries, further strains the already limited healthcare resources.

Telemedicine situation in Kenya

The relevance of telemedicine extends far beyond the borders of Kenya, touching upon a regional significance that is deeply rooted in the common healthcare challenges faced by many countries in East Africa. A constellation of shared difficulties, including limited access to healthcare services, a shortage of medical professionals, and an increasing disease burden characterizes this broader regional context. These challenges are not unique to Kenya but are instead reflective of a widespread scenario across Sub-Saharan Africa, where rural and underserved communities often grapple with significant healthcare disparities (Meso et al., 2009).

This regional relevance is further underscored by the pressing need for innovative solutions to overcome healthcare delivery challenges. The motivation behind such research and implementation efforts stems from a deep-seated desire to address these disparities head-on, ensuring that every individual, regardless of their geographical location, has access to high-standard medical care (Mars, 2013).

The strategic embrace of telemedicine by Kenya, as outlined in the Kenya National e-Health Strategy (2011), is a testament to the country's commitment to improving healthcare accessibility, affordability, and quality for all its citizens, in alignment with its Vision 2030 goals. This initiative serves as a potent example of how leveraging digital health technologies can offer a lifeline to those in remote areas, ensuring that distance no longer dictates the quality of healthcare received. By focusing on telemedicine, Kenya aims to enhance healthcare delivery and bridge the existing gaps within its public healthcare system (Ndung'u et al., n.d.). The aim is not only to transform the Kenyan healthcare landscape but also to serve as a beacon for neighboring countries facing similar challenges, providing valuable insights that can inform policy decisions, strategic planning, and the rollout of telemedicine initiatives across the region.

In essence, Kenya's journey towards integrating telemedicine into its public healthcare system mirrors a larger, regional narrative of striving for equitable healthcare access amidst daunting obstacles. Qin et al., (2013) highlights a collective aspiration among East African nations to harness the power of technology in overcoming traditional barriers to healthcare. As such, Kenya's approach offers a valuable blueprint for neighboring countries, illustrating the potential of telemedicine to revolutionize healthcare delivery in resource-limited settings, thereby contributing to the broader goal of achieving universal health coverage in the region.

Statement of the problem

The Kenyan public healthcare system is faced with significant challenges in providing accessible, efficient, and effective healthcare services, particularly in rural and underserved areas. Despite the potential of telemedicine to address these issues, there is a gap in understanding the factors influencing its adoption and impact on healthcare delivery. The existing shortage of medical personnel, coupled with a high burden of diseases, exacerbates the challenges faced by the healthcare system. The inadequacies in the current healthcare infrastructure and the geographical distribution of the population further hinder the accessibility of specialized healthcare services(Wamai, 2009).

While telemedicine has demonstrated success in various global contexts, its implementation and effectiveness within the specific framework of the Kenyan public healthcare system remain understudied. Moreover, there is a scarcity of literature that investigates user-specific factors that influence the acceptability and adoption of telemedicine technology among patients.

Despite extensive studies on factors driving telemedicine adoption, focusing primarily on healthcare providers, telemedicine's legal aspects, governmental policy regarding financing, and the infrastructure particularly in Kenya, there's a noticeable gap in understanding how user specific adoption influence telemedicine uptake with regards to Kenya's distinct socio-economic conditions as well as its unique infrastructure influence on telemedicine's uptake.

Kenya's healthcare system is tiered, comprising community health services, dispensaries, health centers, and hospitals, each providing varying levels of care. As Onsongo et al., (2023) highlights, at the primary level, community health services and dispensaries provide basic healthcare services to the population. Hospitals at the secondary and tertiary levels provide more specialized medical services with advancement in specialty with each increasing level. This along with its commitment to Vision 2030 objectives, underscores the need for a comprehensive investigation into the adoption of telemedicine.(*Kenya-Vision-2030.Pdf*, 2007).

Research questions and objective

Efficiency

Research Question 1

How does the implementation of telemedicine impact the efficiency of public healthcare provision in Kenya?

Research Objective: To evaluate the extent to which telemedicine has enhanced the efficiency of public healthcare provision in Kenya.

Efficiency in healthcare provision is crucial for maximizing the use of limited resources, particularly in settings constrained by financial, human, and physical resources. Focusing on efficiency allows for the assessment of telemedicine's role in streamlining operations, reducing wait times, and optimizing resource allocation within Kenya's public healthcare system. Evaluating efficiency contributes to understanding the operational benefits and potential cost savings introduced by telemedicine, highlighting how telemedicine can make healthcare systems more sustainable.

Effectiveness

Research Question 2

How does telemedicine influence the effectiveness of public healthcare provision in Kenya?

Research Objective: To examine the influence of telemedicine on the effectiveness of public healthcare services in Kenya.

Effectiveness relates to the quality and outcomes of healthcare services. This focus is vital for understanding how telemedicine interventions impact patient health outcomes, the quality of care, and patient satisfaction. It's essential to investigate this aspect to ensure that telemedicine not only expands service delivery but also enhances the quality and results of healthcare. Examining effectiveness sheds light on the quality dimension of telemedicine, offering insights into how its adoption impacts patient care outcomes and whether it meets the healthcare needs of the population.

Access

Research Question 3

To what extent does telemedicine affect the accessibility of public healthcare provision in Kenya?

Research Objective: To assess the extent to which telemedicine has affected the accessibility of healthcare services, especially in remote and underserved areas.

Accessibility is a critical concern in many parts of Kenya, where geographical and infrastructural barriers limit access to healthcare. This objective is focused on determining how telemedicine has bridged these gaps, providing crucial data on its role in enhancing healthcare reach to the most marginalized populations. Assessing accessibility directly addresses the issue of healthcare equity, revealing the extent to which telemedicine can mitigate geographical and socioeconomic disparities in healthcare provision.

The three objectives and corresponding research questions are intrinsically linked, presenting a holistic view of telemedicine's impact on the public healthcare system. Efficiency improvements can lead to enhanced effectiveness by freeing up resources for quality care, while increased accessibility ensures that the benefits of efficient and effective healthcare reach all segments of the population, including those in remote areas. Together, these aspects paint a comprehensive picture of telemedicine's potential to transform healthcare delivery in Kenya, addressing the critical issues of access, quality, and resource utilization. By focusing on these interrelated dimensions, the research aims to provide an understanding of telemedicine's role in advancing public health objectives, informing policy, and guiding future implementations in similar contexts.

This research was fundamentally motivated by the imperative need to comprehend the user-specific factors influencing the adoption of telemedicine among patients in Kenya. Despite the globally recognized benefits of telemedicine, its uptake in Kenya remains surprisingly low. Therefore, this research resort to unravel the intricacies surrounding the adoption puzzle, aiming to identify and understand the specific challenges that users face regarding accessibility, effectiveness, and efficiency in integrating telemedicine into their healthcare services. By addressing these adoption challenges, the research contributed to the realization of the overarching national goal outlined in Vision 2030, which envisions accessible and affordable healthcare for all Kenyan citizens (Kenya-Vision-2030.Pdf, 2007, p. 203).

Relevance of the study

Telemedicine has been lauded as a game-changing approach to healthcare delivery, particularly in areas facing accessibility, quality, and efficiency difficulties. The global deployment of telemedicine has highlighted its potential to dramatically improve healthcare provision, with various degrees of adoption and impact found across diverse geographical contexts. According to JD Power, (2019), disparities in telemedicine adoption in the United States indicated a multifaceted terrain of access, with younger groups and inhabitants of the West showing higher engagement rates, possibly due to varying degrees of awareness and resource availability. Similarly, Wang et al., (2016) opines that introduction of telemedicine in China brought major improvements in healthcare efficiency and cost-effectiveness, demonstrating the practical benefits of incorporating technology-driven solutions into healthcare systems.

Despite these advances, telemedicine's penetration in Kenya remains low, with a significant gap in the literature regarding the factors driving patient adoption. This disparity is especially prominent considering Kenya's specific socioeconomic and infrastructural problems, necessitating further research into the mechanisms driving telemedicine acceptability and utilization. Furthermore, there is a lack of comprehensive analysis focusing on the specific implementation and effectiveness of telemedicine within the Kenyan public healthcare system, emphasizing the need for localized research into its impact on healthcare accessibility, efficiency, and effectiveness.

This study seeks to close these gaps by assessing telemedicine's role in improving healthcare efficiency, its impact on the effectiveness of healthcare services, and its contribution to improving healthcare accessibility in Kenya, particularly among remote and underserved populations. Central to this inquiry is the exploration of user-specific factors impacting telemedicine adoption among Kenyan patients, with the goal of identifying the underlying issues and limitations that users confront when implementing telemedicine into their healthcare practices.

This study aims to inform policymaking, guide future implementations, and contribute to the achievement of the goals outlined in Vision 2030, which envisions accessible and affordable healthcare for all Kenyan citizens (*Kenya-Vision-2030.Pdf*, 2007).

The outcomes of this study are expected to give useful insights for policymakers, healthcare practitioners, and researchers, allowing for a better understanding of telemedicine's potential to improve healthcare delivery in Kenya and other countries experiencing similar issues.

Outline of the research

This research proceeds with the chapter on conceptual framework and literature review by defining key terms and establishing a conceptual framework, focusing on telemedicine's role in overcoming healthcare delivery barriers in Kenya. It reviews related literature on telemedicine's impact on access, efficiency, and effectiveness in healthcare, incorporating global insights and regional specifics. The chapter identifies gaps in current research, particularly around user adoption and impact in the Kenyan context and sets the groundwork for the study's objectives.

The next chapter discusses methodology, and it outlines the research design, focusing on a mixed approach to evaluate the adoption of telemedicine in Nairobi's public healthcare system. It details case selection, data collection methods (survey and document analysis), and ethical considerations, aiming to provide a comprehensive understanding of telemedicine from the user perspective. The following chapter discusses the study's findings, organized around the key themes of access, efficiency, and effectiveness. This chapter analyzes how telemedicine has been implemented and its perceived impact on the Kenyan healthcare landscape, integrating survey questions with documentary evidence. It proceeds further by interpreting the findings in the context of existing literature, offering a nuanced analysis of telemedicine's role within Kenya's healthcare system. This chapter explores the implications for policy, practice, and future research, highlighting the study's contributions to understanding telemedicine's potential and limitations.

Finally, the last chapter entails a discussion of summarized key findings, limitations, and conclusion.

CHAPTER TWO: CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

Three distinct primary conceptual frameworks of telemedicine emerge from scholarly literature, each with its unique emphasis. Alajlani & Clarke, (2013) articulate telemedicine as leveraging Information Communication Technology (ICT) specifically to navigate geographic barriers, thereby broadening the reach of healthcare services. Conversely, Menachemi et al., (2004) adopt a more nuanced stance, characterizing telemedicine through the prism of employing communication technologies to facilitate or enhance medical care delivery in instances where patients and providers are not co-located. This variety in definitions underscores the multifaceted nature of telemedicine and its applications, highlighting both its potential to transcend geographical limitations and its capacity to redefine the parameters of healthcare delivery. While these authors may be emphasizing the importance in situations where geographical distance is a key consideration, it may not be enough ground to accomplish a common understanding of the term “telemedicine,” this study however narrows it down by providing a deeper way of looking at it.

First, (World Health Organization, 2010) counted 104 distinct, peer-reviewed definitions of the concept telemedicine and defined it as the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities. This research adopts this definition for this study, as it concentrates on healthcare delivery in underserved communities, typically situated in the remote regions of Kenya. The framework centers around user-centric perspectives, which are pivotal in shaping policy decisions and strategic planning in healthcare.

Mars, (2013), explores deeper the umbrella of telemedicine and distinguishes the types of telemedicine with the first being the doctor-to-patient type carried out between patients and medical staff members which includes the use of videotelephony (videoconferencing) by a physician to examine a patient. The second is the doctor-to-doctor type between medical staff members when a physician who has treated a patient consults a specialist either for diagnosis or treatment advice.

Over the past 20 years, telemedicine technology and regulations have grown substantially. Prior to the coronavirus disease-2019 (COVID-19) pandemic, telemedicine coverage and availability in healthcare systems were not always consistent. Drawing from Kaundinya & Agrawal, (2022) research it became clear that COVID-19 epidemic spurred governments, insurers, and health systems to increase telemedicine utilization via temporary exclusions and waivers, resulting in sudden and improved access to telemedicine.

Echoing the findings of Sanjoy Kumar Pal, GS Pandey, Akanchha Kesari, G Choudhuri, Balraj Mittal,(2002), many developing countries faced a severe doctor shortage, particularly among specialists. Large cities reported a concentration of specialized services thereby leaving the rural areas isolated thus confirming the need for healthcare provision in such areas. In their seminal work, Njoroge et al., (2017) he argues that Sub-Saharan Africa, especially Kenya, was progressively implementing ICT adoption in health a perspective that reinforced the critical role of strengthening many aspects of the health system. He observed that adopting eHealth had the potential to improve the health system in several ways, including lowering costs, improving quality of care, increasing efficiency, and improving governance structures. This allowed healthcare to be provided outside of traditional boundaries.

Catwell & Sheikh, (2009) equally emphasized on embracing eHealth an assertion that lends credence to the argument that helps to ensure equitable provision of healthcare to underserved areas and vulnerable populations. Due to the various potential benefits of adopting eHealth in health systems, the corporate and public sectors have expanded investment in eHealth treatments in low- and middle-income countries (LMICs). However, various hurdles impede the successful implementation of eHealth interventions in low- and middle-income countries.

Reflecting on Demombynes & Thegeya, (2012) insights, lives have been completely changed by the mobile revolution, it is apparent that financial access as well as communications played a fundamental role in health with reports that 93 percent of Kenyans owned a mobile phone, and 73 percent use mobile money for various financial transactions including health. The study confirms an increased eHealth project implementation in Kenya that was facilitated by the country's growing ICT sector.

Terminologies associated with telemedicine.

eHealth

The World Health Organization, (2010) defines e-health as the use of information and communication technologies (ICT) for health and it can be considered an umbrella term.

Telehealth

This is a component of eHealth that refers to the provision of both clinical and non-clinical healthcare services, education, and training delivered through ICT. It has been defined as the use of ICTs to exchange health information and provide healthcare services across geographic, time, social, cultural, and political barriers, and the breadth of technology.

Telepharmacy

According to (Baldoni et al., 2019) telepharmacy indicates a form of pharmaceutical care in which pharmacists and patients are not in the same place and can interact using information and communication technology (ICT) facilities. It has been adopted to provide pharmaceutical services to underserved areas and to address the problem of pharmacist shortage.

Similarly, Unni et al.,(2021) defines Telepharmacy as is a technique used in pharmacy practice when a pharmacist uses technology to supervise certain areas of the pharmacy or offer patient care services

Telenursing

This is the use of telecommunications technology in nursing to enhance patient care. It involves the use of electromagnetic channels (e.g., wire, radio, and optical) to transmit voice, data, and video communications signals. (Johnson et al., 2018).

Telemonitoring

This is also referred to as Remote Patient Monitoring (RPM) is an innovative strategy to promote health and improve patient management and care. Disease-related and physiological data on the patient are digitally transmitted via telephone, Internet, or videoconferencing, from the patient's home to a health care center, providing clinical feedback. (Farias et al., 2020)

Telemedicine is part of an integrated approach to delivering healthcare at a distance, often used to improve access to medical services that would often not be consistently available in distant rural communities, to provide care in a more convenient home setting, or to manage patient care in more efficient ways.

Each of these components plays a role in a comprehensive telemedicine strategy, which can improve the quality of care, increase access, and efficiency, reduce health disparities, and be effective in containing healthcare costs as depicted below.

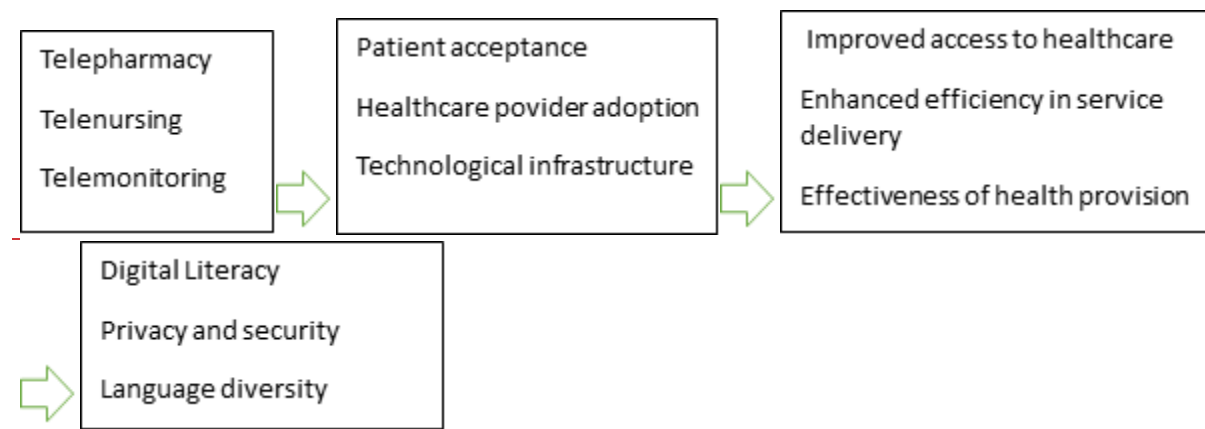


Figure 1. Preliminary conceptual frame map

The conceptual framework of this study is developed by integrating the constructs elicited from two of the most used theories. Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Shachak et al., 2019) Both TAM and UTAUT suggest that the actual use of technology is affected by one's behavioral intention to use it. In TAM, intended use is determined by attitude toward using the technology, which in turn is determined by two perceptions of the system such as perceived usefulness and perceived ease of use. Various external factors affect both perceptions. It proposes four constructs that affect usage intention, performance expectancy, effort expectancy, social influence, and facilitating conditions.

TAM is designed to predict information technology acceptance and usage on the job it illustrates the degree to which a person believes that using a particular system would enhance his or her job performance as well as using less effort. (Venkatesh et al., 2003).

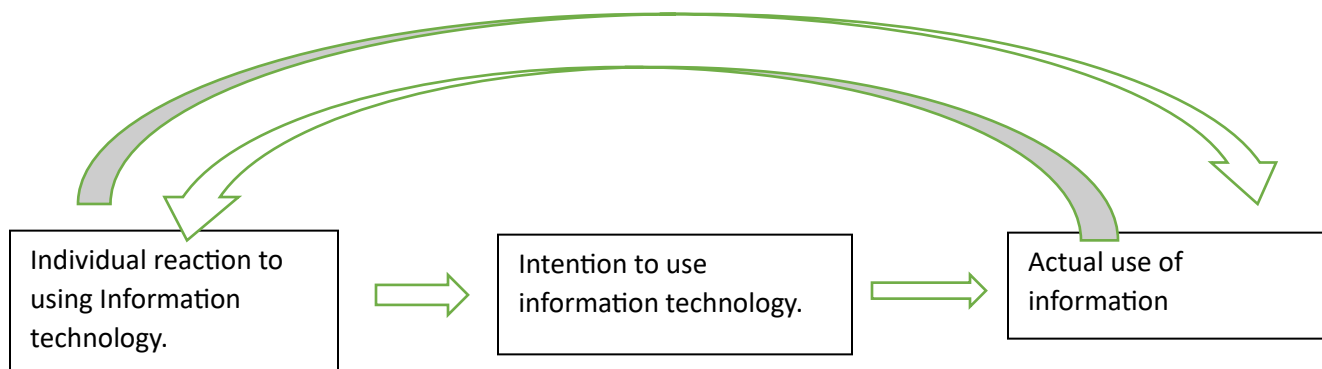


Figure 2. Basic concepts underlying user Acceptance model.

Technology Acceptance Model

A number of theoretical models have been put forth over the previous years to evaluate and explain behaviors and acceptability related to the introduction of ICT. Robust measures have been created to assess how well a technology "fits" with user tasks and have confirmed that these tools are task-technology fit (Rahimi et al., 2018). Similarly, according to Holden & Karsh, (2010), relevance of theories that forecast and explain health IT adoption and use has increased due to growing interest in end users' responses to IT and The Technology Acceptance Model (TAM), is one of such theory.

In response to worries that employees were not utilizing the IT resources provided to them, TAM was created in the 1980s. Its creators reasoned that to boost use, IT acceptance needed to first rise, and this could be measured by asking people if they planned to use IT in the future. Organizations might modify the aspects that shaped an individual's intents to enhance acceptance and, consequently, the use of IT (Holden & Karsh, 2010).

The figure below illustrate the Technological Acceptance model as depicted by Holden & Karsh, (2010) According to this paradigm, users' primary considerations when deciding whether or not to embrace and use an information technology are its usability and ease of use. Along with the behavioral patterns, the determinants affect or influence the users' attitudes toward using a particular system, their intention to use it, and how they actually use it.

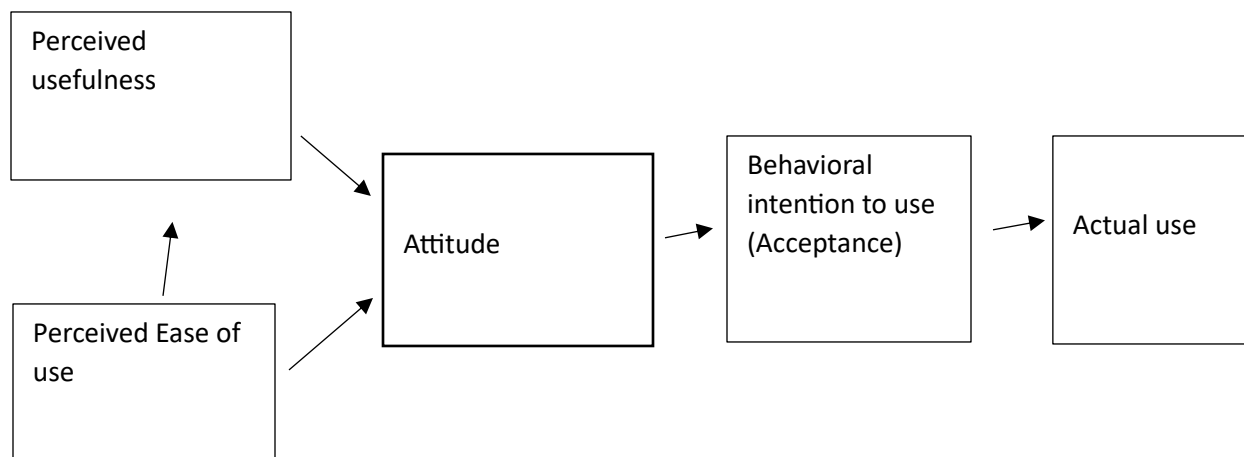


Figure 3. Technological acceptance model

Effectiveness of Telemedicine

In the brief period following the advent of COVID-19, the healthcare system adjusted to the use of telemedicine, including telepharmacy, to launch new programs and prepare for and successfully navigate obstacles (Unni et al., 2021). Studies from authors such as Lee & Lee, (2018) have demonstrated that telemedicine is an effective means of enhancing care, and as such, it has been proposed as the novel approach to treating patients with diabetes. For instance, the application of telemedicine for retinal screening was advantageous and economical in the management of diabetes, yielding an additional cost-effectiveness ratio ranging from \$113.48 each quality-adjusted life year (QALY) to \$3,328.46 per QALY (calculated using the inflation rate for 2017). Similarly, using phone reminders and telemonitoring to control diabetes was considered economical.

CHAPTER THREE: CASE SELECTION RATIONALE

The selection of Kenya, specifically the Nairobi region, and a focus on the public healthcare system for this study on telemedicine adoption is deeply rooted in both the unique healthcare challenges faced by the region and the significant opportunities that telemedicine presents in addressing these challenges. Kenya, as a developing country, faces a myriad of healthcare challenges, including a severe shortage of medical professionals, particularly specialists. With less than 10 doctors per 100,000 people on average and a critical lack of radiologists in 14 nations, Kenya's healthcare landscape is indicative of the broader regional struggle to provide adequate healthcare services, especially in rural areas (Sanjoy Kumar Pal, GS Pandey, Akanchha Kesari, G Choudhuri, Balraj Mittal, 2002). This shortage is exacerbated by a high disease burden and a healthcare infrastructure struggling to meet the demand for specialized care.

The COVID-19 pandemic underscored the importance of telemedicine as a crucial tool in maintaining healthcare delivery during times of crisis. Prior to the pandemic, telemedicine was already on a growth trajectory, but the health crisis accelerated its adoption globally, highlighting its potential to ensure continuous healthcare delivery amidst physical distancing measures (Kaundinya & Agrawal, 2022).

Nairobi, as the capital and a major urban center of Kenya, stands at the intersection of urban and rural healthcare dynamics. It is a microcosm of the broader healthcare challenges and opportunities present in Kenya. The migration patterns from rural areas to Nairobi have increased the demand for efficient healthcare delivery systems, making it a critical area for studying telemedicine's impact on healthcare accessibility, efficiency, and effectiveness. Moreover, Nairobi's status as a technological hub, often referred to as "Silicon Savannah," showcases the region's capacity and readiness for innovative healthcare solutions like telemedicine. The widespread use of mobile technology and internet access provides a conducive environment for the adoption of telemedicine, offering a unique opportunity to study its implementation and impact.

Kenya's public healthcare system, classified into six levels from community to tertiary referral hospitals, is the backbone of healthcare delivery, especially for the underserved and rural populations. The system faces significant challenges, including inadequate resources, personnel, and infrastructure, which telemedicine has the potential to mitigate.

Focusing on the public healthcare system allows for an in-depth understanding of telemedicine's role in enhancing healthcare delivery in a setting that is most reflective of the Kenyan population's healthcare access. It offers insights into how telemedicine can be scaled and adapted to meet the diverse needs of the population, particularly those in resource limited settings.

The focus on Kenya, and specifically the Nairobi region within the public healthcare system, was appropriate for the study of telemedicine adoption due to the unique blend of challenges and opportunities it presented.

CHAPTER FOUR: METHODOLOGY

Data collection

This research adopted a positivist research philosophy, by way of deductive reasoning. Through a cross-sectional study, the study utilized a survey technique because of its ability to provide a snapshot of the population, estimate prevalence rates, assess exposure and outcomes simultaneously, ensure efficiency in data collection, and enable generalizations to the broader population. Leveraging the inherent features of cross-sectional studies, the research unraveled the complexities surrounding telemedicine adoption, contributing valuable insights to healthcare policy and practice in Kenya.

Primary data was collected through a semi-structured questionnaire and to ensure a broad spectrum of responses, a purposive sampling strategy was employed that reached 160 respondents. This strategy aimed to select a diverse group of individuals who have utilized telemedicine services, ensuring a rich depth of insight into their experiences, challenges, and perceptions. The questionnaire included various types of questions designed to elicit specific types of responses. For instance, closed-ended questions were used to provide respondents with predefined response options to choose from whereas multiple-choice questions were used to gain insight into their thoughts and experiences. Ranking questions on the other hand ranked items in order of preference or importance whereas demographic questions collected information about respondents' demographic characteristics, such as age, gender, education level, and income. A mix of these types of questions in the questionnaire helped in gathering comprehensive data and insights from survey participants about their experiences, attitudes, and preferences related to telemedicine adoption.

Measurement tools

The survey used a Likert scale for most of the attitudinal questions, ranging from strongly disagree to strongly agree, to measure the respondents' perceptions of telemedicine's impact on accessibility, efficiency, and effectiveness. Additionally, demographic information was captured to allow for subgroup analyses. A simple linear transformation was used to standardize scores across different scales, making it easier to compare and analyze data. Each variable was multiplied by a constant factor.

Measurement score(variable) = $100 * (\text{sum score} - \text{minimum}) / \text{range}$

This method helped in comparing variables with different scales and units on a similar scale, making the interpretation of coefficients in the statistical model more straightforward.

Statistical Analysis

The study employed multiple linear regression analysis to examine the factors influencing the adoption of telemedicine services. This statistical analysis enabled the study to assess the unique contribution of each predictor while controlling for the effects of other variables.

The dependent variable in the analysis was the level of Adoption of telemedicine services. This variable measured the extent to which users have adopted telemedicine technologies on a scale ranging from 0 to 10.

Three standardized composite indices of independent variables were chosen to include effectiveness which captured the perceived effectiveness of telemedicine services among users. It was measured using a standardized scale based on various effectiveness metrics. Another notable independent variable was the efficiency index which reflected the perceived efficiency of telemedicine in facilitating healthcare delivery. It was standardized using metrics related to the efficiency of service delivery processes. Access variable was the third index and it measured the perceived accessibility of telemedicine services to users. It was standardized based on metrics related to the ease of access and availability of telemedicine resources.

In addition to the independent variables, the study included several control variables to account for potential confounding factors that may influence telemedicine adoption. These control variables remained consistent across all regression analyses and included demographic factor variables such as gender, age, education level, marital status, employment status, and income level to describe the survey population as well as their general perceptions of telemedicine, and its perceived impact on healthcare access, efficiency, and effectiveness.

Cross-tabulation Analysis

A comparison of demographic variables (gender, age, education) with telemedicine usage forms and preferences was conducted to identify any significant associations.

Pearson Correlation

The Pearson correlation coefficient was calculated to assess the strength and direction of the linear relationship between telemedicine adoption and its perceived impact on healthcare delivery aspects like accessibility, efficiency, and effectiveness. This helped in identifying significant associations that were further investigated.

ANOVA (Analysis of Variance)

ANOVA was used to compare the mean scores of three or more independent groups to determine if there are any statistically significant differences between the means of different demographic groups or user experiences regarding telemedicine's impact. For instance, it compared differences in effectiveness, efficiency, and access to telemedicine across age groups.

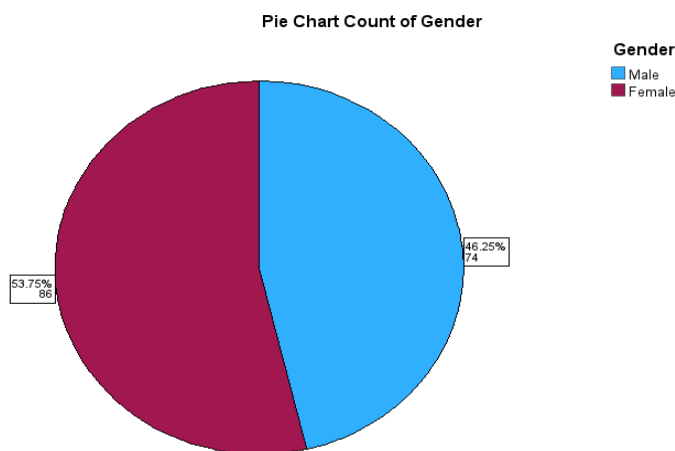
CHAPTER FIVE: DATA ANALYSIS

Descriptive statistics

Respondents Gender

In the study population of 160 respondents, gender distribution was nearly balanced with a slight female majority. The sample consisted of 74 male participants, accounting for 46.3% of the total, while female participants was made up of 53.8%, with a total of 86 individuals. This distribution was reflected in both the percentage of total respondents as well as the valid percent column, which excluded any missing or null responses from the calculations as shown in figure 4 below.

Figure 4 Gender pie chart



Age distribution

The age distribution of participants was divided into four categories. The data indicated that most participants were between the ages of 23-32, with those aged 29-32 comprising the largest proportion at 47.5% of the total sample ($n = 76$), followed by the 23-28 age group at 41.3% ($n = 66$). Participants aged 33-36 represented 10.0% ($n = 16$), while those aged 36 and above constituted the smallest group at 1.3% ($n = 2$). The cumulative percentage increased with each successive age group, culminating at 100%. The total number of participants in the study was 160, which reflects a younger demographic with 88.8% of the participants under the age of 32.

The standard deviation of the age groups is .695, which demonstrates a moderate dispersion around the mean, suggesting that while there is some variability in age groups, the majority of participants tend to be clustered around the early age groups. The data span four age group categories, ranging from 1 to 4, with the minimum and maximum values corresponding to these category numbers. This skewed distribution towards younger age groups may reflect greater familiarity and comfort with technology among younger individuals, influencing the adoption rates of telemedicine services.

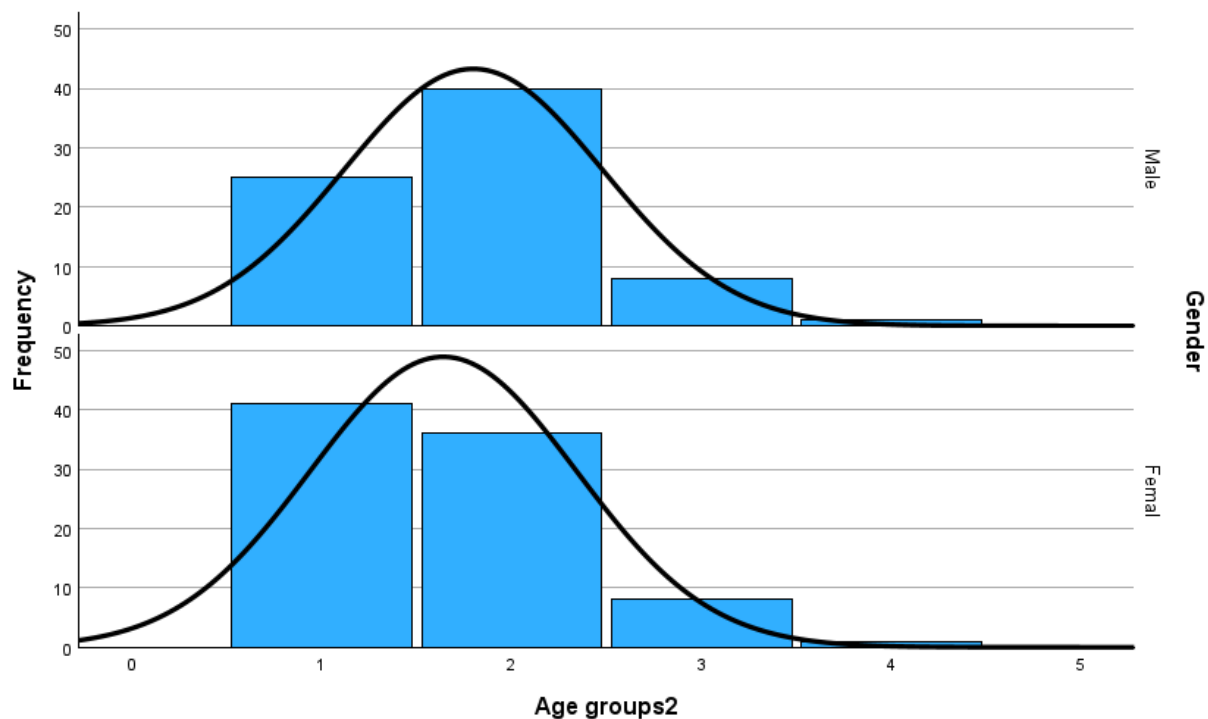


Figure 5 Histogram for Age distribution per gender

Education level

The educational levels of study participants were categorized into three distinct levels: high school, college, and university. The total number of participants was 160, with no missing data. Descriptive statistics indicated a mean educational level of 2.1375 and a median of 2.0000, with the mode also being 2.00. This indicates that the median and most frequent educational attainment among participants was at the college level. The standard deviation of .42689 suggests a low level of variability in educational attainment within the study population.

The frequency distribution reinforces this finding, with the largest proportion of participants, 80.0% ($n = 128$), having attained a college level of education. Those with high school education constituted the smallest group at 3.1% ($n = 5$), while university-educated participants represented 16.9% ($n = 27$) of the sample. The cumulative percentage reached 100%, indicating that all levels of educational attainment were accounted for in the study population.

These statistics suggested that the participant pool was predominantly composed of individuals with a college education, which should be considered when extrapolating the study's findings to populations with different educational backgrounds.

Marital status

The marital status of the participants in the study was diverse, with the majority being unmarried. Specifically, 55.0% of participants reported being single, constituting the largest category with 88 individuals. This was followed by 38.1% who were married, accounting for 61 participants. A smaller proportion of the sample reported being divorced or separated, representing 4.4% with 7 individuals. Only 1 participant (0.6%) was widowed, and 3 participants (1.9%) were in cohabitation arrangements.

The distribution of marital status within the study population underscores the predominance of single individuals, followed by a significant married cohort. This demographic characterization provided a foundation for understanding the social composition of the participants.

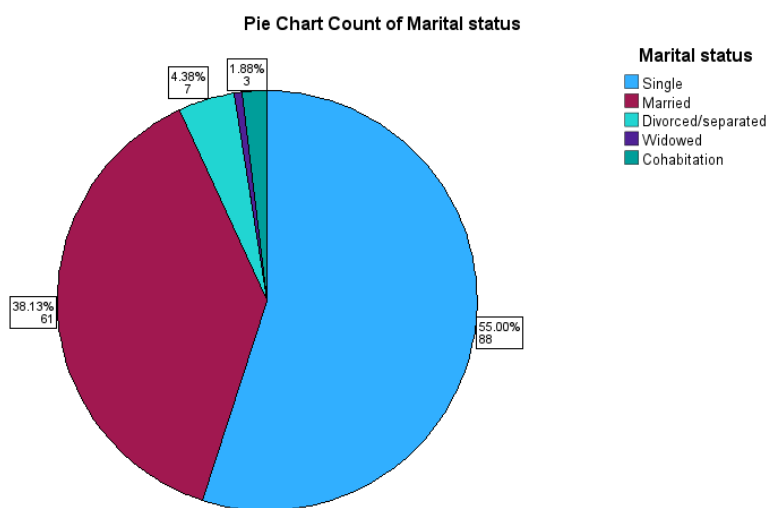


Figure 6. Pie chart representing marital status.

Employment status

The study analyzed the employment status of 160 participants, categorized into six distinct groups. Students represented 19.4% of the sample, amounting to 31 individuals. The self-employed constituted 22.5% with 36 respondents. Only a single participant (0.6%) reported being retired or disabled. The two largest employment categories were equal in size; both those employed part-time and full-time comprised 27.5% of the population, each with 44 individuals. Caregivers formed the smallest group, at 2.5% with 4 respondents as shown in table 1 of population characteristics.

The distribution of employment status highlighted a diverse workforce among the participants, with a significant portion engaged largely in active employment or educational pursuits.

Income distribution

The study reported income distribution among 160 participants. Of these, 157 provided valid income data, with three responses missing. The mean net income category was 4.54, closely aligned with a median of 5.00, indicating a central tendency toward the middle-income brackets. The most reported income category was the highest one, with a mode of 7. The standard deviation was 2.093, reflecting significant variability in income levels among the participants.

Frequency analysis showed a diverse income distribution: 11.5% earned less than \$500, 12.1% earned between \$501-1000, 8.9% earned \$1001-2500, 12.1% earned \$2501-5000, 15.3% earned \$5001-10000, 14.6% earned \$10001-15000, and the largest proportion, 25.5%, earned above \$15000. Cumulative percentages indicated a progression of income levels, with a significant portion of the sample (25.5%) occupying the highest income bracket.

These results suggested a broad range of economic statuses among the study participants, with a significant number reporting higher income levels. The data highlighted the economic diversity within the sample, which is crucial for understanding the financial contexts of the participants when interpreting the study's findings and considering their implications.

Table 1. Population characteristics.

Variable	Category	n	Percentage	Mean	SD
Gender	Male	74	46	1.54	0.5
	Female	86	54		
Age	23-28	66	41.3	1.71	0.69
	29-32	76	47.5		
	33-36	16	10		
	36 and above	2	1.3		
Education	High school	5	3.1	2.1	0.42
	College	128	80		
	University	27	16.9		
Marital status	single	88	55	1.56	0.77
	Married	61	38.1		
	Divorced	7	4.4		
	widowed	1	0.6		
	Cohabitation	3	1.9		
Employment	Student	31	19.4	3.29	1.59
	self Employed	36	22.5		
	Retired	1	0.6		
	Caregivers	4	2.5		
	Employed full time	44	27.5		
	Employed part-time	44	27.5		
Net income	Less than 500	18	11.5	4.54	2.09
	501-1000	18	12.1		
	1001-2500	14	8.8		
	2501-5000	19	11.9		
	5001-10000	24	15		
	10001-15000	23	14.4		
	Above 15000	40	25		
Forms of Telemedicine	Telenursing	44	27.5	2.08	0.88
	Telepharmacy	73	45.6		
	RPM	30	18.8		
	Others	13	8.1		

Table Distribution of Dependent and Independent Variables

Variable	Categories	n	Mean	Median	SD	Skewness
Effectiveness	Cost of additional H. care	160	63.37	66.66	21.47	-0.534
	Coordination					
	Scope of service					
	Expression					
Access	Remote areas	160	41.61	41.66	18.9	-0.703
	Inclusivity					
	Technological infrastructure					
Efficiency	waiting time	160	69.7	66.66	22.27	-1.432
	Reduced cost					
	Timely feedback					
	Online appointments					
Adoption	Level of Adoption	160	3.19	3	0.858	-0.627

Table 2 Distribution of variables

Adoption

The mean level of adoption of telemedicine services, calculated from a sample of 160 respondents, was 3.19, indicating a slightly above-average adoption level on a scale of 0 to 10. The distribution of adoption levels exhibited negative skewness (-0.627), suggesting a slight tail towards lower adoption levels. This finding highlighted the need for further investigation into the determinants and barriers influencing telemedicine adoption among healthcare stakeholders.

Effectiveness

The effectiveness index, with a mean of 63.376 and a median of 66.667, exhibited a negatively skewed distribution (-0.538). This suggested that while the majority of respondents perceived telemedicine as moderately effective, there were some outliers with lower effectiveness scores. Understanding the drivers of perceived effectiveness and addressing potential shortcomings in telemedicine services could enhance adoption rates and overall satisfaction among users.

Efficiency

The efficiency index, with a mean of 69.654 and a median of 66.667, displayed a negatively skewed distribution (-1.432). This indicated a notable tail towards higher efficiency scores, implying that respondents generally perceived telemedicine as efficient in facilitating healthcare delivery.

Access

The access index had a mean of 41.614 and a median of 41.667, it demonstrated negative skewness (-0.703), suggesting a slight tail towards higher access scores. While respondents perceived telemedicine as moderately accessible, addressing disparities in access and improving outreach efforts could promote broader adoption and equitable healthcare delivery.

Utilization Patterns of Telemedicine Forms

Used monitoring		
	Used telenursing	Did not use Telenursing
Used telepharmacy	33	31
Did not use telepharmacy	17.9	10
Did not use monitoring		
	Used telenursing	Did not use Telenursing
Used telepharmacy	5.1	1.3
Did not use telepharmacy	1.7	0

Table 3 Utilization patterns

When crosstabulation was used, there were notably higher frequencies of both telenursing (33) and telepharmacy (31) compared to (telenursing: 5.1; telepharmacy: 1.3). The frequencies of both telenursing (1.7) and telepharmacy (0) were significantly lower.

However, the overlap between Telenursing and the other categories appeared to be relatively low, indicating distinct utilization patterns and potential differences in the perceived roles and effectiveness of these services.

Cross tabulation Analysis

A cross-tabulation bar chart was used to reveal the patterns in the use of telemedicine services among the respondents, split by gender. The bar chart graphically demonstrates the count of males and females using each form of telemedicine, providing a visual representation that complements the numerical data.

Telenursing services were used by 18 males and 26 females, as shown by the bar chart below where the count for females surpasses that for males. This service was chosen by a total of 44 participants, indicating a moderate level of utilization among the services offered. Telepharmacy was the most popular telemedicine service, with the bar chart showing the highest bars for both genders, 33 males and 40 females, summing to a total usage by 73 participants. The chart visually underscored that telepharmacy was the most preferred service, with a notable lean towards higher female usage.

Remote Patient Monitoring on the other hand showed a slightly higher bar for male users (17) compared to females (13), suggesting a marginally greater preference or need among males for this service. A total of 30 participants opted for RPM, making it the second least utilized service while 'Others' category, representing various less common telemedicine services, had the shortest bars on the chart, with 6 male users and 7 female users, indicating the least engagement among the surveyed services.

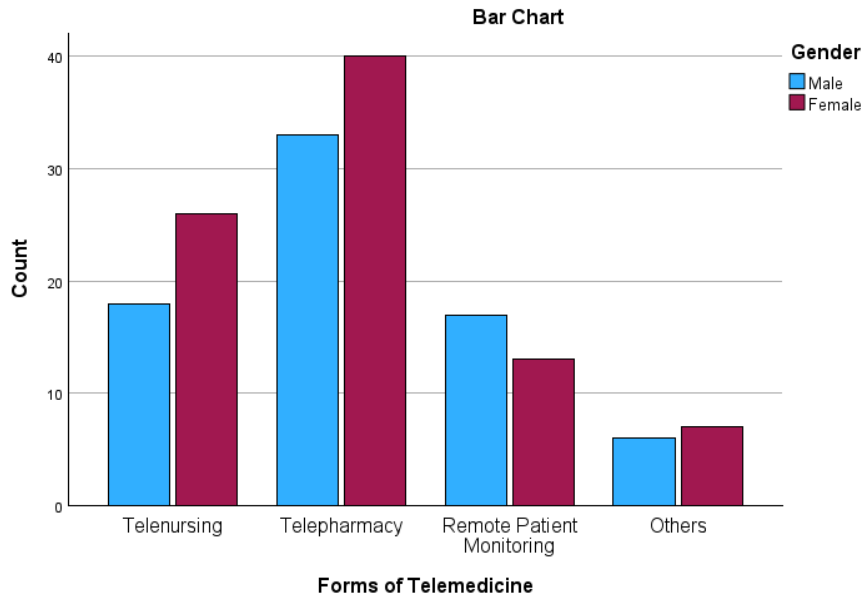


Figure 8. Forms of telemedicine bar chart

The bar chart effectively illustrated that telepharmacy was the dominant service of choice for both genders, with a higher female engagement across all forms of telemedicine except for Remote Patient Monitoring, where male usage is slightly higher. The visual and numerical data combined suggest that while both genders are engaged in telemedicine, there were discernible differences in service preference that could be influenced by factors such as the nature of the service, accessibility, or individual health needs.

The clustered bar chart in figure 8 illustrates the mean usage of various forms of telemedicine, categorized by educational status and differentiated by gender. The chart suggests that telemedicine utilization does not significantly vary between males and females across different educational backgrounds, namely high school, college, and university levels.

For both males and females with a high school education, the mean usage of telemedicine services appears to be approximately equal, suggesting a gender parity in telemedicine utilization at this educational level. The trend continued with individuals at the college level, where both genders show similar mean usage patterns. At the university level, there was also a close alignment between males and females in telemedicine usage, though females showed a slightly higher mean usage than males.

This visual representation indicated that gender did not play a significant role in the differentiation of telemedicine usage among the various educational levels within the study's sample population. However, it was important to consider the specific numerical values and sample sizes that contributed to these means for a more comprehensive understanding of the patterns depicted in the chart.

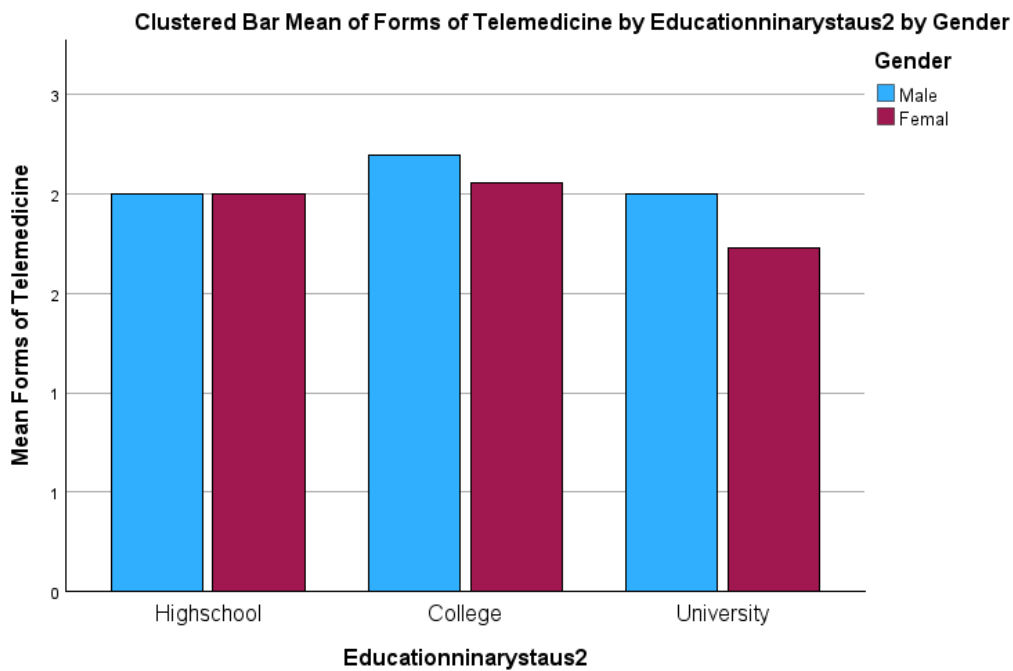


Figure 9 Clustered bar means of forms of telemedicine by education and gender.

Correlation matrix

A correlation analysis was conducted to examine the relationships among efficiency, effectiveness, access, and telemedicine adoption. The Pearson correlation coefficients, along with their significance levels, are presented in Table 1.

		EFFECTIVENESS	EFFICIENCY	ACCESS	Telemedicine adoption
EFFECTIVENESS	Pearson Correlation	1	.720**	.784**	-.042
	Sig. (2-tailed)		<.001	<.001	.606
	N	157	156	154	157
EFFICIENCY	Pearson Correlation	.720**	1	.733**	-.069
	Sig. (2-tailed)	<.001		<.001	.342
	N	156	159	156	159
ACCESS	Pearson Correlation	.784**	.733**	1	.037
	Sig. (2-tailed)	<.001	<.001		.647
	N	154	156	157	157
Telemedicine adoption	Pearson Correlation	-.037	-.017	.004	1
	Sig. (2-tailed)	.646	.829	.959	
	N	157	159	157	160

The correlation between effectiveness and efficiency was strong ($r = .720$, $p < .01$), indicating a robust positive relationship. Similarly, the correlation between effectiveness and access was also strong ($r = .784$, $p < .01$). However, the relationship between effectiveness and the level of adoption was weak and not statistically significant ($r = -.042$, $p = .606$).

Efficiency showed a strong positive correlation with effectiveness ($r = .720$, $p < .01$) and access ($r = .733$, $p < .01$), suggesting that as efficiency increases, so does effectiveness and access. The correlation between efficiency and the level of adoption was weak and not statistically significant ($r = -.069$, $p = .384$).

Access demonstrated a strong positive correlation with effectiveness ($r = .784$, $p < .01$) and efficiency ($r = .733$, $p < .01$), indicating that higher access is associated with greater effectiveness and efficiency. However, the correlation between access and the level of adoption was very weak and not statistically significant ($r = .037$, $p = .647$).

The level of adoption showed weak and non-significant correlations with effectiveness ($r = -.042$, $p = .606$), efficiency ($r = -.069$, $p = .384$), and access ($r = .037$, $p = .647$), suggesting that the level of adoption is not significantly related to effectiveness, efficiency, or access.

Regression analysis

Below table 4 is the output of the model equation for the regression

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	95.0% C I for B	
	B	Std. Error	Beta	t		Lower Bound	
(Constant)	3.631	.244		14.885	<.001	3.149	
Effectiveness	-.008	.006	-.204	-1.505	.134	-.019	
Efficiency	-.008	.005	-.211	-1.696	.092	-.017	

Access	.016	.006	.350	2.507	.013	.003
--------	------	------	------	-------	------	------

The results revealed that neither effectiveness ($B = -.008$, $p = .134$) nor efficiency ($B = -.008$, $p = .092$) had statistically significant effects on the level of adoption of telemedicine services. These predictors showed unstandardized coefficients of $-.008$ and standard errors of $.006$ and $.005$, respectively.

However, access demonstrated a statistically significant positive effect on the level of adoption ($B = .016$, $p = .013$). The coefficient for access was $.016$, with a standard error of $.006$. This indicated that for every one-unit increase in access, the level of adoption of telemedicine services increased by $.016$ units.

The standardized coefficients (Beta) provided insights into the relative importance of each predictor. Access had the highest standardized coefficient ($.350$), suggesting that it had the strongest impact on the level of adoption compared to effectiveness and efficiency.

The results suggested that access to telemedicine services significantly influences the level of adoption, while effectiveness and efficiency did not have statistically significant effects in this model.

Model Summary

Model	R	R Square	Adjusted Square	RStd. Error of the Estimate	Durbin-Watson
1	.224 ^a	.050	.031	.848	1.688

Table 5. Regression model summary

The adjusted R^2 in table 5 which accounts for the number of predictors in the model, was 0.031 . This adjusted value is slightly lower than the R^2 , suggesting that the inclusion of the predictors did not significantly improve the model's explanatory power beyond what would be expected by chance.

The standard error of the estimate was 0.848, indicating the average difference between the observed and predicted values of the dependent variable. A lower value of the standard error indicates a better fit of the model to the data.

The Durbin-Watson statistic is 1.688, which falls within the acceptable range of values (between 0 and 4). This statistic assesses the presence of autocorrelation in the residuals of the regression model. A value close to 2 indicates no significant autocorrelation.

CHAPTER SIX: DISCUSSION, LIMITATION AND CONCLUSION

Discussion

The findings of this study highlight the interplay between access, effectiveness, efficiency, and adoption of telemedicine services in healthcare settings. While access, effectiveness, and efficiency are important factors in shaping the perceived value of telemedicine, they may not directly translate into increased adoption rates. Addressing disparities in access, improving service efficiency, and enhancing the perceived effectiveness of telemedicine are essential steps toward promoting broader adoption and equitable healthcare delivery.

Telemedicine's impact on public healthcare provision in Kenya is multifaceted, encompassing efficiency, effectiveness, and access. Each variable plays a distinct role in shaping the overall outcome of telemedicine adoption within the healthcare system.

Efficiency

Efficiency in healthcare provision, focused on maximizing resource utilization and streamlining operations. Telemedicine was observed to be instrumental in improving efficiency by reducing wait times, optimizing resource allocation, and enhancing service delivery processes. Through remote patient monitoring and telepharmacy, telemedicine minimized the need for physical infrastructure and increased service delivery, especially by serving more patients with existing telemedicine experience. The integration of telemedicine tools and platforms enables healthcare providers to deliver timely interventions, streamline administrative tasks, and improve overall workflow efficiency. Consequently, telemedicine contributes to cost savings, sustainable healthcare practices, and better utilization of limited resources within Kenya's public healthcare system.

Effectiveness

Telemedicine enhanced effectiveness by facilitating timely interventions, improving diagnostic accuracy, and promoting care coordination between healthcare providers. By enabling remote consultations with specialists and facilitating real-time collaboration among healthcare teams, telemedicine ensured that patients received timely and appropriate care tailored to their needs. Moreover, telemedicine interventions have been shown to lead to improved patient health outcomes and higher levels of patient satisfaction. The ability of telemedicine to enhance the

quality of care and patient outcomes underscores its significance in improving overall healthcare delivery in Kenya.

Access

Telemedicine has significantly improved access to healthcare services, particularly in remote and underserved areas of Kenya. By overcoming geographical barriers and reducing the need for physical travel, telemedicine extends the reach of healthcare services to populations that previously faced challenges in accessing medical care. Patients in remote areas can now access specialist consultations, diagnostic services, and medical expertise without the constraints of distance or transportation. Telemedicine also plays a vital role in reducing disparities in healthcare provision by ensuring that all segments of the population, regardless of location or socioeconomic status, have equal access to quality healthcare services. Thus, telemedicine serves as a powerful tool for promoting healthcare equity and inclusivity in Kenya.

Limitation

While purposive sampling was a valuable tool for this study due to its criteria of selecting participants based on specific criteria, the resulting sample may not be representative of the broader population. As a result, findings from studies using purposive sampling may have limited generalizability, and it may be challenging to extrapolate the results to the larger population.

Conclusion

The study confirmed that telemedicine adoption has a transformative effect on the public healthcare system in Kenya. It has markedly improved the efficiency and effectiveness of service delivery and expanded access to healthcare. The integration of telemedicine aligns with the national health objectives outlined in Kenya's Vision 2030, aiming to enhance healthcare quality and accessibility.

Telemedicine presents a practical solution to the ongoing challenges posed by an inadequate medical workforce and limited physical infrastructure. It utilizes information and communication technology to bridge these gaps effectively. Nonetheless, achieving the full potential of telemedicine requires addressing several barriers, including policy adaptation, infrastructure enhancement, and shifts in public perception.

As Kenya advances its healthcare infrastructure, the incorporation of telemedicine into the public health system should be prioritized to ensure all citizens have equitable access to quality healthcare services. The ongoing success and expansion of telemedicine capabilities are expected to play a crucial role in the evolution of healthcare delivery across the country, significantly broadening the reach and improving the quality of medical services nationwide.

REFERENCES

- Alajlani, M., & Clarke, M. (2013). Effect of Culture on Acceptance of Telemedicine in Middle Eastern Countries: Case Study of Jordan and Syria. *Telemedicine and E-Health*, 19(4), 305–311. <https://doi.org/10.1089/tmj.2012.0106>
- Baldoni, S., Amenta, F., & Ricci, G. (2019). Telepharmacy Services: Present Status and Future Perspectives: A Review. *Medicina*, 55(7), 327. <https://doi.org/10.3390/medicina55070327>
- Catwell, L., & Sheikh, A. (2009). Evaluating eHealth Interventions: The Need for Continuous Systemic Evaluation. *PLoS Medicine*, 6(8), e1000126. <https://doi.org/10.1371/journal.pmed.1000126>
- Davis, T. M., Barden, C., Dean, S., Gavish, A., Goliash, I., Goran, S., Graley, A., Herr, P., Jackson, W., Loo, E., Marcin, J. P., Morris, J. M., Morledge, D. E., Olff, C., Rincon, T., Rogers, S., Rogove, H., Rufo, R., Thomas, E., ... Bernard, J. (2016). American Telemedicine Association Guidelines for TeleICU Operations. *Telemedicine and E-Health*, 22(12), 971–980. <https://doi.org/10.1089/tmj.2016.0065>
- Demiris, G. (2003). Integration of Telemedicine in Graduate Medical Informatics Education. *Journal of the American Medical Informatics Association*, 10(4), 310–314. <https://doi.org/10.1197/jamia.M1280>
- Demombynes, G., & Thegeya, A. (2012). *Kenya's Mobile Revolution and the Promise of Mobile Savings* (SSRN Scholarly Paper 2017401). <https://papers.ssrn.com/abstract=2017401>
- Farias, F. A. C. D., Dagostini, C. M., Bicca, Y. D. A., Falavigna, V. F., & Falavigna, A. (2020). Remote Patient Monitoring: A Systematic Review. *Telemedicine and E-Health*, 26(5), 576–583. <https://doi.org/10.1089/tmj.2019.0066>

- GSMA Intelligence. (n.d.). *The Mobile Economy 2020*. Retrieved November 29, 2023, from https://www.gsma.com/mobileeconomy/wp-content/uploads/2020/03/GSMA_MobileEconomy2020_Global.pdf
- Holden, R. J., & Karsh, B.-T. (2010). The Technology Acceptance Model: Its past and its future in health care. *Journal of Biomedical Informatics*, 43(1), 159–172. <https://doi.org/10.1016/j.jbi.2009.07.002>
- JD Power. (2019). *As Telehealth Technology and Methodologies Mature, Consumer Adoption Emerges As Key Challenge for Providers*.
- Johnson, B., Quinlan, M. M., & Marsh, J. S. (2018). Telenursing and Nurse–Patient Communication Within Fertility, Inc. *Journal of Holistic Nursing*, 36(1), 38–53. <https://doi.org/10.1177/0898010116685468>
- Kaundinya, T., & Agrawal, R. (2022). Unpacking a Telemedical Takeover: Recommendations for Improving the Sustainability and Usage of Telemedicine Post-COVID-19. *Quality Management in Healthcare*, 31(2), 68. <https://doi.org/10.1097/QMH.0000000000000329>
- Kenya-Vision-2030.pdf*. (2007). <https://nairobi.aics.gov.it/wp-content/uploads/2019/01/Kenya-Vision-2030.pdf>
- Lee, J. Y., & Lee, S. W. H. (2018). Telemedicine Cost–Effectiveness for Diabetes Management: A Systematic Review. *Diabetes Technology & Therapeutics*, 20(7), 492–500. <https://doi.org/10.1089/dia.2018.0098>
- Mars, M. (2013). Telemedicine and Advances in Urban and Rural Healthcare Delivery in Africa. *Progress in Cardiovascular Diseases*, 56(3), 326–335. <https://doi.org/10.1016/j.pcad.2013.10.006>

- Menachemi, N., Burke, D. E., & Ayers, D. J. (2004). Factors Affecting the Adoption of Telemedicine—A Multiple Adopter Perspective. *Journal of Medical Systems*, 28(6), 617–632. <https://doi.org/10.1023/B:JOMS.0000044964.49821.df>
- Meso, P., Mbarika, V. W. A., & Sood, S. P. (2009). An Overview of Potential Factors for Effective Telemedicine Transfer to Sub-Saharan Africa. *IEEE Transactions on Information Technology in Biomedicine*, 13(5), 734–739. <https://doi.org/10.1109/TITB.2007.899807>
- Ministry of Health. (2014). *Kenya National eHealth Policy*. <https://tciurbanhealth.org/wp-content/uploads/2018/10/e-health-b5-web.pdf>
- Ndung'u, N., Thugge, K., & Otieno, O. (n.d.). *Unlocking the Future Potential for Kenya – The Vision 2030*.
- Njoroge, M., Zurovac, D., Ogara, E. A. A., Chuma, J., & Kirigia, D. (2017). Assessing the feasibility of eHealth and mHealth: A systematic review and analysis of initiatives implemented in Kenya. *BMC Research Notes*, 10(1), 90. <https://doi.org/10.1186/s13104-017-2416-0>
- Onsongo, S., Kamotho, C., Rinke de Wit, T. F., & Lowrie, K. (2023). Experiences on the Utility and Barriers of Telemedicine in Healthcare Delivery in Kenya. *International Journal of Telemedicine and Applications*, 2023, e1487245. <https://doi.org/10.1155/2023/1487245>
- Pal, A., Mbarika, V. W. A., Cobb-Payton, F., Datta, P., & McCoy, S. (2005). Telemedicine Diffusion in a Developing Country: The Case of India (March 2004). *IEEE Transactions on Information Technology in Biomedicine*, 9(1), 59–65. <https://doi.org/10.1109/TITB.2004.842410>

- Qin, R., Dzombak, R., Amin, R., & Mehta, K. (2013). Reliability of a Telemedicine System Designed for Rural Kenya. *Journal of Primary Care & Community Health*, 4(3), 177–181. <https://doi.org/10.1177/2150131912461797>
- Rahimi, B., Nadri, H., Lotfnezhad Afshar, H., & Timpka, T. (2018). A Systematic Review of the Technology Acceptance Model in Health Informatics. *Applied Clinical Informatics*, 09(03), 604–634. <https://doi.org/10.1055/s-0038-1668091>
- Sanjoy Kumar Pal, GS Pandey, Akanchha Kesari, G Choudhuri, Balraj Mittal. (2002). *Telemedicine: E-health and hospital of the future*. 61. <https://nopr.niscpr.res.in/bitstream/123456789/26356/1/JSIR%2061%286%29%20414-422.pdf>
- Shachak, A., Kuziemy, C., & Petersen, C. (2019). Beyond TAM and UTAUT: Future directions for HIT implementation research. *Journal of Biomedical Informatics*, 100, 103315. <https://doi.org/10.1016/j.jbi.2019.103315>
- Strehle, E. M., & Shabde, N. (2006). One hundred years of telemedicine: Does this new technology have a place in paediatrics? *Archives of Disease in Childhood*, 91(12), 956–959. <https://doi.org/10.1136/adc.2006.099622>
- Unni, E. J., Patel, K., Beazer, I. R., & Hung, M. (2021). Telepharmacy during COVID-19: A Scoping Review. *Pharmacy*, 9(4), 183. <https://doi.org/10.3390/pharmacy9040183>
- Venkatesh, Morris, Davis, & Davis. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425. <https://doi.org/10.2307/30036540>
- Wamai, R. G. (2009). *The Kenya Health System—Analysis of the situation and enduring challenges*. 52(2).

- Wang, T.-T., Li, J.-M., Zhu, C.-R., Hong, Z., An, D.-M., Yang, H.-Y., Ren, J.-C., Zou, X.-M., Huang, C., Chi, X.-S., Chen, J.-N., Hong, Z., Wang, W.-Z., Xu, C.-G., He, L., Li, W.-M., & Zhou, D. (2016). Assessment of Utilization and Cost-Effectiveness of Telemedicine Program in Western Regions of China: A 12-Year Study of 249 Hospitals Across 112 Cities. *Telemedicine and E-Health*, 22(11), 909–920. <https://doi.org/10.1089/tmj.2015.0213>
- World Health Organization. (2010). Telemedicine: Opportunities and Developments in Member States: Report on the Second Global Survey on eHealth 2009 (Global Observatory for eHealth Series, Volume 2). *World Health Organization*, 18(2), 153. <https://doi.org/10.4258/hir.2012.18.2.153>

Survey questionnaire

QUESTIONNAIRE ON TELEMEDICINE ADOPTION IN KENYAN PUBLIC HEALTHCARE SYSTEM: A FOCUS ON ACCESS, EFFICIENCY, AND EFFECTIVENESS

Introduction

My name is Peter Nyandat, a student pursuing Masters in Public Policy and Management at Corvinus University of Budapest. I am carrying out a study whose objective is to assess the impact of telemedicine within the public healthcare system. Your participation in this survey will be valuable in contributing to the current state of telemedicine adoption in Kenya. Your response will be treated with the utmost confidentiality. Thank you in advance for your time and contribution to this important research endeavor.

Demographic Information

1.1. What is your **gender**?

- ☐ Male (1)
- ☐ Female (2)
- ☐ Intersex (3)
- ☐ Prefer not to say. (4)
- ☐ Other (5)

1.2. What is your year of birth? (**Age**)

1.3 What is your highest completed level of **education**?

- ☐ Primary Certificate (1)
- ☐ Secondary Certificate (2)
- ☐ Tertiary (3)
- ☐ Other (4)

1.4 What is your **marital status**?

- ☐ Single (1)
- ☐ Married (2)
- ☐ Divorced /Separated (3)
- ☐ Widowed (4)
- ☐ Cohabitation (5)

1.5 Which of the following describes your **employment** status for the last one month?

- ☐ Student (1)
- ☐ Self-employed (2)
- ☐ Retired or disabled. (3)
- ☐ Employed part-time. (4)
- ☐ Employed full time (5)
- ☐ Caregivers (6)

1.5 What is your annual individual **net income**? (US \$ per annum)

- ☐ Les than 500 (1)
- ☐ 501 – 1000 (2)
- ☐ 1001 – 2500 (3)
- ☐ 2501 – 5000 (4)
- ☐ 5001- 10000 (5)
- ☐ 10001 – 15000 (6)
- ☐ Above 15000 (7)

1.6 What factors **motivate** you to use telemedicine?

- ☐ Saves on time traveling to a hospital. (1)
- ☐ Simple, easy to understand. (2)
- ☐ Cost-effectiveness in the delivery of intended service. (3)
- ☐ Easy to use. (4)
- ☐ Improve access to healthcare services. (5)

- Able to express myself effectively. (6)
- Visits provided over telemedicine are the same as in-person visits. (7)
- Provides for my healthcare needs. (8)
- I could become productive quickly using this system. (9)
- The way I interact with the system is pleasant. (10)
- I feel comfortable communicating with a health provider via telemedicine. (11)
- Other (12)

1.7 Telemedicine is associated with the provision of healthcare using Information Communication Technology (ICT). Select which **forms** of Telemedicine services you have used

- Patient consultation/ telenursing (1)
- Drug prescription/telepharmacy (2)
- Remote Patient Monitoring/telemonitoring (3)
- Other (4)

1.8 If a manual system of healthcare delivery is not available how much are you **willing to pay** for patient consultation/telenursing? (US \$ per annum)?

1.9 If a manual system of healthcare delivery is not available how much are you willing to pay for Drug prescription/telepharmacy? (US \$ per annum)?

2.0 If a manual system of healthcare delivery is not available how much are you willing to pay for Remote patient monitoring? (US \$ per annum) ?

2.1 How long have you used telemedicine services?

- Less than 3 months (1)
- 3 to 6 months (2)
- 6 months to 1 year (3)
- More than 1 year (4)

2.2 Use the following scale to rank your **level of knowledge** on Telemedicine: 4= Excellent, 3 = Very good, 2= Good, 1= Weak.

		4	3	2	1
		Excellent	Very good	Very good	Weak
1	Overall knowledge of Telemedicine use				
2	Use of mobile and computer applications				
3	Existing telemedicine applications that can be easily adopted				
4	Internet use e.g. Use of computer browsers to access web pages				

Section 2 How does the implementation of telemedicine impact on the **efficiency** of public healthcare provision in Kenya?

1.1 What do you think of the following statements on telemedicine?

		Strongly disagree	Disagree	Agree	Strongly agree
1	Reduced the average waiting time for patients to receive medical consultation				
2	Reduced the cost of travel time				
3	Increased number of online appointment-scheduling				

4	Enhanced timely feedback on healthcare				
---	--	--	--	--	--

Section 2. How does the implementation of telemedicine impact on the **effectiveness** of public healthcare provision in Kenya?

2.1 What do you think of the following statements on telemedicine

		Strongly disagree	Disagree	Agree	Strongly agree
1	Reduced cost of delivering additional healthcare services				
2	Ability to express yourself effectively				
3	Improved Healthcare coordination between healthcare providers and clients				

Section 3: To what extent does telemedicine affect the **accessibility** of public healthcare provision in Kenya?

3.1. What do you think of the following statements on telemedicine

		Strongly disagree	Disagree	Agree	Strongly agree
1	Increased inclusivity and equity in access across diverse population				
2	Extended healthcare services to remote areas				
3	Increased technological infrastructure usage				
4	Enhanced scope of service to improve the quality of care				

3.2 Rate how the following factors influence **access** to telemedicine. Use the following scale: 4 = extremely difficult, 3= difficult, 2 = minor impact 1 = no impact at all

		Extremely difficult	Difficult	Minor impact	No impact at all
1	Local Area Network (LAN) in the area or Internet				
2	Lack of expertise/skill/ Knowledge in telemedicine				
3	Lack of devices such as smartphone or computer				
4	Language barrier				
5	Health illiteracy				
6	Affordability of devices such as smartphones or computers				

3.3: Please rate the level of difficulty you experienced in accessing telemedicine services on a scale from 0 to 10. In this scale, 0 indicates 'Extremely Difficult' to access telemedicine, and 10 signifies 'Extremely Easy' (0-3: Very Difficult 4-6: Difficult 7-8: Easy 9-10: Very Easy)

3.4: Additional Comments

Please provide any additional comments, suggestions, or concerns you may have regarding telemedicine and public health provision in Kenya.

4. Thank you for taking the time to share your feedback!

