



GRE TSA
UNIVERSITY



**INTERNATIONAL
MULTIDISCIPLINARY
RESEARCH CONFERENCE
PROCEEDINGS**

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KEYNOTE SPEAKERS



Prof. Maurice Okoth: Deputy Chairman of the Governance Board,
Kenya Universities Quality Assurance Network.

Prof. Benedict Alala: Director of Department of Accounting and Finance, Masinde
Muliro University of Science and Technology (MMUST)



MODERATORS



CLUSTER 1

Sub-Theme 1: Computing and Informatics

Sub-Theme 2: Library and Information Science

1. **Dr. Geoffrey Mariga:** Murang'a University
2. **Dr. Stephen Njenga:** Murang'a University

CLUSTER 2

Sub-Theme 3: Hospitality and Tourism Management

Sub-Theme 4: Business

1. **Prof. Rosemary James:** Kenyatta University
2. **Prof. Kihima Bonface:** Technical University of Kenya

CLUSTER 3:

Sub-Theme 5: Education

Sub-Theme 6: Community Development

Sub-theme 7: Communication

Sub-Teme 8: Health Sciences

1. **Dr. Justus Osero:** Kenyatta University
2. **Dr. Purdal John:** Greta University





WELCOME REMARKS

By Dr. Peter Karanja

Vice Chancellor, Greta University

Dr. Peter Karanja officially opened the conference with a warm and heartfelt welcome to all esteemed guest speakers, moderators, and participants. He expressed sincere gratitude for their presence and for graciously accepting the invitation to be part of this significant event.

In his opening address, the Vice Chancellor emphasized the remarkable diversity represented at the conference with 46 papers slotted for presentation in the two-day conference. He underscored the immense value of this gathering as a platform for researchers, industry practitioners, and scholars to share ideas, exchange knowledge, and foster meaningful collaborations.

Dr. Karanja also highlighted the university's pride in successfully organizing and hosting seven international multidisciplinary conferences since 2017, an outstanding achievement that underscores Greta University's continued commitment to academic excellence, research innovation, and global engagement.

Reflecting on this year's theme, *"Building Inclusive and Resilient Communities Through Technology for Sustainable Development,"* he noted that the conference offers a timely and critical forum for exploring how technological advancements can be harnessed to empower communities, strengthen resilience, and drive sustainable development across diverse sectors.





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Prof. Maurice Okoth

Deputy Chairman of the Governance Board, Kenya Universities Quality Assurance Network.

Title: Quality Research in the Era of Artificial Intelligence (AI): Ensuring Visibility of Publications

Over the past few decades, we have witnessed a dramatic evolution in research paradigms, driven by advances in digital technology. From handwritten manuscripts and typewritten theses to cloud-based collaborations and online open-access journals, the way we conduct, disseminate, and consume research has undergone a profound transformation. Today, at the heart of this transformation is Artificial Intelligence (AI)— a powerful and disruptive force that is rapidly reshaping how we approach the entire research lifecycle.

AI is not merely a tool for automation; it is a game-changer. It is influencing everything from literature reviews and data analysis to writing assistance and predictive modeling. While these advances hold immense potential to enhance research quality and productivity, they also raise critical questions around authenticity, ethics, and academic integrity.

At the same time, the global research landscape has become increasingly competitive. Researchers and institutions alike are under mounting pressure to publish in high-impact journals, increase citation indices, and enhance their digital presence. In this crowded and fast-paced environment, ensuring the visibility of one's publications is no longer optional, it is essential.

As we explore the intersections between AI, research quality, and publication visibility today, I invite you to reflect with me on how we, as scholars and institutions, can embrace innovation responsibly, uphold academic excellence, and ensure that our research continues to make a meaningful impact in the world.

Role of AI in Enhancing Research Quality

As we get deeper into today's theme, it is important to recognize the transformative role AI is playing in enhancing the quality of research across disciplines. No longer confined to science fiction, AI is now a practical and powerful partner in the research process, streamlining workflows, reducing human error, and improving the overall rigour of academic work.

One of the most notable areas where AI is making a significant impact is in literature review and information mining. Traditional keyword searches are being replaced by advanced semantic search engines and AI-driven summarizers that understand context and meaning. These tools can scan vast amounts of academic literature in seconds, identify relevant themes, and even summarize findings, saving researchers countless hours and ensuring that no critical piece of literature is overlooked.

Beyond information gathering, AI has revolutionized data analysis and modeling. Machine learning algorithms are now capable of detecting complex patterns and relationships within large datasets that would be nearly impossible for humans to uncover manually. These tools not only increase the accuracy and depth of analysis but also open new possibilities for hypothesis generation, especially in fields such as genomics, climate science, economics, and public health.



AI also contributes significantly to enhancing reproducibility and predictive capability, two cornerstones of research integrity. With AI systems capable of automating aspects of experimental design, tracking data lineage, and testing models repeatedly under varied conditions, researchers can produce more reliable results that stand up to peer scrutiny. Predictive models powered by AI, when properly validated, are now being used in real-time decision-making in areas ranging from drug development to urban planning.

In the realm of academic writing, AI tools play a supporting role in ensuring clarity, correctness, and originality. Plagiarism detection software, powered by sophisticated AI algorithms, now goes beyond surface-level matching to detect reworded or paraphrased content, reinforcing academic honesty. Grammar and style enhancement tools, such as intelligent writing assistants, help authors improve readability and conform to the formal tone expected in scholarly publications.

Risks and Ethical Considerations

While AI holds immense potential to enhance research quality and visibility, it also presents significant ethical and practical risks that we must confront with honesty and responsibility.

First and foremost is the growing temptation to over-rely on AI-generated content. As AI tools become increasingly capable of drafting abstracts, summarizing data, and even writing entire papers, there is a real danger of diminishing the role of human reasoning, critical reflection, and scholarly voice. Research is fundamentally a product of intellectual curiosity and original thinking. If we allow ourselves to lean too heavily on AI for cognitive tasks, we risk eroding the very essence of academic inquiry.

Closely related is the challenge of data integrity and research originality. AI tools often generate outputs based on patterns in existing data, which may inadvertently replicate biases or errors embedded in their training sets. If researchers are not vigilant, such tools could introduce inaccuracies, distort findings, or even promote superficial or redundant research. Additionally, there is the ethical dilemma of originality: how much of a paper generated or heavily assisted by AI can be considered the true intellectual product of the researcher?

These concerns also extend into the murky waters of authorship and intellectual property rights. When AI contributes significantly to writing or analysis, questions arise: Should it be credited? Can AI be considered as the co-author? Can it hold rights? More practically, who bears responsibility for errors or ethical breaches when part of the work was AI-assisted? The traditional definitions of authorship and contribution are being tested in ways academia has yet to fully address.

Perhaps most troubling is the rise of fake research outputs and deepfakes. We are entering an age where AI can fabricate data, generate credible-looking papers filled with false information, or even create fictitious authors and peer reviews. This poses a severe threat to the integrity of the academic publishing system. If we are not careful, the spread of such fabricated content could undermine trust in science and diminish the value of legitimate research.

Ensuring Quality in AI-Enhanced Research

As we embrace the opportunities offered by AI in research, it becomes critically important to uphold the standards that define scholarly excellence. The presence of AI in our research environments must not dilute the quality of our outputs but rather elevate them—through rigorous, transparent, and accountable practices.

To begin with, we must continue to place rigorous methodology at the heart of all research. Regardless of how sophisticated an AI tool may be, it cannot compensate for a poorly designed study or flawed logic. Every AI-assisted project must still be anchored in sound research design, ethical considerations, and adherence to peer-reviewed protocols. The credibility of research—AI-enhanced or otherwise—



relies on careful planning, valid data collection, and clear analysis frameworks that stand up to expert scrutiny.

Equally important is the transparent documentation of AI usage in the research process. Whether AI was used for literature review, statistical analysis, image generation, or manuscript editing, this must be explicitly stated in the methodology or acknowledgments sections of publications. Such transparency ensures reproducibility, informs peer reviewers, and upholds academic honesty. Just as we disclose software packages or analytical instruments, we must now disclose the use of AI tools—and describe their role and limitations in our work.

Moreover, we must maintain critical human oversight at every stage of the research cycle, before turning to AI as a supplementary tool—whether identifying the problem, reviewing literature, developing questions or hypotheses, designing the study, collecting and analyzing data, or reporting and interpreting findings—human judgment and critical thinking should remain central. AI can provide insights, but it cannot determine relevance, ethical nuance, or the societal impact of our findings. It cannot take responsibility for errors, nor can it defend a thesis before a committee. Researchers must therefore actively guide the AI, validate its outputs, and retain full accountability for the final work.

In this era, the best research will come not from either human or machine alone, but from a thoughtful partnership between the two—where AI enhances productivity and insight, and human researchers provide the context, conscience, creativity and problem focused originality that machines lack. If we can commit to these principles of rigour, transparency, and oversight, we will not only safeguard the quality of AI-enhanced research but also position our institutions and scholars at the forefront of credible, visible, and impactful scientific contributions.

Strategies to Improve Publication Visibility

Conducting high-quality research is only part of the journey. In today's digital and competitive scholarly environment, ensuring that research is seen, accessed, and cited is equally critical. The visibility of a publication is not merely about prestige—it is about impact, influence, and the ability to contribute meaningfully to global conversations in our respective fields.

One of the foundational strategies is selecting the right journals for publication. Researchers should prioritize indexed, peer-reviewed, and preferably open-access journals that offer wide reach and credibility. Publishing in journals listed in reputable databases such as Scopus, Web of Science, or DOAJ increases discoverability and signals quality to other scholars, institutions, and funding bodies. Open access platforms, in particular, offer the added benefit of making research freely available, especially to scholars in developing countries who may lack access to subscription-based content.

Another key strategy involves enhancing metadata and search engine optimization (SEO) of published articles. Many researchers overlook the power of well-crafted titles, abstracts, and keywords. These elements are what search engines and academic databases use to index and retrieve articles. Using clear, descriptive language that aligns with trending terms in your field can significantly improve how often and how easily your work is found.

In this digital age, we must also embrace tools for broader research dissemination. Platforms like preprint servers, institutional repositories, and academic social media are valuable avenues to share findings even before formal publication. Sharing summaries of research on platforms like Twitter, LinkedIn, or even YouTube helps reach wider, often interdisciplinary audiences. This not only increases engagement but also fosters collaboration across borders.

Equally important is the use of academic profiling tools such as ORCID, Google Scholar, and ResearchGate. These platforms serve as dynamic digital CVs that consolidate a researcher's work



and metrics in one place. An ORCID ID ensures that all your publications are correctly attributed, especially for those with common names or changing institutional affiliations. Google Scholar profiles allow for real-time tracking of citations, while ResearchGate supports networking and sharing of full-text articles and datasets.

By adopting these visibility-enhancing strategies, researchers can move beyond traditional boundaries of influence and ensure their work has real-world relevance and recognition. After all, a brilliant study that is not read, shared, or cited has limited impact, regardless of its quality.

In this AI-driven age, where information travels faster than ever, the visibility of quality research is not just an advantage—it is a responsibility.

Institutional and Policy Support

As we explore the intersection of Artificial Intelligence and quality research, it becomes clear that the responsibility for fostering excellence and visibility cannot rest solely on individual researchers. It must also be institutionally supported and policy-driven. Universities and research bodies must rise to the occasion by creating enabling environments where innovation is nurtured, ethics are upheld, and digital advancement is strategically guided.

The first step is building institutional AI literacy. Researchers and students across all disciplines need not only access to AI tools but also the knowledge to use them effectively and responsibly. Universities must integrate AI training into research methods courses, offer workshops on emerging tools, and encourage interdisciplinary engagement with AI applications. This is not about turning every scholar into a data scientist, but about empowering all researchers to make informed choices about how and when to integrate AI into their scholarly work.

Alongside literacy, institutions must develop and enforce responsible AI research guidelines. These should address issues such as transparency in AI use, attribution, data ethics, and the limitations of automated tools. Without clear guidelines, we risk inconsistencies, ethical oversights, and academic misconduct. Universities can take the lead by setting the standards—establishing review boards or ethics committees that evaluate AI-involved research proposals, and embedding AI ethics into their codes of conduct.

Moreover, policy support must extend to the realm of open science and digital scholarship. To ensure that quality research is not only produced but also widely visible and impactful, institutions must invest in infrastructure and funding for open-access publishing, institutional repositories, and data-sharing platforms. Grants should include provisions for digital dissemination, and faculty evaluation metrics should recognize digital engagement and public scholarship, not just traditional journal citations.

In short, institutions must shift from passive observers to active enablers of AI-enhanced research excellence. By investing in capacity-building, creating robust policies, and promoting open, inclusive scholarship, we can unlock the full potential of AI to advance knowledge—and ensure that our universities remain visible, credible, and globally competitive in the digital era.

Looking Forward

As we conclude this critical conversation on quality research in the era of Artificial Intelligence, it is important that we cast our eyes forward—with both optimism and responsibility. The question before us is not whether AI will transform research—it already is—but rather, how we can shape that transformation to align with the values of academic excellence, integrity, and global equity.

The first step is in striking a careful balance between innovation and academic integrity. We must continue to explore and embrace the immense possibilities that AI offers, but without compromising



the ethical foundations of scholarship. Research must remain authentic, verifiable, and accountable. AI should be a tool that amplifies human insight, not replaces it. Maintaining this balance will ensure that our work is not only innovative but also respected and trusted within the global academic community. Secondly, we must promote interdisciplinary collaborations driven by AI. The boundaries between disciplines are increasingly porous, and AI thrives in such environments. Whether it's using machine learning to predict climate trends, applying natural language processing in the humanities, or combining epidemiological data with AI for public health solutions—collaboration across fields is the key to unlocking deeper insights and more impactful research. Universities should actively foster ecosystems where computer scientists, social scientists, engineers, and health professionals co-create knowledge powered by AI.

Lastly, we must take deliberate steps to secure a strong and visible future for Global South research in the AI age. Too often, the narrative around AI is dominated by voices and institutions from the Global North. Yet, Africa and other regions in the Global South have unique challenges, perspectives, and innovations to contribute. To ensure our research is visible on the world stage, we must invest in local capacity-building, equitable access to AI infrastructure, and regional collaboration. We must also support publishing in reputable outlets, foster digital literacy, and resist marginalization by carving out our space in global discourse.

The road ahead is not without challenges, but it is filled with possibility. Let us move forward boldly—but wisely. Let us uphold the values that define academia while embracing the tools that define the future. And above all, let us ensure that our research, powered by integrity and inspired by innovation, continues to be visible, valuable, and transformative.

Call to Action

As we bring this keynote address to a close, I urge each of us to reflect deeply on the role we must play in shaping the future of research in this era of Artificial Intelligence. The decisions we make today will define not only the quality of our scholarly outputs but also the integrity, visibility, and global relevance of our academic institutions.

Let us begin by choosing to embrace AI as a collaborator—not a replacement. These tools are powerful allies, capable of enhancing our research capabilities, streamlining our processes, and unlocking insights we could not easily achieve alone. But they must be guided by human intellect, ethical judgment, and a commitment to truth. AI can support our journey—but it cannot, and must not, define it for us.

We must also commit ourselves to responsible, ethical, and impactful research. Whether we are just beginning our academic careers or are seasoned scholars, we all share a responsibility to uphold the highest standards of integrity. Let us be transparent in our use of AI, meticulous in our methods, and intentional about ensuring our work contributes meaningfully to society. Quality must never be sacrificed at the altar of convenience or speed.

And finally, let us work collectively—as departments, institutions, and national research communities—to ensure that our research remains visible, credible, and relevant. This means supporting each other through mentorship, collaboration, and shared infrastructure. It means investing in publication literacy, open-access platforms, and digital dissemination strategies. Most importantly, it means ensuring that the voice of our universities—especially those in the Global South—is heard and respected on the global stage.

In this age of AI, we have an extraordinary opportunity to redefine the future of research. Let us seize that opportunity with courage, wisdom, and unwavering commitment to excellence.





Keynote SPEECH 2

Prof. Benedict Alala

Director of Department of Accounting and Finance, Masinde Muliro University of Science and Technology (MMUST)

Title: Quality research in the era of Artificial Intelligence: ensuring visibility of publications

Good morning. It is a great privilege to join you at the 8th International Multidisciplinary Research Conference organized by Grets University. I am deeply honored to stand before distinguished scholars, seasoned practitioners, innovators, students, and esteemed guests from across regions and disciplines.

This year's theme—"Building Inclusive and Resilient Communities Through Technology for Sustainable Development"—is more than a slogan. It is a timely challenge and a call to action for all of us gathered here. The richness of perspectives in this room reminds us that the solutions our world needs will only emerge when we listen to one another and learn across borders, disciplines, and experiences.

As I often say, technology is a tool; people are the goal. It is people, communities, families, and societies that should remain at the center of every innovation.

Conference Objectives: A Meeting of Minds

Conferences such as this are not mere academic rituals. They are *living laboratories* where ideas are tested, contested, refined, and transformed. Knowledge gains its greatest value when shared, interrogated, and applied.

This conference seeks to:

- ❖ Provide a forum for sharing, discussing, and publishing impactful research
- ❖ Foster collaboration between researchers, academicians, and practitioners
- ❖ Strengthen regional and international research networks
- ❖ Generate actionable ideas that can drive inclusive and resilient development

In these objectives, we find the soul of what meaningful research should be—collaborative, transformative, and socially responsive.

The Challenges Before Us:

We meet at a time when communities are confronted with overlapping and persistent challenges:

- ❖ Rising inequality and digital exclusion
- ❖ Climate shocks and environmental degradation
- ❖ Economic uncertainty and pandemics
- ❖ Displacement and fragile infrastructure systems

Technology, though promising, is not a magic wand. In fact, if poorly designed, it can worsen inequality and deepen exclusion. A smartphone in one person's hand may be a gateway to opportunity; to another, it may remain a distant luxury.

Our mission is not just to create technology, but to ensure it serves, includes, and empowers.



Technology's Role in Sustainable Development:

Technology can be one of the most powerful enablers of sustainable development. It can transform agriculture, strengthen health systems, improve governance, expand education, and drive new forms of economic participation.

Artificial Intelligence (AI), for instance, is already reshaping scientific research and scholarly communication. It brings vast opportunities but also pressing ethical and governance challenges. As researchers, we must interrogate both its promise and its pitfalls.

Technology must be understood not just as innovation, but as an ecosystem, one that requires thoughtful design, responsible deployment, and continuous evaluation.

Pillars for Sustainable Technology:

To build communities that are inclusive and resilient, we must anchor our technological solutions on three core pillars:

1. **Inclusion:** Ensuring no one is left behind.
2. **Resilience:** Building systems that can withstand shocks—economic, social, or environmental.
3. **Sustainability:** Creating solutions that endure and protect our environment and society.

These pillars are inseparable. Inclusion without resilience is fragile; resilience without sustainability is temporary.

Designing for Inclusion:

The usability of technology determines its impact. If people cannot access, understand, or afford a technological solution, it cannot be considered inclusive.

Key principles include:

- ❖ Interfaces in local languages
- ❖ Accessibility for persons with disabilities
- ❖ Affordable hardware and data
- ❖ Community-centered digital literacy training

Inclusivity begins at the design stage not as an afterthought

Research as a Connector

Research should not remain locked in journals or conferences. It must reach communities, policymakers, and practitioners. Multidisciplinary collaboration is essential because real-world problems are complex and interconnected.

- ❖ Engineers need sociologists.
- ❖ Data scientists need policymakers.
- ❖ Educators need industry partners.
- ❖ Researchers need communities.

Co-designing solutions with affected communities ensures relevance and sustainability. Research is not just about discovery it is about connection.

Seeking Grants and Opportunities

To unlock impactful research, we must pursue relevant funding opportunities. This requires:

- ❖ Identifying grants aligned with thematic areas such as climate resilience, education, and community development
- ❖ Targeting region-specific calls, especially those focusing on Sub-Saharan Africa
- ❖ Engaging local foundations, NGOs, and government agencies



A well-aligned grant can transform an idea into a real-world solution

Roles of Students and Faculty

To the students here: you are innovators, coders, designers, and local champions. Your ideas can reshape the future.

To faculty members: you are mentors and catalysts, guiding research journeys, nurturing innovation, and facilitating networks.

Research is not the end—it is the beginning.

Building Resilient Communities Through Technology

Resilience means the capacity to function, adapt, and thrive in moments of crisis. Technology can greatly enhance this resilience through:

- ❖ Digitally connected and institutionally supported local communities
- ❖ Early warning and real-time data systems for disaster management
- ❖ Crowdsourced mapping for crisis response
- ❖ Decentralized technologies such as solar systems, smart sensors, and water management tools
- ❖ IoT solutions for monitoring agriculture, infrastructure, and environmental conditions

Resilience is not accidental it is built through intentional investments in knowledge, systems, and technology.

Strategies for Collective Progress

As we look ahead, several priorities must guide our work:

- ❖ Strengthen university-to-university partnerships
- ❖ Promote open-access publication of local research
- ❖ Pursue grants aligned with urgent development themes
- ❖ Engage the private sector for funding and scaling
- ❖ Advocate for inclusive national tech policies
- ❖ Prioritize co-designed solutions developed with communities

The future will belong to those who collaborate—across disciplines, sectors, and borders.

A Roadmap to 2030

A roadmap is a shared promise. It guides our collective efforts into the next decade:

- ❖ **Short-term (1–2 years):** Pilot inclusive technologies and expand digital skills training
- ❖ **Medium-term (3–5 years):** Establish regional research hubs and influence policy processes
- ❖ **Long-term (by 2030):** Build tech-enabled, shock-resilient, inclusive communities supported by local innovators and robust digital economies

Imagine a 2030 where every student is connected, local problems are solved by local innovators, and research networks thrive across Africa. This is not a fantasy—it is within reach.

Call to Action

As you prepare your papers, presentations, and discussions, ask yourself one powerful question:

Who benefits?

Let us commit to:

- ❖ Publishing openly
- ❖ Designing for the most vulnerable first
- ❖ Building for equity
- ❖ Applying solutions now—not later



Technology must work for everyone, especially the last person in line.

Conclusion

As we conclude this keynote, let us remember that the future is not distant, it is being shaped in this room, through the decisions we make and the actions we take as researchers, educators, and innovators.

Technology alone cannot build inclusive and resilient communities. People will. Communities will. And those people are us.

Let us ensure that the knowledge we generate, the partnerships we forge, and the innovations we create truly empower all— from bustling cities to the most remote villages.

The work begins here, and it continues with each one of us. Thank you.





PAPER PRESENTATIONS

SUB-THEME 1: Computing and Informatics

SUB-THEME 2: Library and Information Science

Perceived Ease of Use and Usefulness as Determinants of Artificial Intelligence Adoption by Lecturers in Public Universities in Ogun State, Nigeria

By Olori Abiola Lateef¹ and Kazali Sakirat Ayoola²

1. Olabisi Onabanjo University, Nigeria
2. Olabisi Onabanjo University, Nigeria

Abstract

The study investigated determinants of artificial intelligence adoption by Lecturers in Public Universities in Ogun State, Nigeria. Three research questions were raised to guide the study. The study adopted a correlational survey research design type. The target population for this study consist all lecturers in Public Universities in Ogun State, while the sample comprised of six hundred and thirty-seven lecturers selected through multistage sampling technique. The three validated instruments used for the study are (PEUAIQ) $r = 0.91$, (PUAIQ) $r = 0.76$ and; (AAIS) $r = 0.79$. Inferential statistics of Pearson's product moment correlation and multiple regression were used for data analysis. Results showed no significant relationship between perceived ease of use and adoption of AI by lecturers ($r = .004$, $P > 0.05$) and no significant relationship between perceived usefulness and adoption of AI by lecturers ($r = .022$, $P > 0.05$) in public universities. The results also showed no significant relative contribution of perceived ease of use and usefulness to AI adoption ($\beta = .009$; $t = .228$; $P < 0.05$), ($\beta = -.025$; $t = -.643$; $P > 0.05$). It was recommended amongst other things that stakeholders of the Universities should incorporate AI-related educational technologies into their institutions' curriculum.

Keywords: Artificial intelligence, emerging educational technologies, perceived ease of use, perceived usefulness, academics.

1. Introduction

In Nigerian schools, challenges associated with the traditional method of teaching, negative attitude towards the use of information and communication technology (ICT) by educators, lack of modern teaching-learning resources and poor school management have encouraged research on emerging educational technologies. In fact, in order to support the use of ICT by tertiary institutions the National Information Technology Development Agency [NITDA] (2019) provides framework and guidelines for information and communication technology (ICT) adoption in tertiary institutions. The goal of the framework is to provide flexible and comprehensive general guidelines for the deployment of ICT tools in Nigerian tertiary institutions for effective and efficient support of the core business processes of teaching, learning, research and administration. The framework and guidelines prescribed in the document are designed to serve the purposes among others, of facilitating the ability of the target tertiary institutions: -

- i. To provide fully automated and ICT driven business processes including records management, content delivery, and performance assessment in Nigerian tertiary institutions;
- ii. To provide suitable environments for life-long learning / continuing education;
- iii. To develop a methodical system of collecting and disseminating data and information of relevance to national higher education issues;
- iv. To deploy efficient management information systems;
- v. To broaden the horizon of educational services provision, including medium / method of content delivery;
- vi. To promote effective information exchange best practices among and between students and lecturers;
- vii. To Deploy/enhance learning management systems and ICTs-supported library services; To promote technology literacy of all members of the community, especially for students; To develop vibrant and sustainable distance education platforms, focused on national development issues.



- viii. To promote the culture of learning at school (development of learning skills, expansion of knowledge acquisition options, open source of educational resources, etc.);
- ix. To institute and sustain capacity building programmes in all areas of information and communication technology;
- x. To provide access to global digital library resources through networking initiatives, opportunities, and collaborations;
- xi. To develop inter-tertiary institution linkages and collaborations, including content delivery.

Holmes and Tuomi (2022) posited that the use of emerging educational technologies such as smart board, virtual reality, augmented reality, gamification, electronic learning and artificial intelligence (AI) has significant impact on teaching and learning. For instance, Cukurova et al. (2023) described artificial intelligence as a machine-driven type of human intelligence capable of delivering exceptional tasks. Artificial intelligence (AI) is also the impersonation of human knowledge procedures capable of assisting in decision making by machines and robots. The capacity of machine to think and act like people has given AI a remarkable place in all fields, including pedagogy.

The integration of artificial intelligence in education provides window of opportunities, but it also raises array of ethical implications that must be carefully addressed before implementation. These include students' data privacy, students' autonomy in decision making, bias and discrimination, overreliance on technology, educational inequality etc. However, to use AI responsibly, educational institutions should provide policy guideline and training for educators to give ethical consideration to its design and implementation. It should be noted that no matter the issues associated with AI, when used with caution the serviceability still outweighs its problems in education.

For instance, Vaishya et al. (2020) asserted that some of the educational tasks artificial intelligence is used for in tertiary education are personalized learning, tutor assistance, content evaluation, performance monitoring, grading, instant feedback, facility management and broadening research activities. Baker (2021) opined that in the 21st century educational system the use of artificial intelligence applications should be encouraged among academics for teaching which include Chatbot, Eduaide. ai, intelligent tutoring systems, Canva Magic Write, Curipod, Education Copilot, Gradescope, Quizizz, adaptive tutoring, personalised learning system, Pearson AI, Thinkster math, Coursera, Quizlet etc. Holmes and Tuomi (2022), noted that artificial intelligence utilization in education improves students' engagement, motivation and retention. For instance, where traditional teaching media could not provide visual element, AI smart content will simulate real objects and interactivity for reality of experience. AI has the potential to address some of the biggest challenges in education today, in terms of innovative teaching-learning practices, and accelerate progress towards sustainable development goal 4 (Edtech, 2020).

Selwyn (2022) posited that aside from teaching, AI has been of great help for academics in carrying out research like data analysis which can help process large data sets, identify pattern and mechanistic literature review. Artificial intelligence in education has revolutionised the method of conducting research in a more accurate manner than the olden days. Al Darayseh (2023) noted that there are several AI toolkits available for researchers for idea generation, grammar editing, plagiarism detection, literature review, citation counts, data analysis and management. They include Google scholar, Semantic scholar, ChatGPT, Google Chrome, meta-AI, Turnitin, Trinka, QuillBot, Grammarly, Elicit, Research Rabbit, Scite AI, Tableau etc.

To further buttress the significant of a robust ICT policy in Nigeria, it should be noted that integration of artificial intelligence (AI) into university education is rapidly advancing globally. This is driven by its possibilities to enhance teaching effectiveness, improve learning outcomes, research and development (R&D); and streamline administrative processes. For instance, Arizona State University is utilising an AI-powered adaptive learning system that analyses students' performance data to

customise course content and provides targeted support (Holmes & Tuomi, 2022). AI is being utilised for virtual teaching assistants, assisting faculty in tasks such as grading, assessment, assignments and facilitating discussions. Case studies from universities like the University of Michigan highlight AI chatbots' effectiveness in boosting students' engagement and support (Wu, 2023). Furthermore, AI-driven predictive analytics tools are gaining popularity in learning institutions to identify students at risk of academic failure and intervene proactively. Georgia State University uses predictive modeling algorithms to pinpoint students needing additional support, thereby improving retention and graduation rates (Afari et al., 2022).

As artificial intelligence is revolutionizing educational system globally several factors do influence its adoption in teaching-learning environments. The availability of technological infrastructures such as hardware (computers, tablets, and interactive whiteboards) and software (educational apps, learning management systems) are crucial. Adequate internet connectivity and technical support will also play significant role. It should be noted that even with adequate provision of hardware/software tools by respective tertiary institutions, lecturers' disposition towards digital instructional technologies is most crucial for adoption. Choi et al. (2023) in a study on perceived ease of use reported that effective technology integration requires that educators are proficient in using technological tools and applications. In ensuring teachers' positive attitude towards educational technology utilisation ongoing professional development and training programmes will equip teachers with the necessary skills and knowledge to incorporate technology into their teaching practices. Without proper training teachers may not find technology easy to use for teaching and research leading to underutilisation (Krause et al., 2024). The alignment of technology with the curriculum and pedagogical approaches is essential for its effective utilisation. Amongst others, the predisposition of users towards instructional technology might likely determine its adoption and this reason informs the study.

1.1 Objectives of the study

The study aims to:

- i. Examine the influence of perceived ease of use on adoption of AI by lecturers.
- ii. Examine the influence of perceived usefulness on adoption of AI by lecturers.

1.2 Statement of the Problem

Despite the growing global awareness and adoption of Artificial Intelligence (AI) technologies across various sectors, including education there is argument of what factors actually influence its adoption by teachers in classroom. While some studies reported significant influence of perceived ease of use and usefulness on AI adoption, some reported no significant impact of perceived ease of use and usefulness on its adoption. However, this continuous disagreement calls for major concern among researchers in the field of educational technology. Also, studies on perception towards utilisation of AI among Nigerian University Lecturers are scarce. Thus, as a result of these circumstances there is need for further empirical evidence to fill the gaps. Therefore, this study investigated perceived ease of use and usefulness as determinants of AI adoption by lecturers in Public Universities in Ogun State, Nigeria.

1.3 Research Questions

1. Is there any significant relationship between Perceived ease of use of AI and its adoption by Lecturers in Public Universities in Ogun State, Nigeria?
2. Is there any significant relationship between perceived usefulness of AI and its adoption by Lecturers in Public Universities in Ogun State, Nigeria?
3. Is there any significant relative contribution of perceived ease of use and perceived usefulness on adoption of AI by Lecturers in Public Universities in Ogun State, Nigeria?



2. Review of Literature

2.1 Theoretical Framework/ Model

The Technology Acceptance Model (TAM) developed by Davis (1989) is a foundational framework for understanding technology adoption. Davis posits that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are primary factors influencing users' acceptance of technology. PU refers to the degree to which users believe that technology will enhance their job performance, while PEOU refers to the degree to which they find technology easy to use. Venkatesh et al. (2003) noted that the primary objective of TAM is to shed light on the processes supporting the acceptance of technology in order to predict the behaviour of and provide a theoretical explanation for the successful implementation of technology in education. An individual's decision to perform a behaviour is the result of the analysis of the benefits to be derived compared to efforts put into the behaviour. This framework is relevant to the study because PEOU and PU may likely determine users' intention to adoption emerging educational technologies such as artificial intelligence

2.2 Empirical Review

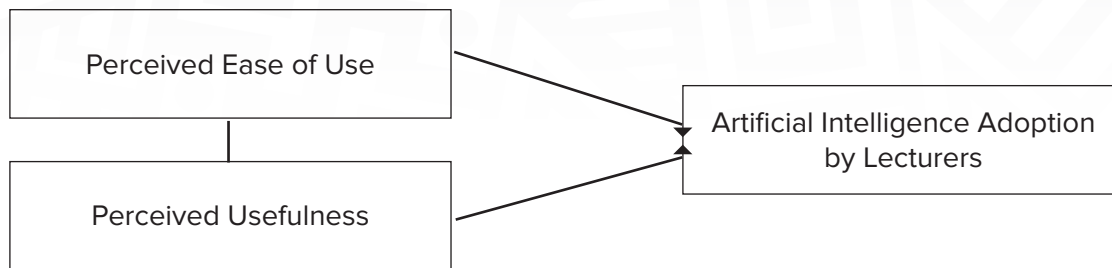
Like other emerging instructional technologies, the perception of educators on ease of use and its usefulness might significantly influence AI utilisation. One key factor influencing the adoption and utilization of ICT among teachers is perceived ease of use (PEOU) which reflects how effortless a teacher believes it is to use a technology (Davis, 1989). Perceived ease of use is defined as the degree to which a person believes that using a specific system or technology will be free of efforts (Venkatesh & Davis, 2000). For teachers, it encompasses the simplicity of accessing, navigating and applying ICT tools in their instructional practices. Positive perception towards technology can lead to greater acceptance and willingness to adopt new tools and methods. The adoption of Artificial Intelligence (AI) in academic settings has been a subject of interest in recent years. Studies on technological proficiency reveal that teachers who possess a higher level of familiarity and comfort with technology are more likely to adopt AI tools effectively. Wu (2023) found that individuals with greater technological proficiency perceived fewer barriers in adopting AI, resulting in higher utilisation of AI for teaching and research purposes.

Du and Gao (2022) reported that teachers with prior exposure to user-friendly technology demonstrated higher levels of ICT utilisation in classrooms. Also, a study by Al Darayseh (2023) revealed a positive correlation between perceived ease of use and ICT adoption among science teachers in Egypt. Al-Adawn et al. (2024) also found that training programmes improve teachers' familiarity with AI tools and indirectly influencing utilisation. On the other hand, Li et al. (2024) investigated perceived ease of use of Artificial Intelligence (AI) among educators in Odaiba District of Tokyo and findings revealed no significant correlation between perceived ease of use and artificial intelligence integration in instruction. Similarly, in a descriptive study by Flogie and Krabonja (2023) among teachers in Greece no significant relationship was found between perceived ease of use and AI adoption for teaching.

Oyelami (2020) in a study found that majority of academic librarians in Nigeria are well aware of the usefulness of emerging educational technologies in transforming teaching and library management. Similarly, Zhang et al. (2023) reported in a study that perceived usefulness significantly predicts willingness by teachers to integrate artificial intelligence in their practices. Kizilcec (2024) explored factors influencing utilisation of educational software by educators in Tarija region of Bolivia and finding showed that potential benefits was significantly correlated with the utilisation. Humida et al. (2022) found that perceived usefulness of AI does not significantly increase teachers' adoption for educational purposes. Choi et al. (2023) in a survey of some school teachers in Iceland found that both PU and PEOU do not significantly predict educators' intention to use AI-based systems.



Figure: 1 Technology Acceptance Model



Source: Adapted from Davis, 1989

3. Methodology

3.1 Research Design

The study adopted a correlational survey research design type.

3.2 Target Population

The target population for this study consist all 2,124 lecturers in the three Public Universities in Ogun State, Nigeria.

3.3 Sample and Sampling Technique

The sample consisted of 637 lecturers of public universities in Ogun State. Multistage sampling techniques was used in this study. In the first stage, proportional sampling technique was used to select thirty percent (30%) of the lecturers in each institution. This gave 274 out of 912 in one instruction, 209 out of 698 in another and 154 out of 514 in the third institutions respectively. In the second stage, simple random sampling was used to select 637 academic staff in the selected institutions as the study sample.

3.4 Instrumentation

The instrument named “Perceived Ease of Use of Artificial Intelligence Questionnaire (PEUAIQ)” was adapted from Venkatesh and Davis (2000). Section A contains lecturers’ demographic information while section B measures lecturers’ perception on ease of use of artificial intelligence. It has 10 items with 4-points likert scale of strongly agreed, agreed, disagreed, and strongly disagreed. The validity was established by giving it to experts in Educational Technology and Evaluation for content and construct validity. Also, the reliability was determined by administering it to 30 lecturers in universities outside the sample but with similar characteristics. Cronbach Alpha reliability statistics was used to analyse the data collected and it yielded a reliability coefficient value of 0.91 which show that the instrument is internally consistent.

Perceived Usefulness of Artificial Intelligence Questionnaire (PUAIQ) was adapted from Jiang et al. (2003). Section A contains information on lecturers’ demography while section B measures lecturers’ perception on usefulness of artificial intelligence. It has 10 items with 4-points likert scale of strongly agreed, agreed, disagreed, and strongly disagreed. The validity was established by giving it to the experts in Educational Technology and Evaluation for content and construct validity while reliability was determined by administering it to 30 lecturers in universities outside the sample but with similar attributes. Cronbach Alpha reliability statistics was used to analyse data collected and it yielded a reliability coefficient index of 0.76, indicating consistency.

Adoption of AI Scale (AAIS) was adapted from Choi et al. (2023). Section A contains information on lecturers’ demography while section B measures lecturers’ perception on utilization of artificial intelligence. It has 10 items with 4-points likert scale of strongly agreed, agreed, disagreed, and



strongly disagreed. The validity was established by giving it to the experts in Educational Technology and Evaluation for content and construct validity. Also, the reliability was determined by administering it to 30 lecturers in universities outside the sample but with similar characteristics. Cronbach Alpha reliability statistics was used to analyse data collected and it yielded a reliability coefficient index of 0.79, suggesting it was internally consistent for the study.

3.5 Data Collection Procedure

For data collection, the instruments were administered electronically by using google form with the assistance of members of academic staff of each selected institution who helped to share the instruments on their institutional WhatsApp platform and completed responses were received by one of researchers.

3.6 Data Analysis

For data analysis, inferential statistics of Pearson's Product Moment Correlation was used to analyse research questions one and two; while question three was analysed statistically with regression at 0.05 level of significance.

4. Results

4.1 Relationship between Perceived ease of use of AI and its adoption by lecturers in Public Universities in Ogun State, Nigeria

Table 1: Correlation results showing relationship between perceived ease of use and adoption of artificial intelligence (AI) by lecturers in public universities

<i>Variables</i>	<i>Mean</i>	<i>Std</i>	<i>N</i>	<i>R</i>	<i>Sig.</i>
Ease of use	34.60	1.640	637	.004	.929
Adoption of AI	35.00	1.625	637		

Table one shows the results of the relationship between perceived ease of use and adoption of Artificial Intelligence (AI) among lecturers. The table showed 34.60 mean score for perceived ease of use with 1.640 standard deviation and 35.00 mean score for adoption of AI with 1.625 standard deviation. The table further shows that the relationship between the two variables is not statistically significant ($r = .004$, $P > 0.05$). This implies that there is no significant relationship between perceived ease of use and adoption of AI by lecturers in Public Universities in Ogun State.

4.2 Relationship between perceived usefulness of AI and its adoption by Lecturers in Public Universities in Ogun State, Nigeria

Table 2: Correlation results showing relationship between perceived ease of use and adoption of artificial intelligence (AI) by lecturers in public universities

<i>Variables</i>	<i>Mean</i>	<i>Std</i>	<i>N</i>	<i>R</i>	<i>Sig.</i>
Usefulness of AI	34.55	1.546	637	.022	.584
Adoption of AI	35.00	1.625	637		

Table two shows the results of the relationship between usefulness and adoption of Artificial Intelligence (AI) among lecturers. The table showed 34.55 mean score for usefulness with 1.546 standard deviation and 35.00 mean score for adoption of AI with 1.625 standard deviation. The table further shows that the relationship between the two variables is not statistically significant ($r = .022$, $P > 0.05$). This implies that there is no significant relationship between perceived usefulness and adoption of AI by Lecturers in Public Universities in Ogun State.

4.3 Relative contribution of perceived ease of use and perceived usefulness on adoption of AI by Lecturers in Public Universities in Ogun State, Nigeria

Table 3: Multiple regression showing relative contribution of perceived ease of use and perceived usefulness on adoption of AI by lecturers in public universities

Coefficients ^a					
Model B	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	Std. Error	Beta			
(Constant)	32.444	2.226		14.578	.000
Perceived ease of use	.009	.039	.009	.228	.820
Perceived Usefulness	-.027	.041	-.025	-.643	.521

Table three reveals the relative contribution of the predictor variables on the criterion variable. The results show no significant relative contribution of perceived ease of use and usefulness to the criterion measure (Adoption of AI) ($\beta = .009$; $t = .228$; $P > 0.05$), ($\beta = -.025$; $t = -.643$; $P > 0.05$) respectively.

5. Discussion of Findings

Results of research question one show no significant relationship between ease of use and AI adoption by lecturers in Public Universities in Ogun State. The findings of this study align with previous research conducted by Li et al. (2024) and findings revealed no significant correlation between perceived ease of use and artificial intelligence integration in instruction. Similarly, Flogie and Krabonja (2023) found among teachers in Greece no significant relationship between perceived ease of use and AI utilisation for teaching. This finding might be as a result of negative attitude, lack of technological exposure, no professional development and training.

Results of research question two show no significant relationship between perceived usefulness and adoption of AI by lecturers in Public Universities in Ogun State. The results support the outcome of Humida et al. (2022) study who found that perceived usefulness of AI does not significantly increase teachers' utilisation for educational purposes. Choi et al. (2023) found that both PU and PEOU do not significantly predict educators' intention to use AI-based systems. The reason for this outcome might be that they do not consider it as improving their productivity, time saving and more efficient.

Results of research question three show no significant relative contribution of both perceived ease of use and usefulness to AI adoption by Lecturers. These findings corroborate Flogie and Krabonja (2023); and Humida et al. (2022) who found that perceived usefulness does not significantly increase teachers' integration of AI for educational purposes.

6. Conclusion

After empirical investigation of the variables of the study, it was concluded that perceived ease of use and perceived usefulness do not significantly determine AI adoption by lecturers in Public Universities in Ogun State. Also, there was no significant relative contribution of the two predictor variables on AI adoption among lecturers.



7. Recommendations

- (1) Stakeholders in Ogun State Public Universities should incorporate AI-related modules into the curriculum to provide more awareness for all academic staff.
- (2) Academics should bridge the gap between their perceived ease of use of AI and its actual adoption
- (3) Bridging the gap on perceived usefulness through teaching and workshop for lecturers is essential.
- (4) Also, public universities in Ogun State should create enabling environment that would encourage the integration of emerging technologies in teaching and learning processes.
- (5) Provision of AI infrastructure for academic staff in public universities in Ogun State is important.

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Understanding the Link Between *Helicobacter pylori* and Stomach Cancer: A Mathematical Perspective

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ABSTRACT

Helicobacter pylori (*H. pylori*) is a bacterium infecting over half of the global population and is strongly associated with stomach cancer. In this study, we develop and analyze a population-based mathematical model to investigate the transmission dynamics of *H. pylori* and its progression to stomach cancer, with a particular focus on how treatment and environmental factors influence the disease spread. The model divides the population into six compartments: susceptible, exposed, infected, treated, cancer-infected, and environmental bacterial concentration. We determine the threshold values that tell us if the disease can spread, study whether the disease dies out or persists over time, explore how changes in key factors can affect disease dynamics, and use computer simulations to test how different conditions influence the spread of the disease. Our simulations show that increasing treatment rates can reduce the control reproduction number below the critical threshold, hence preventing disease persistence in the community. Hygiene improvements further reduce transmission by limiting environmental spread, underscoring the importance of combined interventions. This model demonstrates that effective treatment and improved hygiene are essential to control the spread of *H. pylori* and reduce stomach cancer incidence.

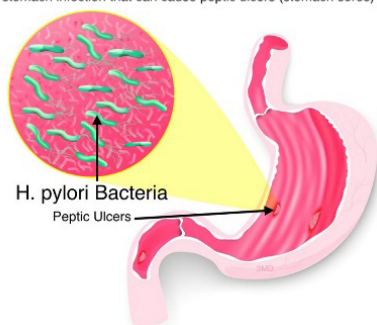
Keywords: *Helicobacter pylori*, stomach cancer, mathematical modeling, sensitivity analysis, model analysis.

1. Introduction

H. pylori is a gram-negative bacterium [1] that colonizes the human gastric mucosa and has been identified as a major cause of peptic ulcers and stomach cancer [2,3]. Transmission occurs through direct and indirect contact [4]. Despite recent advancements in public health objectives including safe water, better sanitation, and enough medical care coverage, *H. pylori* infection is still a prevalent public health issue and is endemic primarily in underdeveloped nations. Preventive and intervention methods against stomach cancer depend increasingly on an understanding of the key mechanisms of disease transmission [5]. *H. pylori* infection significantly increases the risk of developing peptic ulcers, with infected individuals being approximately 3 to 6 times more likely to develop ulcers compared to uninfected individuals. It also doubles to six-fold the risk of developing stomach cancer, contributing to approximately 75% of non-cardia gastric cancers globally [3].

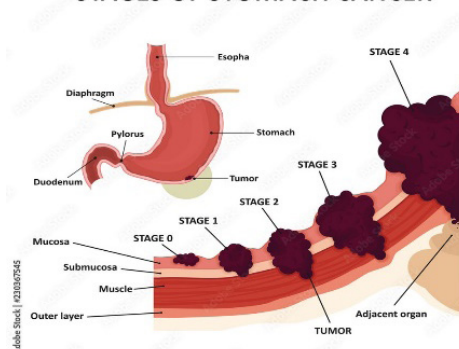
Figure 1: *H. pylori* bacteria and stomach cancer development.

Helicobacter pylori “H. pylori” Bacteria
A stomach infection that can cause peptic ulcers (stomach sores)



(a) *H. pylori* [11]

STAGES OF STOMACH CANCER



(b) Stomach cancer [12]

Stomach cancer is ranked to be the 5th common cancer globally (after Lung, breast, colon, and prostate cancer), and 6th common cancer in the Kenya (after breast, cervix uteri, prostate, oesophagus, and colon cancer) [WHO, 2022]. Figures 2 and 3 shows the top 10 common cancers in the world, and in Kenya, respectively. This study aims to understand how treatment and environmental factors influence the progression from *H. pylori* infection to stomach cancer using a mathematical modeling approach [6].

Figure 2: Stomach cancer is ranked to be the 5th common cancer globally [WHO, 2022]

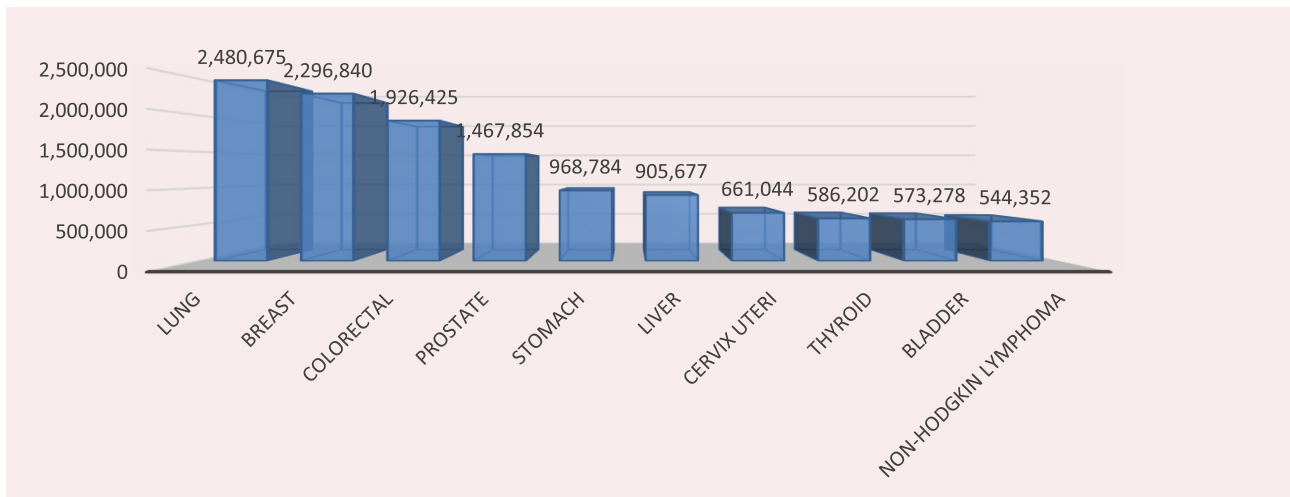
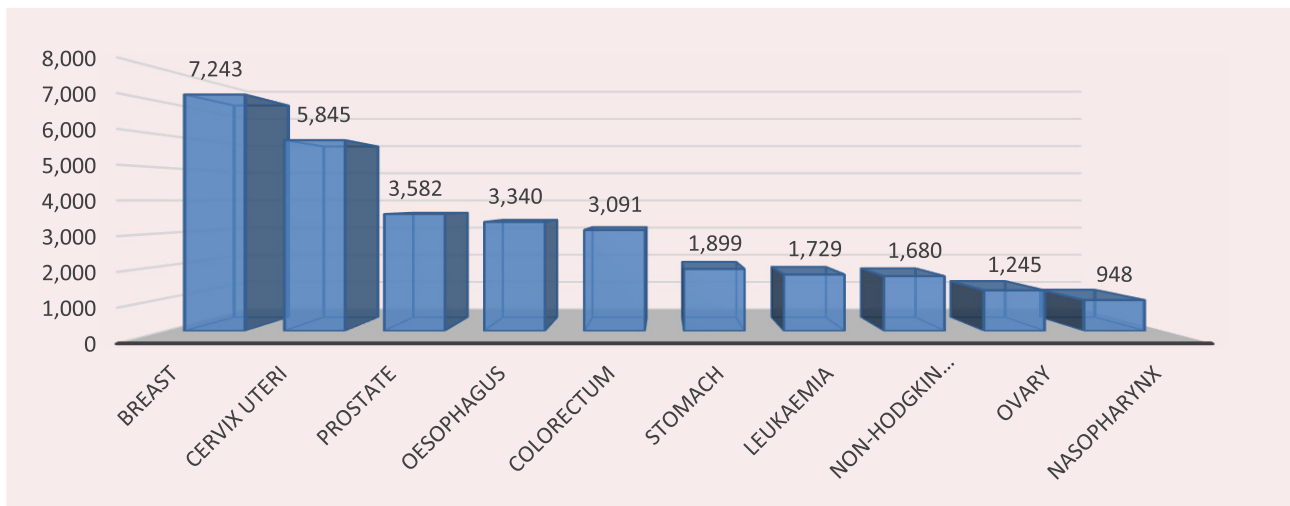


Figure 3: Stomach cancer is ranked to be the 6th common cancer in Kenya [WHO, 2022]



1. Model Formulation

We propose a deterministic model comprising of six compartments: susceptible (S), exposed (E), infected (I), treated (T), cancer-infected (C), and environmental bacterial concentration (H). The model incorporates human-to-human and environment-to-human transmission. The total human population is not assumed constant due to disease-induced mortality. The system of nonlinear ordinary differential equations represents transitions among compartments based on infection, treatment, and progression to cancer. The model flow chart is as given in Figure 4.

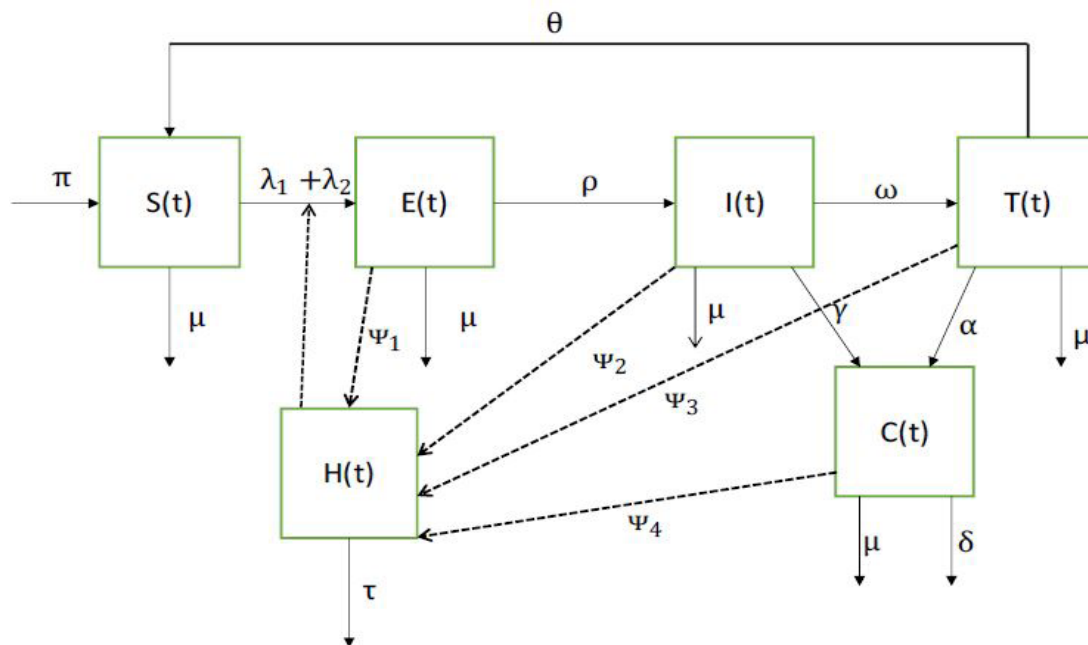


Figure 4: Model Flow Chart [6].

2.1 Model Equations [6]

We deduce the nonlinear first order Ordinary differential equations given as:

$$\frac{dS}{dt} = p + qT - (m + I_1 + I_2)S \quad (1)$$

$$\frac{dE}{dt} = (I_1 + I_2)S - (m + r)E \quad (2)$$

$$\frac{dI}{dt} = rE - (m + w + g)I \quad (3)$$

$$\frac{dT}{dt} = wI - (a + m + q)T \quad (4)$$

$$\frac{dC}{dt} = gI + aT - (m + d)C \quad (5)$$

$$\frac{dH}{dt} = y_1E + y_2I + y_3T + y_4C - \tau H \quad (6)$$

Table 1: Parameter, description and values of the model

Symbol	Description	Value	Source
π Individuals birth rate		10	[6]
μ	Natural individual mortality rate	0.000019	[6]
I_1	Human induced force of infection	0.02	[6]
I_2	Environment induced force of infection	0.1075	[6]
ρ	Exposed individual infectious rate	0.65	[6]
ω	Exposed individual infectious rate	0.0073	[6]
θ	Susceptible rate of individuals who have been treated	0.002485	[6]
δ	Stomach cancer induced mortality rate	0.00839	[6]
γ	Rate at which infected individuals get stomach cancer	0.003	[6]
α	Rate at which treated individuals get stomach cancer	0.0066	[6]
τ	Natural death of <i>H. pylori</i>	0.001	[6]
y_1	Discharge of <i>H. pylori</i> from exposed class	0.0009	[6]
y_2	Discharge of <i>H. pylori</i> from infected class	0.0008	[6]
y_3	Discharge of <i>H. pylori</i> from treated class	0.0004	[6]
y_4	Discharge of <i>H. pylori</i> from stomach cancer class	0.0001	[6]

2. Model Analysis

We established the positivity and boundedness of solutions to ensure biological feasibility. The solutions of $\{S, E, I, T, C, H\}$ are nonnegative for $t \geq 0$ given as [6]

$$S(t) \geq S(0) \exp - \int_0^t (\mu + \lambda_1 + \lambda_2) dr \geq 0 \quad (7)$$

$$E(t) \geq E(0) \exp - (\mu + \rho)t \geq 0 \quad (8)$$

$$I(t) \geq I(0) \exp - (\mu + \omega + \gamma)t \geq 0 \quad (9)$$

$$T(t) \geq T(0) \exp - (\alpha + \mu + \theta)t \geq 0 \quad (10)$$

$$C(t) \geq C(0) \exp - (\mu + \delta)t \geq 0 \quad (11)$$

$$H(t) \geq H(0) \exp - (\tau)t \geq 0 \quad (12)$$

Therefore, the model is bounded as

$$R = \left[S, E, I, T, C, H \geq 0 : N(t) \leq \frac{\pi}{\mu}, H(t) \leq \frac{(\psi_1 + \psi_2 + \psi_3 + \psi_4)\pi}{\tau\mu} \right] \quad (13)$$

Disease-Free Equilibrium (DFE) was obtained by setting the exposed, infected, the treated, the cancer infected, and the bacteria environmental concentration to zero. This results into [6]

$$B^0 = (S^0, E^0, I^0, T^0, C^0, H^0) = \left(\frac{\pi}{\mu}, 0, 0, 0, 0, 0 \right) \quad (14)$$



Control reproduction number (R_c) was computed using the next-generation matrix method [7] for model system (1) to (5) and given as;

$$R_c^* = \frac{\beta_1 S^0 (k_2 k_3 k_4 + \eta_1 \rho k_3 k_4 + \eta_2 \rho \omega k_4 + \eta_3 \gamma \rho k_3 + \eta_3 \alpha \rho \omega)}{k_1 k_2 k_3 k_4} \quad (15)$$

Local and global stability analyses are conducted for the DFE using Routh-Hurwitz criteria [7] and Lyapunov functions [8], respectively, and it was found to be locally and globally asymptotically stable for $R_c < 1$ respectively. Endemic equilibrium was found to be globally asymptotically stable for $R_c > 1$. Possibility of bifurcation in human population was studied using center manifold theory [9] and the system was found to have forward bifurcation at $R_c = 1$.

3. Sensitivity Analysis

Sensitivity analysis was performed using Partial Rank Correlation Coefficients (PRCC) [10] to identify key parameters influencing . The below PRCC values were obtained by generating parameter sets using Latin Hypercube Sampling, simulating the model for each set, ranking the parameter values and outputs, and then computing the partial correlation coefficient between each parameter and the output variable while controlling for other parameters.

Table 2: PRCC Analysis Output Values [6]

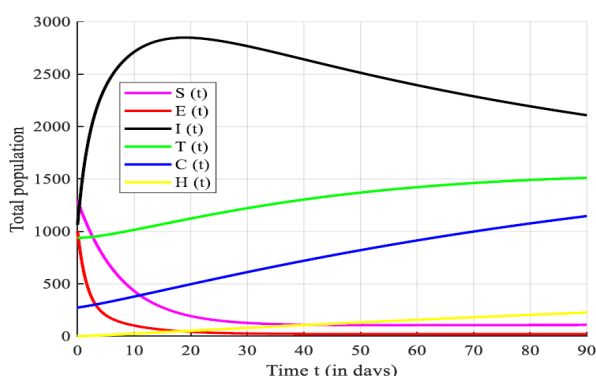
π	μ	λ_1	λ_2	ρ	ω	θ	δ	γ	α	τ	ψ_1	ψ_2	ψ_3	ψ_4
0.99	-0.88	0.19	0.87	-0.87	0.55	-0.18	-0.14	0.17	-0.30	0.08	-0.21	0.02	0.11	-0.30

Treatment rate (ω) was found to have a positive PRCC value which would imply that increased treatment increases infection burden. However, the positive PRCC value for treatment rate (ω) shows increased treated class population. Further, we also see the exposed individual infectious rate (ρ) to have a negative PRCC value. This is because a high ρ can actually reduce the environmental bacterial load (H) because individuals leave exposed class (E) quickly and move to infected class (I) where they may be treated or removed faster. Thus environment induced force of infection (λ_2) is the highest contributor to the infection burden while the exposed individual infectious rate (ρ) is the highest contributor towards the disease control. Improved hygiene thus plays a key role in containing the disease spread.

4. Numerical Simulations

We established that the susceptible population decreases with time, the exposed population decreases with time, the infectious class increases exponentially and then decreases gradually, the treated population increases slowly with time, the cancer-infected population increases with time, and concentration of the bacteria increases with time (See Figure 5) [6].

Figure 5: How different classes change with time [6].



The trend in Figure 5 can be explained as follows: Susceptible populations $S(t)$ trend: Reflects ongoing disease transmission. Susceptible individuals are constantly being “recruited” into the exposed and infected compartments.

Exposed population $E(t)$ trend: This shows the conversion of exposed individuals into infected ones as the epidemic progresses.

Infected population $I(t)$ trend: Early in the outbreak, there’s a large susceptible pool, leading to rapid exponential growth of infections. Over time, as susceptible and exposed populations deplete and treatment starts, new infections slow, and more people either recover, get treated, or progress to cancer.

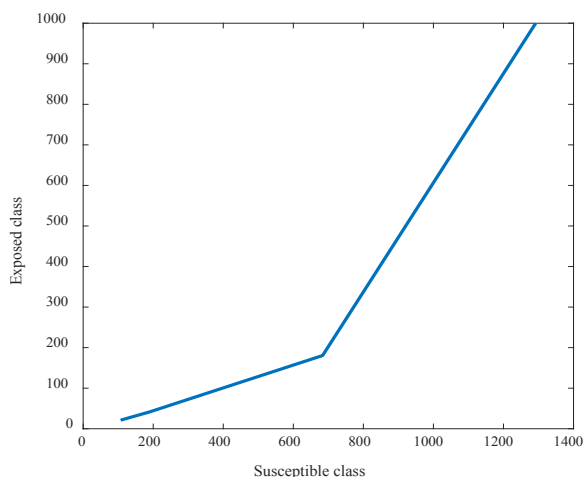
Treated population $T(t)$ trend: Shows the gradual rollout of treatment interventions over time.

Cancer-infected population $C(t)$ trend: Reflects the cumulative nature of cancer cases as the infection persists.

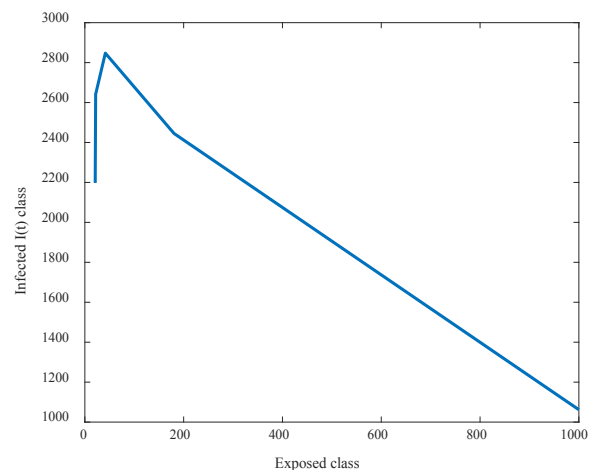
Bacteria concentration $H(t)$ trend: Reflects the slow buildup of environmental reservoirs that can sustain transmission even as human infections decline.

The model demonstrates that controlling *H. pylori* through treatment and hygiene has a profound effect on reducing stomach cancer. It highlights the need for early intervention and access to clean water and medical care. The mathematical framework can support decision-making in public health policy. An analysis was also done on the relationship between the exposed class and the susceptible class as well as between the exposed class and the infected class (See Figure 6)

Figure 6: Variation of various classes [6]



Exposed and Susceptible Classes



Infected $I(t)$ and Exposed Classes



Figure 6 shows that the number of exposed individuals initially increases slowly as the susceptible population grows, reflecting the relatively low force of infection at early stages. As the infection rate rises (driven by increasing interactions between infected and susceptible individuals), the number of exposed individuals grows more rapidly until susceptible numbers decline, causing exposure to level off or decrease. We also see that the number of infected individuals initially rises rapidly as exposed individuals progress to the infectious stage. This growth slows as the rate of new exposures decreases and treatment efforts begin to take effect. Eventually, the infected population reaches a peak, after which it declines rapidly as the pool of exposed individuals diminishes and more infected individuals receive treatment or progress to other disease stages.

Figure 7: Effect of treatment and hygiene interventions.

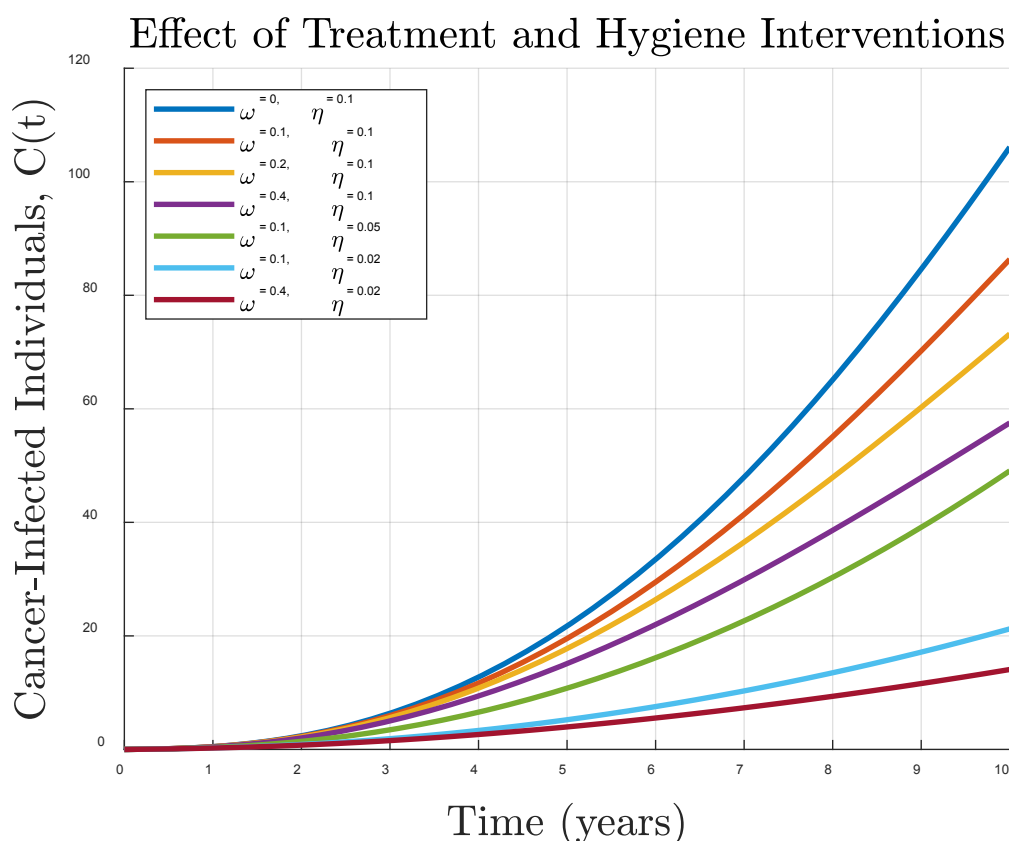


Figure 7 was produced by arbitrarily setting susceptible population $[S(t)] = 1000$, exposed population $[E(t)] = 10$, *H. pylori* infected population $[I(t)] = 5$, *H. pylori* treated population $[T(t)] = 0$, Cancer-infected population $[C(t)] = 0$, and environment bacteria concentration $[H(t)] = 1$ unit.

The plot $[\omega=0, \eta=0.1]$ shows 10% environment bacteria concentration with no treatment of the infected population, plot $[\omega=0.1, \eta=0.1]$ shows 10% environment bacteria concentration with 10% treatment of the infected population, plot $[\omega=0.2, \eta=0.1]$ shows 10% environment bacteria concentration with 20% treatment of the infected population, plot $[\omega=0.4, \eta=0.1]$ shows 10% environment bacteria concentration with 40% treatment of the infected population, plot $[\omega=0.1, \eta=0.05]$ shows 5% environment bacteria concentration with 10% treatment of the infected population, plot $[\omega=0.1, \eta=0.02]$ shows 2% environment bacteria concentration with 10% treatment of the infected population, and plot $[\omega=0.4, \eta=0.02]$ shows 2% environment bacteria concentration with 40% treatment of the infected population. From these numerical results, we see that increased *H. Pylori* treatment rate, and improved hygiene, lowers stomach cancer burden, with improved hygiene having the highest impact on the disease control.

5. Conclusion

Our research emphasizes how crucial it is to combine environmental management with treatment in order to reduce *H. pylori* infections. The model measures the impact of hygiene and treatment on the spread of disease and pinpoints critical thresholds that aid in determining the level of intervention required to control the disease. Sensitivity analysis highlights that treatment rate (ω), environmental transmission rate (λ_2), and exposed individual infectious rate (ρ) are most influential parameters which can guide policy makers on where to focus limited resources. Thus effective treatment and hygiene are critical to control spread of *H. pylori* and reduce stomach cancer burden and hence policy makers should prioritize treatment and sanitation.

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Community-Driven FinTech Models for Sustainable Development in Western Kenya

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ABSTRACT

This research examines innovative gaps in localized funding models for entrepreneurial communities in Western Kenya, with a focus on advancing Sustainable Development Goals particularly SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). These goals align with the African Union's Agenda 2063, which emphasizes shared prosperity and inclusive growth across the continent. The aim of the study is to explore barriers limiting access to financial resources among rural entrepreneurs and to propose tech-enabled, community-driven solutions that are scalable and context-sensitive in secondary towns such as Bungoma, Kakamega, Vihiga, and Kisumu. The primary objective is to develop sustainable financing models such as digital chamas, SACCOs, USSD-based microfinance systems, and digital credit scoring tools that leverage low-tech platforms to enhance grassroots financial inclusion and resilience. A mixed methods approach was employed, involving 20 key interviews with community financial leaders, surveys with 200 entrepreneurs, and a review of six projects using tech-enhanced financial tools. Qualitative data was analyzed using NVivo, and quantitative data via SPSS. Findings indicate a strong preference for mobile-accessible financial networks, particularly those that do not rely on collateral. Key challenges include low digital literacy and mistrust of formal financial institutions. The study recommends enhanced public-private collaboration to scale and formalize advanced community finance platforms, promote digital literacy, and establish rural FinTech hubs across Western Kenya.

Keywords: Chamas, inclusion, entrepreneurship, USSD, technology, SDGs, innovation.

1. Introduction

The Sustainable Development Goals (SDGs), established by the United Nations in 2015, offer a comprehensive framework to tackle global challenges such as poverty, inequality, and climate change while promoting inclusive economic growth. Among the seventeen goals, SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure) are particularly relevant to the African Union's Agenda 2063, which envisions integrated and inclusive development across the continent. Despite the alignment between global and continental development agendas, many regions in sub-Saharan Africa continue to lag in achieving these objectives. In Western Kenya, counties such as Bungoma, Kakamega, Vihiga, and Kisumu face structural limitations—including weak financial infrastructure, low digital literacy, and uneven access to capital—that hinder entrepreneurial development and deepen rural-urban disparities (Lashitew et al., 2019; Suri et al., 2021).

Financial technology (FinTech) presents a transformative opportunity to address these gaps. Innovations such as mobile money, USSD-based financial tools, peer-to-peer lending, block chain, and AI-driven credit scoring have the potential to expand financial access and empower underserved populations, particularly women, youth, and informal entrepreneurs (Almaqtari, 2024; Atayah et al., 2023). These tools reduce dependency on collateral-based lending and promote financial inclusion at scale. Globally, FinTech is also contributing to environmental sustainability through green finance initiatives that integrate environmental, social, and governance (ESG) metrics into digital finance. Applications include platforms that reward sustainable consumer behavior, carbon tracking tools, and eco-investment apps (Cristina et al., 2021; Yang et al., 2021; Yao et al., 2021). However, adoption of these tools in rural African contexts remains limited due to infrastructural constraints and regulatory uncertainty.



In Kenya, national frameworks such as Vision 2030 and the Digital Economy Blueprint highlight the importance of digital transformation for inclusive development. While mobile money services like M-Pesa have improved basic financial access, challenges persist—particularly in Western Kenya—where entrepreneurs still struggle with credit access, low trust in digital systems, and fragmented financial regulation. This study seeks to explore how FinTech and green finance can be leveraged to promote sustainable development in Western Kenya. By examining local dynamics through a systematic literature review and empirical case analysis, the research aims to identify scalable, community-driven financial innovations aligned with the SDGs, Kenya Vision 2030, and Agenda 2063.

2. Literature Review

Financial Technology (FinTech) has emerged as a transformative force in global finance, with significant implications for sustainable development. It facilitates financial inclusion, supports economic growth, and increasingly incorporates environmental sustainability through digital innovations. This literature review is organized into three key themes: financial inclusion, regulatory and institutional considerations, and environmental sustainability.

2.1. FinTech and Financial Inclusion

FinTech tools such as mobile money, block chain, peer-to-peer lending, and AI-driven credit scoring are widely recognized for their potential to enhance financial inclusion, particularly in underserved regions. In the Kenyan context, mobile platforms like M-Pesa have expanded access to credit, savings, and insurance services for marginalized groups, including women and youth (Lashitew et al., 2019; Kim, 2022).

Cristina et al. (2021) demonstrate how FinTech platforms like Clarity AI integrate environmental and social performance metrics into everyday transactions, promoting both inclusion and sustainability. These tools are particularly relevant in Western Kenya, where informal economies dominate, and digital chamas and SACCOs are gaining traction.

However, the effectiveness of such platforms depends heavily on digital literacy and infrastructure. In rural counties such as Vihiga and Busia, limited access to digital networks and low trust in formal institutions continue to pose barriers. This creates a need for simple, locally adapted tools like USSD-based applications, which do not require smartphones or internet access.

2.2. Regulation, Trust, and Institutional Capacity

The successful deployment of FinTech is highly dependent on regulatory environments and institutional governance. Rambaud and Gázquez (2022) caution that overly strict data privacy laws, such as the GDPR, may stifle innovation in under regulated contexts. They propose a RegTech approach that balances data protection with innovation—relevant for counties like Kakamega, where digital penetration is growing but policy support remains limited.

Almaqtari (2024) highlights the role of strong digital governance in enabling sustainable FinTech ecosystems. His findings suggest that institutions with effective governance structures are more likely to align FinTech solutions with ESG goals. In Kisumu and Kakamega, local SACCOs and community banks with structured oversight have seen more success in implementing inclusive finance programs.

On cybersecurity, Najaf et al. (2021) warn that FinTech–bank partnerships can increase vulnerability in the absence of secure digital infrastructure. In Western Kenya, where informal lending dominates, data privacy, fraud prevention, and platform trustworthiness must be addressed to support long-term adoption.



2.3. Green Finance and Environmental Innovation

Environmental sustainability is an emerging dimension in the FinTech ecosystem. Yang et al. (2021) and Yao et al. (2021) examine tools that allow users to track their carbon footprints, invest in green bonds, or receive incentives for sustainable behavior. These applications could be adapted to agriculture-based economies in Western Kenya to promote eco-conscious practices among farmers and SMEs.

Kabaklarlı (2022), applying the Environmental Kuznets Curve (EKC), shows that FinTech can initially contribute to environmental degradation before improvements occur through regulation and innovation. This model may apply to transitioning economies like Vihiga and Busia, where early-stage digital finance should be accompanied by strong environmental safeguards.

Udeagha and Breitenbach (2023) argue that when FinTech is combined with green finance mechanisms—such as solar lending, ESG-scored credit, and block chain-enabled traceability—it can drive both ecological and economic resilience. In Kisumu and Bungoma, pilot programs using mobile platforms for off-grid energy lending show early promise, though integration with environmental policy remains weak.

2.4. Risks, Gaps, and Ethical Considerations

Despite its promise, FinTech expansion also carries risks. Atayah et al. (2023) report that investor skepticism toward ESG disclosures and fears of "greenwashing" have led to a negative correlation between ESG scoring and short-term financial performance. Liu et al. (2021) similarly caution that digital finance can worsen inequality if not paired with inclusive access strategies.

In Western Kenya, mobile loan defaults, predatory lending, and misinformation about digital products are emerging concerns. Older populations and low-literacy users remain particularly vulnerable. Addressing these risks requires targeted financial education, consumer protection frameworks, and inclusive design principles.

2.5. Synthesis and Identified Gaps

The reviewed literature confirms that FinTech can drive financial inclusion, economic development, and environmental sustainability. However, existing research often lacks a subnational focus, especially in rural African contexts. There is limited analysis of FinTech's localized impacts, gender dimensions, and scalability under informal economic systems.

This study addresses these gaps by focusing on Western Kenya's unique regional dynamics. It emphasizes community-driven financial innovation and explores how technology can be adapted to suit the needs of underserved populations—bridging global FinTech potential with local development goals.

2.6 Research Hypotheses

This study tested the relationship between FinTech adoption and sustainable development outcomes in Western Kenya using the following hypotheses:

- **H₀₁** (Null): FinTech adoption has no significant effect on financial inclusion in Western Kenya.
- **H₁₁** (Alternative): FinTech adoption has a significant effect on financial inclusion in Western Kenya.
- **H₀₂**: FinTech adoption does not significantly influence economic growth and income levels in Western Kenya.
- **H₁₂**: FinTech adoption significantly influences economic growth and income levels in Western Kenya.
- **H₀₃**: FinTech tools do not significantly contribute to environmental sustainability in Western Kenya.
- **H₁₃**: FinTech tools significantly contribute to environmental sustainability in Western Kenya.

2.7 Research Objectives

General Objective:

To examine the role of Financial Technology (FinTech) in promoting sustainable development—financially, economically, and environmentally—in Western Kenya.

Specific Objectives:

1. To assess the impact of FinTech adoption on financial inclusion in selected counties of Western Kenya.
2. To evaluate the influence of FinTech-enabled services on economic growth and household income levels in Western Kenya.
3. To analyze the contribution of FinTech innovations to environmental sustainability and green finance uptake in Western Kenya.

3. Methodology

This study used a mixed-method approach that combined a systematic literature review (SLR), bibliometric analysis, and regional data mapping to investigate how Financial Technology (FinTech) influences sustainable development in Western Kenya. The design ensured triangulation between thematic evidence and quantitative trends, aligned with the three core focus areas: financial inclusion, economic growth, and environmental sustainability.

The study concentrated on five counties in Western Kenya: Bungoma, Kakamega, Vihiga, Kisumu, and Busia. These counties were selected due to their emerging entrepreneurial activities, visible digital finance penetration, and representation of diverse economic and infrastructural profiles in the region.

A systematic search was conducted using the Web of Science (WoS) database, targeting publications between 2015 and 2024. Keywords included: “FinTech”, “financial technology”, “digital finance”, “mobile money”, “green finance”, and “digital inclusion”. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) protocol guided the selection.

Table 1.
PRISMA Summary of Literature Selection

Step	Count
Initial records retrieved	1,947
After title/abstract screening	371
After full-text review	157
Empirical studies selected	121

1. Peer-reviewed empirical studies (mixed-methods)
2. Focused on FinTech and sustainability
3. Written in English
4. Conceptual or opinion papers were excluded
5. Articles misclassified under FinTech or sustainability were removed
6. Grey literature (e.g., NGO reports, government white papers) was excluded

All 121 selected articles were coded using NVivo and Excel. They were grouped into thematic areas reflecting the study's objectives.



Table 2.
Thematic Grouping of Reviewed Studies

Theme	Keywords	No. of Studies	Percentage
Financial inclusion	Mobile money, digital access, chamas	31	25.6%
Economic development	Income, credit access, microfinance	30	24.8%
Environmental sustainability	ESG, green finance, carbon tools	21	17.4%
Cross-cutting themes	More than one of the above	39	32.2%
Total		121	100%

To ensure the study remained context-specific, a regional mapping of FinTech themes was conducted based on references found in the selected literature. Counties were coded according to their development profile and thematic relevance.

Table 3.
County Representation in Reviewed Literature

County	Profile	Article Count	Key FinTech Applications
Bungoma	Agrarian/rural	3	Chamas, mobile credit, SACCOs
Kakamega	Rural-urban hybrid	3	Youth digital savings platforms
Vihiga	Rural, low-income	3	Women's inclusion, literacy campaigns
Kisumu	Urbanizing	4	Green lending, digital entrepreneurship
Busia	Cross-border trade	3	Informal finance, USSD mobile payments

To complement thematic coding, bibliometric tools were used to detect co-citation patterns, keyword clusters, and publication trends.

VOSviewer was used to visualize co-occurrence networks.

Bibliometric (in R Studio) generated word clouds, thematic evolution graphs, and citation impact metrics.

Keyword combinations such as “digital credit”, “financial resilience”, “green innovation”, and “FinTech adoption” emerged as research hotspots.

A 20-article pilot was double-coded to test inter-coder agreement, which exceeded 90 percent.

Thematic findings were cross-validated with machine-generated clusters.

Trends identified through bibliometric mapping were verified against empirical content in selected studies.

4. Results and Discussion

This section presents findings derived from the 121 empirical studies selected in the systematic literature review. Results are organized thematically into three domains: financial inclusion, economic development, and environmental sustainability. County-specific trends and cross-cutting implications are integrated based on manual coding and bibliometric analysis.

4.1 Financial inclusion

Financial inclusion was the most consistently represented theme, addressed in 31 out of 121 studies (25.6 percent). The review revealed that mobile money platforms, such as M-Pesa, were instrumental in increasing access to digital savings, mobile-based loans, and informal group finance mechanisms like chamas. Studies also highlighted the role of USSD platforms in enabling rural financial access for users without smartphones.

In Bungoma and Vihiga counties, digital savings groups supported women-led microenterprises and offered alternative pathways to financial independence. However, uptake was uneven. Challenges included limited digital literacy, mistrust in formal financial providers, and data privacy concerns. These findings reflect the practical barriers reported in counties with lower ICT penetration.

The bibliometric analysis confirmed frequent keyword clustering around terms such as “mobile money”, “digital literacy”, and “chamas”, validating the prevalence of this theme. Regional data from Table 3 confirms the strong presence of inclusion-focused programs in Bungoma, Kakamega, and Vihiga.

4.2. Economic development

Thirty studies (24.8 percent) examined the impact of FinTech tools on household income, job creation, and economic growth. Across the reviewed articles, peer-to-peer lending platforms block chain-supported supply chains, and digital credit scoring emerged as significant enablers of microenterprise development.

In Kakamega, mobile-based microcredit services supported youth entrepreneurship, while in Busia; USSD-enabled microloans helped small cross-border traders manage inventory and cash flow. Bungoma reported increased household resilience among informal workers accessing flexible repayment loan models.

However, concerns emerged regarding high default rates and over-reliance on short-term credit. Several studies flagged risks such as predatory lending and digital over-indebtedness. Bibliometric findings reinforced this with emerging keywords like “credit risk”, “financial vulnerability”, and “digital debt trap”.

The county-level insights in Table 3 show that while economic benefits of FinTech are evident in all five counties, their magnitude and sustainability vary depending on user literacy, financial training, and regulatory oversight.

4.3. Environmental sustainability

Only 21 studies (17.4 percent) focused directly on environmental themes, suggesting a gap in green FinTech application in rural Africa. Nonetheless, promising trends were identified in green lending, carbon footprint tracking, and ESG-integrated digital finance.

In Kisumu and Vihiga, pilot programs using mobile platforms to finance solar kits, clean cook stoves, and small irrigation systems were noted. These tools often included gamified features that rewarded users for sustainable consumption behavior or encouraged repayment linked to ecological outcomes. Several studies, including those by Cristina et al. and Udeagha & Breitenbach, emphasized the growing role of block chain in agricultural traceability, especially in export-oriented agribusinesses. Bibliometric tools identified “green bonds”, “ESG scoring”, and “carbon finance” as underdeveloped but emerging keywords.

Given the low share of studies in this category, the environmental dimension remains a growth area for further FinTech innovation, especially in regions like Busia and Bungoma where ecological degradation intersects with poverty.

4.4. County-level patterns

Each of the five counties shows distinct engagement patterns with FinTech:

1. Bungoma shows strong uptake of mobile chamas and SACCO-linked lending.
2. Kakamega focuses on youth-targeted financial services and digital entrepreneurship.
3. Vihiga emphasizes financial literacy training and women’s access to mobile loans.
4. Kisumu leads in testing green FinTech innovations, including solar asset financing.
5. Busia is a key site for mobile-based MSME finance linked to regional trade.



These variations align with Table 3 and suggest that localized FinTech design must reflect the socioeconomic structure and technology readiness of each region.

4.5. Cross-cutting insights and implications

Across the 121 studies, 39 (32.2 percent) addressed more than one theme, illustrating the interconnected nature of FinTech's impact. Bibliometric mapping highlighted strong associations between financial inclusion and economic resilience, but weaker connections with environmental metrics.

4.6. Four cross-cutting insights emerge:

1. FinTech platforms targeting informal groups (e.g., chamas) enhance inclusion and resilience but require support through digital training.
2. Economic growth is amplified when mobile credit is paired with entrepreneurship education.
3. Environmental sustainability remains under-integrated and needs policy–finance linkage.
4. Risk mitigation tools (e.g., digital ID verification, ethics frameworks) are essential to build trust in FinTech ecosystems.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined how Financial Technology (FinTech) contributes to sustainable development in Western Kenya, focusing on three pillars: financial inclusion, economic growth, and environmental sustainability. Using a systematic literature review of 121 empirical studies and bibliometric mapping, the research identified patterns of FinTech adoption across five counties—Bungoma, Kakamega, Vihiga, Kisumu, and Busia.

Findings showed that mobile money and USSD-based platforms have significantly improved financial access, especially for women, youth, and small businesses. Economic benefits included enhanced access to capital, increased entrepreneurial activity, and improved household resilience. However, risks such as digital debt cycles, lack of consumer protection, and insufficient financial literacy remain prevalent.

Environmental sustainability emerged as the least developed domain, though promising innovations in solar finance, ESG scoring, and block chain-based traceability are taking root, particularly in Kisumu and Vihiga. Across counties, adoption patterns vary, highlighting the importance of local context in designing and scaling digital finance tools.

To fully leverage FinTech's potential in supporting the Sustainable Development Goals, context-sensitive policy, community involvement, and digital infrastructure investment are critical.

5.2 Policy Recommendations

1. County governments should develop localized FinTech policy frameworks in partnership with the Central Bank of Kenya, SASRA, and digital innovators. These frameworks should align with Kenya's Digital Economy Blueprint and Vision 2030, and be integrated into County Integrated Development Plans (CIDPs).
2. Public schools, vocational centers, and community organizations should embed financial and digital literacy modules into youth and adult education. These should include training on credit use, digital rights, budgeting, and fraud prevention.
3. Tax incentives and startup grants should be introduced for FinTech ventures working in green finance, ESG integration, and carbon tracking. Green lending initiatives and block chain-based agriculture finance pilots should be scaled in Kisumu, Vihiga, and Bungoma.
4. Regional FinTech hubs should be established in Kisumu, Kakamega, and Bungoma to support inclusive innovation. These hubs should offer mentorship, regulatory sandboxes, and access to capital for startups targeting last-mile financial access and environmental solutions.

5. Regulatory harmonization across counties should ensure interoperability of digital services, standard licensing for digital lenders, and unified consumer protection guidelines. Busia County should be prioritized for cross-border digital finance regulation, given its trade corridor status.

5.3 Future research directions

1. Examine gender-specific impacts of FinTech tools, especially among women in rural and peri-urban areas.
2. Conduct longitudinal studies on mobile credit usage and its long-term effects on poverty reduction and household stability.
3. Investigate FinTech's role in climate adaptation financing, including tools that support agricultural resilience and water access.
4. Assess the viability of decentralized finance (DeFi) platforms in local African markets and their regulatory compatibility.

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Western Medical Research and Indigenous Health System as Competing Architectures in Nigeria's Malaria Crisis, 1977 – 2015: Synergy or Servitude?

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ABSTRACT

This study is a preliminary exploration of the emerging competition between Western orthodox medical practice and the African indigenous healing system, adopting the management of malaria in Nigeria from 1977 to 2015 as a case study. As the pilot of a larger project, the study probes into whether the competition is a synergy or servitude. The colonial health policy in Nigeria, like elsewhere in Africa, was largely characterized by imposed Western medical practice with little or no attention to the indigenous knowledge on health management. This exclusion was enthroned more profoundly through the colonial biomedical research initiatives in which Africans were no more than mere 'guinea pigs' fitting only for experimentation. The Core-Periphery dichotomy in the extant global system continued with the formation of the WHO in 1948 as some European and North American countries and Non-governmental Organizations (NGOs) (state and non-state actors) hid under it to sustain heavily stringed health governance in colonial and postcolonial Africa. Against this background and drawing further inspiration from the African experience with Corona Virus Disease (COVID-19) since 2020, this broad study seeks to examine Western medical research and indigenous health system as competing architectures for managing the malaria crisis in Nigeria between 1977 and 2015. From the colonial health regime background and adopting postcolonial health governance as its framework, the study will deploy the historical inquiry method to distill primary and secondary source data. Three guiding general objectives of the study are to: determine whether the co-existence of Western and indigenous medical systems promises a productive synergy or it signals continuous servitude; provide a fresh perspective on the nature of the international politics and diplomacy of global health governance as it affects Nigeria; and highlight the implications of the neglect of indigenous health knowledge on the health governance in Nigeria over time. It proposes the argument that the imposed Orthodox health policy in Nigeria was an imperialistic phenomenon marked by a long-drawn exclusion of Africans in health and other matters. The policy exhibited power dynamics, historical inequalities and cultural differences, with little or no attention to the indigenous knowledge on health and related matters. This underscores the importance of a new regime of health management protocols anchored on effective indigenous knowledge production and dissemination that would guarantee local solutions for a global challenge.

Key Words: Indigenous knowledge, Western models, Malaria, Health Governance, Health Diplomacy

1. Introduction

Age, damage of human health and anatomy, and other socio-economic and medical consequences of malaria make it one of the gravest medical crises in tropical Africa, nay Nigeria. This underscores the compelling need for sustained research into the scourge as a medical emergency. Therefore, this proposed project examines the internal dynamics and external dimension of health governance in Nigeria with special focus on management of malaria from 1977 to 2015. This is with a view to determining the content and quality of Western health interventions from state and non-state actors like the World Health Organization (hereinafter called WHO), USAID, DFID, Rockefeller Foundation, and Bill and Melinda Gates Foundation, and show how such efforts have enhanced or discouraged indigenous medical research in Nigeria. The study is designed to interrogate and clarify the role and



position of local knowledge produced and disseminated through medical research in the management of malaria in Nigeria during the period of study. This is necessary because, while there are many scholarly works on medical and sociological interrogation of diseases, the historical dimension that captures the trends, challenges and prospects of indigenous medical research in handling the scourge has been largely neglected. Indeed, many of the existing works, which emphasize epidemiology and local responses, are laced with the notion that, local medical research is not relevant to management and control of diseases. Generally, their focus on the obvious transformation of local medical practice through sound research and knowledge production, packaging and persuasive appeals, and the efficacy of African indigenous therapy, is quite limited. This study sets to bridge the gap by responding to such wrong notion and misperception, and by showing how indigenous medical research has been transformed to meet global standard of best practice over time. In the study, 'indigenous health system' is conceived to mean locally funded research efforts and initiatives of both Western-educated scholars, and those local health management practitioners who have produced considerably effective drugs through indigenous knowledge production.

The study will investigate the malaria-related research activities of the Nigerian Institute of Medical Research (hereinafter called NIMR), and those of other indigenous practitioners who have produced anti-Malaria drugs through local knowledge and research. The study is by no means a comparative work. Instead, while it focuses mainly on the NIMR as a hub of medical research in Nigeria, it will discuss the non-state global intervention bodies as a bloc. Their health interventions will necessarily be examined as a means to unpack their impact on the growth and role of indigenous knowledge on health management particularly for a country that transited from colonial rule to postcolonial governance with Western orientations. The study will also help to measure the appropriateness, legitimacy and impact of external intervention agencies in the present and future health policy of Nigeria. Essentially, the proposed study is conceived with a view to determining the direct and implied relationship between research and management of malaria. This will help in establishing the trends of such research; identifying its challenges and prospects, and proposing the way forward for a more robust intersection of intervention, research and disease management.

Malaria has remained a major tropical disease in Africa south of the Sahara for many centuries. While it is admittedly a global scourge, Africa is the most affected region globally, with both West and Central African sub-regions earning the notoriety as 'White Man's Grave' as early as the 1500s. As the WHO Fact Sheet (2021) has reported, "In 2019, nearly half of the world's population was at risk of malaria. Most malaria cases and deaths occur in sub-Saharan Africa" It adds that in 2019, there were 229 million malaria cases globally, while the number of global malarial deaths stood at 409,000. Out of these statistics, Africa carried 94%! Predictably for obvious reasons, Nigeria has larger number of these scary statistics. It is therefore expedient that, this study is directed at examining the Nigerian experience of management of malaria from the historical perspective. The research was provoked by the outbreak of COVID-19 with its multiple aftermaths in Nigeria, which has had a significant lesson that, a productive town-gown interaction as a platform for promoting proactive local initiatives to tackle future unforeseen health challenges has become more compelling.

With a necessary background discussion that will cover the establishment and activities of the Medical Research Institute (MRI), Yaba Lagos in 1907 (from which NIMR later grew in 1977), and foreign medical research efforts in Nigeria in the 1940s, the study will begin more specifically with interrogating the circumstances (as found in the growing propensity for local research and need for foreign health interventions) that culminated in the founding of the NIMR in 1977. Among other things, this will show from the onset, how the WHO, for example, has met its mandate as set out in 1948 to "act as a directing and coordinating authority on international health work" (Constitution of the World Health Organization, 2006: 2). Also, it hopes to present the lessons therefrom as a veritable guide for emplacing indigenous medical research as architecture for sustainable health policy re-engineering in Nigeria. The study is driven by the position that Nigeria, and indeed other African countries, should begin to seriously work

on the anticipated synergy between research and policy for effective management of health and other challenges and to ultimately position Africa as an influential player in global health diplomacy.

The study will be situated within the broad context of global health governance, which, accompanied by production and sharing of knowledge on health matters, is not a new or recent development. Indeed, it has become a critical issue of international politics and growing (*longue duree*) history of inter-state relations over a long time. This history runs through the 19th century industrial revolution which had provoked “rapid increase of urban population, unsanitary settlement in the vicinity of factories, long working hours and deterioration of living conditions for workers, malnutrition and the failure of nation-states to meet these challenges (Ersor, Gungor and Akpinar, 2011: 2-28; Szeleter, 2004: 75-86) to the 20th century when the first attempt at erecting trans-national structure of international health governance was made. Since the first sanitary conference of 1851, which held in Paris, France (McKee, Stott and Gamer, 2001), as Singler (2016) notes “...the governance of health has been central to international politics. As recent spatial, temporal and cognitive transformations have developed from accelerated globalization, the determinants of health have become increasingly global and thus beyond the control of any individual nation-state”. Therefore, Nigeria cannot afford to lag behind and remain in the queue waiting for handouts from intervention agencies alone. There is the urgent need to integrate home-grown initiative with whatever assistance comes from outside. This study hopes to present a guiding platform for that necessity through a robust interrogation of historical trajectories of medical research and contemporary realities as exemplified in the management of malaria in the proposed period of study.

2. Context and Description of Study

In colonial Nigeria, like elsewhere in Africa, colonial health policy determined the thrusts and nuances of administering health matters. Thus, Tropical Medicine was institutionalized as a new medical subfield driven by laboratory experimentation, based on insect-vector theories. Tropical Medicine, largely a synonym of colonial medicine and of course ‘medicine of warm climates’, was a heterogeneous, substantial body of knowledge, a selection of scattered observations and therapies by European medical practitioners in tropical colonies, largely from practical experience (Arnold, 1996: 1-19). It largely relied on the agencies of the colonial state or the patronage of imperial commercial networks for its sustenance. Consequently, while Tropical Medicine admittedly provided the initial frameworks for subsequent emergence of biomedical research in Nigeria, as elsewhere in Africa, Africans were not valued higher than human subjects of experimentation (or guinea pigs). This was done through creation of colonial enclaves, which “were created as distinctive sites of the articulation of colonial power and economic priorities” (Bhattacharya, 2013: 3, 9). What was predominant was that, Tropical Medicine provided for medical researchers in the British Empire, ‘opportunities for advancement through new discoveries and challenges, glamour and the lure of exotic field locations in which to practise their science’. Also, there was “the imposition of ideas and experiences of the nineteenth century British public health (characterized by sanitation, vaccination movements, role of local municipality etc.” (Bhattacharya, 2013: 4, 9) foisted on the colonies.

The foregoing colonial realities explain respectively the background to the Rockefeller Foundation’s yellow fever research in colonial Nigeria in the 1940s, and David Bruce’s research in Africa which had rewards and recognition from Metropolitan institutions. These took place as evidence of institutionalization of British medical practice culture in what was cloaked as Tropical Medicine in the culmination of imperialism with their context firmly located in the quest to consolidate colonialism (Worboys, 1976: 76-98). What followed was the unpleasant reality of shutting the door of opportunity against local research drive while British institutions grew overwhelmingly hegemonic as they had developed capacities to authorize the kind, ways and relevance of scientific knowledge that could be produced, in local spaces in Africa. The local population featured, quite predominantly, as subjects (human specimens) of scientific interests – facilitating the etiology of diseases and in the process,



expanding European imperial empires. Thus, a burgeoning trope of sociological, anthropological, and historical works on biomedical research in Africa has raised serious ethical concerns on the status of the foreign research institutions – especially on the ways they dispense their activities without recourse to ethics, human dignity and accountability (Giles-Vernick and Webb Jnr., 2013; Geissler and Molyneux, 2011; Geissler, Rottenburg and Zenker, 2012; Lachenal, 2014; Livingstone, 2012; Prince and Marsland, 2014; Kelly and Geissler, 2012; Crane, 2014; Graboyes, 2015; and Geissler, 2015).

In the specific case of malaria in Nigeria, it has become expedient to examine how biomedical research from the colonial years up to recent history has contributed to understanding and managing it. It is also expedient to understand the role and involvement of some state and non-state actors, as well as the quality and challenges of local research initiatives in the research-management nexus in the malaria narrative. This is the gap this study seeks to cover. In her recent study of the Rockefeller Foundation Yellow Fever Research Institute (YFRI)'s works in Nigeria, Megan Vaughan (2018:172-205) suggested that some patterns exist in the works of the scientists that operated in the YFRI and those described in studies on contemporary research efforts in Africa. Vaughan's emphasis in this study is that the YFRI, like so many other contemporary research enclaves in Africa, were interested in pure scientific research and not necessarily in solving the health problems of the local population they encountered. Indeed, recent remarkable advancements in information and communication technology have provoked unprecedented knowledge explosion in biomedical research beyond what it was in the late colonial and early postcolonial years.

In addition, non-state players which are large privatized philanthropies, like the Bill and Melinda Gates Foundation, have been ushered in to the fray of research and management of diseases like malaria. These players have over the years grown to become highly influential non-state actors in biomedicine in Africa, with a budget beyond those of the World Health Organization and national governments. Their incursion invariably influenced new patterns of social relations between Africans and new medical authorities that are not necessarily state health institutions, but non-state actors in global health intervention politics across broader geographies. These relations and the entanglements that accompany them have prompted “new normative claims, expectations and subjectivities” (Rene, 2012: 24) similar to Rose and Novas' notions of “biological citizenship” (2005: 439-463; Rose, 2001: 1-30) and “Nguyen's “therapeutic citizenship” (2005). This, in most cases, has been with the connivance of the ruling elite of the postcolonial African states, thus signaling instances of inept municipal governance. This conspiratorial synergy between colonial authorities and non-governmental organizations (non-state actors) dominated the space of biomedical research in colonial Africa, and continued with the enlistment of emerging ruling elite in postcolonial Africa. Eventually, whatever accrued as beneficial impact of such research for Africa was no more than accidental gains or unintended consequences.

With the current parlous state of health services in Nigeria as a direct consequence of government's ineptitude towards health services and medical research, sheer lack of locally-driven health agendas, and paucity of biomedical research institutional cutting-edge capacity, Nigerians remain almost perpetually at the receiving end of bio-economic exploitation as recipients of large donors' handouts and interventions. The advantage for these foreign health institutions is the way these numerous activities and interventions continue to advance neo-liberalist agendas and secure ready markets for large biomedical industries in the West (Rene, 2012). A cursory look at recent and current global health crises including the deadly COVID-19 pandemic also unveils the political, economic and social burdens that accompany Nigeria's over-reliance on global health interventions. These efforts have since overcrowded the Nigerian terrains with foreign initiatives and interventions, resulting in far-reaching implications for the capacities of local scientific institutions and actors to intervene in solving local problems.

Most university laboratories and institutes in Nigeria exist as research enclaves for most foreign countries, established with defined agenda to gather bodily specimens for experiments from local

populations. This way, they advance medical knowledge and improve the health of the metropolitan and global population by using Nigerians as guinea pigs for experimentation with the accompanying, but more often unannounced, hazards. The foregoing brief narrative provides the context and framework for this proposed study, covering the dynamics of global health interventions and the indigenization of medical research and knowledge sharing as crucial elements of health governance in colonial and postcolonial Nigeria, and using NIMR as the main institution of study, with the WHO and some other bodies as a bloc of intervention agencies, from 1977 to 2015. This will produce a guide for enduring local architecture for sustainable effective health management in Nigeria; a major contribution to the growing historiography of health governance; enhance the understanding of its contemporary reality, and providing insights to its future in Nigeria.

2.1 Statement of the Problem

While there is a fairly rich collection of literature on tropical medicine, public health, global health governance, and health-related topics in colonial and postcolonial Africa, there is as yet paucity of comprehensive study (if any) that blends the historical dynamics of indigenous biomedical research and global interventions in the management of malaria in Nigeria with its contemporary reality. Therefore, this proposed project sets to close the yawning gap by examining the intersection of global health intervention and indigenous medical research in the Nigerian instance of management of malaria from 1977 to 2015. It rests on three critical planks. One, health and diseases are phenomena to be understood and managed within the context of the social milieu that created them. Two, any foreign health intervention is predictably laced with strings that are harmful to national interests. Three, a sustainable national health governance architecture can be better constructed with a strong overlay of home-grown research drive, even with careful and cautious acceptance of global interventions. In this vein, the study is important for a better understanding of the contours and nuances of the international politics and diplomacy of global health interventions, especially as related to Nigeria in particular since the colonial years, through decolonization and up to the present. Ultimately, the study will offer some rewarding perspectives into the nexus between indigenous medical research and foreign health intervention on the one hand, and underscore the importance of functional architecture from local medical research initiative as an imperative of binary relevance on the other. The binary relevance is: solving local (health) problems with local initiatives, and emplacing Nigeria on a vantage position in global health diplomacy.

2.2 Research Questions

This study proposes to examine the intersection of indigenous medical research and global health interventions in Nigeria between 1977 and 2015, with a view to offering local architecture of medical research as an imperative for more efficient health governance in, and for, the country. Some research questions are set out to guide the study. They include:

1. Given the long history of malaria in tropical Africa, what was the nature and impact of the intersection between global health interventions and indigenous medical research in Nigeria in the colonial years up to 1960 in terms of availability of facilities (for individual and corporate researchers), sources, administration, and beneficiaries of research fund; quantity, quality and impact of research outputs, knowledge sharing modalities etc.c.?
2. What circumstances led to the founding of NIMR in 1977, and how did locally funded research outputs from NIMR respond to the dynamics of management of malaria in Nigeria up to 1999?
3. What change did NIMR malaria-related research efforts make to the Roll-Back-Malaria programme in Nigeria between 2000 and 2015?
4. How did global health interventions from the WHO and other intervention agencies shape the development of indigenous medical research vis-à-vis management of malaria in Nigeria up to 2015?
5. What are the potential benefits accruable from truly indigenous medical research architecture to sustainable anti-malaria drive in Nigeria?



2.3 Scope

The scope of this study is to begin specifically from 1977 given the establishment of NIMR that year; although the background discussion will necessarily start from 1907 when the Medical Research Institute - first medical research outlet in colonial Nigeria - was created. With such historical background laid, the study proceeds to explore the process of change and continuity in the intersection of health interventions and medical research in Nigeria, bringing into focus the localization of medical research and knowledge sharing through the NIMR. The study period will end in 2015; being the terminal year of the government of former President; Dr Goodluck Jonathan, which built on the foundation of prominent roles that had been laid by the former Olusegun Obasanjo civilian government, for Nigeria in the Roll-Back-Malaria Movement - a renewed global effort at combating malaria since 1998. The study will, therefore, provide some relevant hints and suggestions on how to deploy local research alongside global health interventions as formidable architecture to meeting present and future health challenges in Nigeria.

2.4 Objectives

This research is propelled by the general objective of examining the intersection of global health interventions and indigenous medical research in Nigeria from 1977 to 2015 as expounded in the Abstract section above. More specifically, the research is intended to find answers to the above-outlined research questions. To achieve this, the specific objectives of the study are to provide;

1. A broad historical background that will cover the nature, availability, usage and impact of global health interventions to medical research in Nigeria in the colonial years up to 1960;
2. A discussion of the circumstances that culminated in the founding of NIMR in 1977, and showing how research outputs from NIMR responded to the dynamics of management of malaria in Nigeria up to 2015;
3. A comprehensive and analytical explication of Nigeria's entry into the politics and diplomacy of global health interventions, and implications of such entry for the country;
4. A detailed, evidence-based account on the quality and impact of global health interventions from the WHO and other intervention agencies on the development of indigenous medical research vis-à-vis management of malaria in Nigeria at different stages up to 2015; and
5. A broad outline of the potential benefits accruable from genuinely indigenous medical research architecture to sustainable anti-malaria drive in Nigeria in the present and future.

3. Methodology

This study will rely on primary and secondary source materials. The primary source documents are online and print periodic, special, and routine reports, and photographic collections of NIMR and WHO, WHO Africa Region (Nigeria Office); London School of Hygiene and Tropical Medicine; and Centre for Global Health Histories at the University of York (both in United Kingdom); USAID, DFID, medical research institutes, colonial, missionary, and non-state actors/NGOs (like archives and libraries; e.g. Rockefeller Foundation Archives Centre for the Study of 20th Century Africa, New York, USA); Government White Papers; classified documents; field staff and researchers' diaries; private papers and correspondences; files on NGO projects and grants/funds; research projects, theses and dissertations. I will go on short research travels to those outlets outside Nigeria (United Kingdom and USA) to access these primary data and consult with experts in tropical health and colonial history.

Other sources of primary data to be explored include oral interviews with, and questionnaires administered on, identified professors/researchers and other supporting staff (serving and retired) in NIMR and WHO Africa Region (Nigeria Office), and others drawn from carefully selected Nigerian universities (University of Ibadan, Ibadan; Obafemi Awolowo University, Ile Ife; Ahmadu Bello University, Zaria; University of Nigeria, Nsukka; and University of Ilorin, Ilorin), as well as indigenous practitioners famous for their impressive track records in medical education, research, and production of anti-malaria drugs. These data will be complemented by secondary source documents like online and



print versions of books and chapters in books, articles in peer-reviewed journals, published research reports, documentaries and so on. All data harvested from the foregoing sources will be critically deployed with the adoption of the interpretive methodology by subjecting them to the crucible of rigorous interpretation and objective analysis for the ultimate purpose of achieving the set objectives of the proposed project. Indeed, a good number of these sources have been harvested locally, while more will still be acquired as the larger research progresses.

4. Review of Related Literature

Several scholarly works exist on the diverse aspects of global health governance and biomedical research. The aspects covered for review in this study are global health governance as a theme, medical research, and prevalence of malaria in Africa. This review is illustrative for want of space. It shall be significantly expanded in the larger body of the study.

Margaret Kruk (2012: 54-62) examines global health governance within the context of globalization by locating it as economic and social trends of the past decades, which directly and indirectly affect health, thus creating economic and health disparities within and across countries. To Kruk, the political response to address these disparities, exemplified by the Millennium Development Goals, has pressurized the global community into redressing massive inequities in health and other determinants of human capability across countries. This, in turn, has accelerated a transformation in the architecture of global health governance. The entrance of new actors, such as private foundations and multi-stakeholder initiatives, contributed to a doubling of funds for global health between 2000 and 2010. Today the governance of public health is in flux, with diminished leadership from multilateral institutions, such as the WHO, and poor coherence in policy and programming that undermines the potential for sustainable health gains. These trends pose new challenges and opportunities for global public health, which is centrally concerned with identifying and addressing threats to the health of vulnerable populations worldwide. This is a particularly apt hint on Africans who are part of such global vulnerable populations.

Jens Holst (2020) discusses global health in terms of the emergence of the term, its hegemonic trends and associated biomedical reductionism. This is useful for the present study as it underscores the breadth of the term “Global Health” as being beyond the territorial meaning of “global”, connecting local and global, and referring to an explicitly political concept. Holst opines that, Global Health regards health as a rights-based, universal good; it takes into account social inequalities, power asymmetries, the uneven distribution of resources and governance challenges. He states further that, it represents the necessary continuance of Public Health in the face of diverse and ubiquitous global challenges. A growing number of international players, however, focus on public-private partnerships and privatization and tend to promote biomedical reductionism through predominantly technological solutions. Moreover, the predominant Global Health concept reflects the inherited hegemony of the Global North. It takes insufficient account of the global burden of disease, which is mainly characterized by non-communicable conditions, and the underlying social determinants of health. The acquisition, use and exertion of hegemonic influence by powerful Western countries and their philanthropic private under-hands are situated in this context as major determinants of the dynamics of biomedical research in Africa. This is quite apt for the proposed study.

Some authors have interrogated history of disease research and roles of NGOs in disease control and development; health equity monitoring, spatial and temporal distribution of infectious disease epidemics, and health sector fragmentation in Africa. Some of these works, which are reviewed below, provide insight into the reality of health governance Africa.

Megan Vaughan (2018) did a study of yellow fever research carried out in Nigeria in the 1940s by the Rockefeller Foundation. This work is of deep interest to the present proposed study. It interrogates a



number of debates on medical research that revolved around three critical issues; experimentation, construction of the research field and biosecurity. Vaughan stresses in this study that the research works carried out in the Rockefeller institute, like so many other contemporary research works in similar research enclaves in Africa, were driven mainly by the owner's interest in pure scientific research and not necessarily by any resolve to arrest the health problems of the local population the researchers encountered. In her words, their efforts were "financed by international agencies, self-contained, and with minimal impact on the health of surrounding populations". In other words, those research efforts were more imperialistic and less humanistic. This provides significant hints and clues for the proposed study.

In a related vein, Heidi G. Frontani (2013), in a research report, examines the roles of some Non-Governmental Organizations (Rockefeller Foundation and Wellcome Trust) in disease control and development in colonial Africa. By interrogating earlier similar research works in the field, Frontani's study is a significant contribution to the assessment of best practices for NGOs engagement in long-term disease control efforts and health-sector development in Africa. Apart from some useful hints on activities of NGOs, the work provides good insights into the tenor and nuances of non-state actors' involvement in biomedical research in Africa over time. It also highlights sources of data collection that can be explored for the present proposed study.

Llop-Girones et. al. (2019) set out against the backdrop that, countries must be able to describe and monitor their population's health and well-being needs in an attempt to understand and address them. They note that the Sustainable Development Goals (SDGs), packaged in 2015, have re-emphasized the need to invest in comprehensive health information systems to monitor progress towards health equity; however, knowledge on the capacity of health information systems to be able to do this, particularly in low-income countries (many of which are in Africa), remains very limited. Adopting Mozambique as their working example in Africa, the authors posit that, there are important information gaps in Mozambique's current national health information system which prevents it from being able to comprehensively measure and monitor health equity. Comprehensive national health information systems are an essential public health need. Significant policy and political challenges must also be addressed to ensure effective interventions and action towards health equity in the country, and by implication, the whole of Africa.

Arwen Barr et. al. (2019) identify fragmentation in extant structure, funding and external actor engagement as a critical problem of health governance in Sierra Leone. They highlight three examples of such fragmentation as including community health worker programme, national medical supply chain, and service level agreements to explain the causes, extent and impacts of fragmentation on health sector activities and the strengthening of the Sierra Leonean health system. They aver that alignment of policy and planning initiatives, investment in proactive (to reduce need for reactive) policy and plan development, strengthened partnerships, and strengthened governance and accountability mechanisms are better alternatives to offer opportunities for greater health sector integration. Such fragmentation, in diverse contours, is noticeable in the health governance of many African countries. This proposed study sets to identify and deepen the understanding of these contours and interrogate them with a view to underscoring the need for more coordinated health governance by African countries.

Talisuna et. al. (2020) begin their study on the premise that emergence of diseases with pandemic potentials continue to affect African fragile health, and cause huge human and economic toll. They argue, with copious evidence and by using bubble plot data analysis tool with generated graphs and maps, that the scourge of epidemics is pervasive across Africa. They conclude that "The frequent and widespread occurrence of epidemics and disasters in Africa is a clarion call for investing in preparedness. While strengthening that preparedness should be guided by global frameworks, it is the responsibility of each government to finance country specific needs. Growing the framework of

biomedical research with a view to strengthening the nexus of research and proffering solution to emerging health problematic issues is imperative for Africa". This is quite in tandem with, and relevant to, the focus of the present proposed study.

The World Health Report (1999: 49-63) extensively discusses malaria globally, but copiously citing Africa as one of the regions of greatest concentration of the malaria parasite in the world. It reports on the cause, historical trajectories of control, economic burdens of malaria as well as the challenge of resistance that the causative parasite known as *Plasmodium falciparum* has developed against all known treatments over time. On the economic burden, the Report notes that, "Even in the poor countries of sub-Saharan Africa, households have been found to spend between \$2 and \$25 on malaria treatment, and between \$0.20 and \$15 on prevention each month (1). Treatment costs of malaria for small farmers have been estimated to be as high as 5% of total household expenditure in Kenya and 13% in Nigeria. Many are simply too poor to be able to pay for adequate protection"(1999: 51). In discussing the malaria-control strategies from the 1950s to the 1990s, the Report adds that, International funding for malaria control and research shrank in the 1970s and 1980s, and the emphasis shifted to control strategies. But there were no clear guidelines, and many malaria programmes, set up originally as "one-off" eradication campaigns, were organizationally outside the rest of the health system. Resistance to chloroquine grew rapidly, first in Asia, subsequently in Africa (1999: 54). This is a warning to Nigeria that more needs to be done especially on research, particularly since Africa is home to *Plasmodium falciparum*, described as the most dangerous of the parasites that spread malaria.

In a special Roundtable Discussion titled *Rolling Back Malaria: Action or Rhetoric?* (2000), Breman, (1450-53); Kilama (1453); Greenwood (1453); Druihe (1453-54); Nabarro and Mendis (1454-55) argue in their different presentations that research is cardinal to effective management of malaria in tropical Africa. Breman suggests that research will bring necessary anti-malarial tools readily closer to the low-income people who are the hardest-hit by the scourge; and help in accurate measurement of malaria burden and the level of progress in anti-malarial initiatives. While admitting that "sub-Saharan Africa is grim, and the disease now constitutes a leading cause of poverty accounting for annual losses of up to US\$ 12 000 million", Kilama emphatically assures that, "Malaria control in sub-Saharan Africa is "doable" IF there are effective tools, capacity strengthening, field applied research, adequate funding, better programming and management of malaria interventions".

However, Greenwood warns that, the implementation and evaluation of malaria control programmes require trained staff, and such staff are woefully few in many malaria-endemic areas. He adds that, "Rolling back malaria will not be achieved unless the capacity for research in malaria and for malaria control is increased substantially, especially in Africa".Druihe identifies well-funded research, which he calls prospective studies, anchored on "a realistic strategic plan based firmly on what is known about the means available" as what is missing in the anti-malarial campaign in Africa. Emphasizing the importance of the Roll-Back-Malaria initiative and conceding that the partners realized from the onset that there are challenges to be overcome, Nabarro and Mendis also suggest that, such challenges can be surmounted by "applying science, human and financial resources, and effective organization". At the heart of all these is research.

These studies are relevant to the extent that they provide a larger framework within which this proposed study could be situated, and suggest a wider latitude of primary and published data, that the proposed study can explore. They also provide general grounds for the proposed study which will focus on global health interventions and indigenous medical research with its eyes fixed on the latter as necessary tool for rejigging the management of malaria in Nigeria. However, none of them view the importance of research to the management of malaria from the indigenous African perspective. It is this wide gap that this proposed study will cover.



5. Expected Contribution to Knowledge

This study is expected to make a significant contribution to medical and health history, which still suffers extensive exploration in African historiography, by contributing to the global emerging debates on biomedical research. Beyond this historicizing mandate however, the work is expected mainly to present a comprehensive policy formula of home-grown architecture of medical research for more effective management of malaria in particular, and robust health governance in general, with strong overlay of local contents. It also sets to offer a new perspective for understanding the contemporary contours of global health politics and diplomacy as it affects the Nigerian interests. It will further highlight those socio-cultural (non-medical) determinants that are shaping the state of health and well-being as well as trajectories of health behaviours of people in the study area. This study promises to mark a significant paradigm shift and expansion of historical scholarship territory in both medical/health, social and diplomatic branches of Nigerian history.

6. Statement of Motivation

This proposed study is primarily motivated by my passion and interest to receive cutting-edge training that will make me an authority in health and medicine history with connecting breadth of profound knowledge of the social and diplomatic sub-fields as they apply to the chosen topic. Also, some crucial indicators of quality research are significant motivators for this study. They include huge human capital base, located in profound mentoring capacity of American professors; availability of state-of-the-art research facilities and very rich library (manual and virtual) collections; and the serene ambience and tranquil learning environment of American universities and institutions, which are comparably more excellent than one can find elsewhere. The well-known depth of scholarship and traditions of research excellence in diverse fields with promotion of multidisciplinary and interdisciplinary scholarship in American universities are motivating elements for this study. These will emplace me in a great location for the study, sharpen my focus and remove me from any form of distraction, which ultimately will enable me complete the study in record time. More importantly, I will be able to contribute to emerging debates on global governance generally and health governance as particularly related to management of malaria, while also benefitting from robust contributions from other established and emerging generation of scholars. I, therefore, look forward to benefitting from the broad intellectual architecture of American universities to carry out my study and produce cutting-edge knowledge on the proposed topic.

7. Synopsis of Chapters

Chapter One: Introduction: Medical Research in Colonial Nigeria

This introduction is a general survey of medical research in Nigeria within the broader context and framework of colonization and global health intervention. The chapter will necessarily discuss the establishment of the Medical Research Institute (as a precursor to NIMR), bringing into fore its nature, relevant facilities and impact on malaria-related health policy in colonial Nigeria.

Chapter Two: National Independence, and Indigenization of Medical Research in Nigeria

In a link with the preceding chapter, this chapter will examine the implication of Nigeria's independence on medical research, and discuss the background process that led to the founding of the NIMR in 1977. The chapter will more profoundly interrogate the dynamics of medical research in the NMRI, with an eye on its Western orientation, as a means to determining how it promoted/accommodated indigenous research initiatives on malaria from 1977 to 2015.

Chapter Three: Nigeria and Politics/Diplomacy of Global Health Interventions

This chapter will provide necessary details on Nigeria's entry into the global system of health diplomacy, thus establishing a global context of inter-state relations of intervention for the study. It



will comprehensively cover Nigeria's enlistment into the membership of the WHO, and commitment to other intervention agencies, highlighting the implications of such relationships for global health interventions and indigenous medical research respectively in the management of malaria in the country.

Chapter Four: Global Health Interventions in the Management of Malaria in Nigeria

This chapter will rely on empirical data to discuss and analyse the trajectories of global health interventions in the management of malaria in Nigeria through the WHO and other agencies as a bloc in the period of study. This is with a view to emphasizing the process of the change and continuity (quantum, quality and patterns) of such interventions from 1977 through the Roll-Back-Malaria initiative experience up to 2007, thus showing how they have responded to the dynamics of global and local narratives of malaria in Nigeria.

Chapter Five: Indigenous Medical Research in the Management of Malaria in Nigeria – Integration or Exclusion

Beyond theoretical rhetoric, this chapter will, more specifically, examine the level and impact of integration or exclusion of indigenous medical research knowledge in the management of malaria in Nigeria. It will underscore the importance of the socio-cultural determinants of the people's health behaviour in terms of their commitment and bonding vis-à-vis the measurable success or failure of the management of malaria in Nigeria.

Chapter Six: The Future of Global Health Interventions-Indigenous Medical Research Nexus in Nigeria

Benefitting from discussions in the preceding chapters, this chapter will probe into the future of the nexus between global health interventions and indigenous medical research in the management of malaria in Nigeria, with an outline of the potential benefits accruable from truly home-grown medical research architecture particularly in the post-COVID era.

Chapter Seven: Conclusion

This chapter will form the conclusion of the work, with the results from the foregoing analyses brought together, deductions made, and possible areas of further studies identified. It will clearly advocate expansion of the integration of indigenous medical research knowledge into the mainstream of management of malaria architecture in Nigeria, as a means to deepening scope of Nigeria's involvement in the global health diplomacy system.

Tentative Conclusion of the Preliminary Study

From the preliminary study, data collection, field works, drafting and conference presentation done so far, this study poses a tentative conclusion that;

One, Africa's dependency on Western medical practice is dangerous for the continent and its people as it would only continue to keep them in the periphery of global health governance and diplomacy. Two, emplacing a strong indigenous knowledge system of health governance in and across Africa has become more compelling than ever. Three, the study reviewed the limitations of African research, using the Nigerian experience with malaria (1977-2015) as an example, and citing colonial health policies as instrument of global dominance. Thus, such limitations should be expeditiously addressed to keep Africa in a vantage position for the inevitable global competition. Four, Africa should, as a matter of immediate priority, develop strong architecture for home-grown medical research anchored on indigenous funding with almost zero-reliance on foreign intervention. Five, such home-grown system should necessarily integrate medical, social, political, and historical perspectives in malaria governance as conveyor belt for enduring health system. Six and finally, sustainable health governance for Africa should be firmly rooted in local realities.



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PAPER PRESENTATIONS

SUB-THEME 1: Economic, Social Outlook & Environment

SUB-THEME 2: Hospitality and Tourism Management

The Adaptation and Resilience of Kenyan Communities in Communicating Environment- Friendly Messages through Locally Available Materials

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ABSTRACT

Countless communities across different parts of the world are grappling with environmental degradation. Communities in developing countries are disproportionately disadvantaged in their attempts to conserve their environments due to existing challenges. In response to the challenges they face, communities have to develop interventions that are aligned to their needs and capabilities. In a world where Western standards define what constitutes desirable environmental interventions, communities in Nyanza region of Kenya have adopted interventions that defy some of the limitations they face. The purpose of this study was to analyse the materials chosen to develop environmental signs in Nyanza, Kenya. The objectives were to: identify the materials used by communities in Nyanza, Kenya to develop environmental signs; analyse the meanings communicated by the materials used in the identified environmental signs; and analyse the effectiveness of environmental signs in view of the materials used to develop them. Data were collected through observation of 100 environmental signs across Kisii, Kisumu and Migori counties in Nyanza, Kenya. After observation, data were subjected to semiotic analysis as part of critical discourse analysis under systemic functional linguistics (SFL). Findings revealed that environmental signage developers in Nyanza, Kenya were using concrete, metal, plastic and wood. Such improvisation revealed the resilience and adaptation of communities. Findings also revealed implicit meanings created by the materials used and which could create ironies with intended environmental messages. The implicit meanings could support or interfere with the efficacy of the messages being communicated. Implications included the need for environmentalists to work closely with communication and language specialists to develop more effective environmental signs. It is recommended that communities should be educated and offered support on improvising environmental signs whose materials contribute to the positive messages they communicate.

Keywords: *Environmental signs/signage; Materials; Meanings; Effectiveness.*

1. Introduction

Communities across the world rely on different kinds of signage for communication. Signs are considered highly convenient forms of communication (Scane, 2021). Environmental signage plays a pivotal role in transmitting different messages relating to the environment. As concern about environmental degradation increases, environmental signage is used to persuade people to act in environment-friendly ways by telling them behavioural expectations. The behavioural expectations are often communicated directly through clauses that command audiences not to throw garbage at certain locations, direct audiences on where to throw garbage, persuade audiences to plant trees and to use resources such as water sustainably. In many instances, communities in different parts of the world choose different materials on which to represent environmental messages. The materials chosen to develop the signs are vital because signs do not merely communicate through words but also through the imagery and the graphics they present (Scane, 2021). Though environmental signage heavily relies on words to communicate, the materials used also create symbolic meanings that influence the effectiveness of the signs.



The present study sought to identify the materials that communities in Nyanza, Kenya use to develop environmental signage and in turn analyse the symbolic meanings they communicate. It was guided by the objectives: to identify the materials used by communities in Nyanza, Kenya to develop environmental signs; to analyse the meanings communicated by the materials used in environmental signs in Nyanza, Kenya; and to analyse the effectiveness of environmental signs studied in view of the materials used to develop them. Using findings of the study, environmentalists can create environmental signs using materials whose symbolic meanings minimize ironies.

The study on the materials used to develop environmental signage contributes to ongoing discourse on environment protection. Climate change is a major challenge and though there has been extensive focus on major ecological disruptions, environmental conservation at the community level is important to the achievement of broader goals on sustainability. As a result, this study contributes to understandings of the effectiveness of environmental signs in promoting environmental conservation. It further facilitates the involvement of multidisciplinary teams in the development of environmental signs whose materials are not only convenient to members of different communities in Nyanza, Kenya, but which do not create ironies in their communication.

2. Literature Review

2.1 Communicative functions of Environmental Signs

Environmental signs have different functions but all of them are meant to provide information or influence people meet different demands. Yang (2009) outlines several functions of public signs some of which are applicable to environmental signs. Just like other public signs, environmental signs often direct audiences which involves offering guidance. Environmental signs may also prompt audiences by warning them or reminding them about unacceptable behaviours towards the environment. Environmental signs can restrict people by constraining their actions or activities. In addition to the above, environmental signs compel audiences not to take certain actions or to take them. These functions of signs are mainly communicated through the words written on them (Yang, 2009). However, environmental signs do not only communicate through words. Materials used to develop the signs are considered vital semiotic elements that can either complement the messages contained in the texts written on them or contradict those messages.

According to Berger (2004) the analysis of semiotic elements calls for the separation of form and content. In turn, the exploration of materials used to create environmental signs would involve drawing inferences in line with the ecolinguistic theory being applied. Despite the semantic significance of material, linguists seldom focus on material as a semiotic form. Curtin (2016) suggests looking at material culture by exploring what they represent and authors' original intentions. Curtin (2016) acknowledges that semiotic analysis lays the foundation for challenging the notion of objectivity and the notion of intentionality. In essence, Curtin (2016) argues that though materials may be chosen due to their practical nature, they also carry meanings. The materials chosen may end up not communicating what is intended by the authors. There may be conflict between messages intended by authors and those actually perceived by audiences.

In reference to environmental signs, some of the materials chosen might not merely be objective. They may also carry meanings that are unintended by the authors or which are perceived by the audience based on conventionalized meanings.

2.2 The Symbolic Nature of Environmental Signs

In addition to the words used by environmentalists, interpretations of such signs are highly sensitive because even the materials used to develop them communicate symbolic messages. Clark (2006) explored the concept of material symbols and noted that the language used often works in a complementary manner with material. Thus, the materials used to develop environmental signs

by communities in Nyanza, Kenya carry abstract messages that work alongside the actual words written on them. In support of this line of thinking is the discussion by Sadalla and Sheets (1993) which acknowledged that materials such as concrete blocks, bricks and wood are symbolic. Similarly, while Yang (2023) acknowledged the symbolic state of metal, Cronin, Hadley & Skadalis (2022) point out the iconicity of plastic in society.

Different communities across the world choose to develop environmental signs with materials available to them. In fact, the development of environmental signs and other public signs is regulated in some parts of the world where the developers of such signs are expected to follow legal obligations and compliance standards to attain consistency and legibility and reduce clutter (Berger, 2016). Contrary to other parts of the world, Kenyan communities often have to develop signs without adherence to any strict codes. Not much attention has been paid to the development of environmental signs in Kenya despite such signs playing a vital role in communicating to audiences. Thus, most environmental signs are developed out of locally available materials and in ways that environmentalists deem fit for different purposes. The materials used, whether intended or not, communicate symbolic meanings alongside the texts written on them.

2.3 Theory

The study applied some of the tenets of the Halliday's Systemic Functional Linguistics (SFL) or what is referred to as the Hallidayan tradition. The Hallidayan tradition is part of the theoretical framework that falls under Sibo Chen's (2016) ecolinguistic framework. Chen (2016) links the emergence of the Hallidayan tradition to the existent relationship between environmental degradation and the way people use language. Halliday's SFL supports looking at language from its functional state. In essence, language is partly responsible for misconduct toward the environment (Chen, 2022). Thus, within the broad context of ecolinguistics, Halliday's SFL is used as a form of critical discourse analysis supporting the study of environmental discourse (Chen, 2022). This study applied Halliday's metafunctions which support the analysis of discourses. According to Almurashi (2016) SFL can be applied at different levels one of them being discourse-semantics. This study applies Halliday's metafunctions to the study of material as a semiotic element in environmental signs in Nyanza, Kenya. Based on understandings of the ideational and interpersonal metafunctions in Halliday's SFL, it is possible to examine the intention behind the materials used to develop environmental signs and link the same with conventionalized meanings of those materials. In turn, this supports determination of the actual meanings communicated to audiences in communities.

The interpersonal metafunction mainly focuses on interactions between the addresser and the audience (Putz, 1992). In applying the interpersonal metafunction to the analysis of materials used to develop environmental signs, the study examined how these materials interact with audiences in view of their conventionalized meanings. The analysis reveals some of the implicit meanings communicated through the materials used and in turn evaluates their potential impacts on effectiveness of the environmental signs.

The ideational metafunction mainly relates to ideas (Putz, 1992). In this case, it would involve looking at the ideas underlying the development of environmental signs. Environmental signs communicate messages that capture reality as it is.

2.4 Research Gap

The materials used to develop environmental signs in Kenya haven't been exhaustively studied. The materials can be studied from different perspectives but of interest in this case is the ecolinguistic perspective part of which supports analysis of the symbolism of environmental discourse. Though environmental signs are used to communicate in communities across Nyanza, Kenya, the developers of such communities improvise materials whose impacts on the effectiveness of those signs is unknown.



3. Research Methodology

3.1 Research Design and Location

The study was qualitative in nature. Data was collected from three counties in Nyanza, Kenya: Migori, Kisumu and Kisii counties. Data was collected from the urban and peri-urban areas of the counties. Focus on urban and the peri-urban areas was informed by the fact that these are the areas often highly affected by pollution and are more in need of environmental signs than rural areas.

a. Sampling

A total of 100 formal and informal environmental signs were used for the study. Each county produced a minimum of 30 environmental signs for the study. The environmental signs were selected purposively.

b. Collection Method

Data collected was collected through observation which facilitated photography. Once the images were collected, they were saved then their locations were tagged to ensure each region produced the desired number of signs. The selection of environmental signs was informed by looking at texts written on them and images on them. The messages written on them defined their relevance to environmental issues.

3.2 Data Analysis

Thematic analysis was conducted to determine the materials used in the environmental signs in Nyanza, Kenya. The first step of the thematic analysis involved identification of materials used to develop the environmental signs that were photographed. Once materials were identified, the researchers made reference to conventionalized meanings of these materials as defined in the Oxford Advanced Dictionary and compared those meanings to the meanings intended by the developers of environmental signs by examining the ideas behind their creation. In turn, this facilitated the determination of the extent to which the environmental signs were effective in communicating messages.

4. Results and Discussions

4.1 Background

The selection of materials for the development of environmental signs is vital because these materials are also forms of communication. The materials carry meanings that could either complement or contradict the messages written on them. For example, steel and concrete are often associated with pollution (Rubio, 2014). Similarly, Vermenych (2021) noted that plastic is associated with pollution.

4.2 Materials Used

4.2.1 Metal

Metal featured in some of the environmental signs in Nyanza, Kenya. Though this material is favoured among developers of environmental signs, its use communicates contradictory messages especially when the type of metal used is not carefully chosen. Metal appears in various forms in environmental signs. For instance, some of the signs were written on metallic doors and gates which were improvised to function as environmental signs (Figure 1). Other environmental signs were written on plates purposely created to communicate environmental messages (Figure 2). Iron sheets were used to develop some of the informal signs (Figure 3). Metal carries connotations of strength and this makes it highly preferable in the study context. The dynamic uses of metal in different forms to develop environmental signs attest to its versatility and convenience as perceived in line with conventional meaning. The association of metal with strength means it is used by communities because it lasts. By using metal to create environmental signs, the messages on them are more likely to last long just like the metal.

Figure 1**Figure 2****Figure 3**

Despite versatility and strength of metal, it carries connotations of environmental degradation particularly in relation to the production process (Rubio & Navarro, 2024). Metal production processes including mining and smelting could undermine some of the messages on environmental signs (Rehren, 2020). Thus, when the metal used to develop an environmental sign is not carefully chosen, it could create contradictions that reduce the effectiveness of the message it communicates. Even so, due to limited resources, communities adapt and utilize forms of metal that are available to them regardless of their symbolic meanings.

4.2.2 Concrete Walls/ Pavements and Bricks

Most of the environmental signs in communities across Nyanza, Kenya were written on concrete walls, brick walls and concrete pavements. This means that the developers of environmental signs do not have to devote fresh resources to the development of environmental signs. Instead, they simply write on walls and pavements which are available (Figures 4 and 5).

Figure 4**Figure 5**

Despite the association of concrete with permanence, it also symbolizes the depletion of water and other abiotic resources (Estokova, Fabianova & Ondova, 2022). This implies that some of messages written on concrete walls and pavements which support environmental conservation could be weakened when audiences perceive the negative symbolism associated with concrete. In turn, this may reduce the effectiveness of the environmental signs.

4.2.3 Plastic

In some instances, environmental signs were written on plastic. Plastic is more controversial than other materials that were used to develop some of the environmental signs in Nyanza, Kenya. Plastic is identified as a major pollutant in different parts of the world (Alcosero & Bradillo, 2024). Even so, in communities in Nyanza, Kenya where there are limited resources, plastic material serves the potential for developing environmental signs (Figure 6). The use of plastic to develop environmental signs is contradictory because within these communities, plastic itself is a major pollutant. This deduction is based on observations of persistent plastic pollution in the study area. Additionally, a study by Vermenych (2021) acknowledges the status of plastic as a major pollutant. The negative symbolism of plastic may undermine the positive environmental messages written on plastic materials. Environmental

signs developed using plastic may not be entirely effective because as illustrated in Figure 6, the signs itself may be considered a pollutant from a symbolic standpoint. Thus, despite the effort put into developing the sign, the material's conventionalised symbolic meaning may be counterproductive to its effectiveness.

Figure 6



4.2.4 Wood

Wood is considered eco-friendly to a great extent. Though wood did not feature in many environmental signs in Nyanza, Kenya, it was used in some of the signs (Figures 7 and 8). Wood is considered appropriate for use in the development of environmental signs due to its renewable nature (Hetemäki et al., 2021). The fact that trees can be planted and contribute to sustainability makes them more appropriate than some of the materials being used across different communities in Nyanza, Kenya. However, the use of wood to develop environmental signs is also controversial considering the fact that there are concerns over forest destruction (Hetemäki et al., 2021). The implication is that even wood needs to be used carefully alongside consistent sustainability efforts.

Figure 7



Figure 8



Clearly, wood has the most favoured conventionalized meaning out of the different materials that communities in Nyanza, Kenya use to develop environmental signs. The biodegradable nature of wood and the potential for renewal diminishes negative symbolism and increases the effectiveness of environmental signs.

5. Conclusion

Communities in Nyanza, Kenya acknowledge and embrace environmental signs as vital forms of communication. In all instances, the environmental signs are used to communicate eco-friendly messages. This implies that they play significant roles in influencing perceptions and behaviours towards the environment positively. In most instances, developers of environmental signs in Nyanza, Kenya take advantage of materials that are locally available and these include brick/concrete walls and pavements, metal, plastic and wood. The choice of these materials captures the determination of environmentalists to communicate intended messages. However, some of the materials may create ironies in the process of communication.

National and local governments should work in collaboration with environmentalists and linguists to select materials whose meanings complement rather than contradict the text supporting positive behaviours towards the environment. Additionally, community members should be sensitized on the different materials available for the development of environmental signs. In turn, developers of environmental signs would be better positioned to select materials that minimize ironies in creation of meaning. Even so, communities have limited resources. This implies that government and non-governmental organizations should offer support through the allocation and provision of resources for the development of environmental signs whose materials do not contribute to environmental degradation. Proper selection of materials for environmental signs is important given the fact that most of the signs have text written on them. Though wood is highly preferred, eco-friendly metals can also be adopted. Materials may be in conflict with main messages if they are not carefully chosen because their negative symbolism may reduce the effectiveness of the environmental signs.

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Exploring the Dynamics between Participation in Health Education and Food Security among Refugees in Dadaab Refugee Camp, Kenya

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ABSTRACT

This study investigated the nexus between participation in health education and food security among refugees in the Dadaab Refugee Complex, Kenya. Anchored in systems thinking and informed by regression analysis, the research examined how awareness, satisfaction, and engagement in health education interventions shape refugees' capacity to access, utilize, and sustain food resources. Using a mixed-methods approach involving 453 household surveys, focus group discussions, and key informant interviews, the study explored how participation in targeted educational initiatives influences food security outcomes across the four pillars: availability, accessibility, utilization, and stability. Findings revealed a clear and statistically significant link between health education participation and improved understanding of food security. Awareness of facility-based (Coef. = 1.08, $p < 0.05$) and technology-driven (Coef. = 1.12, $p < 0.05$) health education significantly enhanced food security knowledge, while food accessibility emerged as a strong positive predictor (Coef. = 1.052, $p < 0.01$). Satisfaction with health education and perceptions of clarity and informativeness further strengthened this relationship. However, gaps existed: exposure to education on food stability and accessibility remained low, and newly arrived refugees demonstrated limited awareness, reducing the potential impact of interventions. Qualitative insights underscored that participation in community-based, school-based, religious, and household-level education activities increases the likelihood of adopting positive food security behaviours. Yet, systemic barriers, such as weak governance, inconsistent delivery, low literacy levels, and inadequate infrastructure, diminish the effectiveness of health education in shaping sustainable food security outcomes. The mixed effect of food availability, which presented a negative coefficient, suggested that availability alone cannot guarantee food security without corresponding improvements in affordability, stability, and knowledge-driven utilization. The study concludes that strengthening participation in health education is central to improving food security among refugees. Tailored, inclusive, and multi-modal educational strategies, supported by robust governance and community engagement, are essential to reinforce this nexus and advance sustainable food security in long-term refugee settings.

Keywords: Health Education Strategies; Food Security Pillars; Refugee Populations; One Health Approach; Food Access and Utilization

1. Introduction

Food insecurity remains one of the most persistent challenges facing refugee populations, particularly in protracted displacement settings such as the Dadaab Refugee Complex in Kenya. Despite ongoing humanitarian support, refugees continue to experience limited household food access, constrained livelihood opportunities, and poor dietary diversity. Evidence indicates that nearly half of refugee households globally remain moderately or severely food insecure, with similar trends documented in Dadaab (FAO, 2022; UNHCR, 2023). In such contexts, health education has increasingly been recognized as an important public health tool for improving food-related knowledge, enhancing nutrition practices, and supporting informed decision-making within constrained environments.



Studies in low-resource settings consistently demonstrate that participation in structured health or nutrition education programs contributes to improved household food practices, dietary habits, and resource utilization even in situations where financial capacity is limited (Hejazi et al., 2023; Mortazavi, 2021). These findings underscore the potential of health education to strengthen food security outcomes by equipping individuals with practical skills related to food selection, preparation, storage, budgeting, and health-seeking behaviours. However, there is limited empirical evidence on how such benefits translate into refugee settings, where movement restrictions, aid dependency, and environmental shocks shape daily access to food and information.

In Kenya, Article 43 of the Constitution guarantees the right to food and nutrition, extending to all people within the country, including refugees. The Dadaab camps: Dagahaley, Hagadera, Ifo 1, and Ifo 2, host more than 419,000 refugees who rely heavily on external assistance, with limited land access, limited income-generating activities, and fluctuating humanitarian funding (UNHCR, 2025). These conditions heighten the importance of non-material interventions such as health education, which is delivered through community health volunteers, health facilities, schools, and communication partners such as FilmAid (UNHCR, 2015). Existing studies indicate that these educational strategies vary in quality, consistency, and reach, raising questions about whether participation in such programs meaningfully influences food security outcomes for refugee households.

Previous research in Kenya and other developing contexts highlights that effective health education can improve nutrition knowledge, reshape attitudes, and support household dietary decisions, especially for vulnerable groups such as women, children, and resource-poor households (Beryne, 2015; Shapu et al., 2022; UNICEF, 2022). Yet in Dadaab, evidence suggests that health education programs often operate in fragmented ways, face funding limitations, and may not fully address the broader drivers of food insecurity, including environmental constraints, market volatility, and restricted livelihoods (Christine & Ernest, 2011; Aouinti et al., 2024).

Despite multiple interventions, refugees continue to sell portions of food rations, rely on credit for food purchases, and experience high levels of dietary insufficiency (REACH, 2021; WFP, 2020). These realities underscore the need to understand how participation in health education interacts with household strategies, food practices, and broader food access constraints within the unique socio-economic environment of Dadaab.

This study therefore examines the nexus between participation in health education programs and food security among refugees in the Dadaab Refugee Camp. Specifically, it seeks to: i) Identify the health education strategies currently available, ii) Analyse how participation in these programs influences household food security outcomes, iii) Explore contextual factors that shape participation and effectiveness, and iv) identify opportunities for strengthening health education as a pathway to improved food security in refugee contexts.

Through this lens, the study contributes evidence necessary for designing responsive, context-sensitive health education models that complement existing humanitarian assistance and support the long-term resilience and well-being of refugee populations.

2. Materials and Methods

2.1 Study Area

This study was conducted in the Dadaab Refugee Complex in Garissa County, Kenya, focusing on the four main camps—Dagahaley, Hagadera, Ifo 1, and Ifo 2. Dadaab presents a unique environment for examining the relationship between participation in health education and food security due to its protracted humanitarian setting, recurrent food insecurity, restricted mobility, and heavy reliance on structured education and information channels. Health education in the camp is delivered through



community health volunteers, camp-based facilities, and communication agencies, all operating under Sphere Standards and guided by Kenya's Refugee Act (2021). These programmes target nutrition knowledge, food hygiene, resource utilization, and coping strategies, making the setting appropriate for analysing how participation in such interventions influences household food security outcomes.

2.2 Sample and Survey Data Collection

A mixed-method design was adopted to capture both measurable outcomes of participation in health education and contextual perceptions influencing food security. A descriptive research design was applied to document existing participation patterns, exposure levels, and food security outcomes.

Quantitative Sampling

A total of 385 household representatives were selected using probability proportional to size. The distribution per camp was: Dagahaley (102), Hagadera (129), Ifo 1 (86), and Ifo 2 (67). Households were sampled through simple random sampling to ensure equal chance of selection. Eligible respondents were adults aged 18 or above who had lived in the camps for at least six months and had exposure to at least one form of health education (facility-based, community-based, or media-based).

Qualitative Sampling

Qualitative data were obtained through 28 Focus Group Discussions (FGDs) and 40 Key Informant Interviews (KIs) with health workers, NGO staff, CHVs, teachers, religious leaders, and camp administrators. Purposive sampling was used to target individuals and groups with direct experience in implementing or participating in health education. FGDs captured gender, age, and ability-based perspectives on how participation influenced food-related decisions, household practices, and coping mechanisms.

Data Collection Tools and Procedures

Quantitative data were collected using a structured questionnaire covering participation in health education (frequency, channels, topics), knowledge and practices related to food access, utilization, and stability and standard food security indicators. Qualitative tools included semi-structured interview guides focusing on: types of health education received, barriers to participation and perceived effects on dietary practices, food choices, and household food management. Enumerators were locally recruited and trained. Interviews were conducted in Somali, Kiswahili, or English with interpreters where necessary.

Pilot Testing and Reliability

A pilot test with 30 respondents was conducted outside the sampled blocks. Adjustments were made to ensure clarity and alignment with the study objective. Test–retest reliability produced a 70% agreement level, confirming tool consistency.

2.3 Data Analysis

Data were analysed in Excel and STATA. Descriptive statistics summarised socio-demographic characteristics, levels of participation in health education, and food security status. A Likert-scale comparative assessment captured respondent perceptions on accessibility, relevance, and impact of health education on food practices. To assess the nexus between participation in health education and food security, a multiple regression model was applied:

Where:

- FS = Food Security Index (constructed from access, availability, utilization, and stability indicators)
- HE = Participation in health education (measured through awareness, frequency of exposure, and engagement)
- X = Control variables (age, gender, education, income, household size, camp location)

The analysis examined the extent to which participation predicted improved food security outcomes. Qualitative data were analysed using thematic content analysis. Coding focused on: common participation channels (CHVs, facilities, radio, community forums), how participation influenced food choices, dietary behaviour, and coping strategies and factors facilitating or hindering engagement in health education. Qualitative insights were used to contextualize and explain the statistical findings, strengthening the interpretation of the nexus between participation in health education and household food security.

3. Results

3.1 Socio-Demographic Information

The study included 385 participants across the four camps of Dadaab. The population profile reflects the demographic realities influencing participation in health education and food security outcomes. Females constituted 69.9% of respondents, illustrating the gendered nature of household food management roles. A majority (70.4%) were long-term residents, signalling a stable caseload with accumulated exposure to humanitarian programming. The age structure showed a predominantly youthful population, with 46.5% aged 18–39 and 48.8% aged 40–59.

Geographical representation was balanced across Hagadera (33.8%), Dagahaley (22.3%), Ifo 1 (22.1%), and Ifo 2 (21.8%). Economic vulnerability remained pronounced, as 55.6% reported no access to income. Educational attainment was critically low: 72.4% lacked formal education, restricting capacity to engage with written forms of health education. Food insecurity was widespread, with 78.4% relying on food aid and 92.5% citing WFP as their main food provider.

3.2 Health Education Strategies on Food Security

3.2.1 Awareness of Health Education Strategies

Awareness levels varied substantially across the four delivery strategies. Community-based approaches had the highest strong awareness (29.1% “very aware” and 11.8% “extremely aware”). Facility-based and institution-based strategies showed moderate awareness, whereas technology-based strategies recorded the highest proportion of respondents who were “not at all aware” (24.3%), reflecting digital access constraints.

3.2.2 Preferences for Receiving Health Education

Community-based approaches were most preferred (34.0% preferred; 17.4% most preferred). Facility-based approaches were also widely accepted (35.1% preferred) but had notable resistance, with 19.0% least preferring them. Technology-driven approaches were least favourable, with 23.7% least preferring them, highlighting limited digital literacy.

3.2.3 Satisfaction and Perceived Informative Value

Satisfaction levels were mixed: 36.9% were “very” or “completely satisfied,” while 37.4% expressed dissatisfaction. Only 30.1% perceived the strategies as “moderately informative,” and over one-third (33.5%) found them “slightly” or “not informative.” This indicates that although delivery mechanisms exist, effectiveness and relevance remain weak.

3.2.4 Standards in Delivery of Food Security Pillars

Respondents felt that delivery standards for food security-related education were largely below expectations. Only 24.7% believed food availability education met standards, while 52.6% felt it was below standard. Food accessibility and utilization showed moderate performance, whereas food stability was perceived as the most inadequately addressed (56% below standard).



3.3 Nexus Between Participation in Health Education and Food Security

3.3.1 Understanding and Reception of Health Education

A slight majority (52.5%) reported understanding health education on food security. Among those with understanding, 63.7% were aware of organizations providing such education. Yet only 32.1% received health education often or always, whereas 43.8% reported rare or no exposure. Despite this, interest remained high, with 46.2% wishing to receive information continuously.

3.3.2 Participation in Education on Food Security Pillars

Participation levels varied across the four food security pillars. Food utilization had the highest frequent exposure (28.5% frequently; 10.2% very frequently), while food stability had the lowest, with 55.7% reporting rare or very rare exposure. The limited engagement in availability and stability content weakens the link between education and resilience against food insecurity.

3.4 Barriers to Successful Delivery of Health Education

3.4.1 Key Hindrances

Economic shocks were the most cited barrier (86%), followed by social barriers (59.2%) and access constraints (42.6%). Governance-related barriers were reported by 29.6% of respondents, while 29.4% cited cultural or religious constraints. Stakeholders emphasized the need for increased funding (75%), improved educator capacity (56%), community engagement (54%), and updating current guidelines (50%).

3.4.2 Adoption of Food Security Messages

Adoption of food security messages into daily practice was modest. Food utilization messages were most frequently adopted (30.5% frequent; 9.4% very frequent), while food stability had the lowest adoption (only 28% frequent or very frequent). A significant proportion (50.4%–57.2%) adopted availability and stability messages rarely or very rarely.

3.4.3 Perceived Effectiveness and Impact

Most respondents (31.1%) felt that health education informed them “much,” and 18.8% said “a great deal.” Almost half (44.4%) found it “useful and actionable.” Influence on food security knowledge was strong, with 27.0% “much influenced” and 14.0% “strongly influenced.” Nonetheless, about one-quarter perceived minimal impact.

3.5 Regression Analysis: Nexus Between Participation in Health Education and Food Security

To assess how participation and related factors influence understanding of health education’s role in food security, multivariate logistic regression was conducted. Coefficients and significance levels are presented in the required format (e.g., Coef. = 1.052, $p < 0.01$).

3.5.1 Awareness of Health Education Approaches

Awareness of facility-based and technology-based strategies significantly increased the likelihood of understanding health education’s role in food security with facility-based awareness representing the coefficient of 1.082, $p < 0.001$; technology-based awareness (Coef. = 1.117, $p < 0.001$), Institution-based (Coef. = 0.178, $p = 0.596$) and community-based awareness (Coef. = -0.387, $p = 0.194$) were not statistically significant.

3.5.2 Satisfaction, Perception, and Food Security Standards

Satisfaction with health education and the perception that food accessibility education meets standards significantly increased understanding: Satisfaction: Coef. = 0.774, $p = 0.015$ and Food accessibility meets standard: Coef. = 0.881, $p = 0.009$. However, believing that food availability education meets standards had a negative, significant effect: Food availability meets standard: Coef. = -0.781, $p = 0.011$.

3.5.3 Barriers to Health Education Delivery

Governance emerged as the only significant barrier influencing understanding: Governance barrier: Coef. = 1.052, $p < 0.01$.

3.5.4 Socio-Demographic Factors

Three socio-demographic factors significantly influenced understanding: Income access: Coef. = 1.472, $p < 0.001$; Alternative food sources: Coef. = 0.619, $p = 0.041$; Long-staying refugee status: Coef. = -0.873 , $p = 0.001$. While income and diversified food sourcing improved understanding, long-term camp residence reduced it.

4. Discussion

This study examined the nexus between participation in health education and food security among refugees in the Dadaab Refugee Camp, revealing a complex but meaningful relationship between health education exposure, socio-economic realities, and food security outcomes. The findings demonstrate that participation in health education increases understanding of food security, but its influence is moderated by socio-demographic vulnerabilities, governance barriers, and inconsistencies in program delivery.

Awareness and satisfaction emerged as pivotal factors, with regression results showing that awareness of *facility-based* (Coef. = 1.08, $p < 0.05$) and *technology-driven* (Coef. = 1.12, $p < 0.05$) health education significantly enhanced understanding of food security. This indicates that structured settings and digital platforms—when accessible—provide clearer, more impactful messaging. Conversely, institutional and community-based awareness did not show significant predictive value, suggesting that although widely used, these methods may lack consistency, quality, or adequate follow-up to create measurable cognitive shifts. Satisfaction was also a strong predictor of food security understanding, echoing evidence that well-designed and audience-responsive education increases knowledge uptake.

Socio-demographic patterns further contextualize the relationship. The predominance of women (69.9%) and individuals with no formal education (72.4%) underscores the importance of designing literacy-sensitive, gender-responsive interventions. Economic insecurity was widespread, with more than half of respondents lacking income—a factor that significantly predicted higher food security understanding (Coef. = 1.472, $p < 0.001$), suggesting that those with income can better apply health education principles, such as dietary diversification and informed purchasing. Long-term residency, however, negatively influenced understanding (Coef. = -0.873 , $p = 0.001$), possibly due to program fatigue or diminishing trust in repetitive interventions.

Participation in the four pillars of food security was uneven. Education on *utilization* was the strongest, although still insufficient, with nearly half of participants rarely receiving related messages. *Accessibility* and *stability* received the least emphasis, despite stability being foundational for long-term food security. The regression results provided additional nuance: food accessibility was a significant predictor of positive food security perceptions, while food availability—surprisingly—showed a negative relationship. This suggests that availability messaging does not translate into perceived or actual security if affordability, distribution, and reliability remain constrained.

Barriers to effective participation were substantial. Weak governance structures significantly reduced understanding of food security (Coef. = 1.052, $p < 0.01$), confirming that administrative coordination, clear guidelines, and stable funding mechanisms are critical enablers of impactful education. Economic shocks (86%), social constraints (59.2%), and limited access to education infrastructure similarly undermined participation. These structural challenges reinforce the necessity of integrating systems thinking into health education programming—an approach supported by key informants who highlighted the need for harmonized messaging, multi-institutional collaboration, and curriculum standardization across the food value chain.



Despite these challenges, demand for health education remains high: 73.9% of participants preferred continuous or frequent sessions. Focus groups recommended multi-modal strategies, including health facility waiting-bay education, school-based approaches, religious forums, digital platforms, gardening clubs, and cooking demonstrations. These preferences reflect broad community readiness to adopt holistic, context-sensitive education models.

Overall, the discussion confirms that participation in health education positively influences food security understanding, but its effectiveness is dependent on governance quality, delivery methods, socio-economic context, and the relevance of educational content. Enhancing the integration, frequency, and inclusivity of health education—while addressing systemic barriers—is therefore essential to improving food security among refugees in Dadaab.

5. Recommendations

Based on the study findings and the objective of strengthening the nexus between participation in health education and food security, the following recommendations are proposed:

1. Strengthen Multi-Modal Health Education Delivery

- ❖ Expand facility-based and digital platforms, which showed significant positive influence on food security understanding.
- ❖ Integrate community-based, school-based, and religious-institution approaches with standardized content to ensure consistency and quality.
- ❖ Develop culturally sensitive, literacy-friendly materials utilizing visuals, storytelling, demonstrations, and local languages.

2. Enhance Governance and Coordination Mechanisms

- ❖ Establish a harmonized health education framework co-led by UNHCR, WFP, and Ministry of Health to ensure uniform messaging.
- ❖ Develop and disseminate standardized curricula on food availability, accessibility, utilization, and stability.
- ❖ Strengthen monitoring and feedback loops to assess message adoption and program performance.

3. Address Socio-Economic Barriers to Participation

- ❖ Design livelihood-linked health education (e.g., nutrition for market purchasers, budgeting for ration-complementing foods).
- ❖ Expand opportunities for income generation to improve capacity to apply food security knowledge.
- ❖ Prioritize specialized programs targeting women, low-literacy groups, and newly arrived refugees.

4. Improve Frequency and Visibility of Health Education on food security

- ❖ Increase regularity of health talks in facilities, schools, and community spaces to address current participation gaps.
- ❖ Use posters, radio messaging, community theatre, and digital content to maintain consistent exposure.

5. Promote Practical, Skills-Oriented Education

- ❖ Encourage kitchen gardening, food preservation training, safe food handling demonstrations, and climate-resilient nutrition practices.
- ❖ Support youth and women's groups to lead peer education sessions, improving community ownership.



6. Leverage Technology Responsibly

- ❖ Pilot mobile-based micro-learning modules for food security education.
- ❖ Expand digital literacy opportunities and ensure Wi-Fi access in safe community spaces.
- ❖ Incorporate AI-supported dissemination while safeguarding existing jobs through hybrid human–technology models.

7. Prioritize Support for New Arrivals

- ❖ Develop onboarding packages that introduce newcomers to health education platforms, service providers, and food security concepts.
- ❖ Offer orientation sessions using interpreters and refugee-led community health educators.

8. Integrate Health Education with Food Assistance Systems

- ❖ Embed education into ration distribution, cash-based transfer sessions, and nutrition screening points.
- ❖ Use Expanded Single Registry, Differentiated Assistance and Cash Based transfer platforms to target tailored food security messages to individual households.

6. Conclusion

This study demonstrates a clear but multifaceted nexus between participation in health education and food security among refugees in the Dadaab Refugee Camp. While participation in health education significantly enhances understanding of food security, this relationship is shaped by socio-economic vulnerabilities, delivery methods, and systemic governance factors. Awareness of structured educational platforms—particularly facility-based and technology-driven strategies—was strongly associated with higher food security comprehension, highlighting their central role in future programming.

However, persistent inequalities in access, literacy, economic capacity, and program consistency continue to hinder effective participation. The limited emphasis on critical pillars such as food stability and accessibility further constrains progress. Strengthening governance, standardizing content, improving infrastructure, and promoting inclusive, multi-modal delivery approaches are essential for maximizing the impact of health education.

Ultimately, enhancing participation in health education offers a powerful pathway to improving food security in Dadaab. By aligning educational interventions with community needs, socio-economic realities, and systemic structures, humanitarian actors can foster greater resilience, self-reliance, and long-term well-being among refugee populations.

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Beyond the Basics: Harnessing Entrepreneurial Supply Chain Practices to Elevate Public Healthcare in Kenya

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ABSTRACT

Mounting evidence from literature advances entrepreneurship as a building block to sustainable economic growth. Researchers have linked entrepreneurship to various industrial concepts bringing to birth the entrepreneurial supply chain management in the beginning of the 21st century. The entrepreneurial supply chain management is relatively under-researched which limits its contribution to offering practical solutions in society. To bridge this gap, this study focused on Entrepreneurial Supply Chain practices and the performance of public hospitals in Kenya. These practices revolved around innovative inventory management, proactive strategic sourcing and risk-taking. The study was guided by resource orchestration theory. Employing a multiple linear regression analysis on data collected from 151 public hospitals the findings reveal that entrepreneurial supply chain practices significantly improve performance of public hospitals.

Keywords: *Entrepreneurial Supply Chain Management Innovative Inventory Management Performance, Proactive Strategic Sourcing Risk Taking*

1. Introduction

The right to health is a fundamental human right affirmed clearly in global, regional, and national health frameworks. Consequently, leaders across the globe, whose countries are member states of the World Health Organisation (WHO) aim to continuously improve healthcare systems for all, in a bid to achieve this basic human right (Simeoni & Kinoti, 2023). Good health inspires society to thrive and become productive, while the fear of sickness stalls production, consumption, and overall human well-being. Diseases stagnate a nation's economy by disrupting business continuity and creating supply chain disruptions resulting in a very low annual Gross Domestic Product (GDP), (Smith et al., 2019).

To achieve good health, a lot of money is spent on providing healthcare services in the public hospitals with the annual global healthcare spending standing at USD 7 Trillion as of 2022. Healthcare spending figures are gradually rising due to a rise in the ageing population, more complex diseases requiring complex medications, and other technical/institutional aspects facing the healthcare systems. Despite the heavy budgetary expenditure in healthcare, the service provision in public hospitals across the globe is usually undermined by various factors; rapid advancement in technologies, workforce shortages, unavailability of essential supplies such as medicines.

An aspiration of the Kenyan Government in the Vision 2030 plan is to transform lives through equitable, high-quality, and affordable healthcare to all, by improving public healthcare (GoK, 2021). To achieve this, the Kenyan Government has instituted various reforms and policies in the healthcare sector; Bottom-Up Economic Transformation Agenda (BETA), Universal Health Coverage (UHC), the Fourth Medium Term Plan (2023-2027) establishment and revamping of Kenya Medical Supplies Authority (KEMSA), and a recent establishment of the Social Health Authority in October, 2023, all aimed at



promoting good health for all Kenyans (Ministry of Health, 2023). However, despite these government interventions and heavy budgetary allocations, public hospital service quality keeps deteriorating. There is inefficient demand forecasting, a lack of a decentralised procurement system at the County level, low Information Communication Technology (ICT) utilisation, and inadequate medicines, equipment, and human resources. The doctor-to-patient ratio is 15 doctors for 10,000 Kenyans resulting in long waiting times. This ratio is attributed to high levels of medical drain with 593 doctors being away on study leave and 135 who have completed studies choosing to remain abroad in place of rendering expertise in Kenya (Schneller et al., 2023). Only 14% of public hospitals are stocked with essential medication continuously for 90 days or more and 67% account for an unavailable medical stock for up to 30 days or more. Most public hospitals operate for 8 hours resulting in underutilisation of invested capacities (Toroitich et al., 2021).

Generally, the Kenyan public healthcare systems are faced with a myriad of supply chain challenges ranging from lack of pro-activeness, innovativeness, and risk-taking in service delivery (Kenya National Infection Prevention and Control Plan for Health Care Services, 2021-2023). Compounded together, these challenges have resulted to poor performance of public hospitals. According to Aljuaid et al., (2021), the performance of public hospitals is usually assessed through effectiveness, efficiency, organisational relevance, financial viability, and equity in service delivery. Effectiveness relates to the degree to which the public hospital achieves set goals, while financial viability is the ability of a public hospital to remain afloat over time. Relevance relates to the degree to which stakeholders consider the services offered in public hospitals to be able to meet their needs. Majority of the public hospitals face difficulties in achieving relevance, equity, financial viability, and effectiveness.

Scholars and managers alike have continued to recognise the benefit of entrepreneurship in dealing with organisational problems present in their operating environment. This led to the birth of entrepreneurial supply chain management in the 21st Century. The entrepreneurial supply chain is more aggressive compared to the traditional supply chain as it breaks organisational inertia and comfort and it integrates customers, competitors, suppliers, internal processes, growth, and learning perspectives by incorporating innovation, proactiveness, and risk taking in a supply chain.

Innovation is described by Hamdan and Alheet, (2020), as the experimentation of new techniques, methods, products, and services to effectively respond to market changes. Proactiveness is a forward-looking perspective that enables organisations to be early market movers and beat the competition easily while risk taking is the commitment of enormous resources by organisations to unknown ventures to stimulate organisational growth (Mumaraki, 2020). Entrepreneurial supply chain practices in this study revolved around innovative inventory management, proactive strategic sourcing, and risk taking.

Innovative inventory management in this study is founded through new technology use and the 'Just in Time' (JIT) inventory philosophy. Adoption of new technologies such as the Internet of Things, telemedicine and Radio Frequency Identification, helps reduce patient waiting times, avert risks, and reduce costs in hospitals. The JIT philosophy on the other hand ensures necessary inventories are delivered when needed thus freeing up capital expenditures and promoting organisational efficiency (Smith et al., 2019).

Proactive strategic sourcing enables a firm to make necessary changes that shape the competitive behaviour of the industry. This can be done through upstream or downstream supply strategies including supplier relationships and procurement planning. The establishment of long-term supplier relationships reduces costs and price volatility, creates value and a sustained competitive advantage while enabling firms to evaluate supplier performance in the long run. (Ndung'u et al., 2023). Procurement planning influences performance by identifying quantities, specifications, the framework for delivery, identifying the source of supplies, negotiation, and establishing relationships (Frederico et al., 2021).

Risk taking enables an organisation to break away from routine core businesses and engage intensively in the unknown by seizing available opportunities. Risk taking in an organisation is expressed through collaborative leadership behaviour and income generating opportunities. Collaborative leaders engage in recognising entrepreneurial opportunities, planning, and managing resources (McGee & Terry, 2022). The presence of declining budgets while the demand for services in the healthcare sector increases calls for the adoption of risk taking behaviour to help develop new revenue streams that will help improve the healthcare sector by providing adequate resources to carry out day-to-day activities. Naamati (2020) argue that the reduction of per capita spending on health calls for public hospitals to look for alternative sources of income other than the government budgetary allocation. This is done through strategic identification of income generating activities by a hospital.

2. Literature Review

2.1 Theoretical Review

2.1.1 Schumpeterian Entrepreneurship Theory

According to Schumpeter, entrepreneurship relates to creative destruction where entities destroy equilibrium and create new conditions in the marketplace. Entrepreneurship focuses on new products, processes, and innovations in an organisation. Entrepreneurship is the lifeline of any economy as it is a struggle between the new and the old; most productive against less productive, new supply sources against old sources, risk-taking versus risk-averseness, all aimed at breaking routine and introducing new business ideas and ways of doing things. These activities are prone to error, which in entrepreneurship, is given accolades rather than criticisms. Trying is appreciated in entrepreneurship and results in the creation of a new product, production process, market, supply source, and re-organisation, all aimed at improved performance (Pasupuleti et al., 2024).

Opportunities, according to Schumpeter, are seized through innovation, proactiveness, and risk-taking. The environment is always open to creative individuals who can make choices different from the rest. Opportunities are created through the introduction of information that arises due to changes in the environment. As these changes occur, leadership is keen to identify and be bold enough to partake in novel choices. Utilisation of these available opportunities requires entrepreneurial thinking to leverage performance (Liu et al., 2023).

2.2 Empirical Review

2.2.1 Innovative Inventory Management and organizational performance

Omaghomi et al., (2024) reviewed innovations in Nigerian hospitals and identified the use of technologies in the form of Electronic Health Records being prevalent. Cesarelli et al., (2021), looked into innovative inventory management models with a focus on outsourcing, virtual inventory, and lateral transshipments. The study established that innovativeness in the supply chain promotes better performance in organisations. Given the highlighted previous positive results, our premise is that innovative inventory management improves organisational performance and therefore the following hypothesis is proposed.

H01: Innovative inventory management has no significant effect on the performance of public hospitals in Kenya.

2.2.2 Proactive Strategic Sourcing

A study by Oliech & Mwangangi (2019) established that strategic sourcing reduces shortages, and wastages, improves accountability, and makes services affordable to all. The study further recognised that poorly organised supply chains place the health of millions of Kenyans at risk. A recent shortage of Bacillus Calmette-Guérin (BCG) vaccines in Kenya was attributed to delays in sourcing by the



public hospitals (Simeoni & Kinoti, 2023). In Thailand, the adoption of proactive strategic sourcing has reduced child mortality rates while in Ghana the quality of non-communicable disease treatment has improved (Munyua et al., 2022). Given the highlighted previous positive results, our premise is that proactive strategic sourcing improves organisational performance and therefore the following hypothesis is proposed.

H02: Proactive strategic sourcing has no significant effect on the performance of public hospitals in Kenya.

2.2.3 Risk Taking

McGee & Terry, (2022) assessed the role of collaborative leadership behaviour in creating value in an organisation and revealed that risk taking leaders recognise opportunities, communicate consistently, collaborate effectively, show resilience, plan and manage resources, empower followers, share control, and allow autonomous work. This creates an environment for posterity (Dahleez et al., 2021). Pratono et al., (2020) assessed how risk taking behaviour stimulate organisational growth and found out that risk taking firms are able to drive performance by seizing opportunities for business in uncertain environments. Hamdan and Alheet, (2020) looked into the influence of organisational risk taking on Small and Medium Enterprises in the United Kingdom. The study concluded that risk-taking positively influences firm performance. Given the highlighted previous positive results, our premise is that risk taking improves organisational performance and therefore the following hypothesis is proposed.

H03: Risk Taking has no significant effect on the performance of public hospitals in Kenya.

3. Research Methods

The study was approved by the National Commission for Science, Technology and Innovation under Research License number REF:790201. The study utilised the positivism philosophy, the descriptive research design and the explanatory research design as utilised by Gichui and Atambo, (2023). The study population for this study was 243 public hospitals spread across all 47 counties in Kenya. Primary data collected using a questionnaire was utilised in this study. The questionnaire underwent a pilot study to test validity and reliability. Validity was checked using face content validity through the help of research supervisors. Reliability was tested using the test-retest method, and the Cronbach alpha coefficient of 0.7 helped check the internal consistency as shown in Table 1.

Table 1: Reliability Statistics of Entrepreneurial Supply Chain practices

Variable	Items	Reliability (Cronbach Score)	Comments
Innovative Inventory Management	10	.853	Reliable
Proactive Strategic Sourcing	11	.965	Reliable
Risk Taking	11	.798	Reliable
Performance of Public Hospitals	25	.798	Reliable
Overall Reliability		.858	Reliable

3.1 Data Analysis

Both descriptive and inferential statistics were used for data analysis. The multiple regression analysis was used to test the strength of the relationship between entrepreneurial supply chain practices and the performance of public hospitals in Kenya. The Analysis of Variance (ANOVA) was used to test the overall fitness of the model.

The combined multiple regression model is stated in Equation 3.1

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \quad 3.1$$

Where; Y is the composite index for the performance of public hospitals, β_0 is constant, β is the slope, X_1 is Innovative Inventory Management, X_2 is Proactive Strategic Sourcing, X_3 is Risk taking, β_1 is the regression coefficient of variable X_1 (Innovative Inventory Management), β_2 is the regression coefficient of variable X_2 (Proactive Strategic Sourcing), β_3 is the regression coefficient of variable X_3 (Risk Taking), and ε is the error term.

3.2 Diagnostic Tests

Diagnostic tests were conducted to ensure that the assumptions of linear regression were not violated as this would flaw the study findings as argued by Ndung'u (2021).

4. Results and Discussions

Table 2: Diagnostic Tests Results

S. No	Test	Method	Decision criteria	Results	Decision
1.	Sample Adequacy Test	Kaiser-Meyer-Olkin (KMO)	0.5 threshold	All variables surpassed 0.5	Sample adequate
2.	Normality Test	Shapiro-Wilk test	P value is > than significance of 0.05	p-values greater than 0.05	Date normally distributed
3.	Outliers Test	Cook's Distance	0 to 1 >1 considered outliers	<1 values obtained	No outliers
4.	Correlation Test	Pearson Correlation Coefficient	Values should fall between - 1 and 1.	All variables exceeded 0.05 confidence level set.	Presence of linearity
5.	Homoscedasticity	Breusch-Pagan test	P values greater than 0.05	Values had p value of 0.50>0.05	Presence of heteroscedasticity
6.	Multi-collinearity	VIF	1 to 10	variables <10	Absence of Multi-collinearity
7.	Autocorrelation	Durbin-Watson	Durbin-Watson value of 2.447	value of 0.547	No autocorrelation

Source: Authors (2024)

The results in Table 2 reveal that the sample was adequate as the KMO was above the set threshold of 0.05. The data was normally distributed as the obtained p values were greater than the set threshold of 0.05. there were no outliers as the obtained values ranged between 0 to 1. There was presence of heteroscedasticity as the obtained Breusch- Pagan value was greater than 1. There was absence of multicollinearity as the VIF values were between 0 to 9 and there was no autocorrelation as the obtained value met the threshold of 3.



4.1 Response Rate

The study targeted 151 public hospitals in Kenya. The study sought information from 302 respondents from the 151 public hospitals. A total of 247 questionnaires were dully filled and returned from the public hospitals translating to a response rate of 81.79% which was considered adequate for analysis.

4.2 Descriptive statistics

The study utilised a 5-point Likert scale where; Strongly Disagree (SD)=1, Disagree (D) =2, Neutral (N)=3, Agree (A) =4, and Strongly Agree (SA) =5. According to Nyakarimi (2022), data that appears in the form of an interval scale such as the Likert Scale is best measured using means and standard deviation. The descriptive statistics results are provided in Table 2.

Table 3: Descriptive Statistics

Stats	I.I.M	P.S.S	R.T	P.H.P
Mean	4.203	4.135	4.069	4.36
SD	.5437	.6734	.4053	.931
N	247	247	247	247

Note: Stats=statistic, IIM=Innovative inventory management, PSS=Proactive Strategic Sourcing, RT=Risk taking, PHP=Public hospital performance, SD=Standard Deviation, N=Population

Source: Authors (2024)

The research findings shown in Table 3 depict a composite mean of 4.203 and a standard deviation of 0.5437. The composite mean and standard deviation indicate that the respondents from the public hospitals strongly agreed that the parameters used for innovative inventory management affect the performance of public hospitals in Kenya. The standard deviation of less than 1 for all the measures of innovative inventory management indicated that there were normal variations between the responses, that is, all the responses the respondents gave did not differ widely. These results are similar to Ambekar et al., (2020) who found that the use of new technologies in inventory management in the form of ERP and the Internet of Things helps improve interactions, efficiency, and effectiveness between organisations.

The composite index results with a mean of 4.135 and a standard deviation of 0.6734 indicate that the respondents strongly agreed with the parameters used to measure proactive strategic sourcing. The standard deviation of less than 1 for all the measures of proactive strategic sourcing indicated that the responses by the respondents did not differ widely. The study findings are similar to a study done by Fredrico et al., (2021) who identify strategic sourcing as the main process in an organisation that solely affects the decisions in a supply chain. Further, they reveal that strategic sourcing stimulates positive returns in an organisation by creating a competitive advantage and ensuring a consistent supply of resources. Strategic sourcing creates long-term supplier relationships and vision by incorporating knowledgeable personnel into the supply chain.

Table 3 presents a composite mean of 4.069 and a standard deviation of 0.4053. The composite mean and standard deviation indicate that the respondents from the public hospitals strongly agreed that the parameters used for risk taking affect the performance of public hospitals in Kenya. The results are in tandem with Ang'ana and Chiroma (2021) did a study that found a very strong agreement between variables used for risk taking and performance in organisations. Specifically, the study used collaborative leadership behaviour which they postulate that it's an inherent behaviour that helps organisations succeed by decentralising power, sharing knowledge, and creating a conducive environment that encourages trust, a common vision, and a goal, thus better performance.

Table 3 presents a composite mean of 4.36 and a standard deviation of 0.931. The composite mean and standard deviation indicate that the respondents from the public hospitals strongly agreed that the parameters used for performance of public hospitals in Kenya are effective. A study on the effect of entrepreneurial orientation and organisational culture on firm performance done by Khan et al., (2020) provided similar results whereby organisational performance is embedded in a high entrepreneurial orientation in a firm. Entrepreneurship in an organisation helps in business development, growth of revenues, and product development.

4.3 Hypotheses Testing

Multiple linear regression was conducted at a 95% confidence level to test this relationship.

4.3.1 Entrepreneurial Supply Chain Practices and Performance of Public Hospitals in Kenya

The study sought to establish the relationship between entrepreneurial supply chain practices and the performance of public hospitals in Kenya. The results are captured in Table 4.

Table 4: Entrepreneurial Supply Chain Practices on Performance of Public Hospitals in Kenya

Model	R	R Square	Adjusted R Square	Std. Error of Estimate
1	.718 ^a	.516	.510	.214116

Source: Research Data (2024)

From Table 4, 51.6% of the variations in the performance of public hospitals in Kenya can be explained by entrepreneurial supply chain practices. An improvement in the performance of public universities in Kenya can be achieved through the adoption of entrepreneurial supply chain practices. The results obtained above are in the same vein as a study by Ketchen & Craighead (2020) who found a positive and significant relationship between firm performance and entrepreneurship in supply chains. Liu et al., (2023) concur with these observations and conclude that firms that are innovative achieve competitive advantage through innovation; proactiveness and having a high- risk attitude. The greater the entrepreneurial orientation in an organisation, the greater the organisational performance.

Table 5: Analysis of Variance

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	13.858	3	4.619	86.258	.000 ^b
Residual	13.013	243	.054		
Total	26.871	246			

a. Dependent Variable: Performance of Public Hospitals

b. Predictors: (Constant); Innovative inventory management, proactive strategic sourcing, Risk-taking

Source: Research Data (2024)

From the ANOVA results given in Table 5, it can be concluded that there exists a positive and significant relationship ($F=86.258$, $\text{sig} < 0.05$) between entrepreneurial supply chain practices and performance of public hospitals in Kenya. Therefore, the model was considered fit for the analysis.



Table 4.12c: Coefficients for entrepreneurial supply chain practices on performance of public hospitals in Kenya

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
	(Constant)	4.496	.281		15.99	.000
	Innovative management inventory	.1083	.042	.122	2.579	.010
1	Proactive sourcing strategic	.33033	.026	.598	12.705	.000
	Risk taking	.226176	.032	.316	7.068	.000

Note: Dependent Variable: Performance of public hospitals in Kenya.

Equation 4.1 was used to predict the study variables.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \quad 4.1$$

Whereby; Where; Y is a composite index for the performance of public hospitals, β_0 is constant, β is slope, X_1 is Innovative Inventory Management, X_2 is Proactive Strategic Sourcing, X_3 is Risk taking, β_1 is the regression coefficient of variable X_1 (Innovative Inventory Management), β_2 is regression coefficient of variable X_2 (Proactive Strategic Sourcing), β_3 is regression coefficient of variable X_3 (Risk Taking), and ε is the error term.

Based on the findings provided in Table 6, the predictor model incorporating the study variables is given in Equation 4.2.

$$Y = 4.496 + 0.1083 X_1 + 0.33033 X_2 + 0.226176 X_3 + \varepsilon \quad 4.2$$

The first objective of the study sought to establish the influence of innovative inventory management on the performance of public hospitals in Kenya. The hypothesis was as follows:

H01: Innovative inventory management has no significant effect on the performance of public hospitals in Kenya.

The results in Table 6 reveal that the adoption of innovative inventory management practices has a significant and positive effect on the performance of public hospitals in Kenya ($\beta = 0.1083$; P-Value < 0.05). From this finding, the null hypothesis (H01) was rejected meaning that a unit increase in the adoption of entrepreneurial supply chain practices in the form of innovative inventory management leads to a significant increase in the performance of public hospitals in Kenya by 10.83%. Similar results are also revealed by Kavukoglu (2023) who investigated the correlation between organisational innovation and business excellence with a focus on private hospitals and found a positive association.

The study revealed that innovations in the hospital processes enable a hospital to progress towards excellence and increase the satisfaction of patients.

The second objective of the study sought to establish the influence of proactive strategic sourcing on the performance of public hospitals in Kenya. The hypothesis was as follows:

H02: Proactive strategic sourcing has no significant effect on the performance of public hospitals in Kenya.

The results in Table 6 reveal that the adoption of proactive strategic sourcing practices has a significant and positive effect on the performance of public hospitals in Kenya ($\beta = 0.33033$; P-Value < 0.05). From this finding, the null hypothesis (H02) was rejected meaning that a unit increase in the adoption of entrepreneurial supply chain practices in the form of proactive strategic sourcing leads to a significant increase in the performance of public hospitals in Kenya by 33.03%. Similar results are revealed by Munyi et al., (2024) who found out that proactiveness in strategic sourcing results to positive firm performance.

The third objective of the study aimed at investigating the effect of risk taking on the performance of public hospitals in Kenya. The hypothesis was as follows:

H03: Risk taking has no significant effect on the performance of public hospitals in Kenya.

The results in Table 6 reveal that the risk taking practices have a significant and positive effect on the performance of public hospitals in Kenya ($\beta = 0.226176$; P-Value < 0.05). From this finding, the null hypothesis (H03) was rejected meaning that a unit increase in the adoption of entrepreneurial supply chain practices in the form of risk taking leads to a significant increase in the performance of public hospitals in Kenya by 22.62%. These results confirm the work of Hamdan and Alheet, (2020) who found out that risk-taking positively influences firm performance.

5. Conclusion and Recommendations

The study revealed that entrepreneurial supply chain practices influence the performance of public hospitals in Kenya. The study revealed a positive and significant relationships between innovative inventory management factors (new technology use and just in time inventory), proactive strategic sourcing factors (supplier relationships and procurement planning), risk taking factors (collaborative leadership behaviour and income generating opportunities) and the performance (effectiveness, organisational relevance and financial viability) of public hospitals. Consequently, the study recommends the Chief Executive Officers (CEOs) and Medical Superintendents of public hospitals to adopt innovative inventory management practices, proactive strategic sourcing and risk taking to improve the performance of public hospitals

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An assessment of the effect of Mixed Cropping on Household Food Security in Rarieda Sub-county, Siaya County, Kenya

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ABSTRACT

The number of people lacking food security globally has continued to rise, despite the numerous global interventions that have been put in place to address it. For instance, approximately 8.2 percent of the global population is food insecure, and about 512 million people are projected to suffer hunger come 2030. In Kenya approximately, 17 million people are food insecure with two million relying on food relief. This study examined the influence of mixed cropping on household food security in Rarieda sub-County, Siaya County, Kenya. The study employed a cross-sectional research design with a target population of 25,428 households and a minimum sample size of 384 derived using Fischer's formula. Primary data were collected through key informant interviews, photography, structured questionnaires and direct observation, while secondary data were obtained from existing publications, both physical and online. Qualitative data were examined through content analysis while quantitative data were analyzed using frequencies, percentages, mean and standard deviation. Almost 69% of the households practiced mixed cropping to enhance food security with maize and beans being the most common mixed crops, at 80.40%. About 60.46% of the households intercropped perennial crops with seasonal crops. Almost 73.53%, 68.63%, 71.24%, and 57.84% of the respondents agreed, to some extent, that mixed cropping cushioned farmers against weather-related crop failure, promoted conservation agriculture, enhanced dietary options, and gave surplus yields that could be sold to acquire other household needs, respectively. The study concluded that mixed cropping was associated with household food security, laying emphasis on the need to embrace the practice so as to enhance food security in Rarieda, and by and large, Kenya. For increased productivity and a boost on food security, the study recommended adoption of mixed crop-livestock farming technique.

Keywords: Mixed cropping; Food security; Rarieda sub-County

1. Introduction

Agriculture is an important economic activity in the lower income countries (Montesclaros & Teng, 2021), contributing to food (in)security status of a people. Food security is a situation where at all times all people have adequate economic and physical access to enough, nutritious and safe food to meet their needs for a healthy and active life (FAO et al., 1996). Food availability is determined by sufficient food supply in matters of production, stock and trade; food accessibility by financial capability levels to obtain food; food utilization by variety and nutrition; and food stability means the constancy of the first three dimensions of food security over time (FAO et al., 2020). Since the four dimensions must be present for a household to be declared as food secure, FAO et al. (2022) documented that food insecurity remained a challenge that troubled the global population despite the numerous global interventions put in place to address it. An estimated 8.2 percent of the global population (about 307 million people in Africa, 323 million in Asia, and 34 million in Latin America and the Caribbean) faced food insecurity in 2024 (FAO et al., 2025). About 512 million people, of whom roughly 60 percent will be in Africa, are projected to be facing hunger come 2030 (FAO et al., 2025).

It's ten years since the endorsement of the 2030 Agenda for Sustainable Development by the United Nations. Targets 2.1 and 2.2 of the Sustainable Development Goals aim at ending hunger and ensuring access to safe, nutritious and sufficient food for all people all year round; and eradicating all forms



of malnutrition (UNDP, 2015). This highlights the urgent need to tackle food insecurity and enhance the wellbeing of the populace. Despite the existing agricultural policies and programmes aimed at enhancing agricultural production and promoting food security, there remains incidences of food insecurity (FAO et al., 2025; Herforth et al., 2020). A study by Montesclaros & Teng (2021) advocated for transformation of regional approaches to food security so as to keep up with the pace of the changing landscape of food security.

Save for Northern America and Europe, there is a higher prevalence of moderate to severe food insecurity in rural than urban areas (FAO et al., 2025). This is in support of the observations made by Anyona (2024) that most of the agriculture-dependent groups were rural dwellers. Rarieda, a more-or-less rural sub-County in Siaya County of Kenya, has almost 68 of every 100 households being food insecure (KNBS, 2019). Food insecurity in her sister sub-Counties is lesser: 37 percent in Gem; 46.6 percent in Ugunja; and 56 percent in Bondo (Oloo, 2021; Obonyo et al., 2016; Otieno, 2014). Previous researches on food security in Rarieda focused on socio-cultural determinants of household food security (Musyoka, 2021) and influence of home gardening on household food security (Anyona et al., 2024). This study examined the influence of mixed cropping on household food security in Rarieda Sub-County, Siaya County, Kenya. Besides creating awareness on the subject matter and adding to the existing body of knowledge, the study findings could guide in the implementation of food security initiatives into rural development projects so as to help address the untiring food crisis.

2. Review of Related Literature

The practice of cultivation of two or more crops simultaneously on the same piece of land without row arrangement is referred to as mixed cropping (Yusuf et al., 2008). Previous research findings revealed that household farmers that practiced mixed cropping could achieve food security because the system enhanced soil fertility when intercropped with nitrogen fixers, increased resilience against pest and diseases, increased abiotic tolerance, reduced weed competition, stabilized yields and guaranteed farm income all-year round by lessening the likelihood of total crop failure (Streit et al., 2019; Hirst, 2020).

Globally, studies done in Bangladesh, India and Nepal revealed that mixed cropping increased the farmer's income by 92 percent, 83 percent and 74 percent, respectively (Raseduzzaman, 2013). Therefore, mixed cropping improved food security status of households as the income was used to purchase other food items. A study done in Cuba revealed that mixed cropping was risk advantageous compared to other farming systems. For instance, after Hurricane Ike hit Cuba in 2008, one field survey was conducted to estimate the agricultural damage in the provinces of Holguin and Las Tunas, and the findings indicated that losses were only 50 percent in the field where farmers practiced mixed cropping compare to beyond-90 percent in the fields where farmers adopted other farming systems (Altieri et al., 2012). Likewise, fields that followed mixed cropping showed faster recovery (80-90% within 40 days) (Altieri et al., 2012; Raseduzzaman, 2013). Therefore, mixed cropping can be an important consideration in the achievement of food stability in the global space.

A study by Cho et al. (2016) on assessment of household food security through mixed cropping in Myawar revealed that mixed cropping was positively correlated with household food security. However, the study focused only on annual crops grown by household farmers while ignoring perennial crops. Further, the study focused only on utilization tenet of food security and employed Household Dietary Diversity Score (HDDS) to measure food security. The current study considered both perennial and annual crops, and focused on all the four dimensions of food security to adequately address the subject of food security.

In Africa, crop production is majorly based on mixed cropping of cereals including maize, sorghum and millet with legumes such as beans (Singh & Ajeigbe, 2007). Adedipe et al. (2004) conducted a study in



South-Western Nigeria and found that 88 percent of the respondents practiced mixed cropping with a diverse number of crop combinations. Further, the study revealed that farmers in Nigeria earned gross income of over 300 percent, since their mixed cropping was over-yielded and reduced expenses behind the fertilizers (Singh & Ajeigbe, 2007). Another study by Adjimoti and Kwadzo (2018) in the Collines Region of Benin revealed that mixed cropping contributed positively and significantly to rural household food security. The study further indicated that farmer-specific and institutional variables like level of education, credit, household size, availability of produce storage facilities and access to extension service also affected household's food security status. Goshu et al. (2012) carried out a study in Eastern and Central Ethiopia and found out that mixed cropping was a positive determinant of household food security. However, the above studies focused on availability and accessibility tenets of food security while the current study looked at all the dimensions of food security.

A study by Baba and Abdulai (2021) on the determinants of mixed cropping and its influence on household food security in northern Ghana revealed significant positive associations between mixed cropping and household food security. However, the study used Herfindah index to measure mixed cropping, an index that was not employed in the current study. A study by Appiah Twamusi et al. (2022) found out that mixed cropping had a positive and statistically significant effect on farm household food security status. This finding revealed that mixed cropping had direct effects on food availability and accessibility at the household level. Thus, an increase in the mixed cropping index of a household increased its likelihood of achieving acceptable food consumption and attaining psychometric food security. However, the above study used the Theory of Diversification which was derived from Utility Maximization Theory, deviating from the current study that employed Food Availability Decline Theory and Food Endowment and Entitlement Theory to determine the effect of mixed cropping on household food security in Rarieda sub-County.

A study by Fawole and Oladele (2007) argued that mixed cropping improved household food security more so in households that adopted yam and maize crop mixture. Mango et al. (2018), in their study among smallholder farming households in central Malawi, found a positively significant relationship between mixed cropping and smallholder farm household food security. The study concluded that mixed cropping was one viable option for establishing resilient agricultural systems that could enhance farm household food security. Obasi et al. (2013) examined factors affecting agricultural productivity with 99 farmers in Nigeria. Results of their study indicated that mixed cropping systems of combining yam, cassava, maize, vegetable and melon were the main crops combinations practiced in the state. Adedipe (2004) conducted a study in Niger and found out that 88 percent of the respondents practiced mixed cropping with a diverse number of crop combinations. Further, the study revealed that mixed cropping led to 26 percent rise in total output and 32 percent rise in profit for cowpea farmers.

Ayanwuyi et al. (2010) assessed farmer's perception of the impact of climate change on food crop production in Ogbomoso Agricultural zone of Oyo State, Nigeria. About 74.7 percent of the farmers mentioned planting of different crops as adaptation strategies for the negative impact of climate change. A study by Okunlola and Ofuya (2013) revealed that mixed cropping had better growth and yield parameters that contributed to household food security. The study further revealed that mixed cropping system controlled insect pests on the farm. Ajayi (2014) estimated the economic comparative of mixed and sole cassava cropping systems in the six major cassava-producing states in Nigeria. The results of the study indicated that mixed cropping system provided opportunities of all-year-round farm incomes, serving as a better way to achieve food security. Furthermore, the study observed that the system lessened the likelihood of total crop failure. A study by Buyinza (2018) found out that mixed cropping of maize and beans among Ugandan farmers led to increased productivity, contributing to sustainable domestic food.

In Kenya, a study by Kemboi et al. (2016) found out that farmers who practiced mixed cropping generated high revenue and were food secure. A study by Fermont et al. (2010) revealed that intercropping of cassava as a staple crop was a common practice among the marginal farmers in Eastern Africa. In Kenya and Uganda, around 51 percent and 30 percent, respectively, of cassava acreage were intercropped with legumes mainly barley, beans, sorghum, groundnut and cotton. By this way, the economic return increased by over 70 percent compared to the sole cassava production (Fermont et al., 2010). Studies in Kenya by Matusso et al. (2013) and Kiprono (2012) found out that mixed cropping of maize and soya improved farmers income due to high yields. Herforth (2010) found a positive association between number of crops grown and farm household food security in Kenya.

3. Methodology

3.1 Data source

A cross-sectional research design was used to collect primary data on mixed cropping and household food security from heads of households in Rarieda sub-County of Siaya County, Kenya. The design allowed the researcher to measure the outcome variable and the exposure variables in the study respondents at the same point in time (Omedi et al. 2024; Mugenda & Mugenda, 2003). It provided information about the amount of food produced under mixed cropping agricultural system, and food available and accessible for consumption by the households all-year round. Secondary data was picked up from relevant publications and used to provide insights into the research topic by enabling comparisons of various studies on mixed cropping agricultural system and household food security.

3.2 Study variables

The outcome variable was household food security estimated as: food secure and food insecure. The exposure variables were: presence of mixed cropping; common mixed cropping regime; amount of yields; pest and disease prevalence; probability of crop failure; conservation agriculture; and dietary options as a result of mixed cropping.

3.3 Statistical analysis and results presentation

Quantitative data were descriptively analysed using Statistical Package for Social Sciences (SPSS version 22) computer programme. Results were presented in statistical tables in form of percentages, means and standard deviations. Qualitative data on the effect of mixed cropping on household food security were analyzed by creating themes and patterns relevant to the study. The results were interpreted and discussed in response to the purpose of the study.

3.4 Eligibility criteria

The analysis included data gathered from heads of households that were at least 18 years of age and practicing mixed cropping; five chiefs, one from each ward; and a sub-County Agricultural Officer in Rarieda sub-County. All other persons who did not meet this criterion were excluded from the study.

4. Results

4.1 Background characteristics of the study population

This section looked at gender, age, household heads, educational qualifications, household land sizes, level of household monthly incomes and main occupation as the main background characteristics of the respondents in the study area. The results were as presented in Table 1.



Table 1: Background characteristics of the respondents

Characteristics	Frequency	Percent
Respondents' Gender		
Male	187	48.69
Female	197	51.31
Respondents' Age (Years)		
18-35	99	25.82
36-50	118	30.72
51-65	87	22.55
66-70	64	16.66
>70	16	4.25
Respondents' Education Qualification		
None	0	0.00
Primary	79	20.59
Secondary	139	36.27
Certificate /Diploma	95	24.84
Degree and above	70	18.30
Head of the Household		
Male Headed	234	65.25
Female Headed	150	34.75
Approximate Household Size		
1	9	2.29
2-5	146	37.91
6-8	172	44.77
>8	58	15.03
Main Occupation		
Formal Employment	48	12.42
Business	98	25.49
Farming	181	47.06
Fishing	51	13.40
Other (Specify)	6	1.63
Monthly Income (Ksh.)		
≤4,000	108	28.10
4001-10,000	193	50.33
>10,000	53	21.57
Approximate Land Size		
1-3Ha	232	60.46
4-6Ha	118	30.72
Above 7Ha	18	4.50
Others (Specify)	16	4.25
TOTAL	384	100

The results as presented in Table 1 revealed a modest difference in gender: female respondents were 51 percent while the male respondents were 49 percent. This implied that for their livelihood, both females and males were actively involved in activities that produced food for their households. This finding conformed to the findings of Asha (2009) which found out that both men and women were actively participating in activities that aimed at providing food for the family.

About 31 percent of the respondents were within 36-50 years' age bracket, implying that agriculture was majorly done by the middle age population. The younger population normally migrates from rural to urban areas in search of employment in other sectors of economy leaving agriculture to the uneducated and older generation (Arunga, 2012). Additionally, agriculture is labor intensive, which makes it difficult for the older, lesser energetic population to practice it. The elderly (>70years old) were not actively involved in farming since they were less energetic.

On level of education, the study sought to determine how educated the respondents were as that would determine their ability to apply scientific knowledge and skills in agricultural productivity. The results in Table 1 revealed that about 20.59 percent of the household heads had primary education level, 36.27 percent had secondary education level, 24.84 percent had certificate and diploma education level while 18.30 percent had degree and above level of education. According to UNESCO (2015), basic education was important as it enabled people to read and understand the world around them. Educational attainment by the household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs by enabling them to read instructions on fertilizer packs and diversify household incomes so as to enhance household food supply.

On head of households, the current study aimed to establish where decision making and control over agricultural production resources were vested. The result on gender representation for household respondents and household heads was very significant as it brought in the aspect of gender participation which was seen to be very important in terms of food security and resource management (Adam et al., 2019). The findings in Table 1 revealed that majority (65.25%) of households were headed by male while female-headed households were at 34.75 percent. Generally, locally, males possess the ownership and control of land.

In establishing the household sizes, the study sought to ascertain the burden of feeding the families and this was important as it helped to estimate the household food ration requirement. The result in Table 1 revealed that majority of the households had 6 to 8 members (44.77%). This implied that the family sizes were big and needed high agricultural productivity to meet their food requirement needs. On determining the respondents' occupation, the study sought to assess the respondents' major sources of livelihoods. The results in Table 1 revealed that about 12.42 percent had formal employment, 25.49 percent engaged in business, 13.40 percent were fishermen, and majority (47.06%) practiced agriculture. This implied that most of the households' respondents in Rarieda were farmers who grow crops such as maize, sorghum, beans, millet and small-scale livestock keeping. This finding conforms to the findings of the report by Siaya County Integrated Development Plan (2018) which revealed that 60 percent of households in Rarieda practiced agriculture.

On determining the income brackets of respondents, the study sought to ascertain the respondents' ability to meet their financial obligations as far as their basic needs were concerned. The results in Table 1 indicated that majority of the respondents were low-income earners with Ksh 4,001 to 10,000 accounting for over 50 percent while those above Ksh 10,000 were only 21.57 percent. This implied that the households had low purchasing power and could barely meet the financial threshold to buy food stuff for their households in case they did not produce enough in their farms. Further, this indicator determined their ability to afford the agricultural inputs for food productivity. These findings corroborate the findings obtained by MoALF (2016) that revealed that Siaya County, where Rarieda sub-County sits, recorded a high poverty level of approximately 47.60 percent, hence persistent food insecurity.

Further, the results in Table 1 indicated that about 60.46 percent of the respondents had land sizes of 3 hectares and below. This implied that their small land-holdings could not sufficiently support meaningful agricultural productivity leading to scarcity and underproduction of agricultural produce, hence food insecurity. These findings agreed with the findings of a study by Obonyo (2016) in Ugunja



that revealed that most rural population depended on small ancestral land for production hence persistent food insecurity.

3.1 Effect of mixed cropping on household food security in Rarieda sub-county

Descriptive analysis involving percentage, mean and standard deviation was carried out to bring out the effect of mixed cropping on household food security in Rarieda sub-County, Siaya County, Kenya. The results were as presented in Table 2.

Table 2: Descriptive statistics on the effect of mixed cropping on household food security in Rarieda sub-County

Mixed Cropping Statements	Strongly agreed	Agreed	Neutral	Disagreed	Strongly disagreed	Mean	S. D.
I do practice mixed cropping regime to enhance my household food security	29.74%	39.22%	9.15%	16.99%	4.90%	3.72	1.198
Maize and beans are the most common mixed cropping regime with most households	41.18%	39.22%	6.21%	10.46%	2.94%	4.05	1.076
Mixed cropping regime gives better yields than mono-cropping regime	33.66%	37.58%	6.54%	14.71%	7.52%	3.75	1.269
Mixed cropping regime makes pest and diseases less prevalent	21.24%	45.42%	7.19%	16.99%	9.15%	3.53	1.252
Households rarely experience total crop failure under mixed cropping regime	17.79%	37.25%	8.82%	24.84%	11.11%	3.26	1.312
Mixed cropping cushions farmers from weather related crop failure.	34.64%	38.89%	7.84%	12.42%	6.21%	3.83	1.207
Mixed cropping promotes conservation agriculture and the land can sustain high crop yields over a long period of time	31.05%	37.58%	7.52%	15.69%	8.17%	3.68	1.284
Mixed cropping enhances dietary options available for the households	34.97%	36.27%	8.17%	14.05%	6.54%	3.79	1.242
Mixed cropping regime gives surplus yields that can be sold to acquire other household needs not harvested from the farm	24.51%	33.33%	14.71%	19.61%	7.84%	3.47	1.268
In mixed cropping regimes perennial crops are grown with seasonal crops and this ensures continuous supply of food to the households	30.72%	29.74%	7.52%	17.97%	14.05%	3.45	1.439
Composite Mean and Standard Deviation (S.D.)						3.65	1.255

The results as presented in Table 2 revealed that respondents, at 29.74 percent, agreed while 39.22 percent strongly agreed that they practiced mixed cropping regime to enhance their household food security. Most of the households in Rarieda sub-County adopted various mixed crop combinations such as maize and beans, maize and groundnuts, millet and maize. This could be understood that most of the households had realized the food benefits that accrued from this system. It is noteworthy that households who adopted mixed cropping system realized better food security than those who had not because the system enabled household farmers to obtain a variety of foods which could be harvested at different intervals. Therefore, households had access to food most of the times. At times, household farmers could sell their surplus produce in the market to obtain income which they used to meet other household needs. These findings agreed with the findings of the study by Cho et al. (2016) which revealed that mixed cropping was positively correlated with household food security. However, the study by Cho et al. (2016) focused only on annual crops grown by household farmers and not perennial crops. Further, the above study focused on utilization tenet of food security and employed Household Dietary Diversity Score (HDDS) to measure food security. The present study bridged all the identified gaps by focusing on all the four dimensions of food security and on both annual and perennial crops.

An interview with the key informant further revealed that;

When household farmers in the sub-County grow variety of crops on their farms, they are able to obtain food throughout the season since the system allows them to grow both the perennial crops such as potatoes, cassava and banana and seasonal crops such as maize and beans. This has helped most households in this area to be somehow food secure.

(Rarieda sub-County Agricultural Officer)

These sentiments revealed that a farmer who adopted mixed cropping systems of tubers and cereals was more likely to obtain food on regular basis, making them somewhat food secure. When probed further, farmers revealed that they faced several challenges such as inadequate funds which hindered them from accessing fertilizers and certified seeds which were necessary farm inputs towards realization of sufficient harvests.

The results in Table 2 revealed that approximately 41.18 percent of household's respondents strongly agreed while 39.22 percent agreed, respectively, that maize and beans were the most common mixed cropping regime. This was so because maize and beans combination were presumed to produce more yields compared to other combinations. Plate 1 showed mixed cropping of beans, maize and bananas crops in South Uyoma.

Plate 1: Mixed cropping of beans, maize and banana crops in South Uyoma



Source: Field data, 2023

In Plate 1, the good performance of intercropping maize and beans was as a result of the two crops utilizing natural resources more exhaustively. Green bean crop is a legume that helps in fixing biological nitrogen in the ground, transferring it to the maize cereal crop, and in increasing the efficiency of nitrogen use by the maize cereal crop as revealed by the studies of Kerman et al. (2019) and Zeng et al. (2021). Further, there occurs less incidences of pests, diseases and weeds attack when maize and beans are intercropped, an observation that leads to greater crop yields per unit area. The study findings agreed with that of Arunga et al. (2012) which found out that most farmers in the country preferred maize and beans combination. Bouman's (2009) findings that a bigger percentage of households in Africa valued maize and beans also conformed with the current study findings. However, the current study findings differed with the findings of studies by Obasi et al. (2013) and Fawole and Oladele (2007) which listed crops such as yam, cassava, maize, vegetable and melon as the main crop combinations practiced in Nigeria.

The results in Table 2 further revealed that respondents at 21.24 percent strongly agreed and 45.42 percent agreed, respectively, that mixed cropping regime made pest and diseases less prevalent and that enhanced crop yields and productivity. Pest attack is a major issue in small-holder agriculture. Mixed cropping of maize and beans has been found to have suppressive effects on the number of pests and diseases such as bean rust, bacterial blight which majorly affect beans and armyworms and gray leaf spot which attack maize. These pests and diseases if not checked can lead to total loss of farm produce. Maize, being the staple food for most households in Rarieda, if attacked by pests such as armyworms and diseases such as gray leaf spot can lead to low produce that can further escalate food insecurity in the area. Therefore, households in the sub-County adopted mixed cropping system due to its ability to make pests and diseases less prevalent. For instance, about 66 percent of the households' respondents confirmed that severity of pests and diseases greatly declined whenever they adopted mixed cropping system of maize and beans. This system made it difficult for the pest and diseases to spread through the farm; it also decreased the availability of host plants and alteration of pathogen dispersal by micro-climate changes. These findings affirmed the findings of a study by Ememwa et al. (2017) which revealed that cassava brown streak disease was managed by mixed cropping.

The results in Table 2 further established that almost 17.79 percent of the respondents strongly agreed while 37.25 percent agreed, respectively, that mixed cropping regime was credited for saving the households from experiencing total crop failure. The household farmer could access food throughout the season because if one crop failed to produce the household farmers could still rely on the other crop. For instance, the household farmer in Rarieda sub-County who had mixed crops like maize and beans on one farm, bananas and groundnuts on the other farm, and potatoes and cassava on the other farm could obtain food consistently because even if maize failed to yield they could still turn to groundnuts, beans, cassava, potatoes and banana which they could consume and sell the surpluses to get money to buy other foodstuffs such as meat and fish so as to improve food security status of households. This finding conformed to the findings of a study by Streit et al. (2019) which found out that mixed cropping lessened the likelihood of total crop failure because if one crop failed the other crop in the field could still produce.

The results from Table 2 further indicated that about 30.72 percent of the respondents strongly agreed while 29.74 percent agreed, respectively, that in mixed cropping regimes perennial crops such as sweet potatoes, cassava and banana were grown with seasonal crops such as maize and beans. This ensured continuous supply of food to the households thus improving the food security status of households. These findings agreed with findings of studies by Frison et al. (2013), Streit et al. (2019) and Lithourgidis et al. (2011) which revealed that mixed cropping provided households with food throughout the season.

4. Conclusion

The study summed up the following to be the leading effects of mixed cropping on household food security in Rarieda sub-County: the practice aimed at enhancing food security (68.96%); maize and beans were the most common mixed cropping regime (80.40%); mixed cropping gave better yields than monoculture (71.24%); reduced pests and diseases prevalence (66.66%); reduced chances of total crop failure (55.04%); cushioned farmers from weather-related crop failure (73.53%); promoted conservation agriculture (68.63%); enhanced household's dietary options (71.24%); gave surplus yields that could be traded for other household needs (57.84%); and incorporated both perennial and seasonal crops (60.46%).

Clearly, there was a positive association between mixed cropping and household food security in Rarieda sub-County, with a composite mean of 3.65 and a standard deviation of 1.255. Besides emphasizing the practice of mixed cropping for household food security, the study recommended adoption of mixed crop-livestock farming as such is more resilient to climate and environmental extremes. Synergized livestock husbandry and crop production is able to increase productivity, resource efficiency, farmer income and food security while maintaining environmental services.

Compliance with ethical standards

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Disclosure of conflict of interest

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Decarbonizing Urban Hospitality: A Qualitative Study of Greenhouse Gas Emissions in Nairobi Hotels

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ABSTRACT

As Nairobi emerges as a top urban tourism destination in East Africa, there is a growing focus on the environmental impact of its hotel industry, especially regarding the carbon emissions from hotels. This study analyzed greenhouse gas (GHG) emissions in a sample of 12 hotels, carefully selected to represent a range of star ratings in the city. Data was collected through detailed interviews with hotel managers, technical staff, and service providers. The research found that most emissions originate from diesel generators, inadequate waste management, reliance on single-use plastics, and energy- and labor-intensive laundry processes. Hotels with higher star ratings produced significantly more emissions, mainly due to increased demand and energy consumption. Efforts to reduce emissions faced challenges from limited institutional knowledge and the absence of standardized carbon reporting protocols. The study recommends adopting renewable energy sources, enforcing waste segregation, and developing hotel-specific carbon accounting systems. By aligning these recommendations with Kenya's commitments under the Paris Agreement and Sustainable Development Goal 13, Nairobi's hotel industry can provide higher-quality guest experiences that are also more sustainable, setting a benchmark for other African cities in sustainable urban tourism.

Keywords: carbon emissions, hospitality, sustainability, Nairobi hotels, urban tourism, SDG 13

1. Introduction

Global climate change has specifically highlighted sectors that play a substantial role in the release of greenhouse gases (GHGs), and tourism has been pinpointed as one of them. Of the numerous aspects of the tourism industry, the hotel sector has specifically been highlighted due to high energy usage, resource consumption, and waste production. The hotel operation methods, such as the thermal control of bedrooms, laundry, provision of food, and usage of plastics, put high strain on the environment's balance (Gössling & Peeters, 2015; Zhang et al., 2018). Whereas conventional literature has extensively focused on emissions from transportation and flying, research and policy circles have increasingly highlighted the carbon impact of accommodation services, especially on urban hotel types.

In many developing countries, debate on the topic of greenhouse gas emissions has been largely theoretical, mainly due to a lack of data and weak institutional frameworks. The case in Nairobi, the capital of Kenya and a major tourist and commercial hub in East Africa, is a telling example. Despite the growth of Nairobi and its hospitality industry, little has been done to measure the impact of these developments on carbon emissions. Many of the hotels in Nairobi, especially those with good ratings, have mainly relied on diesel generators due to an unreliability in the power supply, used energy-intensive services like laundry and housekeeping, and used vast amounts of single-use plastics (Maithya, 2023). However, few of these hotels have adopted tracking and reporting systems for their environmental footprint.

At the same time, Kenya evidenced a clear commitment to climate change through observance of the international treaties, such as the Paris Agreement and the Sustainable Development Goals (SDGs), and specifically highlighted SDG 13 (Climate Action). The National Climate Change Action Plan (2018–2022) set targets to reduce emissions and encourage the use of renewable energy, but the hotel



industry was almost completely ignored in such plans. The ignorance of the hotel industry meant that, despite hotels being major emitting entities within urban environments, there were no set protocols for measuring or reducing the environmental impact related to hotels (Abeydeera & Karunasena, 2019).

Several regional studies carried out across the world have shown that higher-rated hotels often generate higher levels of carbon, as a result of their larger physical footprints, better amenities, and higher service demands (Chen et al., 2020; International Tourism Partnership, 2018). These findings align with those of Nairobi. Hotels with more complex operations, those of 4 and 5 stars, for instance, had higher rates of electricity and fuel usage, produced higher levels of waste, and showed higher levels of dependency on extensive supply chains and labor networks. There existed, however, a significant lack of awareness on the part of hotel managers and workers of the environmental effects of such activities, and a lack of guidance on ways of reducing them.

This study sought to fill this gap through the conduct of a qualitative assessment of emissions at 15 hotels conveniently selected across Nairobi. In interviews with hotel managers, technicians, and service providers, the research examined standard operational methods and identified major emission sources. In addition, the research explored how hotel size, rating, and organizational expertise influence the scope of carbon footprints. Thus, the research aspired to provide practical recommendations on emissions minimization at the hotel level, which can be attained through enhanced waste management methods, integration of renewable energy technologies, and deployment of simplified carbon accounting methods.

Finally, this study has progressed the necessary dialogue on sustainable tourism in African urban centers. As hospitality in Nairobi and other places continues to grow, there is a critical need for solutions that sit within local contexts and that harmonize with both economic development and environmental conservation. Through a focus on practical solutions and integrating the insights of industry stakeholders, the research sought to influence both policy-making and the actual implementation of policies, hence guiding the industry toward a climate-resilient and environmentally sustainable future.

2. Research Design

This research used a qualitative methodology, employing a semi-structured interview guide to explore sources of carbon emissions and mitigation issues in urban hotels in Nairobi. The approach provided in-depth insights into operational practices, staff awareness, and institutional barriers. Data were collected through direct interviews with hotel personnel, capturing lived experiences and managerial perspectives relevant to sustainability and emissions. This design was suitable for understanding complex, context-specific environmental practices in real-world hospitality settings.

2.1 Instruments for Data Collection

Data was collected using a semi-structured interview guide developed to acquire detailed answers regarding hotel operations related to carbon emissions. The guide consisted of standardized questions that focused on areas like energy usage, waste management, plastic usage, and environmental awareness.

Data collection was made possible through three main instruments:

1. Audio recorder – used to capture interview responses for transcription.
2. Notebook and pen – for note-taking during interviews and observations.

A printed interview guide was sent to participants before each session to encourage openness and enable well-informed participation.



Before each interview started, participants were briefed on the objectives and importance of the study. Informed consent was obtained, and respondents were encouraged to ask questions and clarify any issues they may have. Interviews were only done after participants fully understood the process and agreed to participate.

2.2 Data Analysis

The data collected from interviews was subjected to thematic analysis, which is a qualitative method aimed at discovering patterns and meaning within narrative feedback. The responses were transcribed and thoroughly coded to determine major themes related to carbon emission sources, business practices, and organizational consciousness.

The interview schedule also gathered data on hotel amenities and services, such as generator use, waste management practices, and laundry methods, previously explored through their contribution to carbon emissions. Thematic categories were determined by an inductive process, allowing for comparisons across different classifications of hotels and types of establishments.

2.3 Key Informant Interviews

To acquire a deeper operational understanding of carbon emission sources and sustainability measures, the current research employed Key Informant Interviews (KIs) of selected hotel staff. The interviews included representatives of four major staff categories: hotel management, front desk officers, food and beverage, and maintenance staff. The choice of informants was deliberately strategic and based on their respective positions, mandates, and specialties pertinent to hotel operations regarding energy use, waste generation, and service provision.

Purposive sampling was used to ensure the participation of persons responsible for direct energy use, facilities management, and guest service activities. The selection and interview variables were guided by literature and prior research on environmental practices within hotel management. The variables subjected to examination include energy procurement, maintenance functions, food service, and guest service activities, which all contribute to carbon emissions in varying degrees.

Information gathered during interviews underwent thematic analysis in order to enable the identification of patterns and discrepancies in responses in various types of hotel categories.

Tables 1: Key Informant Interview Summary by Hotel Category

Hotel Category	Participants	Selection Criteria and Rationale
1-Star Hotels	2 managers, 1 receptionist, 1 maintenance officer, 1 kitchen staff	Managers appointed by hotel owners; receptionists handle guest services; maintenance oversees energy systems; kitchen staff manage food service
2-Star Hotels	2 managers, 1 receptionist, 1 maintenance officer, 1 kitchen staff	All participants were directly engaged in hotel operations relevant to emissions; purposive selection based on roles
3-Star Hotels	2 managers, 1 receptionist, 1 maintenance officer, 1 kitchen staff	Selected based on their technical or service-related roles influencing operational efficiency and emissions
4-Star Hotels	2 managers, 1 receptionist, 1 maintenance officer, 1 kitchen staff	Senior staff with oversight over energy-intensive and guest-oriented services; selected for their operational insights

Source: Field Survey, 2025

3. Results

The findings from the key informant interviews showed a direct relationship between Nairobi's hotel activities and greenhouse gas (GHG) emissions. The views of the respondents were assessed against several factors, such as electricity sources, fuel usage, transportation services, plastic usage, waste production and management, and laundry operations. Thematic analysis, supported by field observations, showed a common lack of environmental awareness among different hotel categories, with most operations showing minimal initiatives toward carbon reduction.

With regard to energy demand, most responses stated that they rely on the national grid (Kenya Power), complemented by diesel generators. Despite the frequent power blackouts and general supply variability, a significant increase in the use of generator sets was noted in hotels, especially of higher ratings, to satisfy their energy needs. In contrast, one-star hotels used their generator sets for power supply only within special time frames, depending on their resource status and service levels. As such, fuel consumption increased in relation to the level of services provided, as three- and four-star hotels showed substantially higher diesel or petrol consumption due to their higher energy needs.

Transportation methods ranged greatly within hotel classes. One-star hotels normally operated on lower capacities and lacked transportation service to customers, relying on public means of transportation for the movement of staff and goods procurement. Conversely, four-star hotels had a higher probability of carpooling or shuttle service specific to the needs of international customers and had dedicated chauffeurs for service and food service movement. The increased transportation demand in higher-class hotels represented higher fuel consumption and respective carbon emissions. Information gathered on fuel purchases validated these findings. Interviews had shown that daily fuel amounts purchased were inherently determined by electricity needs and service offerings. Irregular power supply has led to more dependence on generators, particularly for hotels offering full services. Larger hotels found it difficult to operate effectively without a stable supply of electricity, leading to a substantial increase in fuel consumption and related emissions.

Waste generation patterns were closely linked to the type of hotel operations. One-star establishments produced very little waste compared to two- and three-star hotels, which generated moderate amounts. Four-star hotels produced the most waste due to their comprehensive kitchen, guest, and event services. The waste sorting practices across all categories were inadequate: nearly all one- and two-star hotels lacked waste segregation systems. A small number of three- and four-star hotels had basic sorting measures, but overall, compliance with regulatory standards was minimal. Interviewees valued the waste management services provided by Nairobi City County; however, they were dissatisfied with the delays and inefficiency of waste collection, especially in lower-ranked hotels.

Plastic use was common across all hotel types, mainly for food and beverage services. Bottled water, packing materials, and takeout containers were widely used. While one-, two-, and three-star hotels showed some reuse of plastic, their recycling efforts were mostly informal and limited. Four-star hotels, however, demonstrated a stronger commitment to reuse, resale, and recycling, although they still lacked a well-organized sustainability strategy. Plastic use was often justified as necessary for enhancing guest convenience, especially with takeout services.

Laundry activities were found to be a significant source of greenhouse gas emissions. Most hotels offered laundry services not only for in-house guests but also for external customers, which led to enormous augmentation in terms of water and energy consumption. This trend was noted in all categories of hotels, though strongly in the mid-range and higher-category hotels. Few of these establishments promoted eco-efficient laundry technology or practices to mitigate such negative impacts.



Transportation emissions have been identified as a major environmental issue. The hospitality industry's direct connection to transportation, particularly concerning guest transfers and in-house logistics, means that hotels actively contribute to the increase in carbon emissions in transportation. This is especially true among higher-rated hotels that offer airport shuttle services and carpooling.

Overall, the research identified an entrenched deficit in awareness and official records on carbon emissions. None of the hotels interviewed had in place protocols relating to reporting or measuring greenhouse gas emissions. There existed little institutional knowledge on climate change effects, and staff training on sustainability concerns occurred relatively infrequently. The absence of harmonized carbon accounting tools and political incentives compounded the issue, consequently putting Nairobi's hotel industry at a competitive disadvantage in achieving national climate targets or external commitments like the Paris Agreement.

Table 2. Perception and Assessment of Hotel Management on Carbon Emissions in One-Star Hotels

Variable	Theme	Perception Summary
Source of Power	Generator and National Grid	100% of respondents reported using both generator and grid electricity. However, due to the unreliability of the grid, generators were more heavily relied on.
Transportation Services	None	All (100%) hotels did not offer guest transportation or logistics services, citing their small-scale operational model.
Kitchen Services	Public transport	95% of kitchen staff relied on public transportation; only 5% used hotel-provided transport for kitchen supply runs.
Fuel Usage	Diesel & petrol	80% relied on limited electricity and used generators as needed. Fuel consumption was low due to budget and service limitations.
Waste Generation	Low quantity	90% of hotels generated low waste volumes; 10% generated a moderate amount due to slightly higher guest turnover.
Waste Sorting	Not practiced	100% of respondents confirmed no waste segregation practices in place.
Waste Management	Government-managed	All hotels used city waste management services. However, 20% reported delays and dissatisfaction with waste collection efficiency.
Plastic Use	Bottled water & takeaways	90% of hotels actively used plastic products; 10% expressed reservations.
Plastic Usage Rate	Moderate to low	50% indicated moderate plastic use; 50% indicated low use.
Plastic Waste Management	Recycling (external)	100% reported external recycling through municipal waste collectors or informal providers.
Laundry Services	For guests and outsiders	90% of hotels provided laundry services to both guests and outsiders; 10% offered the service exclusively to guests.

Table 3. Perception and Assessment of Hotel Management on Carbon Emissions in Two-Star Hotels

Variable	Theme	Perception Summary
Source of Power	Generator and National Grid	100% of respondents reported using both generator and grid electricity, with the grid deemed unreliable and inconsistent.
Transportation Services	None	95% did not offer any transportation to guests or staff; only 5% used hotel-owned vehicles for operational tasks like purchasing supplies.

Fuel Usage	Diesel & petrol (moderate use)	80% noted substantial reliance on generators due to poor grid supply; 20% reported moderate use based on scheduled grid power availability.
Waste Generation	Medium quantity	90% of hotels produced a medium volume of waste; 10% produced low waste due to limited operations.
Waste Sorting	Not practiced	100% of respondents indicated a lack of any waste segregation system.
Waste Management	Government-managed	All hotels relied on city waste services; no reports of delays or dissatisfaction with collection in this category.
Plastic Use	Bottled water only	95% acknowledged regular plastic use; 5% expressed concern about plastic consumption.
Plastic Usage Rate	Low to moderate	55% reported moderate use; 45% indicated low usage of plastics.
Plastic Waste Management	Disposal only	100% of plastic waste was disposed of without reuse or recycling efforts.
Laundry Services	For guests and outsiders	77% provided laundry services to both external clients and guests; 23% offered laundry only to in-house guests.

Source: Field Survey, 2025

Table 4. Perception and Assessment of Hotel Management on Carbon Emissions in Three-Star Hotels

Variable	Theme	Perception Summary
Source of Power	Generator and National Grid	100% of respondents relied on both grid electricity and generators, citing the grid's unreliability as the reason for frequent generator use.
Transportation Services	Carpool and designated drivers	40% of hotels provided carpool services, particularly for diaspora guests; 60% did not offer any guest transport services.
Kitchen Services	Designated driver & public transport	85% used hotel-designated vehicles for kitchen logistics; 15% relied on public transportation.
Fuel Usage	Diesel & petrol (high consumption)	80% reported high generator use due to poor grid supply; 20% experienced more stable electricity from dedicated transformers, reducing fuel dependence.
Waste Generation	High to medium	90% produced high volumes of waste due to extensive services; 10% reported medium levels linked to fewer guests or scaled-down operations.
Waste Sorting	Limited (a few hotels only)	85% did not practice waste sorting; 15% followed basic segregation procedures aligned with hotel policies or external regulations.
Waste Management	Government-managed	All hotels relied on city waste collection services; 20% reported delays or inefficiencies in waste removal.
Plastic Use	Bottled water & takeaway containers	90% used plastics extensively in food and beverage services; 10% showed minimal or selective use.
Plastic Usage Rate	Moderate to low	50% indicated moderate use of plastics; the remaining 50% reported lower usage, mainly due to internal policies.



Plastic Waste Management	Reuse and informal recycling	20% reused or resold plastic waste; 80% engaged in recycling, often through informal or third-party waste handlers.

Source: Field Survey, 2025

Table 5. Perception and Assessment of Hotel Management on Carbon Emissions in Four-Star Hotels

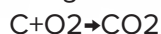
Variable	Theme	Perception Summary
Source of Power	Generator and National Grid	100% of respondents confirmed dual reliance on grid electricity and generators, citing the inconsistency and unreliability of grid supply as a major concern.
Transportation Services	Carpool and designated drivers	80% offered carpool or shuttle services for international and high-profile guests; 20% did not provide transportation services, relying on guests' arrangements.
Kitchen Services	Designated drivers	100% of respondents used hotel vehicles for kitchen procurement, citing frequent supply runs and the need for reliability.
Fuel Usage	Diesel (very high consumption)	75% indicated substantial daily fuel use due to the continuous operation of multiple services; 25% managed moderate consumption with scheduled power use.
Waste Generation	High	95% reported generating large waste volumes owing to full-service offerings; 5% indicated moderate levels linked to size and guest turnover.
Waste Sorting	Limited (partial implementation)	70% did not practice waste sorting; 30% engaged in segregation following internal or regulatory guidelines.
Waste Management	Government-managed	100% used city-managed waste services; none reported collection delays, and most were satisfied with the service provided.
Plastic Use	Bottled water & takeaway containers	90% reported active plastic use for guest convenience; 10% expressed concern and implemented moderate reduction strategies.
Plastic Usage Rate	High	75% reported high use due to food delivery and takeaway services; 25% practiced minimal use.
Plastic Waste Management	Reuse and recycling	40% reused or resold plastic waste; 60% engaged in structured recycling systems, often involving third-party collection.

Source: Field Survey, 2025

3.1 Evaluation of Emission Factors

The study of emission factors from one- to four-star hotels in Nairobi revealed a strong correlation between the hotel's size and its greenhouse gas (GHG) emissions. An increase in hotel size, measured by total accommodation units and the range of services offered, was found to be positively associated with higher emissions (see Tables 6–9). Larger hotels, especially those providing a variety of services such as restaurants, fitness and well-being centers, bars, and recreational pools, exhibited higher carbon emissions due to elevated energy use and waste production. This finding supports previous research, which shows that luxury hotels tend to emit more GHGs compared to smaller accommodation or self-catering units, as they require more infrastructure and services (Chen, Zhang, & Li, 2020).

To assess emissions, the research followed the methodology suggested in the literature by the Intergovernmental Panel on Climate Change (IPCC) and other related sources (Intergovernmental Panel on Climate Change [IPCC], 2006; Intergovernmental Panel on Climate Change [IPCC], 2019). The calculation of carbon dioxide (CO₂) emissions due to the combustion of fossil fuels has been done using the known chemical reaction as follows:



Using the atomic weights (carbon = 12, oxygen = 16, carbon dioxide = 44), the conversion ratio of carbon-to-carbon dioxide would be approximately:

$$44/12 \approx 3.67$$

Therefore, the direct coefficient used to convert the carbon content of fossil fuels into emissions of carbon dioxide is 3.67, consistent with the internationally accepted standards of emissions accounting.

Additionally, the emissions from solid wastes were calculated by using the volume of MSW incinerated, based on the IPCC Guidelines for Greenhouse Gas Inventories (United Nations World Tourism Organization [UNWTO], 2020). The formula used for emission calculation was:

$$m_i = WB \times EF_i$$

Where:

M_i represents the emission of pollutant i .

EF_i = Emission factor for pollutant i (in kg-CO₂/ton MSW)

WB = Amount of MSW burned (kg/year)

During the current research, the average emission factor of the open incineration of waste, commonly found in Kenya, was determined to be 801.2 kg CO₂/metric ton of waste, which corresponds to 0.88 kg CO₂/kg of MSW, as noted in Oladeji, Adebayo, & Osei (2024). These rates were used in assessing the contribution of waste from hotels to the total emissions associated with a specific type of hotel.

By incorporating energy consumption and waste generation emission factors, the study offers a detailed analysis of operational emissions in Nairobi's hospitality sector. The analysis reveals key areas of intervention by policies and sustainable practices that can help significantly reduce environmental impacts.

Table 6. Emission Factors for One-Star Hotels in Nairobi, Kenya

Hotel Name	Fuel Consumed per Week (Litres)	Waste Generated per Week (Litres)	Average Number of Guests per Week	Emissions from Fuel (kg-CO ₂)	Emissions from Waste (kg-CO ₂)
La Miguella Guest House	700	1200	28	2,569	1,056
Oloolua Resort	630	720	49	2,312.10	633.6
Sweet Home Guest House	300	960	33	1,101	844.8

Source: Field Survey, Nairobi (2025)



Table 7. Emission Factors for Two-Star Hotels in Nairobi, Kenya

Hotel Name	Fuel Consumed per Week (Litres)	Waste Generated per Week (Litres)	Average Number of Guests per Week	Emissions from Fuel (kg-CO ₂)	Emissions from Waste (kg-CO ₂)
Seldom Hotel	850	1350	64	3,119.50	1,188
Hotel Southern Blue	670	1000	55	2,460.90	880
Caphill Hotel	720	1180	48	2,642.40	1,038.40

Source: Field Survey, Nairobi (2025)

Table 8. Emission Factors for Three-Star Hotels in Nairobi, Kenya

Hotel Name	Fuel Consumed per Week (Litres)	Waste Generated per Week (Litres)	Average Number of Guests per Week	Emissions from Fuel (kg-CO ₂)	Emissions from Waste (kg-CO ₂)
Kahama Hotel	1,200	1,600	84	4,404	1,408
Impala Hotel Parklands	1,050	1,400	75	3,853.50	1,232
Triple O's hotel	1,100	1,520	79	4,037	1,337.60

Source: Field Survey, Nairobi (2025)

Table 9. Emission Factors for Four-Star Hotels in Nairobi, Kenya

Hotel Name	Fuel Consumed per Week (Litres)	Waste Generated per Week (Litres)	Average Number of Guests per Week	Emissions from Fuel (kg-CO ₂)	Emissions from Waste (kg-CO ₂)
La Mada Hotel	1,800	2,200	110	6,606	1,936
The Heron Hotel	1,720	2,100	104	6,312.40	1,848
Emara Ole-Sereni	1,900	2,400	116	6,973	2,112

Source: Field Survey, Nairobi (2025)

4. Discussion

4.1 Emission sources in Nairobi hotels

The United Nations World Tourism Organisation (UNWTO) has also presented that the entire hotel sector releases approximately 1% of all carbon emissions (International Tourism Partnership, 2018). As an economically developing and fast urbanising capital, Nairobi is one of the key tourist and hotel hubs in East Africa. From the studies, it has been revealed that Nairobi hotels' activities are among the causes of the emission of greenhouse gases, through transport, use of energy, and waste management.

Transportation was one of the highest emission sources, more so in high-rated hotels (3–4 stars) that typically run carpool and airport transport for visitors. This is also in line with the United Nations World Tourism Organization [UNWTO] (2020)'s report, wherein the transport sector on the entire globe contributed around 7.3 billion metric tons of CO₂ emissions in 2020, and therefore, it is one of the highest contributors to climate change. In Nairobi, excessive use of internal combustion vehicles running on PMS and diesel emits more carbon, in line with previous studies, wherein transport-related CO₂ has been estimated among the highest emitters in urban economies.

4.2 Energy Use and Greenhouse Gas (GHG) Emissions

From the data gathered in the 1 to 4-star hotels, it has been discovered that there is a direct correlation between energy consumption and CO₂ emission. As in the rest of the cities within Africa, Nairobi hotels also significantly rely on diesel generators because the supply of electricity is unreliable. This also corroborates with Mozersky & Kammen (2018), where generators are seen providing over 6% of the installed energy capacity within Africa, partly due to the lack of capital investment in renewable energy installations.

Some Nairobi hotels, particularly 3-star and 4-star, would use over 6,000 kg of CO₂ worth of fuel weekly to run facilities like hot pools, spas, washing machines, and restaurants. This concurs with Abdallah & El-Shennawy (2013) and Chen, Zhang, & Li (2020), whose research results showed that fossil-fuel burning in the hotel industry released significant quantities of carbon dioxide (CO₂), nitrogen oxide (NOX), nitrous oxide (N₂O), sulfur dioxide (SO₂), and methane (CH₄) gases, all powerful GHGs. As Kenyan hospitality continues to grow, petroleum-powered system uses will continue to increase emissions if more emphasis is not placed on sustainable conversions.

4.3 Solid Waste Carbon Emissions

Waste management also constituted one of the key emission points in Nairobi hotels. The research findings indicated that, with the increase in the class of hotels, waste generated also climbed, and four-star hotels produced the maximum amount. The above finding confirms the United Nations World Tourism Organization [UNWTO] (2020) and Wu, Lai, & Tang (2021), whose studies indicated the high role of the hotel industry in providing urban waste flows. Burning of waste, primarily open burning (which is common in Kenya), results in very high emissions of CO₂, estimated at around 0.88 kg CO₂ per kg of solid waste (SW).

The study identified that a majority of hotels offload waste management to local councils, yet few hotels utilize efficient recycling or segregation mechanisms. This is in line with findings in the Sustainable Hospitality Alliance (2021), which similarly conclude that waste reporting and auditing are necessary to facilitate emission reductions. Shifts toward reduce-reuse-recycle (3Rs) behavior for hotels can also drive faster reductions in environmental footprints and facilitate closer alignment with SDG 12 (Responsible Consumption and Production).

4.4 Nairobi Hotels' Carbon Footprints

The carbon footprint calculation carried out in the study also reflected a strong correlation between emissions and hotel class. The bigger hotels possessed bigger service facilities and always reported higher emissions, consistent with Chen, Zhang, & Li (2020)'s finding that high-end hotels with spa, bar, and conference facilities consume more energy and produce higher waste than budget hotels and guest houses.

In Nairobi, electricity generation, fuel burning, waste, and laundry services were the overall leading causes of each of the hotels' entire carbon footprint. Despite being connected to grid electricity, the majority of the hotels generate electricity independently through diesel generators, hence the poor resilience of electric infrastructures within Kenyan cities. This confirms Gössling & Peeters (2015), whose review revealed that the accommodation sector bears an unfair share of the overall emissions of tourism, given the high energy intensity of guest services.

These results reveal the emphasis on the capital city's hospitality sector adopting carbon accounting technologies and reduction of emissions, especially considering that the sector is still expanding in the aftermath of increasing tourist inflows.



4.5 Carbon Footprint Minimization Strategies

The findings also suggest the need for policy interventions and campaigns to reduce carbon emissions in hotels. That is also in line with the work of (Abeydeera & Karunasena, 2019; Hertwich et al., 2019; & Sustainable Hospitality Alliance, 2021), who again emphasize the need for multi-stakeholder engagement, governments, researchers, and hoteliers in developing sustainable solutions to reduce emissions.

Levels of awareness among staff and visitors were low, and therefore, training and education programs among the staff were also required. Carbon literacy is essential to changing behavior, according to Mensah (2020), and therefore, such education has to be incorporated at every level of hotel operation. These kinds of programs need to be localized and incorporate low-cost initiatives such as energy audits, low-flow water systems, solar water heaters, and waste reduction enhancements.

In accordance with the Global Hotel Decarbonisation Report, hotels worldwide must cut absolute carbon emissions by 60% in 2030 and 90% in 2050 in a bid to remain within long-term climate targets ([International Tourism Partnership, 2018). Nairobi hotels are not left behind. As the tourism sector is still growing in the region, cutting GHG emissions will be necessary towards achieving such development, ecologically sustainable, economically sound, and socially equitable.

5. Conclusion

The research intended to assess Nairobi hotels, Kenya, in terms of their carbon footprint and greenhouse gas (GHG) reporting. 12 one to four-star-rated hotels were sampled based on their CO₂ emissions, the leading greenhouse gas of concern. The research findings were that electricity produced from diesel is the largest single source of emissions, especially for hotels with minimal access to reliable grid electricity. Others, like the production of solid waste, laundry, and water consumption, were significant sources of emissions that indirectly add to GHG emissions via energy consumption and waste breakdown (Oladeji et al., 2024).

The study also revealed that the methodology used, in reconciling activity data and emission factors (EFs) through the implementation of IPCC protocols, is expandable outside of the pilot sample to the whole hotel sector. It can be utilized in emission baselines development required in monitoring, benchmarking, and carbon footprint savings strategy development in the sector (Abeydeera & Karunasena, 2019).

One of the main constraints was the absence of policies or enforcement measures with clear objectives for hotel emissions in Nairobi. Their absence has hindered the development of incentives for hotel owners to adopt environmental management practices or to implement open-source GHG accounting guidelines. This issue is common in tourism-heavy areas where policy gaps and limited climate awareness have impeded sustainable development (Wu, Lai & Tang, 2021; Oladeji et al., 2024).

To curb this problem, this study proposes a model of environmental responsibility integration of hotels. It includes the promotion of:

- i. Education and environmental awareness of tourists and hotel workers.
- ii. Public-private partnership capacity-building programmes.
- iii. Harmonization of the national institutions with Kenya's national climate targets;
- iv. Regular reporting and GHG disclosure using web-based reporting and dashboards for transparency reasons.

Besides, executing creative and technological measures is essential in relation to emission curbing. They are:

- i. Installation of renewable energy technologies like solar PV, biogas systems, and energy storage in a bid to minimize the utilization of diesel generators (Mozersky & Kammen, 2018);
- ii. Smart integration of building technologies such as automatic lighting, energy-efficient appliances, and IoT-driven HVAC systems to rationalize the use of energy (Abdallah & El-Shennawy, 2013);
- iii. Deployment of technologies for digital reporting and monitoring, like carbon accounting software, GHG reporting using blockchain for higher transparency, and predictive analytics using AI to identify emission hotspots (Hertwich et al., 2019);
- iv. Introduction of new waste-to-energy technologies and water recycling projects to curb indirect emissions (Mensah, 2020).

This change should be accompanied by:

- i. Sustainable building designs and retrofitting of buildings with green technologies (Sustainable Hospitality Alliance, 2021);
- ii. Innovation-oriented development and execution of green operation policies (Elkhwesky et al., 2020);
- iii. Compliance with national and county environmental standards, backed by electronic tracking of compliance.

To accompany the findings outlined within, additional research is recommended on:

- i. The refrigerant and air-conditioning system's greenhouse gas imprint, of wider relevance in Nairobi city hotels, based on new technologies for cooling.
- ii. Hotels' transportation fleets, where the operation of electric vehicles and smart mobility systems can remarkably reduce emissions.
- iii. Sectoral greenhouse gas inventory development through big data and online platforms in accordance with the Paris Agreement Nationally Determined Contributions (NDCs) of Kenya.

Finally, if Nairobi's tourism industry is to grow alongside global climate ambitions, it needs to incorporate carbon literacy, sustainability, and technological advancement into its culture. This integration, besides being crucial for nature conservation, becomes essential for competitiveness in the increasingly climate-conscious global marketplace of international tourism (Sustainable Hospitality Alliance, 2021).

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SOLID WASTE MINIMIZATION PRACTICES IN KIGANJO, THIKA SUB-COUNTY, KIAMBU COUNTY, KENYA

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ABSTRACT

This study investigated waste minimization practices in Kiganjo in response to the growing environmental and health concerns associated with solid waste management. Guided by Fisher et al. formula, data was obtained from a minimum sample size of 384 residents in Kiganjo area of Kiambu County. Analytical findings indicated a significant positive relationship between waste segregation and waste minimization ($r = 0.436$; $p < 0.01$). Major types of wastes segregated were organic waste (25.1%), glass (23.1%), plastics (22.4%), paper and cardboard (18%), and metal (11.5%). The most cited motivation behind segregation was awareness of environmental impact, reported by 27.8% of the participants while community pressure and social norms (14.2%) had the least impacts implying that peer influence was not a major driver in this area. There was a significance positive relationship between waste recycling and waste minimization ($r=0.695$; $p < 0.01$). Major types of recycled wastes were paper (28.5%), plastics (20.4 %), glass (17.9%), metal (17.2%) and clothing and textiles at 16.1%. The leading motivation for recycling was the economic savings (e.g. selling recyclables), accounting for 31.3% of the responses while social and community responsibility (8.6%) were the least. There was a positive relationship between proper housekeeping and waste minimization ($r=0.281$; $p < 0.01$). However, majority of the respondents (73.7%) reported that they did not reuse materials from proper housekeeping with about 26.3% indicating that they did. The study concluded that waste minimization practices were influenced by awareness of environmental impact, local government initiatives and campaigns, availability of waste segregation bins, community pressure or social norms and personal habits or preferences. The study recommended provision of bins for public use, creation of public awareness on the importance and method of waste separation, establishment of community recycling stations and linking them to waste collectors and processors.

Keywords: Solid waste minimization; Waste segregation; Waste recycling; Proper housekeeping

1. Introduction

Domestic waste includes both biodegradable components, such as food leftovers, kitchen and garden refuse, and non-biodegradable items like plastics, glass, metals, and packaging materials. The composition of such waste depends largely on household consumption patterns and income levels (Njogu et al. 2018). The composition of domestic waste streams is a function of income, consumption patterns and recycling opportunities. In Kenya, most domestic waste is poorly managed and usually dumped in disposal sites without proper separation (NEMA, 2014). Waste generation rates are dependent on several factors. The basic factor is population, which is the number of people generating the waste in the area in question. The greater the number of people generating the waste, the greater the rate of waste generation (Njogu et al. 2018). Ngoc and Schnitzer (2009) documented that the amount of waste produced was influenced by factors such as the level of economic growth, industrial activity and prevailing climatic conditions. Since all human activities generate waste, an effective and sustainable waste management system is necessary to safeguard public health, maintain environmental quality, and improve urban aesthetics.

Kenya Vision 2030 highlights the importance of establishing sustainable and efficient waste management systems as the country moves towards industrialization. Solid waste management was identified as a key flagship project in major towns such as Mombasa, Thika, Kisumu, Eldoret and Nakuru (NEMA 2014). In this regard, the Vision 2030 identified solid waste management for five cities



and towns, namely, Mombasa, Thika, Kisumu, Eldoret and Nakuru as one of the flagship projects. The 2010 Constitution of Kenya also emphasizes the right of every person to live in a clean and healthy environment (Article 42). Article 69 further requires the state to promote public participation in environmental protection, conduct environmental impact assessments, and ensure sustainable use of resources. In line with this, County Governments are tasked with responsibilities such as refuse collection, dumpsite management and solid waste disposal. The Environment

Management and Co-ordination Act (1999) additionally prohibits unlawful waste disposal and requires waste to be handled through licensed facilities.

Domestic solid waste management entails several activities: separating waste at the source, storage, collection, reuse, recycling, reduction, transportation, and safe disposal (Lacoste et al., 2007). Ineffective management can trigger outbreaks of diseases such as cholera, typhoid, dysentery, and malaria, which undermine public health and productivity. For instance, the outbreak of pneumonic plague in Surat, India, was attributed to local authorities' failure to manage household garbage properly (Priya & Kumar, 2003). Studies have shown that effective waste management depends on structured systems. In India, policies require households to segregate waste using color-coded bins, followed by collection, transport, and treatment before disposal. Treatment methods include incineration, shredding, and autoclaving (Rajesh et al., 2018). Some studies recommend waste minimization through practices such as segregation at the source, reuse, recycling, and improved housekeeping (Rao & Prabhakar, 2013). Other scholars highlight additional strategies such as technological innovation, recovery of by-products, and adopting cleaner production methods (Vigneswaran et al., 1999; Babu et al., 2009).

Waste segregation, separating different types of waste before disposal, plays a central role in effective waste management (Ibna et al., 2021). This practice is shaped by factors like household income, government involvement, housing type, and the age of the household head (Pallegedara et al., 2022). For example, a study in Malaysia found strong links between locality, age, housing type, and waste segregation practices (Sharifah et al., 2022). However, in most developing countries, segregation is rarely practiced at the household level, making it difficult for municipalities to collect sorted waste (Saja et al., 2021). Research in Dar es Salaam showed that poor awareness, weak enforcement of regulations, lack of incentives, and limited prioritization hindered segregation (Jacob et al., 2021).

Recycling is another important waste management approach. It involves transforming discarded materials into new products, thereby reducing reliance on raw resources (Villalba, 2020). Reuse, on the other hand, refers to using items again in their original form or for alternative purposes (Villalba, 2020). Studies in Tanzania revealed that recycling and reuse of plastics, electronics, and metals were often practiced informally, with waste moving from households to collectors, recycling centers, and industries. However, the process was hindered by inadequate facilities and lack of supportive policies (Kris et al., 2021). In Nairobi, recycling is largely informal, involving unregistered waste pickers and traders who sell to licensed recyclers in bulk (Baud et al., 2004).

Housekeeping practices, defined as maintaining a clean, safe, and environmentally friendly environment, are also crucial for waste minimization (Raghubalan, 2015). Studies in healthcare institutions have shown that structured training improved the ability of housekeeping staff to handle biomedical waste safely, reducing risks of infection and improving disposal methods (Japamani et al., 2023; Shruti et al., 2022).

In many developing countries, poor solid waste management continues to pose risks due to limited awareness, lack of resources, insufficient disposal sites, and slow adoption of modern technologies (Muchangos et al., 2014). Despite governments spending large portions of their revenue on waste management, challenges such as illegal dumping and uncollected waste persist, leading to foul odors,

blocked drainage, public nuisance, and insect breeding (Choe & Fraser, 1999; Sharma et al., 2007). It is at this backdrop that this study sought to investigate solid waste minimization practices in Kiganjo. Waste minimization not only protects the environment but also promotes health and sustainability.

2. Review of Literature

Waste segregation refers to sorting waste into categories based on how it will be handled or treated (Ibna et al., 2021). A survey in Sri Lanka established that segregation behaviors are influenced by household income, the role of local authorities, age of the household head, and housing type (Pallegedara et al., 2022). Similarly, research in Malaysia reported that household characteristics such as location and dwelling type significantly determined segregation practices (Sharifah et al., 2022). Although separating waste at the source can reduce costs and improve collection efficiency, it is not widely practiced in many developing nations due to limited awareness and inadequate infrastructure (Abdel-Shafy & Mansour, 2018; Saja et al., 2021). In Dar es Salaam, Tanzania, segregation was hindered by lack of incentives, weak enforcement, and insufficient planning (Jacob et al., 2021).

Studies further note that household segregation is a prerequisite for other waste minimization activities such as recycling and composting (Ajayi et al., 2017). For instance, in Kisii, Kenya, separating household waste has been recommended as a strategy for producing compost manure and energy, with potential income benefits (Jacob, 2018). Research in Ghana also confirmed that households practicing segregation alongside recycling significantly reduced pollution (Prince & Abena, 2022).

Recycling is the process of converting discarded materials into new products, while reuse involves using items more than once, either for their original purpose or for a new function (Villalba, 2020). Recycling not only conserves resources but also diverts waste from landfills and minimizes environmental impacts (DGB Group, 2021). In Tanzania, research found that households engage in informal recycling of plastics, metals, and electronics, with materials moving from households to waste pickers, then to recycling centers and industries. This process, however, is constrained by lack of facilities and weak policy support (Kris et al., 2021). In Nairobi, informal recycling is facilitated by licensed waste dealers who buy from small-scale collectors and resell to large recyclers (Baud et al., 2004). Globally, recycling of plastics has expanded significantly. For example, Dinger (2000) notes that post-consumer plastic recycling has supported the creation of new products such as toys, detergent bottles, and disposable cameras. Such initiatives contribute to resource conservation and economic savings. Scholars argue that among waste management options, reuse and recycling are preferable because they conserve resources and provide social and economic benefits (Troschinetz & Mihelcic, 2009; Louppe, 2006). In Ghana, a study concluded that combining segregation and recycling helps reduce household waste pollution (Prince & Abena, 2022).

Housekeeping can be understood as maintaining a clean, safe, and environmentally friendly living or working space (Raghubalan, 2015). In educational institutions, students have been reported to play a key role in maintaining hygiene through regular cleaning and proper waste control (Frimpong, 2020). In healthcare settings, housekeeping employees often have inadequate knowledge of waste handling. However, structured training programs have been shown to improve their practices and enhance safety (Japamani et al., 2023). Similarly, Shruti et al. (2022) found that experience and repeated training improved biomedical waste handling among staff. In the household context, regular cleaning and waste separation are essential components of good housekeeping, which in turn supports waste minimization (Zarifah et al., 2017; Rao & Prabhakar, 2013). Frequent cleaning and proper organization encourage consistent sorting of waste and reduce accumulation of refuse.



3. Material and Method

Study Design and Setting

This study adopted a descriptive research design to investigate solid waste minimization practices in Kiganjo, Thika Sub-County. The choice of this design was guided by the objectives of the study, which aimed to explore current practices such as waste segregation, recycling and housekeeping behaviors, and to determine the influence on overall waste minimization. The targeted population was the inhabitants of informal settlements represented by Kiganjo informal community in Kamenu Ward. The informal settlement of Kiganjo has a population of 10,105 residents (KNBS, 2019). The study was conducted in Kiganjo informal settlement located in Kamenu Ward, Thika Sub County, Kiambu County, Kenya. Most of the people who live here are casual laborers working in Thika factories. Kiganjo was used as the study area since we observed that it is an area that is rapidly developing. Due to this rapid development there is production of lots of waste materials which are not properly disposed and managed.

Sampling & Sample Size, Tools & Data Collection, and Study Variables

The study was conducted using simple random sampling so as to ensure equal representation of members across the region. A sample size of 384 residents was used, guided by Fishers (1983) formula. Questionnaires were used to collect information on age, gender, household income and the education level of the household head, segregation practices, recycling and proper housekeeping. This type of information was helpful in understanding the relationship between these variables and solid waste minimization practices.

Data analysis

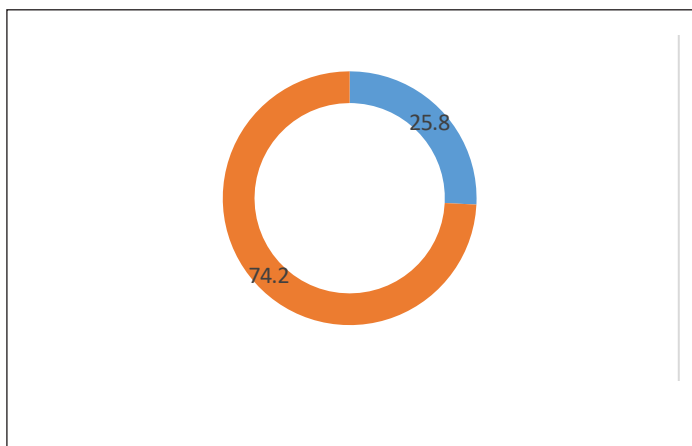
Data was analyzed both descriptively and inferentially using Statistical Package for Social Sciences (SPSS). Descriptive statistics involved frequencies and percentages while inferential statistics involved correlation analysis. Analysed data were presented in tables and figures, followed by an interpretation and discussion of the same.

4. Results and Discussion

Influence of Waste Segregation on Waste Minimization

Descriptive statistic was done to bring out the number of residents who participated in waste segregation, the types of waste segregated and the motivation behind the segregation practices.

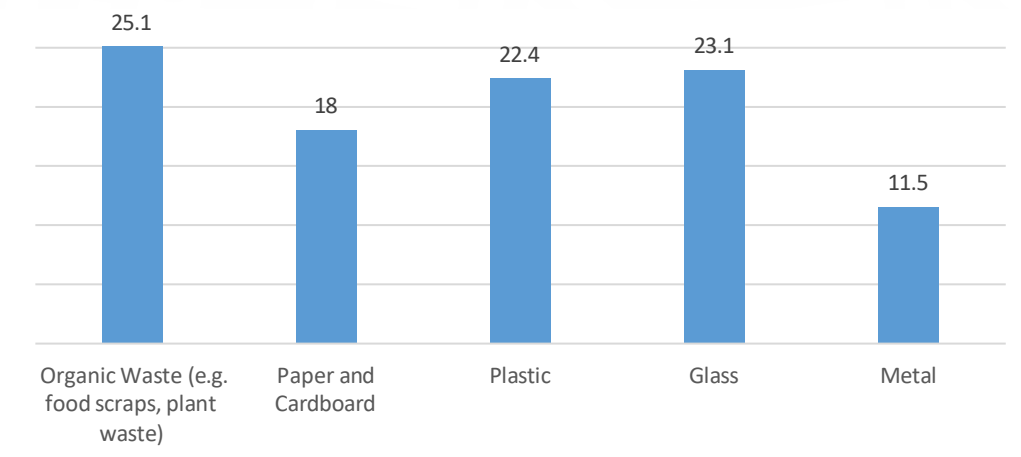
Figure 1: A doughnut showing the presence of waste segregation at Kiganjo



Findings in Figure 1 showed that majority (about 74.2%) of the respondents practiced waste segregation as a measure of waste minimization. This is inconsistent with findings of a study by Saja et al. (2021).

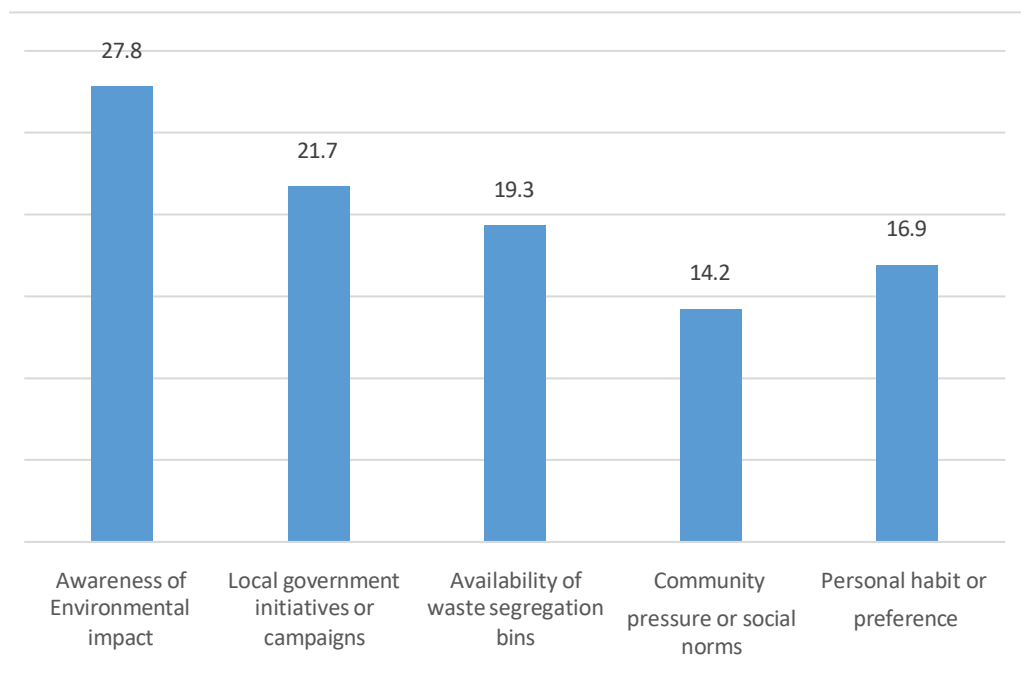
The major types of wastes that were being segregated were as presented in Figure 2.

Figure 2: Bar graph showing types of waste segregated



From Figure 2, majority of the respondents segregated organic waste (25.1%), followed by glass (23.1%) then plastics (22.4%) followed by paper and cardboard (18%) and the least segregated was metal (11.5%). The study further sought to unravel reasons for segregating wastes. Findings of the study were as presented in Figure 3.

Figure 3: Bar graph showing waste segregation factors



From Figure 3, the most cited motivation for waste segregation was awareness of environmental impact, reported by 27.8 percent of the participants. This suggested that a significant portion of the population was conscious of the environmental benefits of waste minimization. Another notable motivator included local government initiatives or campaigns (21.7%) and the availability of waste segregation bins (19.3%), showing that external support systems also influence waste segregation behavior. Community pressure or social norms (14.2%) had the least impacts implying that peer



influence is not a major driver in this area. Meanwhile, personal habits or preferences accounted for (16.9%) highlighting that some residents have adopted segregation as part of their routine behavior.

Cross tabulation analysis was done to establish the waste segregation behavior in Kiganjo, whose results were at indicated in Table 1.

Table 1: Results of cross-tabulation analysis showing waste segregation behavior in Kiganjo

Waste segregation frequency		
Rarely	Sometimes	Always
23.02	39.21	37.77
Chi-square = 218.069; p -value =0.000		
Linear-by-Linear Association = 102.106; p -value =0.000		

Findings in Table 1 showed that majority of the residents indicated that they segregated waste sometimes (39.21%), followed by those that segregated always (37.77%) with the least respondents reporting that they rarely segregated their waste (23.02%). The study noted that waste segregation was a significant measure towards waste minimization, at a chi-square value of 218.069 and p -value of 0.000.

Further, Kendall's tau_b correlation analysis was done to show the relationship between waste segregation and waste minimization at Kiganjo, Thika. The results were as indicated in Table 2.

Table 2: Results of correlation analysis showing the relationship between waste segregation and waste minimization

	Waste segregation	Waste minimization
Waste segregation	r 1	.436**
	ρ .	0.000
Waste minimization	r .436**	1
	ρ 0.000	.

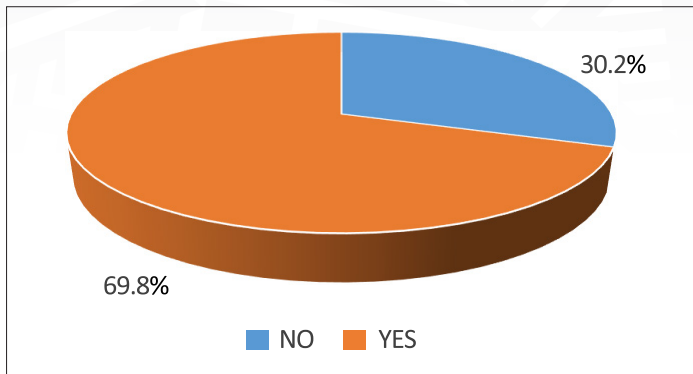
** $p < 0.01$

The findings in Table 2 showed a significant positive relationship between waste segregation and waste minimization ($r = 0.436$, $p < 0.01$). This indicated that households that actively practiced waste segregation was more likely to achieve waste minimization in Kiganjo. This is consistent with the findings of a study by Ajayi et al. (2017) and that of Prince and Abena (2022). The positive nature of the correlation suggested that improved segregation effort contributed to better waste minimization.

Influence of Waste Recycling on Waste Minimization

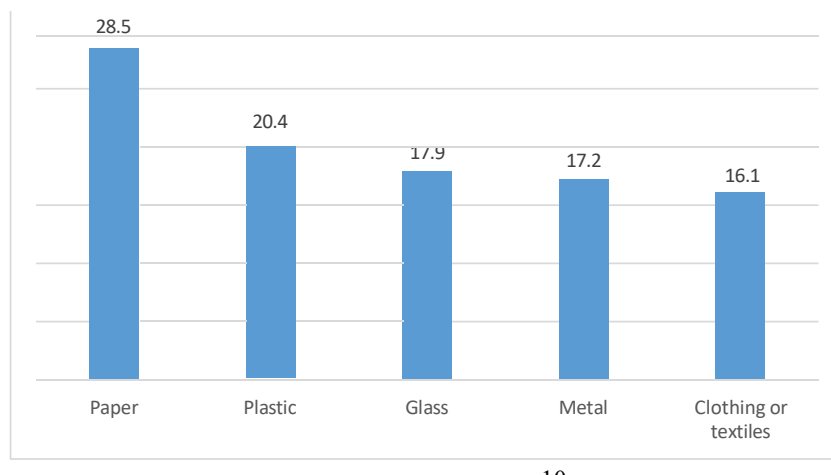
The study sought to investigate the level of resident participation in recycling of waste in Kiganjo. Findings were as presented in Figure 4.

Figure 4: A pie chart showing participation in waste recycling



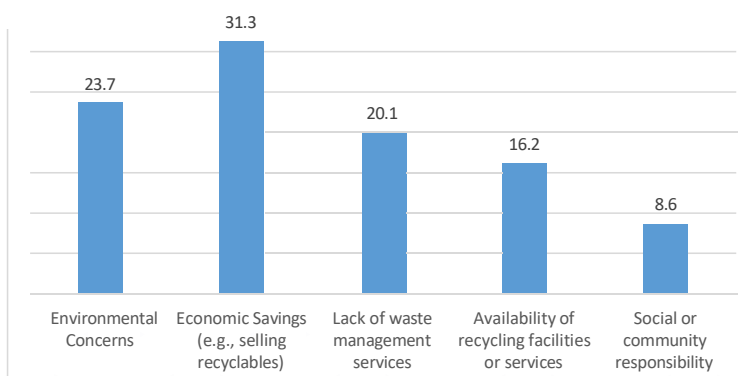
Results in Figure 4 indicated that about 69.8 percent of the participants reported that they actively recycled waste, while another 30.2 percent of the participants reported not engaging in any form of recycling. This suggested that a significant majority of the population participate in waste recycling. As appreciated by Baud et al. (2004), some respondents practiced waste recycling as a source of employment. The major types of recycled wastes were as presented in Figure 5.

Figure 5: A bar graph showing types of waste recycled



Results in Figure 5 indicated that paper was the most recycled material, with about 28.5 percent of the responds indicating participation in its recycling. This was followed by plastics (20.4 %), glass (17.9%), metal (17.2%) and clothing or textiles at 16.1%. These results suggested that paper and plastics are the most recycled possibly due to their high usage and ease of collection. Figure 6 presented various motivations that influence recycling behavior among the residents of Kiganjo.

Figure 6: A bar graph showing motivations influencing recycling behavior



The leading motivation for recycling of wastes was the economic savings (e.g. selling recyclables), accounting for 31.3% of the responses. Environmental concerns followed closely at 23.7%, indicating that a significant portion of the population recycles out of a desire to protect the environment. Lack of waste management services (20.1%), availability of recycling facilities or services (16.2%) and social or community responsibility (8.6%) were the least.

Cross tabulation analysis was done to bring out the relationship between waste recycle behavior and how often it is carried out. Results were as presented in Table 3.

Table 3 Result of cross tabulation analysis showing the relationship between wastes recycle behavior and how often it is carried out

Findings in Table 3 showed that majority of the residents indicated that they recycled waste sometimes (43.77%), followed by those that recycled always (33.21%) with the least respondents reporting that they rarely recycled their waste (23.02%). The study noted that waste recycling was a significant measure towards waste minimization, at a chi-square value of 328.082 and p -value of 0.000.

Moreover, Kendall's tau_b correlation analysis was done to show the relationship between waste recycling and waste minimization at Kiganjo, Thika. The results were as indicated in Table 4.

Table 4: Results of correlation analysis showing the relationship between waste recycling and waste minimization

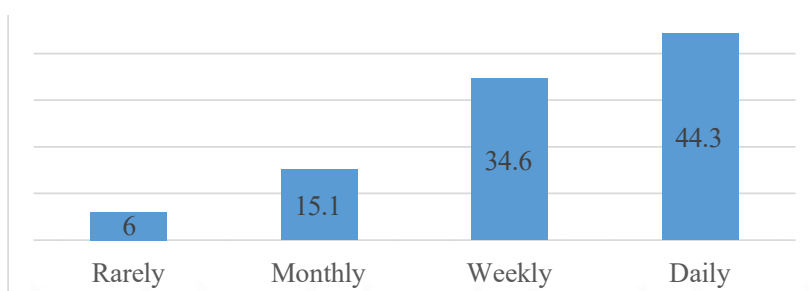
		Waste Recycle	Waste Minimization
Waste Recycle	r	1	.695**
	ρ	.	0.000
Waste Minimization	r	.695**	1
	ρ	0.000	.
** $\rho < 0.01$			

The findings in table 4 showed the correlation between waste recycling and waste minimization is $r=0.695$ with a significant level of $p < 0.01$. This reflects a strong positive correlation meaning that respondents who engage in waste recycling are significantly more likely to minimize their household waste. Aligned with the results of a study done by Rao and Prabhakar (2013) and a study done by Zarifah et al. (2017), recycling was a method of waste minimization.

Influence of Proper Housekeeping Practices on Waste Minimization

The study sought to investigate the frequency of proper housekeeping, whose findings were as presented in Figure 7.

Figure 7: A bar graph showing frequency of housekeeping practices



Results in Figure 7 showed that majority of the respondents reported cleaning their homes daily (44.3%), followed by weekly (34.6%) then monthly (15.1%). The least were those who cleaned rarely (6%). As appreciated by Jones and Pizam (2008) housekeeping consists of the simpler aspect of building care and maintenance, practices that create a serene environment for life.

Cross tabulation analysis was done to bring out the relationship between sorting of waste into categories and how often spaces are cleaned and organized. Results were as presented in Table 5.

Table 5: Results of cross tabulation analysis showing the relationship between sorting of waste and space cleaning

		Sorting Waste		
		No	Yes, Sometimes	Yes, Always
Cleaning	Rarely	52.17	39.13	8.70
	Monthly	15.52	63.79	20.69
	Weekly	18.05	54.89	27.07
	Daily	12.35	33.53	54.12
Chi-square=57.318; p -value=0.000				
Linear-by-Linear Association=36.113; p -value=0.000				

Table 5 showed a cross tabulation analysis indicating a clear relationship between how often people clean their spaces and whether they sort their waste. Majority (52.17%) of those who rarely cleaned their spaces did not sort their waste, while only a small proportion (8.70%) sorted their waste always. The frequency of cleaning was directly associated with the likelihood of sorting waste always. For instance, about 8.70% of those who cleaned rarely sorted their waste always whereas 54.12% who cleaned daily sorted their waste. Much as the findings of the study done by Zarifah, Salniza and Izah (2017) household waste separation, which is one of the good housekeeping techniques, is a means of waste minimization. The chi-square value of 57.318 and a p -value of 0.000 indicates that the relationship between cleaning frequency and waste sorting is statistically significant. The Linear-by-Linear Association value of 36.113 with a p -value of 0.000 confirms a strong positive trend. As cleaning becomes more frequent, so does the consistent practice of waste sorting. This suggest that promoting regularly cleaning habits may improve responsible waste minimization.

Kendall's tau_b correlation analysis was done to show the relationship between proper housekeeping practices and waste minimization at Kiganjo, Thika. The results were as indicated in Table 6.

Table 6: Results of correlation analysis showing the relationship between proper housekeeping practices and waste minimization

		Proper housekeeping	Waste Minimization
Proper housekeeping	r	1	0.281**
	ρ	.	0.000
Waste Minimization	r	0.281**	1
	ρ	0.000	.

** $p < 0.01$



The findings in table 6 showed the correlation between proper housekeeping and waste minimization is $r=0.281$ with a significant level of $p < 0.01$. This reflects a strong positive correlation meaning that respondents who engage in proper housekeeping are significantly more likely to minimize their household waste. In line with a study done by Rao and Prabhakar (2013) proper housekeeping was a method of waste minimization.

5. Conclusion

This study investigated waste minimization practices in Kiganjo, in response to the growing environmental and health concerns associated with solid waste management. Guided by Fisher et al. formula, data was obtained from a minimum sample size of 384 residents at Kiganjo area of Kiambu County. The study concluded that segregation, proper housekeeping, and recycling are interlinked pillars of effective waste minimization. Despite a general awareness of these practices, implementation remains low due to inadequate facilities, limited knowledge, and weak enforcement. Households that integrated these practices reported cleaner environments, reduced waste volumes, and improved health outcomes. Therefore, there is a strong case for promoting education, infrastructure investment, and policy enforcement to enhance sustainable waste management.

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Policy Communication and Awareness and Responsible Tourism Practices in Mountain Destinations. Case of Mount Kenya World Heritage Site

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ABSTRACT

Tourism has been ranked as a significant economic contributor globally. However, its impacts especially in fragile ecosystems such as mountain regions has raised concerns on its sustainability. In efforts to mitigate the negative impacts emanating from tourism activities, government and other stakeholders are developing policies to regulate tourism activities and promote responsible practices. However, despite the existence of these policies destinations are still grappling with the negative impacts of tourism. The purpose of this study is to assess the efficacy of policy communication and awareness in promoting responsible tourism practices. The objective of the study was to assess the efficacy of policy communication and awareness in promoting responsible tourism practices. The study adopted descriptive research design with both qualitative and quantitative methods. Structured interviews in Likert scale format and key informant interviews were used for data collection. The target population were the guides, porters, visitors and government officials. The findings indicated that while policy communication and awareness has a significant contribution in the promotion of responsible tourism practice, its effectiveness has not been realized yet. However, for sustainability to be achieved, there is need for a solid, policy communication framework to create awareness to all stakeholders on the contents of the developed policies.

Key words: Responsible tourism Practices, Policy Communication, Policy awareness, Mount Kenya World Heritage Site.

1. Introduction

The Tourism industry has been recognized globally as a significant economic field and an important factor in the growth and prosperity of various countries (Euromontana, 2017). However, participation in tourism activities has had both direct and indirect implications on the environment, communities and the practicing industries at large. The global awareness of the impacts of tourism led to the development of responsible tourism programs at the Rio de Janeiro earth summit in 1992 and as a result, the Agenda 21 and the Rio Declaration for sustainable development were established (Castellani & Sala, 2010).

The Rio Earth Summit's Mountain Agenda of 1993 addressed the global tourist industry, emphasizing the importance of sustainability, indicating that careful management is required both to conserve the great recreational values of mountains while extracting benefits locally (Euromontana, 2017). As part of the 2030 Agenda for Sustainable Development, the Sustainable Development Goals (SDGs) aim to foster sustainable tourism activities and relevant capacity- building that increase environmental awareness, protection and conservation, as well as reverence for biodiversity, natural ecosystems, and cultural diversity Mountains are water towers, home to biodiversity, and have a vast wealth of natural resources. More so, mountain communities have a rich cultural heritage that is equally significant in the growth and development of tourism (Amat-Montesinos, 2017). Significantly, mountains are well known as a touristic destination for adventure tourism activities ranging from 'hard' to 'soft'.

Mountain tourism accounts for a considerable quota of global tourism as stated by United Nations Environmental Programme and will continue to thrive (UNEP, 2007). According to United Nations World Tourism Organization (2014), international tourism arrivals surpassed 1087 billion in 2013, with tourism receipts exceeding US\$1159 billion, mountain regions accounting for 15– 20 percent of the tourism revenue. According to estimates, there were 163–217 million visitors who visited the mountain regions in 2013, with expected receipts of US\$174–232 billion. As pointed out by Nepal and Jamal (2011), the fast development and growth of tourism has resulted in a significant increase in visitation to several mountain regions throughout the world.

According to the Tourism Department of the City of Cape Town, 2002 as indicated by Frey and George (2010), responsible tourism is based on accountable behavior, ethical standards, and governance, and is built on three pillars of sustainability: environment, economics, and social culture. In order to enhance successful sustainable tourism development operation requires a solid communication plan that identifies how information, awareness formation, advocacy, network building, conflict remediation, and communication networks will be endorsed (Delgado & Palomeque, 2012).

Furthermore, the establishment of communication networks and sufficient information sharing will improve the limited information and knowledge base required to ensure more suitable policy responses to sustainability (OECD, 2018). Effective policy campaigns help establish, promote, develop, and sustain desired awareness, knowledge, attitude, and behavior for environmentally sustainable practices (Okaka, 2010). Becken and Clapcott (2011) stated that various stakeholders at the national and local levels need to be aware of what is contained in the policy strategic plans in order to understand their long-term goals, communicate their opinions, define solutions, and effectively network with one another.

Effective policy communication and stakeholder awareness are increasingly recognized as central to the promotion of responsible tourism practices. Studies show that while regulatory frameworks establish the rules for sustainable tourism, their success depends largely on how well these policies are communicated to and understood by stakeholders (Becken & Clapcott, 2011; OECD, 2018). Communication mechanisms such as education, training, participatory advocacy, and the use of information and communication technologies enhance awareness and help translate policy provisions into practical action (Okaka, 2010; Saarinen, 2010).

Responsible tourism, which emphasizes minimizing negative environmental and socio-cultural impacts while maximizing benefits to host communities, requires that stakeholders are not only aware of regulatory guidelines but also actively engaged in their implementation (Frey & George, 2010). However, research highlights that many destinations, especially in developing countries, face gaps in awareness creation and dissemination strategies, which weakens compliance and limits the effectiveness of policy interventions (Dodds, 2007; Torres-Delgado & Palomeque, 2012). This underscores the need to strengthen policy communication frameworks as a pathway to ensuring responsible tourism practices.

1.1 Problem Statement

Kenya has enacted several regulatory policies aimed at guiding responsible tourism practices in the Mount Kenya World Heritage Site, including the Mount Kenya Ecosystem Management Plan, the Wildlife Conservation and Management Act, and the Forest Conservation and Management Act. These policies are designed to control activities such as resource use, waste management, and visitor conduct to safeguard the fragile mountain ecosystem. However, despite their existence, the site continues to face irresponsible practices such as deforestation, illegal resource extraction, poor waste disposal, and human–wildlife conflicts (Njoroge, 2020; Kenya Wildlife Service [KWS], 2019). This indicates that the main challenge lies not in the absence of policies but in their limited communication and the low levels of stakeholder awareness. Many porters, guides, visitors, and local communities remain



inadequately informed about the regulatory provisions, while participatory advocacy mechanisms are weak. Consequently, policies often fail to translate into behavioral change or compliance on the ground. This therefore justifies the need for the study on efficacy of policy communication and awareness in promoting responsible tourism practices.

1.2 Research Objective

The objective of the study was to assess the efficacy of policy communication and awareness in promoting responsible tourism practices in Mountain tourism destinations, a case of Mount Kenya World Heritage Site.

1.3 Research Hypothesis

H₀₁ There is no significant relationship between policy communication and awareness and responsible tourism practices

2. Literature Review

2.1 Empirical Review

According to a report by OECD (2018) on tourism policies for sustainable and inclusive growth, the dissemination of relevant information to the public is critical so as to raise public awareness of sustainability issues and to encourage people to change their behavior. Education and training would enhance a superior understanding and recognition of the changes that are needed to implement the concept, reinforcing the need to think of sustainable tourism policy as an information policy format. According to Grenna, Santi and Scuppa (2006) effective sustainable tourism development activity requires a comprehensive strategic plan that identifies how information and awareness creation, advocacy, network building, conflict mitigation, and communication platforms will be supported. Efficient communication of policies for sustainable tourism improves management facilitation, stakeholder interaction for consensus solutions, market linkages, and visitor safety (UNWTO, 2019).

Dodds (2007) in their study on Malta's tourism policies suggested that sustainable tourism policy advocacy, focusing on the role of education and awareness-raising activities stressed the importance of incorporating sustainable tourism policy issues into school curricula in different types of tourism management and planning education systems, including vocational and technical schools as well as universities. Okaka (2010) carried out a study on the development of regional communication campaign strategy for environmental and natural resource management policy awareness for the East African Community. According to the study findings, majority of the target audience remained overlooked in the key tasks of message design, delivery, and evaluation during campaigns. Similarly, Saarinen (2010) on a study on the awareness of local tourism found out that communication can initiate and facilitate a process in which stakeholders can express their perspectives and find a consensus.

2.2 Theoretical Framework

2.2.1 Stakeholders Theory

To grasp the idea of stakeholder theory, it's necessary to first define what a stakeholder is. According to Freeman (1984) a stakeholder refers to any group or person who may influence or is affected by the achievement of the organizational goals. Freeman goes on to say that an individual can be defined by its relationships with other members of the organization. (Donaldson and Preston 1995) added to this definition by arguing that a group or person must have a legitimate interest in the company in order to be listed as a stakeholder. Stakeholder theory emphasizes that organizations and institutions should consider the interests of all groups that can affect or be affected by their actions (Freeman, 1984). In the context of responsible tourism, this implies that regulatory policies will only succeed if they are effectively communicated to and understood by all stakeholders such as government agencies, local communities, guides, porters, and visitors. The theory highlights three

key dimensions: the descriptive aspect, which explains how different stakeholders are involved in tourism development; the instrumental aspect, which shows that engaging stakeholders leads to better sustainability outcomes; and the normative aspect, which argues that all stakeholders have an intrinsic right to participate in shaping tourism practices (Donaldson & Preston, 1995). Without clear dissemination and participatory awareness programs, stakeholders may remain uninformed about regulatory provisions, leading to continued irresponsible practices. Thus, stakeholder theory provides the foundation for understanding why effective communication and awareness of regulatory policies are crucial for aligning diverse stakeholder interests toward responsible tourism practices.

2.3 Research Gap

Although previous studies highlight the importance of policy communication and stakeholder awareness in promoting sustainable tourism, most have concentrated on general policy frameworks or on tourism development in broader contexts (Becken & Clapcott, 2011; Dodds, 2007; Saarinen, 2010). Limited research has examined how regulatory policies specifically designed to guide responsible practices are communicated, understood, and applied in fragile ecosystems such as mountain World Heritage Sites. In the African context, existing scholarship often emphasizes conservation outcomes and community participation but gives less attention to the mechanisms through which policy information is disseminated and translated into stakeholder behavior (Njoroge, 2020; Okaka, 2010). This creates a gap in understanding the link between regulatory policy communication, awareness creation, and the adoption of responsible tourism practices.

3. Methodology

The study adopted descriptive research design that combined both qualitative and quantitative methodologies to achieve study objectivity. Descriptive research design is considered appropriate where the goal of the researcher is to establish the level of association between variables (Elahi & Dehdashti, 2015). The area of the study was Mount Kenya World Heritage Site and the target population were the heritage site stakeholders who included the visitors, porters, and guides and government officials. To sample the respondents, the study adopted stratified random sampling for the stakeholders and further used proportionate stratification to select the sample size per stakeholder category. The Yamane's (1973) formula as used by Mutana and Mukwanda (2020) in a similar study was used to compute the sample size for the visitors, guides and porters to ensure that a suitable distribution of the sample frame was achieved throughout the entire population. For the government officials, purposive sampling was adopted.

Yamane's formula Whereby,
n-the sample size

N-the population size

e-the acceptance sampling error

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

$$n = \frac{2300}{1 + 2300(0.05^2)}$$

$$n = \frac{2300}{6.75}$$

$$n = 340$$



Data was collected using a triangulation method in order to generate a detailed understanding of the study concept (Paton, 2005). Primary data was collected using structured questionnaires in Likert scale format while Secondary data involved in-depth interviews for the key informants. To ensure reliability of the results, the Cronbach's Coefficient Alpha was tested giving a result of 0.756 indicating that the research instrument was consistent (Sekaran and Bougie, 2009). Data was analyzed using descriptive statistics such as mean, standard deviation and frequency distribution. Inferential statistics was carried out by use of regression model. The ANOVA was used to determine the fitness of the overall model in terms of F-ratio. Bivariate analyses including correlation and regression analyses was done to establish the relationship between the dependent and the independent variable. The respondents were assured of information confidentiality and Prior to any interview, informed consent was obtained. Finally, legality was established by applying for and obtaining the necessary permits for the research to be conducted.

4. Results and Discussions

4.1 Response rate

From the targeted sample size of 178 porters and guides, 117 porters and guides successfully filled and returned the questionnaires representing a response rate of 66.10%. Furthermore, 104 visitors out of the total targeted sample size of 162 successfully participated in the study representing a response rate of 64.19%. The response rates indicated a satisfactory return rate as argued by Mugenda Mugenda (2008) that a 50% and above return on the response rate is adequate and sufficient for a researcher to carry out data analysis.

Table 4.1: Response rate

Respondents	Sample size	Returned in numbers	percentage return rate
Porters and guides	178	117	66.10%
Visitors/ tourists	162	104	58.6%

As presented in table 4.15 on policy communication and awareness strategies, dissemination of policy information which obtained a moderate mean of 2.91 and std. deviation of 1.171, 47% of the respondents disagreed, 19.7% were not sure and 33.4% agreed. On the same breath, majority of the respondents (83.7%) agreed that there was training of relevant stakeholders on policy (mean=4.03, std. deviation=0.730). On the issue of the existence of policy education programs (mean=3.56, and std. deviation=0.865), 47.9% agreed while 46.2% were not sure. The study revealed that 56.4% of disagreed on there being a coordinated tourism policy communication (mean=2.81, and std. deviation=1.174). At the same time on there being a participatory tourism policy advocacy (mean=2.82, and std. deviation=1.208), 59% disagreed while 35.1% agreed. At the same time, 52.1% of the guides and porters were not sure on there being an effective policy communication network (mean=3.37, and std. deviation=0.826). The study sought to establish the influence of policy communication and awareness in promoting responsible tourism practises.as indicated in table 4.16, majority of respondents (71.8%) agreed that policy communication and awareness have addressed responsible tourism practices issuers with mean=3.80, std. deviation=0.660.

On the same breath, 71.8% agreed that policy communication strategies inform stakeholders of their roles with mean=3.78, std. deviation=0.574. Additionally, (91.4%) agreed that through training, stakeholders are able to conduct tours responsibly with mean=4.12, std. deviation=0.528. On the same breath, 88% agreed that policy education programs have enhanced capacity building with mean=4.04, std. deviation=0.532. The study also revealed that most of the respondents (88%) agreed that if well effected policy communication can influence individual behavior with mean=3.97, std. deviation=0.454.

The study further sought to test the relationship between policy communication and awareness and responsible tourism practices. As shown in Table 4.30, the R value was 0.495 signifying there is a relationship between codes of conduct and responsible tourism practices. The adjusted R² value of 0.235 indicates that 23.5% of responsible tourism practices is explained by policy communication and awareness all factors held constant. This indicates that the other 76.5% can be explained by other variables.

Table 4.4: Policy communication and awareness regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square	F	df1	df2	Sig. F
					Change	Change			Change
1	.495 ^a	.245	.235	.30842	.245	23.868	1	115	.000

Predictors: (Constant), Communication and awareness

The model was significant at p value 0.000 which is less than 0.05 with the F ratio=23.868 as presented in table 4.31 below. This indicates that when reviewed separately policy communication and awareness have a significant effect on responsible tourism practices.

Table 4.5: Policy Communication and Awareness Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	11.700	1	11.700	23.868	.000 ^b
1	Residual	20.939	115	.295		
	Total	32.639	116			

Dependent Variable: Responsible tourism practices

b. Predictors: (Constant), Communication and awareness

With $\beta=0.148$ at a p value 0.000 which is less than 0.05 shows that policy communication and awareness has a positive and significant effect on responsible tourism practices as indicated in table 4.32. The model bivariate linear regression is $Y=3.713+0.148(X3)+e$ where 3.713 is the constant where the regression equation crosses Y-axis and X3 is the policy communication and awareness index. This means that for every incremental improvement in policy communication and awareness, responsible tourism practices are projected to increase by 0.148. From table 4.32, the p-value 0.000 is less than 0.05 indicating that the null hypothesis, H03 was rejected since there is a significant relationship between policy communication and awareness and responsible tourism practices.

Table 4.6: Coefficients of the model for Policy Communication and Awareness

Model	B	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		Std. Error	Beta			
1	(Constant)	3.713	.117		31.647	.000
	Policy Communication And Awareness	.148	.035	.367	4.227	.000

a. Dependent Variable: Responsible Tourism Practices



The study findings are supported by the interview findings with KWS officer stating that;

'Whereas there is no a solid policy communication and awareness framework per say, KWS has developed strategies to disseminate their policy information such as websites, having KWS offices distributed in all counties, mandating tourism departments in KWS parks to disseminate policy information and recently, we have embarked on use of social media. However, I would like to point out that lack of a solid policy communication framework has still been a hindrance to implementation of the policies.'

The findings corroborated with that of the KFS forester who also stated that;

'The KFS has adopted policy communication strategies such as organizing for sensitization meetings and awareness seminars, conducting training for porters and guides and using communication channels such as exhibition centers, field race and billboards'

The study from the key informant interviews on policy communication and awareness demonstrated that while there is no a solid policy communication and awareness framework, the managing bodies have adopted use of official websites, seminars, having designated county offices, conducting trainings and sensitization meetings for the stakeholders and making use of communication channels such as billboards and exhibition centers to communicate policies. However, the Officers noted that, there was need to have a solid policy communication and awareness framework if the enforcement and implementation of policies will be fully realized.

The study findings corroborate to those of OECD (2018) that dissemination of relevant policy information to the public is critical in order to raise public awareness on responsible tourism issues and encourage people to change their behavior. More so, education, and training of the stakeholders would lead to a better understanding and recognition of the changes that are needed to implement the responsible tourism concept. Solid communication that can identify information, awareness formation, advocacy, network building, and communication networks as indicated by the study findings and supported by Torres et al, (2012) is essential for the successful development and implementation of responsible tourism.

The study findings further, lend credence to Becken et al, (2011) that the establishment of communication networks and sufficient information sharing improve the limited information and knowledge base required to ensure more suitable policy responses to responsible tourism. Stakeholders need to be able to access data they need to understand their long-term goals, communicate their opinions, define solutions and effectively network with one another. As articulated by Dodds (2007) and supported by the interview findings, policy communication shortfalls should be addressed on a continuing basis in order to improve the information systems.

4.2 Summary of the Findings

The study investigated the efficacy of policy communication and awareness in fostering responsible tourism practices at the Mount Kenya World Heritage Site. Findings indicate that the effectiveness of regulatory policies is closely linked to the extent and quality of communication strategies employed to disseminate policy information and raise stakeholder awareness. Although management agencies such as the Kenya Wildlife Service (KWS) and the Kenya Forest Service (KFS) have implemented initiatives including training sessions, sensitization meetings, county information desks, and the use of websites and departmental offices, these mechanisms remain fragmented and insufficient in ensuring widespread stakeholder understanding.

Quantitative analysis further underscores these gaps. Correlation results confirmed a statistically significant positive relationship between policy communication and awareness and responsible

tourism practices ($r = 0.347$, $p < 0.05$). Regression analysis showed that policy communication and awareness explained 23.5% of the variance in responsible tourism practices, highlighting its predictive role, although other factors such as enforcement and community participation also contribute. These results suggest that while policy communication strategies exist, they are inadequate in transforming regulatory provisions into consistent behavioral change among stakeholders.

5. Conclusion and Recommendations

5.1 Conclusion

The findings demonstrate that policy communication and awareness exert a significant influence on responsible tourism practices at Mount Kenya WHS. However, their full potential has not been realized due to the absence of a coherent and coordinated framework. The persistence of irresponsible practices including deforestation, waste mismanagement, and human–wildlife conflicts despite the presence of comprehensive policies illustrates a critical disconnect between policy design and implementation. Thus, the study concludes that effective communication and awareness mechanisms are not peripheral, but rather central to the success of regulatory policies aimed at promoting sustainable tourism.

5.2 Recommendations

To strengthen the link between regulatory policies and responsible tourism outcomes, the study proposes the following recommendations:

1. **Develop a Coherent Communication Framework:** Establish a structured and multi-channel communication strategy that integrates both traditional and digital platforms to ensure consistency, inclusivity, and wider reach.
2. **Enhance Capacity-Building Initiatives:** Implement continuous training and educational programs for guides, porters, and local communities to improve comprehension and practical application of regulatory provisions.
3. **Promote Participatory Policy Advocacy:** Create inclusive platforms where government agencies, local communities, and private sector actors collaborate in policy interpretation, awareness creation, and monitoring of responsible practices.
4. **Adopt International Best Practices:** Benchmark against successful mountain destinations such as Mt. Fuji in Japan and the Swiss Alps, where integrated communication and participatory approaches have proven effective in sustaining fragile ecosystems.
5. **Align with National and Global Agendas:** Ensure that communication and awareness strategies contribute to the realization of Kenya Vision 2030 and the Sustainable Development Goals, particularly those addressing environmental sustainability, biodiversity conservation, and inclusive community development.

In conclusion, the study reinforces the argument that regulatory policy communication and awareness are critical determinants of responsible tourism practices. Without robust communication strategies, policies remain underutilized, limiting their effectiveness in safeguarding fragile ecosystems. Strengthening these mechanisms is therefore imperative for Mount Kenya WHS to achieve long-term sustainability and serve as a model for responsible tourism management in the region.



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Econometric Analysis of Labor Mobility and Economic Growth in Kenya, '(1990–2024)

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ABSTRACT

Kenya's labor sector has greatly shifted over the last thirty years while the labor market has been facing serious structural flaws. A large proportion of the working population is still stuck in precarious employment, especially in the unorganized- informal and agricultural sectors where labor conditions, pay, and job security are subpar. Over 65% of employed people work informally, and a sizable portion are underemployed, working fewer hours than they would like to or are capable of, or they are involved in low-productivity activities that are out of line with their qualifications and skill set, as per the Kenya National Bureau of Statistics reports. Thus, this study focused on Kenya's economic growth and labor mobility in the dynamic relationship between 1990 and 2024. In developing economies, labor mobility both sectoral and geographic is becoming more widely acknowledged as a key driver of productivity development and economic transformation. Using annual secondary data from reliable sources; the World Bank, and the International Labor Organization (ILO), the study estimated the effects of labor mobility on Kenya's GDP growth using time-series and econometric techniques like quantitative design, unit root testing, pair-wise correlation analysis, and regression analysis. Using Augmented Dickey Fuller (ADF) test, the dataset for both independent and dependent variables was found to be stationary at levels. The pairwise correlation revealed a correlation of -0.2694 and $p < 0.05$ which implies that the relationship was negative and significant. The relationship analysis resulted to R^2 of 0.639 ($p < 0.000$) while the labour mobility was -0.05811. The post diagnostic estimations conducted were, normality, heteroscedasticity, and CUSUM tests which confirmed the stability and suitability of the established model in explaining the relationship. This implies that when labor mobility shifts by one-unit, economic growth shifts by 0.639 units. The study finds evidence of a significant long-run relationship between labor mobility indicator (vulnerable employment and underemployment) and economic growth. The results have important implications for national employment policies, regional integration strategies, and investment in skills development aligned with Kenya Vision 2030 and the African Continental Free Trade Area (AfCFTA).

Keywords: Econometric analysis: Labor mobility: Vulnerable employment: Economic growth

1. Introduction

One of the most important factors influencing economic dynamism, structural change, and sustainable growth in the modern global economy is labor mobility. The reallocation of human resources to more productive sectors and regions is made possible by labor movement, whether it be sectoral (across economic activities) or geographic (internal or cross-border). This increases total factor productivity and speeds up economic growth (Lucas, 2004; World Bank, 2019). Labor mobility now plays a more significant role in determining growth paths due to the globalization of labor markets brought about by technological improvement and the integration of global value chains. Over 169 million foreign migrant workers contribute significantly to the world economy, according to the International Labour Organization (ILO, 2023). They frequently fill important labor shortages and send money home to support household consumption and the stability of the national balance of payments.



International organizations like the World Bank (2020) and the Organization for Economic Co-operation and Development (OECD, 2021) support inclusive, effective, and market-responsive labor mobility frameworks from a policy perspective. These frameworks place a strong emphasis on including labor into growth models as an exogenous and endogenous factor that affects demographic shifts, investment choices, and productivity.

In Africa, labor mobility plays a major role in discussions of development, especially when it comes to urbanization, young employment, and regional integration. The potential of intra-African labor mobility to alleviate regional skill mismatches and promote inclusive growth through structural transformation has been emphasized by the African Union (AU, 2022) and the United Nations Economic Commission for Africa (UNECA, 2023). However, because of regulatory fragmentation, poor labor market information systems, and insufficient social protection measures, labor mobility in Sub-Saharan Africa is still underutilized despite its significance.

As labor moves from subsistence farming to informal urban work, Africa has witnessed an increase in internal migration, particularly from rural to urban areas. According to McMillan, Rodrik, and Sepúlveda (2017), a large portion of labor reallocation in Africa has slowed growth because there hasn't been any migration into high-productivity industries. Furthermore, the ILO (2023) estimates that over 60% of Africa's youth are affected by youth unemployment and underemployment, which limits the full potential of labor to boost growth.

The necessity of strategic labor market reforms to facilitate effective workforce reallocation and enhance the absorptive capacity of productive sectors, specially manufacturing and value-added services, has been highlighted by recent empirical studies (Fox & Thomas, 2020; Diao et al., 2021). These findings highlight the necessity of context-specific assessments that look at the long-term effects of labor mobility on economic growth in African nations.

As one of the most prosperous economies in East Africa, Kenya makes a strong argument for examining the connection between economic growth and labor mobility. The nation's labor market has experienced substantial changes since the 1990s as a result of economic liberalization, urbanization, demographic trends, and technological advancements. Due to a demographic youth bulge and rural-to-urban migration, Kenya's working-age population has increased significantly, from 14 million in 1990 to nearly 30 million in 2024 (KNBS, 2023). Sectoral labor reallocation has taken place at the same time, with a growing percentage of jobs in services and informal businesses and a decrease in employment in agriculture (Ngugi & Odhiambo, 2022).

Kenya's economic growth has been uneven and structurally limited in spite of these changes. The World Bank (2023) reports that although Kenya's GDP has grown by an average of 4.5% over the past ten years, the country is still susceptible to regional inequality, informality, and productivity stagnation. Limited job creation in high-productivity industries has been a defining feature of structural transition, which raises questions about how well labor mobility can support long-term growth (Mwangi & Wambugu, 2023).

Although labor market reforms are identified as a major driver of inclusive growth in national development strategies like Kenya Vision 2030 and the Medium-Term Plan IV (2023–2027), there are still few empirical assessments of the relationship between labor mobility and economic performance. Existing research mostly focuses on rural-urban migration, youth unemployment, and the dynamics of the informal sector without using strong econometric methods to assess causality or long-term trends.

This paper bridges this crucial gap by conducting an econometric analysis of Kenya's economic growth and labor mobility between 1990 and 2024, incorporating sectoral movements, long-term dynamics, and structural discontinuities. The goal is to use time-series analysis and macroeconomic data to assess how much internal and sectoral labor mobility has fueled GDP growth.



Despite the growing recognition that labor mobility is essential to growth, there aren't many studies that have done longitudinal econometric analyses in the context of Kenya. The complicated relationships between labor reallocation and structural transformation over several decades are ignored by the majority of policy frameworks and scholarly evaluations, which concentrate on descriptive or short-term assessments.

By providing empirical evidence of the correlational relationship between labor mobility and economic growth in Kenya (1990–2024), breaking down labor mobility by sector and region to identify disparate growth impacts, and providing policy-relevant insights for labor market planning, youth employment, and economic transformation, this study provides a near solution to this gap.

1.1 Statement of the Problem

It is commonly recognized that labor mobility is an essential catalyst for economic expansion and structural change, especially in developing nations looking to capitalize on demographic dividends and shift toward industries with higher productivity. Since 1990, there have been significant changes in Kenya's labor market dynamics, including inter-sectoral movements from agriculture to services, rural-urban migration, and the expansion of the informal economy. Kenya still has high rates of youth unemployment, underemployment, and uneven growth patterns in spite of these reforms, which begs the fundamental question of how well labor mobility promotes long-term economic progress.

Although national policy frameworks like Kenya Vision 2030 and the Medium-Term Plan IV (2023–2027) highlight employment creation and labor market flexibility as important development pillars, there is little empirical data on the link between labor mobility and the nation's economic growth. The majority of current research is descriptive, concentrates on short-term labor market indicators, or lacks strong econometric methods to distinguish the long-term effects of labor reallocation on GDP growth. Additionally, labor mobility in Kenya has frequently been uncontrolled and informal, which restricts the productivity increases that are usually linked to effective labor reallocation.

Given Kenya's young population, fast urbanization, and enduring structural issues like rising unemployment and regional inequality, this empirical analytical gap is especially important. Policymakers run the danger of developing policies that are out of step with the dynamics of the labor market if they don't have a thorough grasp of how labor mobility has historically affected economic growth. By performing a longitudinal econometric analysis of labor migration and economic growth in Kenya from 1990 to 2024, this work aims to close this information gap. In order to inform more focused and efficient employment and development strategies, the goal is to offer evidence-based insights into whether, how, and to what extent labor mobility contributes to Kenya's economic performance.

2. Literature Review

Despite a growing body of research on labor dynamics and macroeconomic performance in Sub-Saharan Africa, empirical studies focusing explicitly on the relationship between labor mobility and economic growth in Kenya remains relatively sparse. Much of the existing literature has concentrated on employment trends, rural–urban migration, and structural transformation, often treating labor mobility as a peripheral rather than a core explanatory variable. This study seeks to fill this empirical gap by conducting a time-series econometric analysis of labor mobility's impact on Kenya's economic growth over the period 1990–2024.

Inter-sectoral mobility and labor market flexibility are critical for fostering productivity and inclusive growth, according to recent studies. The impact of inter-sectoral labor movements from agriculture to manufacturing and services on Kenya's output growth was studied by Ngugi and Odhiambo (2022). They discovered a long-term positive correlation between labor reallocation and GDP growth, especially when labor shifted toward higher-productivity sectors, using data from 1985 to 2020 and Johansen cointegration and VECM techniques.



Similarly, Kivuva et al. (2021) used dynamic panel regression on county-level data to determine Kenya's urban-rural labor movement. Indicating that labor mobility serves as a channel for knowledge transfer and resource reallocation, their findings showed that counties with more labor inflows tended to show higher per capita output growth. However, their study was limited to patterns of internal mobility and failed to take industry linkages or international labor movement into consideration.

Nchake and Oduor (2023) used a GMM estimating methodology to evaluate the relationship between economic growth, labor informality, and mobility in East African nations. The study found that, in Kenya, greater labor migration into the unorganized sector was linked to slower growth unless it was accompanied by measures that made it easier to access capital and develop skills. This nuanced finding highlights the significance of comprehending the direction and nature of mobility by indicating that not all types of labor mobility are growth-enhancing.

World Bank (2020) conducted an analysis of job creation and labor transitions in the Kenyan economy and found that job transitions from subsistence agriculture into non-farm household enterprises or wage employment were positively correlated with income growth. However, the report lacked econometric testing for causality or long-run dynamics.

Mwangi and Wambugu (2023), in their econometric study on the role of demographic change in Kenya's labor market, used a structural break analysis to account for policy shocks such as Vision 2030 and COVID-19, recommending the inclusion of such breaks in future time series models to improve estimation accuracy. These studies collectively indicate that while the theoretical and empirical linkage between labor mobility and economic growth is gaining traction, there is still limited Kenya-specific evidence that incorporates comprehensive time-series data over the past three decades, particularly accounting for sectoral labor shifts, external labor migration, and institutional or policy shifts.

While classical and neoclassical economic models historically emphasized capital accumulation and productivity, modern growth theories and structural transformation models recognize labor mobility as a key mechanism for reallocating resources toward more productive activities (Lewis, 1954; Todaro & Smith, 2015). The concept has evolved to incorporate not just geographic movement (rural–urban, interregional, or international migration) but also occupational and sectoral shifts (e.g., from agriculture to services or manufacturing).

Recent theoretical contributions extend endogenous growth models by incorporating human capital mobility and structural change. According to McMillan Rodrik, and Sepúlveda (2022), labor reallocation from low-productivity to high-productivity sectors drives productivity growth and accelerates per capita income gains. Kenya, like many Sub-Saharan economies, has experienced uneven structural transformation, with labor gradually shifting from agriculture into informal services rather than high-productivity manufacturing or formal employment. This misallocation raises questions about the quality and direction of labor mobility.

Lucas (2020) provides a dynamic migration equilibrium framework, positing that internal labor mobility is essential for spatial equilibrium and productivity equalization across regions. In Kenya, spatial disparities remain pronounced, particularly between urban and arid/semi-arid rural counties, challenging the assumption that labor automatically flows to high-productivity locations. Theoretical insights thus suggest that policy and institutional environments mediate the growth impact of mobility. Sectoral labor mobility is a critical lens through which labor's contribution to economic growth can be analyzed. Kenya has undergone a gradual shift in labor distribution: as per KNBS Economic Survey (2023), employment in agriculture declined from over 70% in 1990 to about 52% by 2022, with a corresponding increase in services. However, the growth payoff from this shift remains ambiguous. Ngugi and Odhiambo (2022) argue that Kenya's labor transition has not followed a "productivity-enhancing" trajectory due to the dominance of informal employment and low technological diffusion in urban sectors.



Conceptually, geographic labor mobility is shaped by push–pull factors: wage differentials, employment opportunities, and public service access. In Kenya, rural–urban migration has been a consistent trend since the 1990s. Kivuva et al. (2021) conceptualize migration as an equilibrating force, but note that institutional inefficiencies such as land tenure insecurity and urban infrastructure deficits—limit the benefits of internal mobility.

Cross-border migration also plays a role in labor mobility. Kenya serves both as a source and destination of regional migrants (e.g., to the Gulf and from neighboring countries). While remittances support household consumption, Oduor & Nchake (2023) argue that “brain drain” and temporary migration can create skill shortages, dampen long-run productivity growth if not complemented by skills circulation or return migration programs.

Modern conceptual frameworks emphasize the role of human capital and demographic transitions in labor mobility. Kenya's youth bulge where over 60% of the population is under 30 presents both an opportunity and a challenge. Mwangi and Wambugu (2023) apply demographic transition theory to argue that without quality education and vocational training, increased labor force participation may exert pressure on low-productivity sectors, especially informal services.

World Bank (2020) and ILO (2021) conceptualize labor mobility within a broader human development context, emphasizing the importance of skills adaptability, gender equity, and labor rights. These dimensions are crucial for understanding the quality of labor mobility and its potential impact on inclusive growth.

Institutional matter in shaping the efficiency of labor mobility Acemoglu and Robinson (2019) posited that extractive political institutions hinder the efficient reallocation of resources, including labor. In Kenya, the devolved governance system introduced in 2013 aims to reduce regional inequality and promote local employment. However, Chirchir and Mwabu (2022) observe that devolution has had mixed effects, with weak fiscal capacity in counties limiting labor absorption in public and private sectors.

Policy interventions such as Kenya's Vision 2030, the National Employment Authority Act (2016), and labor market information systems form part of the enabling environment for labor mobility. However, gaps in implementation, data infrastructure, and enforcement remain persistent barriers to effective labor reallocation. Thus, this study contributes to the literature by bridging this gap employing recent econometric techniques on long-run Kenyan data (1990–2024) to test the causal and dynamic relationships between vulnerability employment rate as labor mobility and economic growth. Labor mobility the movement of labor across sectors, regions, or borders has increasingly been conceptualized as a dynamic factor in economic growth, especially in developing economies like Kenya.

3. Methodology

This study adopted a quantitative research design employing time series econometric analysis to examine the impact of labor mobility on economic growth in Kenya over the period 1990–2024. The methodology was structured around three key components: data collection, model specification, and estimation techniques. Secondary annual data for the period between 1990 to 2024 was obtained from credible sources including: World Development Indicators (World Bank) and International Labor Organization (ILO). Economic Growth (EG): Measured using real GDP growth rate while Labor Mobility (LM): Proxied by the vulnerable employment rate.

The relationship was modeled using a simple linear regression of the form:

$$EG_t = \beta_0 + \beta_1 LM_t + \epsilon_t$$

Where:

EG_t = Economic Growth at time t

LM_t = Labour Mobility at time t

ϵ_t = Error term

Ordinary Least Squares (OLS) was used for initial estimation due to its simplicity and efficiency under classical assumptions. Diagnostic tests were conducted, including tests for autocorrelation, heteroscedasticity, normality of residuals (Jarque-Bera test). All estimations and diagnostics were conducted using EViews software version 10.0.

4. Results and Discussions

This section presents the findings of both descriptive and inferential statistical analyses, and the discussions. This study examined the relationship between the labor mobility and economic growth in Kenya.

4.1 Descriptive statistics

Table 1 below shows a summary of descriptive statistics and normality test results for two variables: EG (Economic Growth) and LM (Labor Mobility) based on 34 observations.

Table 1: Descriptive statistics summary

Details	EG	LM
Mean	60.9901	5.5700
Median	61.1784	5.0213
Std.Dev	1.6669	2.2912
Skewness	0.5291	0.6556
Kurtosis	2.9282	2.1784
Jarque-Bera	1.5471	3.2919
Probability	0.4614	0.1928
Observations	34	34

Source; E-views version 10.0 (2025)

From the above summary, EG has an average of about 60.99, while LM has an average of about 5.57. The EG was on a different scale which is the percentage of GDP and LM was on index scale. In both variables, the median is near the mean, indicating minimal skewness and the absence of extreme outliers as posited by (Gujarati, & Porter, 2009). Although LM's mean is lower than EG's, its relative variability is higher with standard deviation of 1.67 and 2.29 which indicates that LM varies more. JB is a skewness and kurtosis-based test for normalcy. The null hypothesis of normalcy cannot be rejected because both p-values are greater than 0.05. This implies that the distributions of both variables are roughly normal, which supports the use of OLS regression and other parametric tests.

4.2 Correlational Analysis

The direction of the linear relationship between two variables was measured by covariance analysis. A positive correlation is seen between EG & LM with covariance of 0.2694, which means that economic growth, tends to rise in tandem with labor mobility. The real statistical variances of each variable are represented by diagonal elements, EG = 0.2961, LM = 5.1024.



Table 2: Correlational summary

Correlation t-statistic Probability Observations	EG	LM
EG	0.2961 - -	
LM	-0.2694 7.4030 0.0000 34	5.1024 - - 34

Source: E-views 10.0 output (2025)

A correlation significance test, involved evaluating the Pearson correlation between EG and LM which was eluded by the t-statistic. According to assumption of the null hypothesis, there is no linear association between EG and LM. However, a significant departure from the null hypothesis is indicated by the relatively high t-value of 7.4030. Similarly, the result is statistically significant at the 1% level, as indicated by the corresponding p-value of less than 0.01. This implies that, over the examined time, Kenya's Economic Growth (EG) and Labor Mobility (LM) had a statistically significant negative linear association. Hence the null hypothesis was rejected in the favor of alternative hypothesis.

4.3 Stationarity Test

Table 4 below provided a summary result from the Augmented Dickey-Fuller (ADF) test used to determine the stationarity of two time series variables under the study. The ADF test checks whether a time series has a unit root, which would indicate non-stationarity which is crucial for most time series models. The null hypothesis (H_0) states that the series has a unit root (non-stationary) while alternative Hypothesis (H_1) reveals that the series is stationary.

Table 4: ADF for stationarity test

Variables	ADF t-statistic	P-Value	Critical value 1%	Critical value 5%
EG	-2.4239	0.0360	-2.0132	-1.8090
LM	-3.1252	0.0012	-2.0145	-1.0357

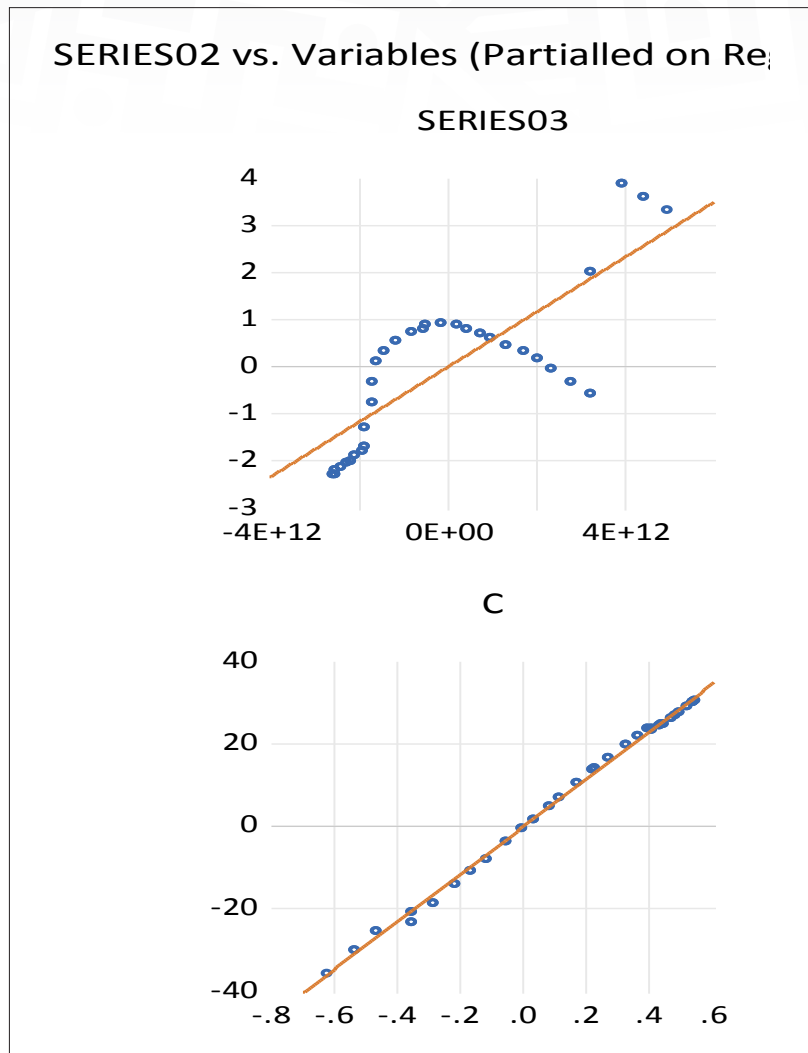
Source; E-views version 10.0 (2025)

From the output in table 4 above, ADF t-stat = -2.4239 (pv0.0360) for EG while LM ADF t-stat = -3.1252, which is lower (more negative) than both the 1% and 5% critical values and p-value = 0.0012, very small, allows us to reject the null hypothesis concluding that both variables were stationary at levels ($I(0)$).

4.4 Polynomial Regression

Data points lie almost perfectly along the 45-degree reference line which indicated that residuals are normally distributed, or at least much closer to normality than the linear model significantly improving the model fit. It implies that polynomial regression captures the nonlinear structure in the data better than the linear model. Thus, the assumptions of normality and homoskedasticity are better satisfied, meaning that there was better estimation efficiency and a valid confidence/prediction interval. Hence, the researcher proceeded with OLS regression analysis which validates with adjusted R^2 to prevent overfitting of the model.

Figure 1; Q-Q plot of residuals from polynomial regression



Source; E-views computation version 10.0 (2025)

4.4 Ordinary Least of Squares (OLS) Regression Analysis

The regression output presented below can be interpreted as follows, under a simple linear regression model of the form: $EG = \beta_0 + \beta_1 LM + \epsilon$.

Table 5: Regression Analysis

Dependent variable; Economic growth				
Method; Least squares				
Included observations; 33				
Variable	Coefficient	Std. Error	t-statistic	Prob.
LM	-0.58113	7.8415	7.4031	0.0000
C	0.07545	0.4716	122.4585	0.0000
R-squared	0.6387			
Adj. R-squared	0.6271			
F-statistic	54.8053			
Prob(F-statistic)	0.0000			
Durbin-Watson stat	2.3575			

Source; E-views version 10.0 (2025)

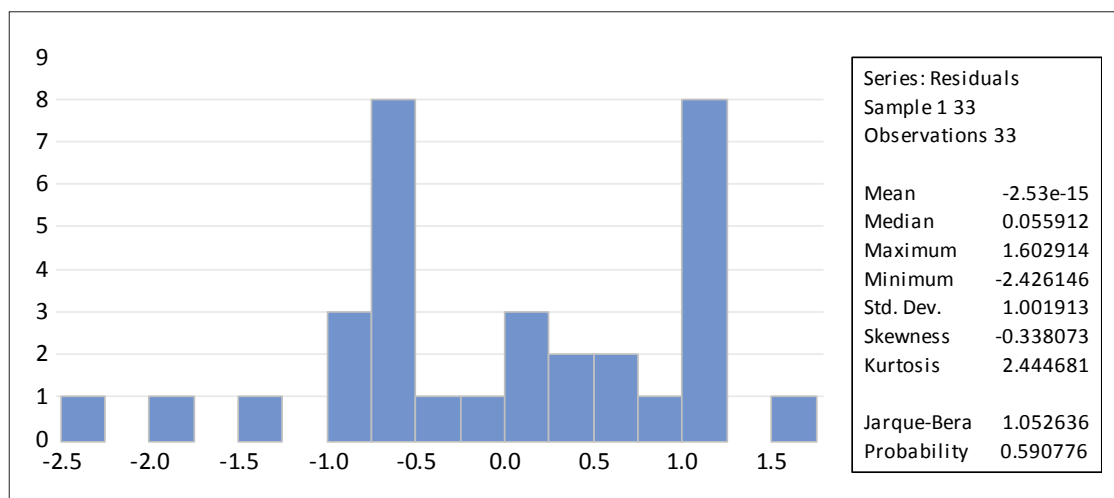


From the regression findings, LM (Labor Mobility) shows a negative and statistically significant impact on economic growth ($p\text{-value} = 0.0000 < 0.05$). The coefficient (-0.58113) suggests that one unit increase in labor mobility is associated with a 0.58113 unit decrease in economic growth, holding other factors constant. The constant (intercept) is 0.07545, meaning that when $LM = 0$, economic growth would still be at 0.07545 due to other factors not included in the model. The R-squared, 63.9% of the variation in economic growth is explained by labor mobility. Adjusted R-squared of 0.6271 adjusts for the predictor showing a strong and good model fit. While the F-statistic = 54.8053 ($p = 0.0000$) implying that the overall regression is highly significant, confirming that LM collectively explains EG well.

4.5 Normality Test

The Jarque-Bera test was used to check if the regression residuals are normally distributed. The null hypothesis assumes the residuals follow a normal distribution ($p\text{-value} > 0.05$), while the alternative hypothesis assumes they do not ($p < 0.05$). Figure 1 shows the Jarque-Bera test results for normality as revealed in the histogram below.

Figure 2: Normality Test Histogram



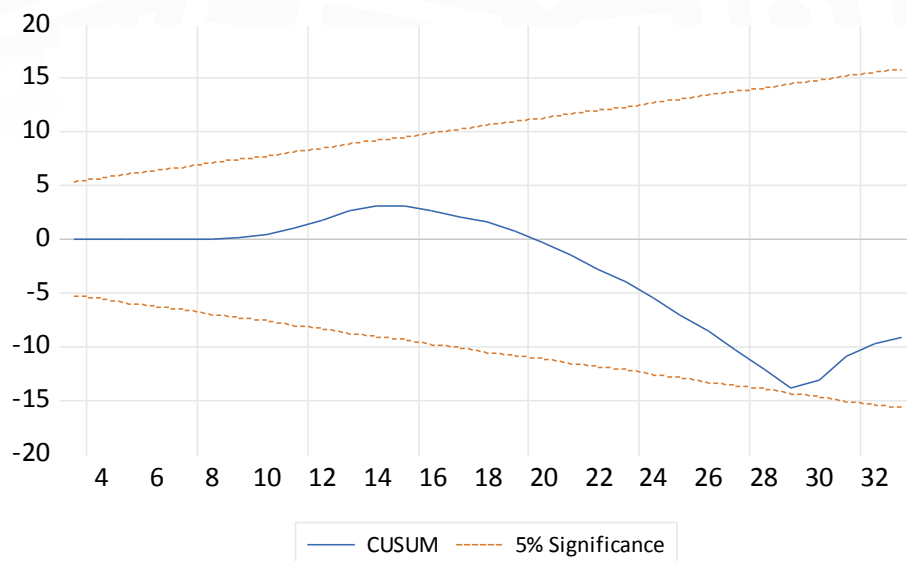
Source; E-views version 10.0 (2025)

Figure 2 above displays a JB statistic of 1.052636 and a p-value of 0.590776. Since the p-value exceeded the 0.05 significance level, the null hypothesis could not be rejected, indicating that the residuals follow a normal distribution. This outcome suggests that the normality assumption is met, supporting the reliability of the regression model estimates and the statistical conclusions can be drawn from them.

4.6 Model Stability test-CUSUM Test

The CUSUM (Cumulative Sum) test plot is a diagnostic test for model stability over time, particularly in time series regression analysis. CUSUM is used to test for parameter stability in a regression model. It was applied to determine whether the coefficients of the regression model remain stable over the sample period. The CUSUM line in the middle plots the cumulative sum of the residuals from recursive regressions.

Figure 3: CUSUM Test Plot



Source; E-views version 10.0 (2025)

From figure 3 above, the dashed Lines (5% Significance Bounds) represent the critical bounds. If the CUSUM line stays within these bounds, the null hypothesis of parameter stability is not rejected, thus the model was revealed to be stable for future economic predictions.

4.7 Recommendations

Basing on the findings of the study, the government should incentivize labor reallocation from low-productivity sectors (especially agriculture and informal services) to high-productivity sectors such as manufacturing, ICT, and formal services. Through revival as well as development of local industries. Similarly, this can also be achieved through investment in vocational and technical education tailored to emerging sectors as well as a sector-specific subsidies and fiscal incentives for firms that absorb labor from low-productivity areas.

The government of Kenya has been connecting employment overseas. The overseas placements are concentrated in low-skilled, insecure, and poorly protected jobs (domestic work, casual labor, and construction), Kenya risks replicating the same vulnerabilities abroad. This can undermine long-term economic growth because remittances may not compensate for the loss of skilled labor and the persistence of low-quality employment structures. Hence this study recommends that the Kenyan government can keep considering better and sustainable solutions like creation of more industries to expand formal employment.

Kenya's youth are the most mobile and underutilized segment of the labor force. The government should scale up youth apprenticeship and internship programs with labor mobility components and expand the Ajira Digital Program to promote remote work and inter-county employment opportunities. Kenya should actively integrate its labor market into regional blocs (e.g., EAC, AfCFTA) through: bilateral labor agreements to facilitate legal migration and incentives for diaspora returnees to invest and transfer skills to the domestic economy. The Ministry of Labour and Social Protection, in partnership with research institutions and universities, should undertake panel surveys to monitor long-term labor mobility effects on productivity and use econometric evidence to periodically revise the national employment strategy.



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Forecasting Domestic Tax Revenues in Kenya: A Comparative Analysis of Sarima and Holt-Winters Models

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ABSTRACT

Accurate revenue forecasting is paramount for effective fiscal policy implementation. Despite significant growth in Kenya's tax revenue collection (123% increase from 2011/2012 to 2019/2020), ambitious targets are frequently unmet, leading to fiscal strain and increased government borrowing. This study addresses the challenge of inaccurate forecasts by identifying suitable time series models for predicting domestic tax revenues in Kenya. We compare the performance of Seasonal Autoregressive Integrated Moving Average (SARIMA) and Holt-Winters (HW) methods. Using secondary data on Kenyan domestic tax collections from July 2014 to December 2020, we performed model identification, estimation, diagnostic checking, and forecasting. Model selection was based on Bayesian Information Criterion (BIC), Akaike's Information Criterion (AIC), and forecast accuracy measures including Mean Absolute Error (MAE), Mean Absolute Scaled Error (MASE), and Mean Absolute Percentage Error (MAPE). The SARIMA (0,1,1)(0,1,0)[12] model emerged as the superior forecasting tool, exhibiting the lowest BIC (1363.031) and lowest forecasting errors (MAE=4,998.15, MAPE=7.67, MASE=0.38). Diebold-Mariano (DM) tests confirmed significant differences in model performance, and the Model Confidence Set (MCS) procedure further validated SARIMA's highest predictive accuracy. This research provides valuable insights for enhancing the realism of Kenya's budgetary processes.

Keywords: Revenue forecasting, SARIMA, Holt-Winters, Domestic taxes, Kenya

1. Introduction

Institutions and governments worldwide levy taxes on their subjects to collect revenues that are used to finance their expenditures. taxation is a vital tool towards financing capital-intensive government projects, healthcare, education, and other important programs that are budgeted each year (Harelimana, 2018).

According to Kaplan and Poulson (2018), increased taxation in economies has resulted in a rise in inflation levels for both goods and services. It is also a determining factor for investors, where many of them look for opportunities in areas with lower tax regimes to maximize profits (Fisher, 2014).

Domestic taxes, which may be direct or indirect, are levied on income generated within a country. In Kenya, the primary domestic taxes include Corporation Tax, Pay As You Earn (PAYE), Withholding Tax, Value Added Tax (VAT), Rental Income Tax, Excise Duty, Advance Tax, Personal Income Tax (PIT), Turnover Tax, and Capital Gains Tax (Moyi & Ronge, 2006).

An article by Amadala (2021) highlighted to the Kenya National Treasury the necessity of a stronger revenue forecasting capacity. Ofori *et al.* (2020) emphasizes that accurate tax revenue predictions are crucial for effective economic planning. The Kenyan government has implemented numerous tax reforms aimed at increasing tax revenues to fund the budget without excessive borrowing. This effort aligns with the broader goal of internal revenue mobilization to meet public expenditure needs (Signé, 2016). However, challenges such as corruption, fraud, and tax evasion remain significant obstacles to revenue collection. Lilian (2015) reported that tax evasion schemes by multinational companies



result in an annual loss of Ksh. 639 billion. The seasonal nature of certain tax categories, such as Value Added Tax (VAT) and import duties, presents challenges for tax revenue forecasting (Samuel & Kibua, 2019). Nonetheless, the use of appropriate revenue forecasting models is essential for effective fiscal planning and projection, ultimately leading to reliable tax revenue forecasts.

The ever-growing size of Kenya's budget has steered discussions regarding the capability of the country to fund its budget. This is as a result of the increase in borrowing in the country and continuous dependence on foreign and domestic debt to fund its expenditures (Jenkins & Shukla, 2000). For instance, the national budget expanded from Ksh. 2.20 trillion in FY 2015/2016 to Ksh. 3.02 trillion in FY 2019/2020 and Ksh. 4.29 trillion in the FY 2025/2026 (National Treasury and Planning, 2025). This represents an approximate growth of 90.9% over the last 10 years. ICPAK (2016) highlights the immense role played by revenue forecasting and accurate tax analysis in budget planning and efficient economic decision-making.

Despite this significant increase, the revenue targets have rarely been met. The failure to achieve these targets is mainly due to overly ambitious goal-setting driven by the desire to meet specific GDP targets, inefficiencies in tax administration, and inaccurate forecasting (Chimilila, 2017). Missing these targets places pressure on the government and tax authorities, as it hampers the fulfillment of national expenditure commitments, leading to increased domestic and foreign borrowing. Employing accurate forecasting methods can help set more realistic revenue collection targets. Kyobe and Danninger (2005) noted that about 85% of the 34 developing countries surveyed relied on subjective judgments and simple extrapolation methods for their revenue forecasts. Thus this study is set to compare advanced time series models such as SARIMA and Holt-Winters in the Kenyan domestic tax revenue context, leaving a gap in evidence-based model selection for fiscal planning. Specifically, the study was to examine the main contributors of the Domestic Taxes Department (DTD) annual tax revenues in Kenya, to forecast Kenya's Domestic tax revenues using SARIMA and Holt-Winters time series models and to determine the best model for forecasting the Domestic tax revenues in Kenya.

2. Literature Review

Suwanvijit (2013) used the historical data from January 2002 to December 2011 to estimate the rate of tourists' arrival in Malaysia, Thailand, and Indonesia using the HW model. This model used the MAPE statistic to investigate the error levels in the model and employed the resultant model in the estimation of the tourism growth rates for the next 5 years. The arrival rate experienced an approximately 17% average annual increase, which was a valuable contribution to the tourism sector and forecasting.

Rahman *et al.* (2016) used monthly revenue data from the Bangladesh Bridge Authority between July 1998 to July 2016 to forecast monthly revenue using the best additive and multiplicative HW model. The study found the Additive HW method to be more accurate and used it to predict monthly revenue for January 2021.

A comparative review of the HW method and Fuzzy Time was used by Nur Fatimah Fauzi *et al.* (2020) in the prediction of the arrival rate of visitors in Langkawi from January 2015 to December 2019. Holt-Winters model achieved a low Mean Squared Error () compared to () by Fuzzy Time Series. It was therefore selected to estimate the visitors' arrival rate for 2020 and 2021 and produced more reliable results compared to its counterpart.

Ayakeme *et al.* (2021) compared how well the ARIMA and additive/multiplicative Holt-Winters models effectively predicted the domestic revenues generated by the Bayelsa government from 2012 to 2018. ARIMA (0,1,1) resulted to performed better based on the BIC and AIC test values applied to the two models. Using the ARIMA model, they projected the domestic revenues for the state for the years 2019 to 2021 and compared their accuracy to that of the Holt-Winters methods through MAE



and MSE metrics. Similarly, ARIMA yielded better forecasts, hence recommended for future revenue forecasting.

Makananisa (2015) reviewed the SARIMA and HW techniques in the prediction of key revenues together with the total collected taxes in South Africa using twelve periods data from 1995 to 2010. The accuracy levels of the two models were evaluated. The study discovered that the two methods were suitable and had different capabilities in the prediction of different taxes. For instance, Personal Income Tax and Value Added Tax figures were accurately estimated by SARIMA, while the HW method was superior in forecasting Corporate Income and Total Tax Revenue. The research supports the use of the two methods, especially where data has minimal economic disruptions.

Samuel and Kibua (2019) fitted a SARIMA model to forecast Kenya's tax revenues and identified SARIMA (2,0,0)(2,0,0)₁₂ to be the best predictor of Kenya's tax revenue. The predictability ability was checked using RMSE and MAE to confirm its suitability. The study was aimed at supporting long-term fiscal planning

3. Materials and Methods

The study utilized secondary data from the Kenya Revenue Authority (KRA) covering monthly collections of domestic Value Added Tax, Pay As You Earn, Corporation Tax, and total Domestic Tax revenue. The dataset spans 78 months, from July 2014 to December 2020.

The study adopted analytical descriptive study design. The research uses the quantitative forecasting approach, which utilizes historical data and statistical models to make predictions. The analysis process involved the following steps, as emphasized by Larmore (2016) in the creation of time series models:

- i. Plotting of the data trend to check seasonality in the data.
- ii. Examining whether the data had stationarity problems. This was confirmed by the PP and ADF tests.
- iii. Initial Model estimation using the SARIMA and HW methods. This involved model identification, analysis, and testing.
- iv. Estimation of model parameters.
- v. Diagnostic checking and model evaluation
- vi. Best model selection.
- vii. Forecasting: This entails estimating future outcomes based on present and past data. This was done after the models passed the diagnostic tests. Performance metrics were used to evaluate performance and model accuracy.

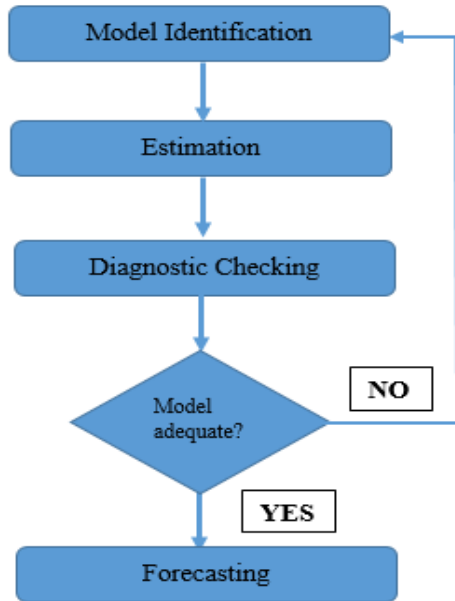
Consider that:

Y_t and $\hat{Y}_t$ are the actual and forecasted observation times t ,
 $e_t = Y_t - \hat{Y}_t$ is the forecast error at time t

Further, Forecast error $e_{(t+h)} = Y_{(t+h)} - \hat{Y}_{(t+h)}$; $h - i \leq 0 : h > i \geq 0 \therefore \varepsilon_{t+h-i} = 0$ (1)

The Box-Jenkins Procedure summarizes the forecasting conceptual framework to be adopted by researchers. This process involves four major steps that include: Model Identification, Model Estimation, Adequacy/Diagnostic checking, and Data forecasting (Box *et al.*, 2015; Jenkins *et al.*, 2000). The steps are done repeatedly until the model adequacy is achieved.

Figure 1: Box-Jenkins Model Principles



To gauge the model's accuracy, RMSE, MAE, MAPE, and MASE statistics were computed. They can be expressed as:

$$\text{Mean Absolute Error (MAE)} = \frac{\sum_{i=1}^n |\varepsilon_i|}{n}$$

$$\text{Mean Absolute Scaled Error (MASE)} = \text{mean}(|a_i|),$$

$$\text{where } (a_i) = \frac{e_i}{\frac{1}{T-1} \sum_{i=2}^T |y_t - y_{t-1}|} ; t = 1, 2 \dots T \text{ sample periods (}$$

$$\text{Root mean squared error (RMSE)} = \sqrt{\frac{\sum_{i=1}^n \varepsilon_i^2}{n}}$$

$$\text{Mean absolute percentage error (MAPE)} = \frac{\sum_{i=1}^n |PE_i|}{n}$$

$$\text{where Percentage error (PE)} = \frac{Y_t - F_i}{Y_t} * 100$$

Y_t is the Actual value, F_i is the Estimated value

and $e_i = Y_i - \hat{Y}_i$ is the forecast error at time i , Y_i is the actual observation at time i , and $\hat{Y}_i$ is the forecasted value at time i .

In the interpretation of the values, the scores of <10% are viewed as excellent, while scores 10% to 20% generally portray good forecasts. (Cetin & Yavuz ,2020).

The Bayesian Information Criterion (*BIC*) and Akaike's Information Criterion (*AIC*) statistics were used to select the best model. They can be expressed as $AIC = -2\ln(\text{Likelihood}) + 2r$ and $BIC = -2\ln(\text{Likelihood}) + r \ln(T)$. According to Gathondu (2014), the value increases with the proportion of the assumed number of model parameters (r), and its score is considered best when the resultant value is lowest. The value of r represents the set of all parameters.



4. Results

The main contributors to the Domestic Taxes Department (DTD) annual tax revenues in Kenya were analyzed and presented in the table 4.1

4.1 Descriptive Summary

Table 1: Major Tax Heads in Domestic Tax Summary Statistics

Statistics	Paye	Value Added Tax	Corporation Tax	Withholding Tax	Excise	Total
Mean	19106773698	10227044967	12263661307	6111990845	5904013489	6.1175E+10
Standard Error	638320921.5	231914464.9	1508541596	289629122.1	425473991.1	2788343977
Median	20489223811	10375724537	6186943778	6354535705	6886116429	6.3026E+10
Standard Deviation	5637497735	2048213095	13323078633	2557935147	3757684544	2.4626E+10
Sample Variance	3.17814E+19	4.19518E+18	1.77504E+20	6.54303E+18	1.41202E+19	6.0644E+20
Kurtosis	0.1394	0.4454	-0.6698	-0.4032	-1.0216	-0.6249
Skewness	-0.8223	-0.6042	0.8907	-0.3650	-0.5246	-0.1893
Range	24324134831	9485496332	46604677098	9947997541	12016358262	9.3565E+10
Minimum	5412583113	4888093918	101483864	1136849737	0	1.3338E+10
Maximum	29736717944	14373590250	46706160962	11084847278	12016358262	1.069E+11
Sum	1.49033E+12	7.9771E+11	9.56566E+11	4.76735E+11	4.60513E+11	4.7716E+12
Count	78	78	78	78	78	78

The proportions of revenue contributed by the major tax heads are highlighted for the period between July 2014 to December 2020.

The regression analysis was used to investigate whether the revenue contributed by various tax heads significantly differed. The major tax heads were involved.

Table 2: Regression Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.996 ^a	0.992	0.991	2302319209.5395
a. Predictors: (Constant), Pay As You Earn, Corporation, Value Added Tax, Excise, Withholding Tax				

The R^2 value is 0.992. This suggests that the major tax heads involved in the model explain about 99.2% of the variations in the model. The remaining 0.8% of the variation is attributed to external forces and other factors not included in the model.

Table 3: ANOVA Analysis

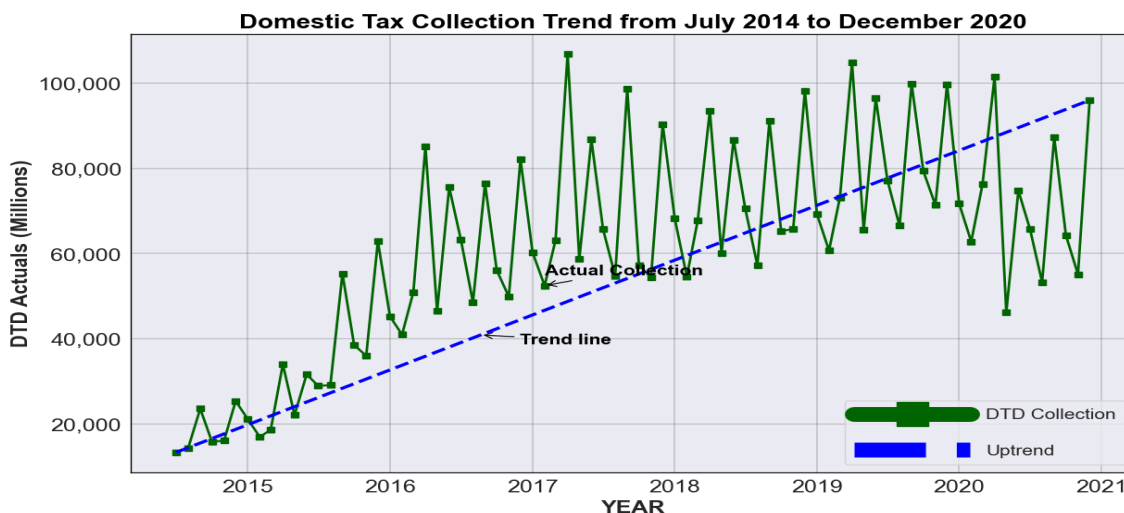
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.631E+22	5	9.263E+21	1747.483	.000 ^b
	Residual	3.816E+22	72			
	Total	4.670E+22	77			

A. Dependent Variable: Total
 B. Predictors: (Constant), Pay As You Earn, Corporation Tax, Value Added Tax, Excise, Withholding tax

The ANOVA analysis (table 3) revealed a $F(5,72)=1747.48$, $p=.000$. The p-value is less than .05 hence, the null hypothesis is rejected. This reveals a significant influence of the Pay As You Earn, Corporation Tax, Value Added Tax, Excise Tax, and Withholding Tax on the total Domestic tax collection. This also implies that the proportion of revenue contributed by various taxes in Kenya significantly differs.

4.2 Domestic Tax Revenue Trend

Between July 2014 and December 2020, the total DTD collection revealed an increasing and fluctuating trend. This is illustrated in the Figure below.

Figure 2: Time plot of Domestic Taxes from July 2014 to December 2020

4.3 SARIMA Model Selection

The SARIMA models fitted and evaluated using three information criteria: AIC, AICc, and BIC. Among the eleven iterated models, the ARIMA (0,1,1) (0,1,0)₁₂ had the lowest values for AIC (1358.683), AICc(1358.876), and BIC (1363.031), indicating it was the best-fitting model for the domestic tax data. The model consistently achieved the lowest values across the three information criteria, hence providing strong evidence for its selection. The proximity of the AIC and AICc values of all the selected models signifies that the sample size was adequately chosen and no overfitting occurred. This also implies that less information is lost when predicting using this model. The results were shown in table below

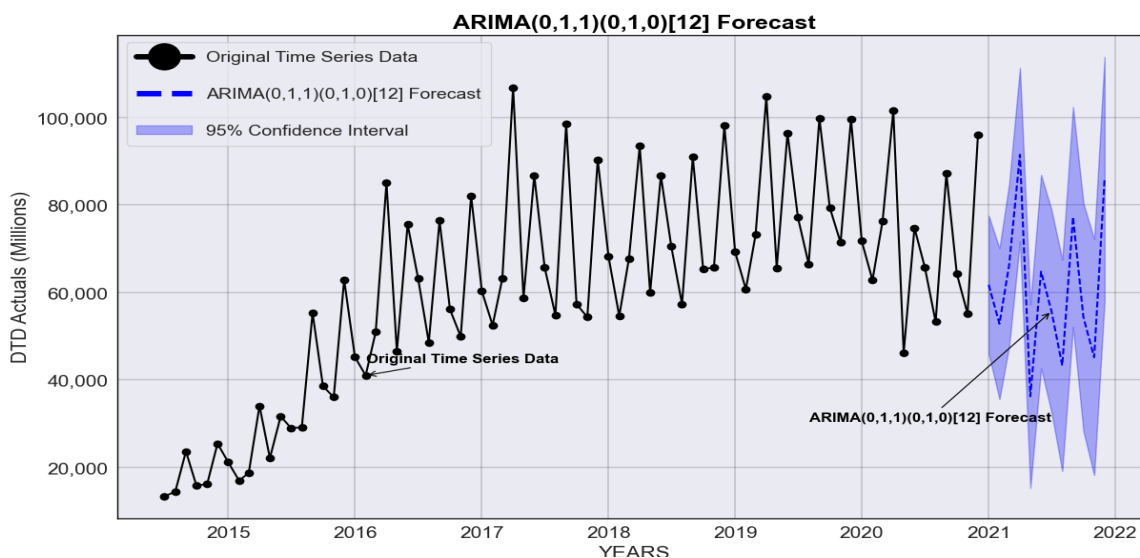


Table 4: SARIMA Models

Rank	Model	AIC	AICc	BIC
1	ARIMA(0,1,1)(0,1,0)[12]	1358.683	1358.876	1363.031
2	ARIMA(0,1,1)(0,1,1)[12]	1359.075	1359.469	1365.598
3	ARIMA(0,1,1)(1,1,0)[12]	1359.472	1359.866	1365.995
4	ARIMA(0,1,2)(0,1,0)[12]	1360.445	1360.838	1366.968
5	ARIMA(1,1,1)(0,1,0)[12]	1360.556	1360.949	1367.079
6	ARIMA(0,1,1)(1,1,1)[12]	1360.889	1361.556	1369.586
7	ARIMA(1,1,2)(0,1,0)[12]	1361.396	1362.063	1370.094
8	ARIMA(2,1,2)(1,1,1)[12]	1363.884	1365.849	1379.104
9	ARIMA(1,1,0)(0,1,0)[12]	1364.376	1364.57	1368.725
10	ARIMA(1,1,0)(1,1,0)[12]	1365.142	1365.536	1371.665
11	ARIMA(0,1,0)(0,1,0)[12]	1374.551	1374.614	1376.725

4.4 SARIMA Forecast

The observed domestic tax collections between July 2014 and December 2020 were used to predict Figures 8 below illustrate how the SARIMA model projections were visualized. The forecast line (blue dotted line) outlines the expected fluctuations in domestic revenues in a period of 1 year. The 95% confidence interval highlights the progressive uncertainty following the extended horizon of the forecast. It remained aligned with the previous seasonal trend. This implies that the model has adequately learned from the historical data for the short-term forecast.

Figure 4: SARIMA DTD Forecast

4.5 Holt-Winters Model

Using the smoothing factors, the additive and multiplicative models are represented using the formula; (2)

Table 5: Holt-Winter smoothing factors

		Additive-Holt-Winters	Multiplicative-Holt-Winters
Factors	alpha(α)	0.523	0.679
	beta(β)	0.054	0.071
	gamma(γ)	0.965	1
	Level Mean(a)	76365.890	72192.81
	Trend(b)	185.665	-131.98
Smoothing Parameters	$\hat{s}_1$	-10052.874	0.95
	$\hat{s}_2$	-17426.104	0.81
	$\hat{s}_3$	-3734.406	0.93
	$\hat{s}_4$	23813.634	1.26
	$\hat{s}_5$	-22338.760	0.69
	$\hat{s}_6$	9224.005	1.10
	$\hat{s}_7$	-4676.475	0.90
	$\hat{s}_8$	-18829.459	0.74
	$\hat{s}_9$	14722.804	1.23
	$\hat{s}_{10}$	-9001.395	0.93
	$\hat{s}_{11}$	-16775.452	0.83
	$\hat{s}_{12}$	19499.240	1.33

The resultant additive Holt-Winters model for domestic tax collections (Y_t), level mean estimate (L_t), trend estimate (b_t), and seasonal factors (S_t) are as follows:

$$\ln(Y_t) = (76365.89 - 185.55t) + s_t + e_t \quad (3)$$

$$b_t = 0.054(L_t - L_{t-1}) + (1 - 0.054)b_{t-1}$$

$$S_t = 0.965(Y_t - L_t) + (1 - 0.965)S_{t-1} \approx 0.965(Y_t - L_t) + 0.035S_{t-1}$$

The resulting multiplicative Holt-Winters model, on the other hand, can be fitted as indicated below;

$$Y_t = (72192.81t) + sn_t + e_t \quad (4)$$

$$L_t = 0.679\left(\frac{Y_t}{S_{t-s}}\right) + (1 - 0.679)(L_{t-1} + b_{t-1}) \approx 0.679\left(\frac{Y_t}{S_{t-s}}\right) + 0.321(L_{t-1} + b_{t-1})$$

$$b_t = 0.071(L_t - L_{t-1}) + (1 - 0.071)b_{t-1} \approx 0.071(L_t - L_{t-1}) + 0.929b_{t-1}$$

$$S_t = 1\left(\frac{Y_t}{L_t}\right) + (1 - 1)S_{t-s} \approx 1\left(\frac{Y_t}{L_t}\right)$$



4.6 Holt-Winters Forecast

The observed domestic tax collections between July 2014 and December 2020 were used to predict the likely revenues collected in the following 12 months of the year 2021. Figures 10 and 11 below illustrate how the Additive and Multiplicative Holt-Winters model projections were visualized.

Figure 5: Additive HW Forecast

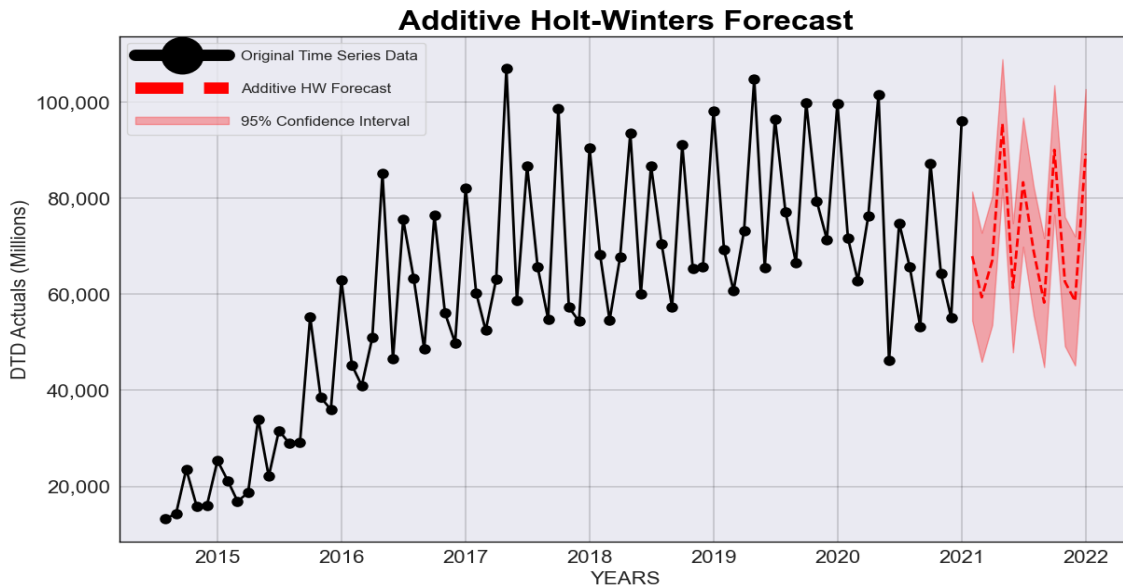
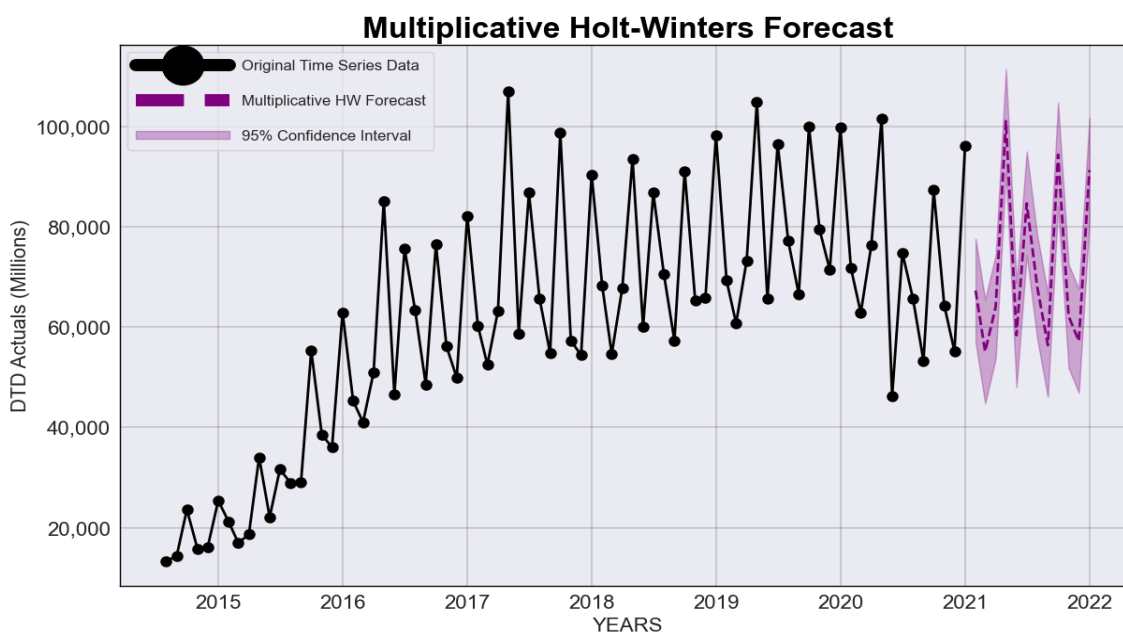


Figure 6: Multiplicative HW Forecast



4.6 Comparative Evaluation of the Model's Accuracy

The resultant prediction models were tested to deduce the model with the least prediction errors (MAE, MAPE, and MASE). SARIMA (0,1,1)(0,1,0)₁₂ model had the least errors, followed by the multiplicative and additive Holt-Winters models, respectively (Table 8). In all the models, MAPE values were less than 10%, signifying excellent model forecasts.

Table 6: Holt-Winters and SARIMA Mode Error Metrics

Models	SARIMA (0,1,1)(0,1,0) ₁₂	Additive Holt-Winters Method	Multiplicative Holt-Winters Method
MAE	4998.15	6108.80	5206.61
MAPE	7.67	9.992	8.075
MASE	0.38	0.46	0.39

4.7 Prediction versus Actual Data

The domestic tax total collections for 12 months were predicted using the 3 test models and compared with the actual data from the revenue agency. These collections were aggregated to fit the financial calendar of the country, which depicts the three months' total collection for each quarter. The resultant values are shown in Table 9. The above table compares the performance of the of the three times series forecasting models; Additive HW, Multiplicative HW, and SARIMA against the actual observed values for the four quarters in the financial year. The RMSE and MAE error metrics were used.

Table 7: Domestic taxes Predicted and Actual Values in Ksh.Millions

Period	Additive HW Values	Multiplicative HW Values	Sarima Values	Actual Values
Q3	253,170.30	243,497.87	233,889.23	208,307.79
Q4	316,379.22	302,343.99	257,806.63	283,721.06
Q1	318,065.84	314,997.12	251,757.69	265,190.88
Q2	342,118.04	364,852.70	269,997.35	280,193.16
RMSE	16838.15	18670.48	8219.96	
MAE	16026.71	15689.90	6432.64	

The comparison above provided insights on the model that resulted to the least errors according to the laid selection criteria. This was the simulation with the lowest RMSE and MAE values. SARIMA model produced the most accurate forecasts, achieving the lowest RMSE (8,219.96) and MAE (6,432.64). This was followed by the Additive Holt-Winters model (RMSE = 16,838.15, MAE = 16,026.71) and the Multiplicative Holt-Winters model (RMSE = 18,670.48, MAE = 15,689.90). The Additive and Multiplicative Holt-Winters methods exhibited slightly higher error metrics and therefore deviated more from the actual values. While the Multiplicative HW method had a marginally better MAE, it performed worse in terms of RMSE, suggesting that the seasonal pattern in the data was not strongly multiplicative.

5. Discussion, Conclusion and Recommendations

5.1 Discussion

The results align with extensive work done in various countries that point to SARIMA as a preferred choice in forecasting data with complex seasonal patterns and longer periods, whereas the Holt-Winters model tends to perform better on data with stable seasonal patterns. In forecasting export data in West Sumatra, Hasibuan *et al.* (2023) found the SARIMA model to have better forecasting proficiency in relation to the Holt-Winters model. It resulted in a lower MAPE value of 0.44% and MAD of 0.89% compared to the Holt-Winters model, indicating a higher accuracy in capturing the seasonal fluctuations. Similarly, in the forecasting of Nigeria's tax revenue, Tasi'u *et al.* (2024) found the SARIMA (3,2,1)(0,1,1)₄ model to have the lowest MAE and RMSE values (0.082 and 0.165) and outperformed the Holt-Winters model.



Makananisa (2015) reviewed the SARIMA and HW techniques in the prediction of key revenues together with the total collected taxes in South Africa using twelve periods data from 1995 to 2010. The study discovered that the two methods were suitable and had different capabilities in the prediction of different taxes. For instance, Personal Income Tax and Value Added Taxes were accurately estimated by SARIMA, while the HW method was superior in forecasting Corporate Income and Total Tax Revenue. These results confirmed that both methods are suitable and depend on the data traits and type of tax head. Additionally, Kithure (2018), in the forecasting of VAT in Kenya, using data from 2009 to 2016, found the ARIMA time series model to be suitable.

The results of the Autoregressive Integrated Moving Average model performed better compared to the Holt-Winters model in the forecasting of Value Added Tax in Ghana. (Makridakis *et al.*, 2008). ARIMA (1,1,4) had lower forecasting errors, hence produced a better model. This study result slightly differs from the outcome of this study.

5.2 Conclusion:

SARIMA model produced the most accurate forecasts. This was followed by the Additive Holt-Winters model and the Multiplicative Holt-Winters model. The Additive and Multiplicative Holt-Winters methods exhibited slightly higher error metrics and therefore deviated more from the actual values.

5.3 Recommendation for Future Research

The structural breaks and discontinuities in the data distort the data trends, hence reducing the consistency and accuracy of data models. These need to be considered in financial data modelling due to their volatility.

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Influence of Anthropogenic Activities on Distribution of Flora and Fauna within Karura Forest in Nairobi County, Kenya

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ABSTRACT

This paper contributes to the debate on the human-environment interaction within urban forest spaces in developing nations. Specifically, it aims to: examine the nature of human activities taking place within Karura forest, assess the perceived influence of human activities on the distribution of flora and fauna within Karura Forest, and evaluate extent of Community involvement in the management and conservation of Karura Forest. The theory of Human-Environment Interaction was adopted. A convergent parallel research design was adopted and study target population were Community Forest Association (CFA) members, Kenya Forest Service officers, and tourists. One hundred (100) CFA members, five (5) forest officers and ten (10) tourists were purposively sampled. Data was collected through administering of questionnaires to the 160 CFA members, conducting of interviews with forest officers and tourists and observation of features. Analysis of data was done descriptively and presented in form of frequencies and percentages. It was confirmed that the main anthropogenic activities were eco-tourism activities such as jogging/ walking, nature walks, cycling, educational tours, picnicking, bird watching and filming. Some of the unauthorized human activities within Karura forest include: illegal logging, waste disposal, human encroachment, charcoal burning and livestock grazing. A high number of the respondents revealed that human activities led to changes in the distribution of plant species within Karura Forest. Eco-tourism and waste disposal had minimal influence of migration of wild animals while urban expansion, livestock grazing and charcoal burning has substantial influence of migration of animal species. It was clear that most of the respondents engaged in conservation of forests to a low level. To enhance sustainable forest management, we propose that the Ministry of Environment, Forestry and Climate Change should increase funding for conservation efforts, awareness campaigns, surveillance of the forest using CCTV and strengthening community involvement in eco-tourism activities.

Key words: Anthropogenic activities, Eco-tourism, Fauna, Flora, Forest conservation, Karura Forest

1. Introduction

Forests remain essential to sustainability of the earth's ecological nature. This is attributed to the argument that forests support a wide variety of both animal and plant species, regulate climate, purify air, and ensure the continuity of hydrological cycles (FAO, 2020). Urban forests, in particular, serve a unique dual role—they preserve biodiversity while also providing much-needed green spaces for people living in densely populated cities (Esperon-Rodriguez et al., 2025; O'Brien et al., 2022). Urban forests in cities like London and Berlin now experience pressure from recreational use, which, though beneficial for people, often disturbs wildlife habitats and contributes to pollution (Smith et al., 2019).

In Asia, similar patterns emerge. Countries such as India, China, and Japan have seen dramatic biodiversity losses due to logging, agricultural expansion, and urban sprawl (Ito-Morales, 2024). Forests like those in Sumatra have undergone major ecological changes that mirror those occurring in Kenya. Even in developed cities like Tokyo and Bangkok, forests are affected by recreational activities that compact the soil and alter ecological systems (Chaudhary et al., 2018; Nagendra, 2019). North America presents another case study in the global impact of anthropogenic influence. Across the U.S.



and Canada, forests have been reshaped by urbanization, agricultural activity, and the introduction of non-native species (Hansen et al., 2019; Davis, 2020). Urban forests in cities like New York and Toronto face habitat fragmentation and rising pressures from tourism and recreation. These disturbances limit species movement and compromise ecosystem stability (Alberti, 2015).

In South America, the Amazon Rainforest stands as a stark reminder of biodiversity loss driven by logging and land conversion. The consequences are severe: species extinctions, shrinking habitats, and disrupted ecological systems (Peres et al., 2019). Even urban forests in cities like São Paulo are not immune human encroachment and recreational use lead to soil degradation and ecosystem imbalance (Santos et al., 2020). Within Africa, forests face immense pressure from both development and population growth. Human interaction within the forest, especially through recreational activities, has also been shown to alter animal behavior and population patterns (Ngetich, 2019). These issues are representative of broader conservation challenges across the continent. Recent conservation measures including reforestation and regulated ecotourism have begun to restore damaged areas and enhance ecological resilience (Kenya Forest Service, 2020). These efforts demonstrate the potential for recovery when human interests align with environmental stewardship.

Despite its importance, limited research has been conducted to holistically analyze the variables associated with human activities and their influence on the distribution of flora and fauna in Karura Forest. Understanding these variables is critical for designing sustainable management strategies that balance urban development and biodiversity conservation. This study seeks to fill knowledge gaps by exploring how anthropogenic activities interact with environmental factors to affect the distribution of flora and fauna in Karura Forest.

While conservation efforts by organizations such as the Kenya Forest Service (KFS) and Friends of Karura Forest have restored portions of the forest and increased biodiversity, significant gaps remain in understanding the variables influencing the distribution of flora and fauna in the forest. Environmental factors like climate, soil conditions, and water availability interact with human activities to shape the forest's biodiversity, but the extent and mechanisms of these interactions are not fully documented (Githiru et al., 2017). This lack of comprehensive understanding poses a challenge to effective forest management and biodiversity conservation. Without clear data on how specific human activities—such as eco-tourism, urban development, tourism, and conservation programs—affect the spatial distribution of species, it is difficult to develop targeted strategies to mitigate negative impacts and enhance the forest's resilience. This study aims to: examine human activities taking place in Karura Forest, challenges facing the management of flora and fauna in Karura forest, and evaluate the effect of human activities on flora and fauna in Karura Forest within Nairobi County, Kenya.

1.1 Theoretical framework

This study was grounded on the Theory of Human-Environment Interaction (Possibilism) that was developed by Paul Vidal de la Blache and Lucien Febvre between late 19th century and early 20th Century (Febre, 2010; Vidal de la Blache, 2009). According to this theory, human actions, such as land use changes, resource exploitation, and urbanization, significantly affect ecological systems, while environmental factors, in turn, influence human behaviour and activities (Turner et al., 2007). According to the Human-Environment Interaction Theory, human activities such as urbanization, deforestation, and recreational use modify the physical environment, which in turn impacts the ecological balance of the area.

The theory guided the study in examining how such human-driven changes influence the spatial distribution of flora and fauna, including the displacement of species and loss of biodiversity. Human-Environment Interaction Theory also highlights the socio-economic factors that drive environmental change. By applying this theory, the study explored the socio-economic drivers behind such practices and how they impact forest management strategies (Githiru et al., 2017). The interaction between

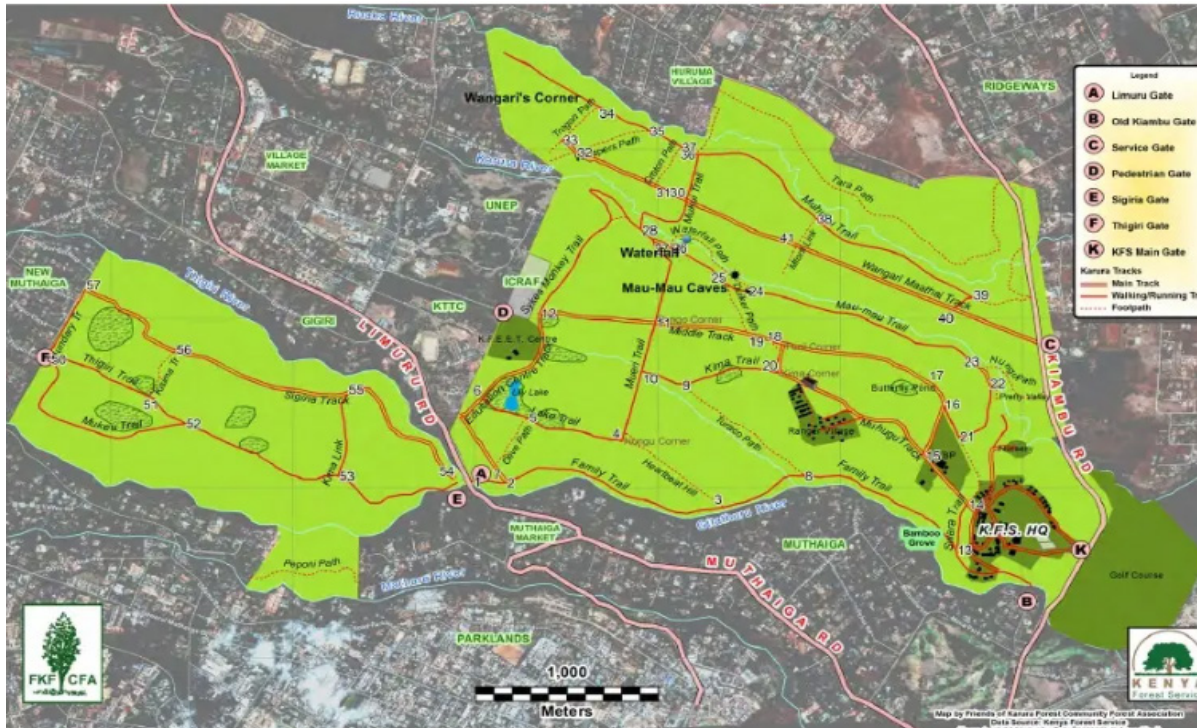
these anthropogenic activities and the forest's ecological health was examined to understand the need for sustainable practices that balance human demands with conservation goals.

2. Research Methods

2.1 Study Area

Karura Forest is located in Nairobi, Kenya, approximately 5 kilometers north of Nairobi's central business district. It lies between latitudes 1°13' to 1°16' S and longitudes 36°49' to 36°50' E. Karura Forest covers an area of approximately 1,041 hectares (10.41 square kilometers), making it one of the largest urban gazetted forests in the world.

Figure 1: Map of Study area



Source: Kenya Forest Service (2025)

Its expansive size is critical for ecological conservation in the rapidly urbanizing Nairobi region (Kenya Forest Service, 2022). The forest experiences a tropical highland climate characterized by moderate to heavy rainfall. Annual rainfall ranges from 800 mm to 1200 mm and temperature average between 10°C and 26°C (Kenya Meteorological Department, 2022). Karura Forest is a mixed tropical forest dominated by indigenous and exotic tree species. Indigenous species include *Croton megalocarpus*, *Brachylaena huillensis*, and *Newtonia buchananii*, while exotic species such as eucalyptus and cypress were introduced for timber production. While Karura Forest itself is uninhabited, it is surrounded by high-population-density urban areas such as Runda, Muthaiga, and Gigiri as shown in Figure 1 above, which have a combined population of approximately 150,000 residents. These populations rely on the forest for recreation and ecosystem services (UN Habitat, 2021).

2.2 Methods

This study employed a survey research design, which is well-suited for investigating the effects of human activities on flora and fauna in Karura Forest. The target population was the CFA members, Kenya Forest Service officers and tourists. One hundred (100) CFA members, five (5) Kenya Forest Service (KFS) officers and ten (10) tourists were purposively sampled. A semi-structured questionnaire was used to collect data from the CFA members while interview guides were used to interview 5 KFS officers. Field observations were used to document the actual human activities in the forest, as

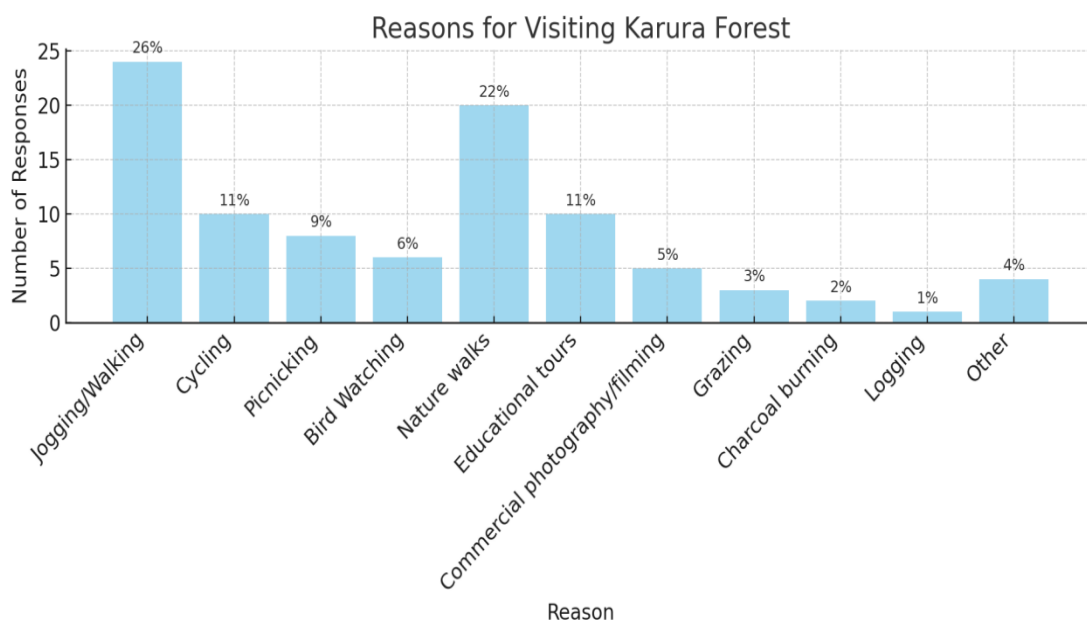
well as their impacts on the environment. Both quantitative and qualitative data was analyzed to gain a comprehensive understanding of the effects of anthropogenic activities on the flora and fauna in Karura Forest (Creswell, 2014). Quantitative data was presented in form of tables, figures, frequencies and percentages while qualitative data was presented in narratives and synthesized text.

3. Results and Discussions

3.1 Nature of human activities within Karura forest

The first objective of the study was to examine the various human activities that are taking place within Karura forest in Nairobi County, Kenya. To achieve this objective, the first sub-objective was to establish the reasons why people visit Karura Forest. As shown in Figure 2 below, A simple majority of the respondents noted that the main reasons why they visited Karura forest was to for jogging or walking (26 %), followed closely by nature walks (22 %), while others were for cycling (11 %), educational tours (11 %), picnicking (9 %), bird watching (6 %), commercial photography/ filming, while other reasons included livestock grazing (3 %), charcoal burning (2 %) and logging (1 %).

Figure 2 Reasons for Visiting Karura Forest



Source: Field Data (2025)

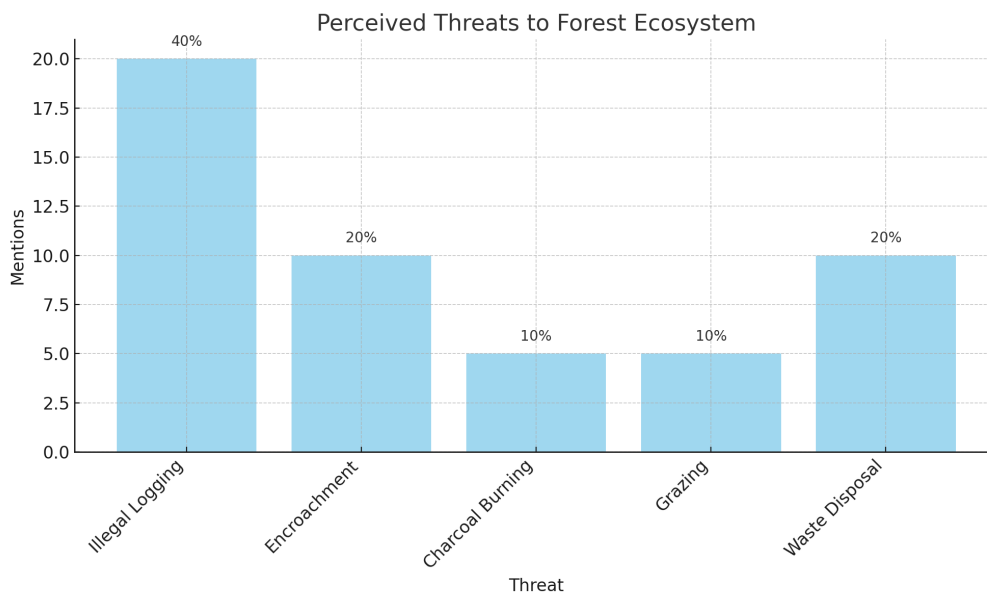
3.2 Multiple Response Question

Anthropogenic activities within Karura Forest reflect a complex interplay between human use and environmental conservation. Many visitors engage in recreational pursuits like jogging, cycling, and nature walks, which promote eco-tourism and public appreciation of green spaces. As **one of** the male regular forest user, remarked, *"I often come here for jogging and cycling but I've also noticed that some people litter along the trails, which is disappointing."* On the positive side, organized clean-up events and tree-planting efforts contribute to forest restoration. A female volunteer and environmental science student, explained, *"We've organized tree-planting and forest clean-up drives... but I've also seen people lighting small fires for picnics, which is risky during the dry season."*

However, not all activities are beneficial as one of the male respondents, observed, *"Some people come here to harvest medicinal plants or collect firewood illegally, especially in less-patrolled areas."* Such practices disrupt biodiversity and degrade forest ecosystems. Overall, while Karura Forest provides space for both recreation and conservation, there remains a pressing need for environmental education, increased surveillance, and stricter regulation to curb harmful human activities.

Furthermore, in order to establish the nature of human-environment interaction within Karura Forest, the respondents were asked whether they were aware of unauthorized human activities taking place within the forest. The results were as indicated in Figure 3 below.

Figure 3: Unauthorized human activities



Source: Field Data (2025) *Multiple response question

As shown in Figure 3 above, illegal logging was considered the biggest threat (40%), followed by waste disposal and human encroachment (20% each) and lastly charcoal burning and grazing (10 % each). These highlight critical areas for regulatory attention. Despite its significant ecological and social importance, Karura Forest has faced threats such as deforestation, encroachment, illegal logging, and pollution due to Nairobi's rapid urbanization (Njenga et al., 2018). These activities have fragmented habitats, altered ecosystems, and impacted the distribution and abundance of flora and fauna. Additionally, recreational activities, though well-regulated, may disrupt wildlife and lead to habitat degradation in certain areas (Friends of Karura Forest, 2021).

Through interviews, it was confirmed that Karura Forest faces a range of challenges in the protection of its plant and animal life, as highlighted by various stakeholders involved in its conservation. A female respondent, pointed out that " *People still try to grab parts of the forest or cut down trees for firewood. It's hard to monitor all areas, especially at night.*" One of the male forest rangers stationed in Karura, echoed these concerns, by adding that "*we struggle with limited resources. There are not enough rangers to patrol the forest effectively, and we lack adequate surveillance equipment to track illegal activities and poaching.*" In addition to human threats, one of the female conservation officers working with a local NGO, emphasized ecological challenges, stating that "*invasive species are a major threat to indigenous plants. Some of these species spread quickly and choke out native vegetation, which in turn affects the animals that rely on those plants for food and shelter.*" These insights reveal the multifaceted nature of the threats facing Karura Forest, requiring both human and ecological interventions to ensure its long-term protection.

3.3 Influence of human activities on distribution of flora and fauna

The second objective was to assess the effect of human activities on distribution of wild plants and wild animals within Karura Forest. The respondents were asked to respond to the question as to whether human activities influenced the distribution of plant species within Karura Forest. The results were as presented in Table 1 below.

Table 1: Whether human activities led to changes in distribution of plant species

Human activities led to changes in plant species distribution	Frequency	Percent
Yes	122	76
No	38	24
Total	160	100

Source: Field Data (2025)

As revealed in Table 1, majority of the respondents (n = 122, 76 %) noted that human activities led to changes in distribution of plant species while a few of the respondents (n = 38, 24 %) reported that the human activities did not lead to changes in the plant species distribution within Karura Forest. This finding reveals that there were changes in species populations within Karura Forest, indicating ecological shifts likely linked to anthropogenic activities. It was revealed through interviews that there was an increase in invasive plant species, which out-compete native flora for nutrients, water, and sunlight. This shift can lead to the loss of indigenous plant species and alter the structure of the forest ecosystem.

Further, the influence of human activities on the distribution of flora and fauna was assessed in terms of extent to which the human activities influenced the migration of wildlife species. The results were as indicated in Table 2 below. As indicated in Table 2, the mean value for the influence of eco-tourism on the migration of wildlife was 1.62 ± 0.11 . This implies that eco-tourism had minimal influence on the migration of wildlife within the Karura Forest. Therefore, it can be construed that eco-tourism had a positive influence on the migration of wildlife since these activities increase public awareness about conservation and generate funding through entrance fees. The revenue supports forest maintenance and community-based projects, while tourists often become advocates of environmental protection.

Table 2: Extent to which human activities led to migration of wildlife with Karura Forest

Human activity	Extent of influence				Mean & Standard Deviation
	1 = Not at all	2 = Less Extent	3 = Moderate Extent	4 = Great Extent	
Eco-tourism	87 (54.5 %)	54 (33.8 %)	12 (7.5 %)	7 (4.4 %)	1.62 ± 0.11
Urban expansion	9 (5.6 %)	28 (17.5 %)	45 (28.1 %)	78 (48.8 %)	3.20 ± 0.17
Waste disposal	63 (39.4 %)	70 (43.8 %)	21 (13.1 %)	6 (3.75 %)	1.96 ± 0.12
Livestock grazing	2 (1.25 %)	57 (35.6 %)	79 (49.4 %)	22 (13.8 %)	2.76 ± 0.18
Charcoal burning	3 (1.9 %)	35 (21.9 %)	68 (42.5 %)	54 (33.8 %)	3.08 ± 0.16

Source: Field Data (2025)

Table 2 demonstrates that urban expansion had a mean influence of 3.20 ± 0.17 on the migration of wild animals within the Karura forest. This indicates that the demand for residential spaces, infrastructural facilities and industrial expansion has led to migration of wildlife within Karura Forest. As natural areas are cleared for infrastructure and housing, wildlife corridors are disrupted, limiting the movement of species and affecting breeding patterns.

From Table 2, the mean value for the influence of waste disposal on migration of animal species was 1.96 ± 0.12 . This index confirms that waste disposal had a minimal influence on the migration of wild animals within Karura Forest. However, improper waste management contaminates both soil and water sources, posing health risks to wildlife.

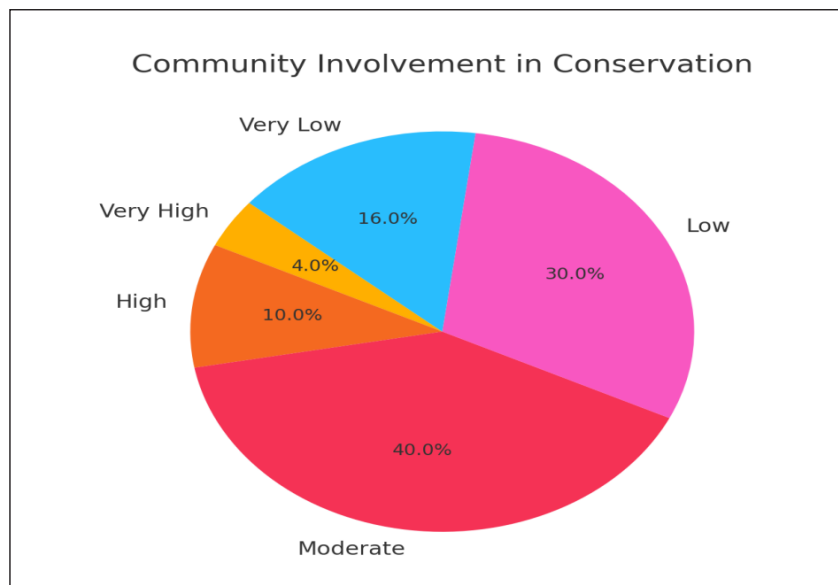
As presented in Table 2, the mean index for the influence of livestock grazing on the migration of wild animals was 2.76 ± 0.18 . This revelation demonstrates that livestock grazing had a substantial influence on the migration of wildlife. This could be attributed to the idea that during movement of livestock and herders, some animals such as antelopes and birds are likely to migrate to new uninhabited regions within the Karura Forest. Also, this activity results in the destruction of habitats, reduces biodiversity, and causes soil erosion, which further degrades the ecosystem.

As revealed in Table 2, the mean value for the influence of charcoal burning on the migration of wild animals within Karura Forest was 3.08 ± 0.16 . This finding indicates that charcoal burning has a substantial influence on the migration of wild animals particularly birds. Through interviews it was revealed that there was a decline in bird populations, particularly species like hornbills and doves. These birds play important roles in seed dispersal and insect control, so their reduction may disrupt ecological balance. Habitat degradation and noise pollution from nearby urban areas are likely contributors to their decline. Additionally, sightings of monkeys and antelopes have become increasingly rare.

3.4 Community Involvement in Forest Conservation

Moreover, the human-environment interaction was assessed in terms of community involvement in forest conservation within the Karura forest. The CFA members were asked to rate their level of involvement in conservation activities within the forest. The analyzed results are as demonstrated in Figure 4 below.

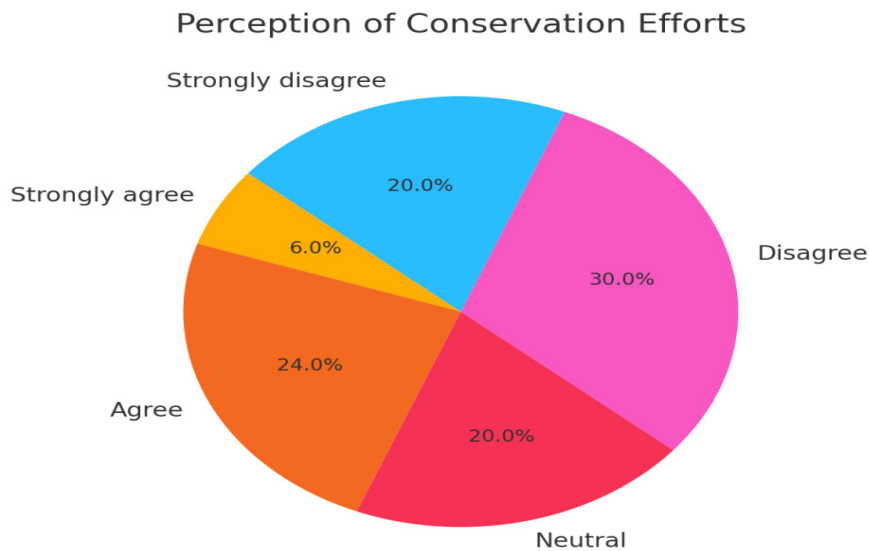
Figure 4: Community Involvement in Conservation Efforts



Source: Author (2025)

It is clear from Figure 4 that a majority of the respondents (40 %) engaged in forest conservation at a moderate level, 30 % noted to a low level, 16 % said to a very low level, 10 % revealed at a high level and 4 % reported at very high level. This finding imply that a substantial number of the CFA members engaged in conservation of Karura forest at a low level.

Figure 5: Perceptions on effectiveness of conservation efforts



Source: Author (2025)

Figure 5 show the results as to whether the conservation efforts were effective, a majority of the respondents (30%) disagreed, 24 % were in agreement, 20 % were neutral and strongly disagreed each and the remaining 6 % strongly disagreed. From this findings, it can be construed that most of the respondents disagreed with the statement that current conservation efforts are effective. This indicates that many feel existing programs are under-resourced or inadequately implemented.

Photograph 1: A panoramic view of Karura Forest illustrating the diverse forest canopy and the coexistence of native and exotic vegetation.



Source: Author (2025)

The image showcases the diverse natural landscape of Karura Forest, highlighting the lush tree canopy, open green spaces, and the mix of native and exotic vegetation. This panoramic view captures the forest's dual identity where efforts are still ongoing to phase out invasive species while protecting established native biodiversity. The dense greenery visible across the terrain reflects the forest's role as an urban ecological refuge, supporting flora, fauna, and recreational activities. It symbolizes both the challenges of invasive species management and the progress made in restoring the forest's natural integrity through indigenous reforestation initiatives.

4. Conclusion and Recommendations

4.1 Conclusion

The study identified several human activities taking place in Karura Forest. Most visitors frequent the forest for jogging, walking, and nature-related activities. However, a portion of respondents acknowledged unauthorized activities such as illegal logging, grazing, and charcoal burning. While eco-tourism and waste disposal had minimal influence on the migration of wildlife, it was confirmed that urban expansion, livestock grazing and charcoal burning had substantial influence on the migration of wild animals within the forest. The data suggests that while the forest is valued for recreation and relaxation, its ecosystem is threatened by actions that compromise ecological stability.

Respondents also noted moderate to low community involvement in conservation activities, suggesting insufficient public participation. Half of the respondents disagreed or strongly disagreed with the statement that current conservation efforts are sufficient. This indicates that many feel existing programs are under-resourced or inadequately implemented. From the photograph 1, there is evidence of efforts to phase out invasive species while protecting established native biodiversity.

4.2 Recommendations

To promote sustainability in Karura Forest, respondents suggested several key measures. First, increasing funding for forest management is essential to support conservation efforts, maintain infrastructure, and conduct scientific monitoring. Enhanced financial support would allow for more effective patrolling, better equipment, and the hiring of skilled personnel. Secondly, enhancing community sensitization programs is crucial to educate local residents about the value of biodiversity and the long-term benefits of conservation. Awareness campaigns can foster a culture of environmental stewardship. Strengthening law enforcement against illegal activities such as logging, poaching, and encroachment is also vital. This includes deploying forest rangers, improving surveillance, and enforcing penalties to deter offenders. Additionally, promoting Eco-tourism presents an opportunity to generate revenue while conserving the forest. By involving local communities in tourism activities as guides, service providers, or artisans they can benefit economically, which fosters a sense of ownership and responsibility for forest protection.

Future studies could explore the long-term effects of eco-tourism on the biodiversity of Karura Forest. Comparative studies between Karura Forest and other urban forests in Kenya could provide broader insights into conservation challenges and best practices. Additionally, research on the effectiveness of current policy frameworks and enforcement mechanisms could guide reforms. Finally, examining the role of indigenous knowledge in sustainable forest management could offer innovative solutions to conservation issues.



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Influence of Modern Religions on Traditional Ecological Knowledge on Environmental Preservation: A Case of the Luo of Lower Nyakach, Kisumu County

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ABSTRACT

This study examined the influence of modern religions, specifically Christianity and Islam, on Traditional Ecological Knowledge (TEK) among the Luo community in Lower Nyakach, Kisumu County, Kenya. TEK, encompassing taboos, totems, rituals, and sacred practices, historically guided sustainable environmental management within the community. However, the expansion of modern religions has challenged and, in many cases, displaced these indigenous practices. The following research objectives guided the study: 1) to assess the influence of modern religions on the continuity of traditional ecological practices among the Luo of Lower Nyakach; 2) to identify specific traditional ecological knowledge systems that have declined, transformed, or persisted under modern religious influence; 3) to examine community perceptions of the compatibility or conflict between TEK and modern religious teachings; 4) to propose strategies for integrating indigenous ecological values within modern religious frameworks for sustainable environmental management. The purpose of the study was to examine the influence of modern religions on traditional ecological knowledge among the Luo community of Lower Nyakach. Through qualitative methods including interviews, focus group discussions, and participant observation, the research revealed a significant decline in sacred ecological rituals, increasing perceptions of traditional beliefs as incompatible with faith, and a growing generational disconnect in the transmission of TEK. Nonetheless, the findings also highlight emerging forms of syncretism, where religious and traditional values co-exist, and offer hope for ecological resilience. The study recommends fostering interfaith dialogue, promoting community-based education on TEK, and integrating indigenous ecological wisdom into religious teachings and environmental policy.

Key Words: Traditional ecological knowledge (TEK); Preservation; Religions, Ecology, Modern.

1. Introduction

Traditional Ecological Knowledge (TEK) refers to the cumulative body of knowledge, practices, and beliefs developed by indigenous communities through centuries of interaction with their environment. Among the Luo of Lower Nyakach in Kisumu County, TEK encompasses taboos, totems, rituals, and spiritual practices that historically governed the sustainable use of natural resources. However, with the introduction and widespread adoption of modern religions, particularly Christianity and Islam, there is growing concern that these traditional environmental stewardship practices are eroding. This article examined the extent to which modern religions have influenced the preservation, transformation, or loss of TEK among the Luo of Lower Nyakach.

1.1 Background of the Study

For generations, the Luo community in Lower Nyakach relied on sacred groves, spiritual taboos, and ritual practices to conserve forests, rivers, and animal species. Certain trees were considered sacred, and particular hills and water bodies were revered; others conducted rituals to appease ancestral spirits and deities associated with nature. These ecological traditions formed a robust environmental ethics that guided the use of natural resources. However, the post-colonial expansion of Christianity and Islam introduced new belief systems that often dismissed indigenous practices as pagan or



unscientific. Churches and mosques now stand where sacred forests once thrived, and the role of traditional priests and diviners has diminished. The tension between modern religious teachings and traditional beliefs raises critical questions about the future of environmental sustainability in the region.

1.2 Statement of the Problem

Despite the Luo community's historical reliance on indigenous religious beliefs for environmental management, the rapid expansion of modern religions appears to have disrupted traditional practices. Sacred rituals are now perceived as outdated or even heretical by religious converts, while younger generations show decreasing interest in ancestral ecological wisdom. The erosion of TEK threatens not only cultural identity but also local biodiversity and sustainable land use. However, few empirical studies have systematically explored the magnitude and nature of this impact, particularly in the Lower Nyakach region. This study seeks to fill this gap.

1.3 Purpose of the study

The purpose of this study was to examine the influence of modern religions specifically Christianity and Islam on Traditional Ecological Knowledge (TEK) among the Luo community of Lower Nyakach, Kisumu County, Kenya. The research sought to explore how the introduction and spread of these religions have contributed to the transformation, decline, or persistence of indigenous ecological practices rooted in spiritual beliefs, and to assess the perceptions of community members regarding the compatibility or conflict between TEK and modern religious teachings. Ultimately, the study aimed to generate strategies for integrating indigenous ecological values within modern religious frameworks to promote sustainable environmental management while preserving cultural identity.

1.4 Research Objectives

The following objectives guided the study:

1. To assess the influence of modern religions on the continuity of traditional ecological practices among the Luo of Lower Nyakach.
2. To identify specific traditional ecological knowledge systems that have declined, transformed, or persisted under modern religious influence.
3. To examine community perceptions of the compatibility or conflict between TEK and modern religious teachings.
4. To propose strategies for integrating indigenous ecological values within modern religious frameworks for sustainable environmental management.

2. Literature Review

2.1. Influence of Modern Religions on Traditional Ecological Practices

The interaction between modern religions, primarily Christianity and Islam, and indigenous environmental ethics has been a topic of widespread debate. Scholars such as Mbiti (1991) note that traditional African religions are deeply intertwined with ecological consciousness, emphasizing the sacredness of the land, rivers, forests, and animals. Among the Luo, traditional beliefs historically regulated land use, water conservation, and seasonal farming through taboos and rituals (Onyango, 2010). However, the advent of Christianity and Islam introduced new spiritual paradigms, often condemning indigenous practices as pagan or superstitious (Kalu, 2008). The advent of Christianity and Islam has led to the abandonment or alteration of many ecologically sound traditional practices, as evidenced by the reduced observance of rituals that once safeguarded sacred groves and water bodies (Ocholla-Ayayo, 1976). However, the continuity of TEK faces serious challenges, especially from the expansion of modern religions. Kimmerer (2002) warns that formal education systems and Western religious doctrines have often disregarded or actively undermined TEK, branding it as unscientific or superstitious. Her work involves integrating indigenous wisdom into practices that are often considered unscientific or superstitious. Her work calls for the integration of indigenous wisdom into mainstream education and ethical frameworks, proposing that blending TEK with formal science



could foster a more inclusive and sustainable environmental ethic. In the context of Kenya, this implies that religious institutions, which often control moral narratives, need to recognize the ecological value embedded in indigenous traditions.

2.2. Transformation, Decline, or Persistence of TEK under Religious Influence

Among the Luo people, Traditional Ecological Knowledge (TEK) has not entirely vanished, but it has evolved. Certain things have been redefined in the contemporary religious circles, whereas others have deteriorated as a result of dogmatic upheaval. For example, the holiness or sanctity of certain hills or forests has been acknowledged by the lands owned by churches or the government, as well as other conservation programs in modern times (Were, 2003). Nevertheless, there are still practices, such as seasonal agricultural time schedules, the utilization of local medicinal plants, and the creation of tabooed lands enforced by the community, even though they may not hold as much spiritual significance (Odhiambo, 2020). This selectiveness indicates that TEK is enduring, yet it is prone to erosion due to culture and Modern religions.

The intersection of religion and ecology is directly addressed (Ndiritu, 2015), as the author highlights how Christianity and Islam have influenced the local perception of the natural environment. He observes how religious conversion has led to the loss of customary beliefs, including those that conserve ecosystems. Most of the Luo sacred landscapes, such as hills, rivers, and forests, which served as spiritual places in the past, have lost their cultural significance and are now regarded as ordinary places. According to Ndiritu, such desecralization contributes to environmental degradation, as spiritual sanctions have been lifted on the exploitation that the elder previously regulated.

Expanding on this, Ocholla (2019) focuses specifically on the Luo of Kenya, analyzing how Christianity has contributed to the erosion of African traditions. He shows that missionaries and religious institutions played a central role in discrediting indigenous practices, including those with ecological functions. For instance, totems that once safeguarded animal species and taboos that regulated harvesting times are now dismissed as idolatry or witchcraft by Christianity and Islam. Ocholla introduces the concept of religious dissonance, where individuals struggle to reconcile their Christian faith with ancestral environmental practices. However, he also identifies emerging syncretic practices, where communities creatively blend Christian theology with traditional ecological ethics, indicating a possible pathway for cultural and environmental continuity.

2.3. Community Perceptions on TEK and Modern Religions

Perceptions within communities are diverse. While some elders view modern religion as incompatible with traditional ecological values, younger generations often express neutrality or preference for syncretic practices (Owuor, 2019). Research indicates that some Christians in Lower Nyakach reinterpret traditional ecological values as forms of "stewardship" in line with Biblical teachings (Genesis 2:15), thus creating avenues for integration rather than opposition (Bwire, 2021). However, hardline theological stances from mainstream churches often discourage this synthesis, leading to cultural conflict and generational misunderstandings regarding land and resource use.

2.4. Integrating Indigenous Ecological Values into Modern Religious Frameworks

There is a growing scholarly call to reconcile TEK with modern religious teachings to foster sustainable environmental management. This scholarly call includes incorporating indigenous ecological values into church teachings, community sensitization, and environmental advocacy led by faith groups (Tavernier, 2014). In areas like Lower Nyakach, faith-based organizations can serve as mediators, promoting a theology of creation care that values both scripture and ancestral wisdom (Makori, 2022). Initiatives such as eco-theological dialogues, community-based conservation informed by cultural rites, and education curricula that blend traditional and religious worldviews are promising pathways forward.

3. Methodology

This study employed a qualitative research design, specifically an ethnographic approach, to investigate the influence of modern religions on Traditional Ecological Knowledge (TEK) within the Luo community. The researcher collected data through in-depth interviews, focus group discussions, and participant observation. Key respondents included the Luo elders, religious leaders (both Christian and Muslim), and local environmental practitioners in Lower Nyakach. Purposive sampling was used to select individuals who were well-versed in both indigenous and religious practices. Thematic analysis of the data was performed to identify common trends and meanings in the provided stories. The study also examined syncretic practices and their impact on the development of current ecological attitudes and behaviors. Strict adherence to ethical considerations, including informed consent, anonymity, and cultural sensitivity, was maintained.

3.1 Study Area

The study was conducted in Lower Nyakach, a sub-county in Kisumu County, located in western Kenya along the shores of Lake Victoria. The area is predominantly inhabited by the Luo ethnic group, who have traditionally relied on indigenous knowledge systems to interact with their environment. Lower Nyakach is characterized by a combination of highland and lowland ecological zones, featuring diverse ecosystems that include riverine areas, wetlands, hills, and drylands. The major rivers, such as River Nyando, and the proximity to Lake Victoria, make the region ecologically significant. The community in Lower Nyakach has historically practiced farming, fishing, and livestock rearing using traditional methods embedded in spiritual and ecological beliefs. Sacred sites, including groves, hills, and water bodies, were integral to ecological conservation and cultural identity. However, in recent decades, the region has undergone a rapid transformation in its religious landscape, marked by the growth of Christianity and Islam, alongside increasing exposure to formal education and urban influences. These developments have introduced new worldviews that often conflict with or reinterpret indigenous practices.

Lower Nyakach was selected for this study because it presents a dynamic setting where the tension, negotiation, and integration between Traditional Ecological Knowledge (TEK) and modern religious teachings can be observed. The area's cultural richness, ecological diversity, and ongoing religious evolution provided an ideal context to explore the impacts of religious change on environmental conservation practices rooted in indigenous belief systems.

3.2 Theoretical Framework

Based on the following theory of Ecotheology, this study argues that religious beliefs and moral systems can serve as desirable platforms of environmental ethics. Ecotheology facilitates the reinterpretation of religious texts and traditions to foster ecological awareness and promote sustainable behaviors. Additionally, the research also incorporates the Human-Environment Relations Theory (HER), which examines the influence of human cultures, beliefs, and social constructions on environmental actions. The theories provide the instrument to examine not only the degradation of indigenous ecological systems, but also the emergence of new eco-spiritualities among the Luo.

4. Results and Discussion

4.1 Influence of Modern Religions on Traditional Ecological Practices among the Luo of Lower Nyakach

Technique entrants, the growth of modern religions primarily Christianity and Islam has significantly contributed to the traditional ecological practices in the Luo community of Lower Nyakach. By tradition, nature-centered spirituality was central to the Luo vision, and the issue of ecological protection could not be isolated or distinguished from religious faith and ritual performances. Sacred groves, such as small forests, and trees like *ngou* (fig trees), were regarded as abodes of spirits or ancestors. As



Mbiti (1991) observed, "Africans are notoriously religious," and for the Luo, spirituality permeated every aspect of life, including the environment. These natural features were protected not merely for their utility, but because they were believed to be imbued with spiritual significance. Rivers such as Nyando were considered sacred, and pollution or overexploitation was forbidden. Violators risked spiritual repercussions mediated by ancestral spirits or '*juogi*' (spiritual forces).

However, the spread of Christianity and Islam introduced new theological paradigms that often clashed with indigenous beliefs. Christian missionaries, in particular, condemned traditional religious practices as 'heathen' and encouraged converts to demonstrate spiritual rebirth by abandoning 'superstition.' As Kenyatta (1938) noted in the Kikuyu context, which is also relevant to the Luo, "conversion to Christianity was not simply a matter of belief but of total transformation, including rejection of traditional customs." In Lower Nyakach, shrines were destroyed, sacred trees felled, and elders discouraged from performing rituals that once regulated land use and natural resource management.

Islam also reshaped community values by emphasizing a monotheistic worldview where nature was God's creation, to be used wisely but not worshipped. While both Christianity and Islam introduced moral teachings that encouraged respect for creation, their influence led to the erosion of communal ecological taboos and rituals. This aligns with Nasimiyu-Wasike's (1992) observation that "Western religions, though offering ethical models, often failed to appreciate the ecological wisdom embedded in African traditional religions."

Nevertheless, the relationship between modern religions and indigenous ecological knowledge is not entirely adversarial. Some churches in the region have begun integrating environmental stewardship into their teachings. For example, during community interviews in Lower Nyakach (Field Data, 2025), one church elder noted,

"We now teach our youth to care for the environment because God gave us this land to protect, not destroy." (Elder C, May 2025).

Similarly, Islamic clerics have drawn from Qur'anic teachings to promote tree planting and water conservation, interpreting humanity's role as *Khalifa* (steward) of the Earth (Qur'an 6:165).

One of the respondents confessed that;

The marginalization of traditional ecological custodians such as 'ajuoga' (diviners) and clan elders has weakened the enforcement of community-based environmental norms. Practices such as rotational grazing, river cleansing ceremonies, and prohibitions on fishing during certain seasons have been vastly reduced. (Elder A, May 2025).

The results of neglecting native spiritual systems without substituting their environmental protective measures should be considered, as it is described as a moral and ecological vacuum (Opongo, 2015).

To conclude, modern religions have had their disruptive nature and transformational impact among the Luo of the Lower Nyakach. Although these religions have introduced new spiritual and moral standards, they have also contributed to the erosion of traditional ecological practices rooted in indigenous beliefs. The difficulty lies in developing an integrative framework that respects both religious values and indigenous ecological knowledge to support sustainable environmental governance.

4.2 Transformation, Decline, or Persistence of TEK under Religious Influence among the Luo Community of Lower Nyakach.

The correspondence of modern religions and Traditional Ecological Knowledge (TEK) among the Luo of Lower Nyakach represents a more subtle tendency of evolution, loss, and aimed survival. Since TEK is rooted firmly in indigenous spiritual concepts, it has also been significantly influenced by Christianity, as well as some influence from Islam.

Transformation of TEK

Transformation refers to the adaptation of traditional ecological systems using contemporary religions as the guiding factor. Some of the ecological ways in the Luo context have been repackaged to suit the Christian value system. An example is that some of the sacred groves (kayago), where once spiritual relations were linked with ancestral spirits, have been maintained not based on their spiritual significance, but on their ecological and historical values (Owuor, 2006).

Christian teachings, particularly among mainline Protestant and Catholic groups, have encouraged environmental stewardship by referencing scriptures such as Genesis 2:15: "And the Lord God took the man, and put him into the garden of Eden to dress it and to keep it." This has provided a theological basis for promoting care for creation, resonating with indigenous conservationist practices (Wachira, 2020). Consequently, one of the priests confessed that;

Some local churches have incorporated tree-planting, water preservation, and anti-deforestation campaigns into their community outreach programs (Priest A, 2nd May, 2025)

Additionally, the traditional practice of using totems, where clans identified with particular animals or natural elements, has in some cases been preserved as a cultural rather than a religious identity. According to Onyango (2013), younger generations increasingly embrace totemic identity as part of Luo heritage, even when practicing Christianity.

Decline of Traditional Ecological Knowledge (TEK)

Modern religious influence has also precipitated the decline of several TEK systems. Pentecostal and Evangelical movements in particular have taken a hard stance against practices deemed "pagan" or "satanic," leading to the abandonment of rituals such as libations, rainmaking ceremonies, and the consultation of *ajuoga* (traditional diviners and herbalists) (Mbiti, 1990). These rituals, which were once central to community environmental decisions such as when to plant, harvest, or conduct fishing expeditions, have been dismissed as incompatible with Christian doctrine.

Ochieng (2017) notes that younger members of the Luo community often lack knowledge of sacred ecological zones and the taboos that once protected them. This generational disconnect has been exacerbated by church teachings that encourage distancing from "traditional strongholds," destroying shrines and deforestation of once-protected groves. One elder interviewed in Lower Nyakach stated; *"When missionaries came, they told us to burn our drums, destroy the sacred trees, and stop the sacrifices. Now the land is bare, and the rains are not the same"* (Elder A, 2nd May, 2025).

Persistence of Traditional Ecological Knowledge (TEK)

Despite the erosion of some practices, elements of TEK persist, especially those that are utilitarian or have been decoupled from religious connotations. Soil conservation techniques such as matengo pits, intercropping, and the use of compost manure remain widespread among Luo farmers (Odhiambo, 2012). Herbal medicine also continues to be used alongside biomedical approaches, especially in rural areas where access to healthcare is limited. This contributes to the preservation of biodiversity in the area.

Moreover, syncretism has enabled the persistence of certain practices within a religiously modified context. For example, while formal rainmaking ceremonies may be rare, some communities organize prayer gatherings during droughts, thereby maintaining the communal function of invoking divine intervention to restore environmental balance (Obiero, 2021).

In recent years, there has been a resurgence of interest in indigenous ecological knowledge, driven by climate change and environmental degradation. Organizations formed around faiths like the Kenya Conference of Catholic Bishops (KCCB) have introduced a series of initiatives that mainstream indigenous conservation practices into Christian environmental morality, therefore, legitimizing TEK in religious contexts (KCCB, 2023).



4.3. Community Perceptions on TEK and Modern Religions: A Case of the Luo of Lower Nyakach

The attitudes of the local Luo community in Lower Nyakach regarding the interplay between Traditional Ecological Knowledge (TEK) and modern faiths are mixed, reflecting a dynamic interplay between culture and spirituality. TEK is considered a living tradition by many members of the community and thus plays a crucial role in shaping the community's identity, ancestral knowledge, and morality. Nonetheless, with the emergence and spread of modern religions, particularly Christianity and Islam, a noticeable shift in the perception and appreciation of these formal systems has been observed.

According to the interviews and focus group discussions held in Lower Nyakach, there was diversity in the opinions. Others, mostly older people and the conservative custodians of knowledge, were worried that modern religions have led to the loss of sacred natural sites, rituals, and taboos that guided sustainable attitudes towards nature. They added that the number of young people who have adopted contemporary religious doctrines is so high that they view indigenous beliefs and practices as backward or pagan, resulting in a loss of interest in traditional ecological approaches or their direct rejection.

On the other hand, there are segments of the population, mainly middle-aged and younger adults who have grown up with both systems, who articulate a more syncretic worldview. They see value in integrating TEK with modern religious values, especially where both traditions promote stewardship, care for creation, and ethical resource use. For example, some Christian leaders in the area have begun to incorporate ecological teachings into sermons, referencing biblical principles that align with traditional Luo respect for nature.

Moreover, a significant number of respondents acknowledged the practical effectiveness of TEK in areas such as rain prediction, soil conservation, and biodiversity management. Although they might consider their religious beliefs a barrier to engaging in rituals or ancestral worship, they recognize that the ecological wisdom inherent in them is special. This practical attitude often results in the discrimination of more ancient practices, which do not visibly contradict religious doctrine.

Notably, the community also has an emerging discourse on the potential prospects of church institutions and their leaders working together in advocating for environmental protection. Some respondents noted that religious platforms could revive ecological ethics within the Luo culture, particularly when presented in a manner that aligns with moral and theological values.

Overall, the perceptions involved in the relationships between the community and Lower Nyakach show a multidimensional relation between reverence, skepticism, adaptation, and integration of TEK into the modern religious sectors. In the context of existing tensions, one may also find fertile ground for dialogue and mutual enrichment that could become a starting point for culturally based and spiritually informed environmental conservation initiatives.

4.4. Integrating Indigenous Ecological Values into Modern Religious Frameworks among the Luo Community

The incorporation of indigenous ecological principles into current religious systems is a positive strategy for realizing sustainable environmental management within a culturally diverse society. The native religious beliefs and customs among the Luo of Lower Nyakach are deeply rooted in ecological stewardship, as evidenced by taboos, sacred groves, totems, worship of the souls, and rituals that have regulated human relationships with the environment throughout modern times. The introduction of modern religions, such as Christianity and Islam, has, however, caused a noticeable transformation in these traditional systems. Notwithstanding this, there is still an emerging recognition that it is necessary to harmonize these two systems of knowledge to the advantage of both faith-based and environmental goals.

Contemporary religious bodies, especially churches in the area, are increasingly interested in environmental activism, primarily through theological reflections on caring for the environment, stewardship, and social justice. Such an overlap enables the revalorization of indigenous ecological knowledge (TEK) within contemporary religious ideology. Integrative strategies can include redefining traditional ecological values based on biblical or Quranic scriptures, facilitating intergenerational dialogue between older and religious seafarers, and advocating for educational courses in eco-theology within faith communities. As an example, the Luo who believe in *juok* (spiritual essence), which exists in holy places like forests or lakes, can be compared with the Christian perceptions of creation as a holy place and full of divine presence. Likewise, ceremonies performed prior to the extraction of natural resources can be observed, as religious leaders and elders conducted rituals to maintain ecological balance. Within the religious context, we also find liturgical seasons and fasts observed by many religions, emphasizing the importance of restraint and reflection.

The attempts at integration also have to deal with theological and epistemological tensions. There are members of the clergy who look down upon traditional practices and term them as either 'pagan' or 'idolatrours' in that it does not conform to monotheistic teachings. This is an issue that can be resolved through an inclusive discussion that portrays TEK as not an alternative religion, but rather as a cultural heritage with inherent ecological knowledge. Further, including cultural custodians and elders in forums and planning of religion and the environment will aid in the demystification and stigmatization of indigenous practices.

Lower Nyakach case studies are characterized by an emergence of alliances between church-based organizations and local conservation organizations that strive to integrate traditional norms regarding fish ban seasons or sacred forests into a larger environmental action. The latter is achieved within the framework of this model, based on respect and reciprocity, which illustrates how the traditional and religious perceptions of reality can unite to strengthen sustainable behaviors.

Summing up, it can be said that there is no fear of integrating the indigenous or local ecological values into new religious structures, as the modern religious context, as in the lower Nyakach, is more than necessary to integrate and harmonize them with the local ecological values that have a high influence on the local economy. The philosophy promotes environmental resilience while preserving cultural identity, ultimately leading to more inclusive and grounded approaches to ecological conservation.

5. Conclusion and Recommendations

5.1. Summary

This paper examined how the emergence of Christianity and Islam has impacted the Traditional Ecological Knowledge (TEK) of the Luo people in Lower Nyakach, Kisumu County. In the Luo, TEK encompassed belief systems, taboos, totems, and sacred rituals that in the past facilitated the attainment of sustainable environmental management. The research revealed that contemporary religions have often classified these native practices as pagan or obsolete, and in turn, have discriminated against or disregarded them, particularly among younger generations.

Nevertheless, the research also uncovered cases of transformation and adaptation. Some sacred practices have deteriorated, but others have undergone reinterpretation as religious practices, such as environmental stewardship, unified through biblical and Quranic teachings. Other aspects of TEK, such as traditional agriculture methods and traditional medicine, have remained useful during the present time. There is a diverse perception in the community, with older people feeling that the modern form of religion is disturbing, and the younger generation has a way of mixing the two different forms. Notably, efforts are emerging to incorporate TEK into religious teachings and environmental conservation.



5.2. Conclusion

The relationship between contemporary religions and traditional ecological knowledge among the Luo of Lower Nyakach is a complex one, characterized by both conflict/convergence. Christianity and Islam have worked to destroy some forms of ecological traditions, although they have adopted protocols concerning ethics supporting environmental manipulation. The study has concluded that TEK can be effectively integrated into contemporary religious contexts and is even necessary to encourage sustainable environmentalism. Integration needs to be done respectfully based on a dialogue, community education, and mutual efforts and understanding. There is wisdom in ecology found in all religions, as well as in indigenous systems. This is a culturally accommodating initiative that has the potential to conserve the environment and the Luo cultural identity in Lower Nyakach and beyond.

5.3 Recommendations

1. Promotion of Interfaith Dialogue-Religious leaders from Christianity, Islam, and indigenous custodians should be encouraged to engage in open dialogue on ecological conservation. This would create common ground where both sacred teachings and Traditional Ecological Knowledge (TEK) can co-exist for sustainable environmental management.
2. Integration of TEK into Religious Teachings-Churches and mosques in Lower Nyakach should incorporate indigenous ecological wisdom into sermons, catechism, madrasa teachings, and youth programs. This will help validate TEK as a cultural heritage that complements religious stewardship rather than contradicting it.
3. Community-Based Environmental Education-Schools, community centers, and faith-based organizations should introduce education programs that integrate TEK and modern ecological science. This approach would bridge the generational gap and revive interest among youth.
4. Policy Inclusion of TEK-County and national governments should recognize TEK in environmental policy frameworks. By embedding cultural practices such as taboos, sacred groves, and seasonal bans into legal conservation strategies, traditional wisdom can reinforce modern sustainability goals.
5. Youth Perceptions of TEK in a Digital Age-There is need to examine how digital culture, social media, and modern education shape young people's perceptions of indigenous ecological wisdom alongside religious teachings.
6. Longitudinal Studies on TEK Resilience-A long-term study tracking changes in TEK across generations in Lower Nyakach could provide deeper insight into the speed and direction of cultural change under religious influence.

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Resilience to Insecurity in African Mega Cities: Some Lessons from the Nigerian Law Enforcement and Co-Creation of Crime Prevention

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ABSTRACT

One way to address urban crime and improve policing is through employing what research suggest, developing partnerships between the police and communities. Such collaborations are anchored in the concept of co-creation. Utilizing qualitative investigation, this study evaluates the specific forms of politics and power relations as well as strategies being used to confront the increasing crime rate in Lagos with the involvement of various actors. What the Lagos experience teaches is that crime reduction through co-creation is more likely to emerge and endure, even in concentrated political settlements, with law enforcement power centralised around the presidency and an executive bureaucracy. While with many challenges, findings show that co-creation of crime prevention exemplifies many success, particularly outside the elite provinces. The limitations on coproduction opportunities are noteworthy and will require significant political support moving forward.

Keywords: Security governance; State and non-state actors; Collaborative partnerships

1. Introduction

States in Africa are considered to have failed to deliver on public utilities and services - their citizens remain poor and are commonly disregarded by their leaders, corruption reigns, and security services are miserably unreliable, ineffectual, and deficits remain extreme (Carbone & Pellegata, 2017), particularly in the informal neighbourhoods that provide homes to more than half of city dwellers. For security, improvement initiatives are many, but they seem unsustainable in the face of systemic state performance deficits. Co-creation has been acknowledged as one way to tackle this complexity (Ward, *et al.*, 2011; Baud *et al.*, 2021; Collard *et al.*, 2021). Thus, co-creation is a way in which complexity in public service delivery is tackled by a group of stakeholders, instead of any singular actor (Mazerolle, *et al.*, 2017). This approach has been used in countries like Finland (Raisio, *et al.*, 2021, Jalonen, *et al.*, 2021), United States (Brewer & Grabosky 2014), and Zimbabwe (Zhou & Njanji, 2021) among others. Co-creation is also evident in Lagos and is particularly apparent in the Lagos concept for Neighborhood Watch.

Co-creation is conspicuous in the community safety domains. There are quite a few studies on different policing interventions that use co-creation approaches. Modern instances are evident in problem-oriented policing (Reisig 2010; Scott & Kirby 2012; Exum, *et al.* 2014), reassurance policing (Tuffin *et al.*, 2006; Raisio, *et al.*, 2021), pulling levers (Berry *et al.* 2011; Braga & Weisburd 2012; Messing *et al.* 2015), third-party policing–TPP (Mazerolle & Ransley, 2005; Mazerolle, *et al.*, 2017), networked policing (Crawford, 2006; Rosenbaum, & Schuck, 2012), plural policing (Crawford, *et al.* 2005; Ericson, 2007), and intelligence-led policing (Weisburd & Eck 2004; Ratcliffe, 2008), and community policing (Jones & van Steden, 2013; Mangai, *et al.*, 2023). Yet, only few of these studies are able to identify the processes shaping the partnerships that produced successful results in community safety. Even so, the effectiveness of the processes must be understood in relation to wider political settlement contexts so as to understand the challenges and offer precise solutions.



To date, political settlements has primarily been applied at the level of national politics and security governance in Nigeria. While there are different dimensions and typologies of political settlements (Kelsall, et al., 2021; Schulz & Kelsall, 2021), this study explores the power configuration dimension of political settlements – that is, the extent of concentration of power (which directly shapes security services by [non]-state) in the country's top leadership. This article thus brings together an appreciation of the wider political system and explores the co-productive practices operating in Lagos' security landscape, and critically examines their effectiveness. Its key contribution is to examine the extent to which state and resident partnerships for crime control constitute cooperation, and the scale and significance of the solution that this collaboration have delivered. This article identifies the politics that shape decisions to invest in co-creation initiatives and offer them the support to deliver on their mandates. It explores the ways in which co-creation of crime prevention has been shaped and continues to be shaped by the politics, state commitment and local capacity for security, and the outcomes achieved so far as well as in terms of creating a more enabling environment for crime prevention in Lagos at present, and in the future.

The research questions guiding this study include: How is security governed in Lagos and how has this impacted coproduction of crime prevention? What is the nature of co-creation approach? How do non-state security providers relate to the state in terms of influence and/or neglect? What institutional support do they receive and require to effectively fulfil their mandates? In what ways has the co-creation contributed to crime reduction and what obstacles are they facing? How can those outcomes be improved and the challenges addressed? How can they be harnessed by state for the prevention of crime? Assessing these issues is highly significant to adding the experiences of Lagos to the growing body of literature; drawing important implications for handling crime and advancing understanding about how co-creation forms and how it might function more effectively. This article contributes to an understanding of how coproduction of crime control can contribute to inclusive and equitable security provisions in African cities.

To develop the ideas of this study further, the next section discusses the methodology of this research. This is followed by research findings and discussions on the governance, politics, activities and complications of co-creation in Lagos. Moving forward, the article provides some policy recommendations about future directions for the coproduction of security before the conclusion.

2. Methodology

For the field research, the study adopted qualitative approach allowing for a nuanced and complex understanding of the coproduction apparatus and its functioning and its relationship to the politics. Data was collected from various group of people. The study took a bottom-up approach, beginning with a rapid interview at street level, speaking with residents/people on streets, then to a conversation with the key informants/actors. Overall, two sets of respondents were interviewed. The first group were citizenry living in Lagos. To engage these people, four pivotal areas were purposive selected from both Lagos metropolitan area and peri-urban areas. In the metropolitan areas, Mushin, Oshodi-Isolo and Lagos-Island were selected while Ikorodu was selected in the peri-urban area. In all, 50 respondents were surveyed through purposive sampling. That is, approaching individuals on the streets, asking and requesting their participation in the research. The second group of respondents were key informants. This includes members of the state and non-state groups that played important roles in the security process and governance of Lagos. A total of 15 key informant interviews were prepared for but only 12 were completed. The key informant interviews were more informal dialogues, speaking with representatives of communities, police department, NGOs, house guards and vigilante operatives. The study then moved upwards, bringing the community representatives and key stakeholders together in a forum of research validation workshop and engagement meeting.



For qualitative research, there is no strict number that is agreed on to reach data saturation. Nevertheless, this study took advice from Vasileiou *et al.*, (2018) who claimed that a minimum sample size of twelve can produce data saturation for a qualitative study. Hence, 62 interviews were considered satisfactory for the qualitative analysis and evaluation criteria for this study.

Data collection involved semi-structured interviews with open-ended questions. Respondents were asked, among other questions, about their participation in co-creation of crime prevention and what lessons could be learned from these collaborations. Depending on the choice of participants, discussions were held in either Yoruba¹, Pidging², or English. A combination of voice recording transcription and note-taking were used during the interview. For those conducted in Yoruba and Pidgin, they were later transcribed into English. For data analysis, the study conducted a thematic analysis using the six-phase method (Cichoń, 2020). As part of this procedure, descriptive codes demonstrating features of the discussions were generated and then collated to form overall discussion subjects. Following this, excerpts were extracted from each theme from the discussion transcripts.

The final stage involved telling the story in writing from the research problem.

3. Findings and Discussion

This section discusses findings relating to the politics and governance of security; the nature of co-creation movements and various outcomes and challenges of these co-creation partnerships. Unless where otherwise stated, the narratives are the summary of the outcomes of the literature review, residents and key informant interviews carried out from September 2022 to January, 2023.

3.1 The politics and governance of crime prevention

Results show that security performance in Lagos is due in part to the nature of politics at both federal and state levels. Under the Nigeria's constitution, responsibility for law enforcement (e.g. police and prisons) resides with the federal government. Thus, the legal and executive framework for combatting crime is overtly concentrated at the centre and cedes no power to subnational (state and local) governments. The Nigeria Police Force (NPF) is in charge of internal security, and has a centralized management command and control structure in which the federal government singlehandedly determines all policy and operational matters. Therefore, the law of the Federal Republic of Nigeria limits the Lagos state from hiring police officers and/or imposing a new security tax and policies. This complexity of Nigeria's federal structure compounds decision-making surrounding security.

There are issues of a lack of coherence which hinder the effective functioning of the police. In practice, while the federal government has exclusive power over the NPF regardless the devolution of police command, state governments have power over the state justice system excluding the NPF. Basically, there are multiple structures for the management of police and justice institutions at both federal and state levels. The Federal Ministries of Interior, Justice and Police Affairs have major responsibility for policy-making, and coordination. But, there is poor coordination between these federal ministries, as each seems to function discretely without an inclusive policy framework. The Ministry of Police Affairs particularly, is reduced in its power, because the Inspector-General of Police (IGP) reports directly to the president. There is also the Police Service Commission (PSC) - a civilian oversight body established under the Nigerian Constitution for the NPF.³ It has power to appoint, promote, discipline and dismiss all NPF officers except the IGP. At the state level, each state government has its own

1. A local Nigerian language for Lagos indigenous people.

2. A simplified form of English language, some elements of which are taken from local language especially as used by a non-Lagos indigene speaker.

3. Police Service Commission (PSC) - <http://www.psc.gov.ng/>

security council headed by the state governor, which is parallel to and complements the state police command structure. However, where decisions made by the Lagos state governor and/or his council challenge those of the federal police command, they are thrown-out by the Lagos State Commissioner of Police who takes orders directly from the IGP, who in turn reports to the President.

This structure has created several tensions between the central and state authorities or even within both. The following illustrates examples of the many faceoff tensions. On June 15 2024, the IGP accused the PSC of enlisting unqualified individual into the newly recruited constables and therefore dissociated the NPF from the new constables. On the other hand, PSC disclaimed the contentions, and lobbied the presidency for the immediate removal of the IGP.⁴ On January 5 2022, a Chief Superintendent of Police refused to obey the Lagos State Governor, Babajide Sanwo-Olu's order to evacuate police officers who had laid siege on the Magodo Estate on the Lagos Mainland.³ On this day, residents of the estate protested the continuous presence of armed police men. The protest and the closure of the estate gate were already brewing violence as this grounded vehicular movement and some residents and business owners were prevented from going to their various destinations.

The intervention of the governor, (who, by law, is the Chief Security Officer of Lagos) was refuted by the police officer who told the governor that he only answers to the instructions of his superiors who were yet to get an order to leave the estate from the IGP. The appointments of the IGP is the prerogative of the president.⁴ This at times disturbs the quality of security services provided as officers are loyal to the president and his allies at the expense of the communities they are meant to serve. Police personnel are posted to Lagos by the IG seated in Abuja. They are frequently rotated in an effort to keep them from becoming too comfortable with and/or being co-opted by local political elites. But, in many cases, the postings are done in a partisan political setting that produces a large turnover of senior police officers whenever regimes change. Although this approach seeks to reduce corruption and impunity, it hinders the development of grassroots security knowledge, undermines professionalism, continuity, long-term security planning, learning and innovation in the Lagos police command. Besides, centralized governance arrangement is characterized by a bizarre concentration of power in the "ruling party". As a result, each ruling party tends to govern mainly on the basis of its election campaign promises, rather than on the basis of a wide-ranging national security agenda. The result has been a perpetual discontinuity in policy direction following party and/or individual president turnovers in government. A respondents said: *"...any time a new government comes to power, security plans set by predecessors are abandoned and replaced with new ones, sometimes without regard for the wider national security implications..."*⁵

This system has also created extreme inequality as the limited security resources available are shared by political elites and members of the ruling political parties for their personal, business and household protection. In cases of emergencies or responses to distress calls, preferential treatments for elite communities by the state security agencies operations are evident, particularly compared to the informal settlements within the city core and the peripheral areas, despite that these areas provide homes to more than half of Lagos dwellers. Consequently, the question remains as to whether this system of security governance can be deemed pro-poor and inclusive? A respondent said *"... in this Lagos, it is not uncommon to see politicians, notable figures and those VIPs, and the worst of it, are social media celebrities with police force convoy while many people and places are without police protection. Of a truth, the common man is only in the hand of God in this city. That is why everyone has devised ways to protect themselves and family..."*⁶

4. PSC - https://punchng.com/provide-evidence-of-corruption-in-recruitment-exercise-psc-tells-ig/#google_vignette

5. Police Superintendent defies Governor's order - <https://saharareporters.com/2022/01/04/police-superintendent-defies-governor-sanwo-olus-order-claims-nigerias-attorney-general>

6. Nigerian Constitution, Chapter 6; Part 3; Section 215.

7. Interview with residents of Mushin – September, 2022.

8. Key stakeholder/informant interview, Lagos – November, 2022.



It is therefore evident that Lagos, Nigeria possesses a concentrated political settlement, with police authority centralized around the presidency, including the state governments that do the president's biddings. The net effect however is the tendency to over-rely on the executive presidency for action and, when this is not sanctioned by the executive, there is a resultant lack of attention by the very departments that are supposed to exercise law enforcement. Besides, security resources are oriented to the benefit of the elite, neglecting the less privileged. Generally, respondent branded this approach to security administration as a system which does not work, and which severely dwindles the state government's ability to implement security reforms and programmes.⁹ In a reflection of the generally weak state of bureaucratic capacity, a majority of respondents reported that NPF has not been able to deliver its mandated functions effectively.¹⁰

In situations such as this, co-creation has been found to be a key mechanism through which the uneven waters of political settlements can be navigated (Mitlin & Satterthwaite, 2013; Jones, & van Steden, 2013; Baud *et al.*, 2021), particularly in Lagos, where the political settlement fails to generate incentives for elites to come together and deliver equitable security improvements to the people.

3.2 The nature of co-creation of crime prevention

In Lagos, co-creation of crime prevention has emerged in different forms such as Vigilantes, House Guard (known as "Mai-guard" or "Olode"), and the Community Court (CC). These are briefly discussed as follows.

Vigilantes

One indicator of the Nigerian security governance failure is the rise of vigilantes. These are a self-appointed residents who undertake law enforcement in their local communities or who take it upon themselves to confront criminals and their activities in their neighborhood. This type of non-state action is common in low-income neighborhoods and informal settlements of Lagos. This is because informal settlements have to deal with crime and insecurity but do not always have the political capital to demand proactive patrolling from the "presidency" controlled state police unlike the elite's neighbourhoods. Vigilantes do however, collaborate with the NPF in different ways. They engage with NPF on night patrols. They also compile information on crimes, suspicious activity, and criminal suspects in their area and provide that relevant intelligence to the police as needed.

In some cases, they join the NPF intelligence response team to raid hideouts of criminal in their local areas. With the clearance of the NPF, they also assist Lagos state agencies in the protection of their premises, plants and equipment. Thus, at least, this model allows NPF to increase efficiency by concentrating on their core functions while transferring surplus responsibilities to vigilantes. A respondent said: *"...we realise that the police are increasingly unable to respond swiftly to distress calls, so landlords devise alternative arrangements for protecting themselves by supporting members of vigilante group in securing our community..."*¹¹. Having collaborated more closely with the NPF through vigilante services, a respondent said: *"...we always blame the NPF for every issue on this street. But as I began to work with them (NPF) through our community vigilante group, I began to understand their plight. The politics is not in their favour. They lack equipment, capacity, and personnel. If we must secure our streets and communities, we must do it together with them. So, this vigilante group has come to stay..."*¹²

9. Interview with residents of Mushin – September, 2022.

10. Interview with residents of Mushin – September, 2022

11. Interview with the residents of Ikorodu - September, 2022.

12. Interview with a key informant – November, 2022.

Findings show that Lagos vigilantes cannot prosecute criminals, they are not expected to carry arms nor use brute force. They are only expected to hold suspects until they are handed over to the NPF. Nevertheless, when a respondent did speak of the use of force, his instances were cases in which vigilante officials acted in self-defense, and/or in situations where suspects attempting to escape.¹³ But then, further critical evaluation of abuses by vigilantes are discussed later in this article. The commander/leader of vigilantes is called the vigilante chairperson. Unlike the state centralized and narrow security governance, vigilante chairperson is selected through voting by members of the community vigilante groups, and then ratify by the concerned community leaders. Vigilante chairperson gives direction for the execution of all vigilante activities within the community.

Vigilante's personnel are paid through financial contributions by residents. They sometimes receive support from the local government, politicians and donors. The employment of vigilante members is part of local government and community strategies to co-opt unemployed youths into community development roles. Indeed, some of these youth were sometimes reformed "area boys" who could use their own local criminal knowledge to help curb crime, typifying the Yoruba adage, "Ole lo mo ese ole to lori apata" (meaning - It is the thief who can trace the footsteps of another thief on the rock).

In Lagos, vigilantes differ from one another in terms of membership, structure, means of recruitment, training and oversight, as well as in their relations to NPF. They exist under different names - for instance, vigilante effort in "Oworoshoki" community is called "Ma Dan Wo" while it is called "Ma Sun" and "Onyabo" in Oshodi and Ikorodu communities respectively. Vigilante officers are indigenous locals where they operate, which is a deliberate strategy to make use of their local knowledge to achieve maximum collaborations in grassroots security intelligence gathering and community policing.

For most parts, members of the vigilantes have no other formal employment. They take odd jobs during the day (e.g. working as casual labourer on construction sites, commercial motorcyclist, etc.) to supplement their incomes from the vigilante engagement. Although women traditionally play a significant role in Lagos vigilante, with cultural factors shaping their contributions, vigilante member in practice are mostly men. Nevertheless, women remain prominent in this collaboration, particularly as primary informants, presenting ample opportunities for their continued participation. Vigilante personnel ages varies, but typically they are either in their mid-twenties or, if much older, in their fifties or sixties.

House guards (known as "Mai-guard" or "Olode")

Beyond community safety through vigilante-police collaborations, security of individual properties is prioritized in Lagos. While some have been able to engage the state police through political and economic power, other are left to carter for themselves. Hence, the idea of Mai-guard" or "Olode. A respondents said *"...I have to engage a house guard. I cannot leave my house unguarded. I already suffered break-in twice in this year (2023). It could have been worse if not for the community vigilante. Yet, you see a local government councilor on this street with 2-3 policemen at his gate. Other politicians and big men of Lagos will take their share of our police too. These are the people who should protect us but, it is unfortunate that they have left the people to guard a few elites..."*¹³

As the name implies, house guards watch individual houses, managing and controlling access in and out. In some exceptional cases, however, some streets/communities in Lagos use "Olode" to patrol their streets in the night instead of vigilante group. The personnel are commonly private, traditional in their outlook (use voodoo or black-magic to capture criminals), and uneducated. They are also lacking in formal organization unlike vigilante that is associated with the community resident groups. But in

13. Interview with a key Informant – Vigilante officer – November, 2022

14. Interview with residents of Lagos Island –September, 2022



the recent time, retired gentlemen of the state security agencies are now joining this initiatives. The use of house guard services is common with the residents of high, and medium neighborhoods of Lagos. House guard reward varies and it is usually negotiated with the property-owner. A generous occupier can pay a guard comfortably more than an entry grade NPF constable receives.

Co-creation is evident as they often work hand-in-hand with the relevant community vigilantes and sometimes with the NPF. At times, a house guard could be member of a vigilante group who has also been specifically assigned to a property on request of the property owner. Unlike other initiatives, house guards are exclusively male. They play a significant role in security alertness and information sharing in Lagos. House security guards demonstrate a remarkable level of knowledge about their socio-physical surroundings. They engage in doorstep and kiosk shops where they do petty trading and sell basic household commodities in addition to house guard services. Their activities are at times more collaborative. They also engage in chats with colleague guards of adjoining properties. In this manner, news and warnings, especially relating to crime and insecurity spread quickly in the community and to appropriate security agencies.

3.3 Community court

Away from policing, CCs in Lagos are informal structures that co-create judicial roles by acting as jury with the aim of providing order in the community by meting out penalties to suspects who are found guilty. These jury systems exist in the traditional settlements of Lagos like Ikorodu, Iworoshoki, Somolu, Isale-Eko among others. They are rooted in historical institutions, and have precedents. The first CC is the head of the family (usually male) with the duty of restraining his family members regarding deviant behaviors in the community. He is also expected to handle complaints of petty crimes or misbehavior within his family and resolve these. However, some cases are transferred to the “Olori-Ebi”, who is usually the oldest man in an extended family. He would listen to the complainants and then the accused would be allowed to present their defense. At this stage, witnesses, if any, will be called upon.

Some more extended issues are transferred to the “Olori Adugbo” (neighborhood head). The Olori-Adugbo is the “Baale” appointed by the Oba as the administrative head of a neighborhood. He enjoys the approval and recognition of the Oba and reserves the right to conduct preliminary investigations in immoral and lawless cases in his neighborhood. He could pass judgment on subtle cases such as theft which must be in conjunction with some other chiefs whose members are not parties to the case. Any appeal from the Olori Adugbo’s court would be addressed by the Oba’s court. The “Baale” is a member of the Oba’s court, but he would have to allow other “Baales” to adjudicate on cases that come from his area. The Oba will then give judgment after listening to both sides of the case and to the contributions of his “Baales” and witnesses, if any. Whatever judgment is given would be final, at least in the CC process.

This community effort is commonly associated with civil cases and minor infractions. Penalties involve fines and the judgement may vary from warnings, to communal service or outright ban from the community. In many cases, this process is coproduced with members of the NPF, and vigilantes, particularly in situations where cases become too heated for the community’s court process to handle without the security officers’ presence. Cases of grievous crimes are handed over to the NPF for state prosecution – a process where the CC actors also play an important witness role.

3.4 Outcomes of co-creation of crime prevention

These multi-sectoral collaborations have helped to reduce violent crime to some extent in Lagos, and mainly in informal communities where the NPF is lacking. Particularly in the last five years, co-creation of crime prevention has contributed in no small measure in bringing down the crime level. A respondents said: *"...things are a little better. Before now, it was dreadful as criminals and hoodlums operate openly. Although this is not the desired Lagos we want, there has been a commendable level of improvements in safety and security in the last five years..."*¹⁵ The vigilantes and house guards have been using their local knowledge to assist community policing. They have been of immense assistance to the NPF, often due to their knowledge of Lagos terrain. Their presence on Lagos streets, serving as the "eyes on the street" has been a deterrence to criminals. They undoubtedly offer important services - supporting and helping the NPF fight crime generally.

A respondents narrated that: *"... we are local people. We know our community very well. We can easily spot strangers and suspicious movements. This local knowledge is what we have, that the NPF do not have. So, we complement their efforts by providing dependable intelligence for their work. Beyond that, we also escort NPF patrol, and our presence has helped them to penetrate streets they would not have been able to navigate by themselves..."*¹⁶ Likewise, another respondent also said: *"... before we started "Ma dan wo" vigilante, crime was a serious problem here in Iworoshoki.*

*People were being robbed in broad-day-light. Some were even killed. Walking in dark hours of evening and early morning was a big risk. But, "Ma dan wo" has really help to curb this. Although pockets of crimes still exist, the community is far better now..."*¹⁷ In Ikorodu community, residents hailed the local vigilante ("Onyabo") for their help in curbing the atrocities of deadly cult gangs called "one-million boys and Bados"¹⁸. While the presence of "Mai-guard" is neither an essential force nor effective enough for preventing street crimes, these persons nevertheless, play a vital role as security witnesses and informants. A system of "Olode" has the capacity to turn some sets of properties into a more organic social unit that communicates internally, increasing resistance to criminal activities in the neighbourhood.

Findings further show that because the vigilantes are usually local residents, people view them more favourably, and more ready to work with them compared to the NPF. However, they can be very chauvinist, and problematic in cases which relate to women in particular¹⁹, the CC system has been tremendously helpful in reducing crime and strengthen the capacity of traditional rulers in Lagos.²¹ This initiative has contributed to the less congested court in some parts of Lagos and public confidence in the criminal justice system of Lagos. A respondent said *"...going to court is waste of time and resources. In this community, it doesn't take time for our royal father to weigh into issues and resolve the dispute amicably at no cost to parties involved..."*²² The positive result of the CC is also evidenced by the increasing number of cases that the community rulers referred to the NPF for further prosecution and scrutiny. Besides, issues and conflicts related to fighting, land issues, which could have escalated into serious breach of public peace has been settled through this CC system.

16. Ibid.

17. Interview with residents of Iworoshoki – September, 2022.

18. Interview with residents of Ikorodu – September, 2022

19. Interview with residents of Iworoshoki – September, 2022

20. Ibid

21. Interview with residents of Lagos Island – September, 2022.



3.5 Challenges of co-creation of crime prevention

Despite the many benefits, the proliferation of vigilantes has raised several concerns. Vigilante in Lagos is a patchwork of isolated actors and groups, with much fragmentation and weak organization. At present, the number and membership of community vigilantes is unknown. With unstandardized recruitment processes, poor training and supervision, their members are prone to arbitrary use of violence and violation of human rights. Extortion of locals, particularly those accused of crimes is also widespread. They are also susceptible to political bias and allegiance. Since the police in Lagos is federal, the public acceptance and funding of vigilantes allows local politicians to use them as their own private soldiers to intimidate political opponents and secure their positions as sources of patronage. Being a cosmopolitan city with significant ethnic and religious diversities, vigilantes are also affiliated to a variety of ethno-religion protective groups, with clash of interest at times. Presently, vigilantes are being coordinated by a voluntary “trade union associations” called the Vigilante Group of Nigeria (VGN). Therefore, vigilantes are not directly accountable to a public bureau or the legislative body, but rather to often weak and voluntary regulators.

Another challenge is the constitutional legitimacy of community-organized vigilantes in terms of the provisions of the Nigerian constitution, the Police Act, and the Public Order Act. Many bureaucrats, including the Attorney General and Justice Minister have said they are unofficial.²² Moreover, because of the obvious weakness in performance and corruption issues facing the NPF, the debate on the legitimacy of vigilantes continues among media houses and politicians with no clarity. Undeniably, the significant and legitimate role of non-state security structures was in part recognized by the DfID-supported Community Policing Initiative. The initiative (in which individual community policing developers were identified from within the police force and trained to operate alongside community vigilante groups) was piloted in Lagos, and other five states of Nigeria. However, there was no buy-in by major actors, like the Minister of Justice, and IGP (and by inference, the President). Hence, the initiative was unable to generate the desired multiplier effect.

Even when the federal political cards are clearly stacked against it, the vigilante initiatives have been found to be legitimate in the judgment of common people and have been found to even produce better outcomes.²³ As such, non-state arrangements have been accorded different degrees of legitimacy by residents that exercise their demand for security through these sources. Consequently, the state has lost a substantial share of its monopoly on the use of force and as a sole security provider. There is also the challenge of firearm possession and use. Other than the NPF, no personnel are expected to possess firearm except with a license from the Presidency or the IGP. Vigilante members however carry, at best, a single-shot game-hunting rifles traditionally called “Sakabula” in the local Lagos parlance. Yet, these are less effective against armed robbers who go about with modern weaponries. Thus, some stakeholders have argued that vigilantes need more firepower to fight criminals armed with military-grade weapons while others worry that granting gun permits to every vigilante officer would lead to misuse, and anarchy as seen in countries suffering from gun violence.²⁴

The affairs between vigilantes and the NPF range from amiable and collaborative to distrustful and hostile. In some areas, vigilantes work closely with the NPF and the police solicit partnerships with vigilantes. Elsewhere, the relationship may be uneasy, as detailed by a respondent: *“...the activities of vigilantes are usually unlawful in the way and manner they deal with suspected criminals when they are apprehended. Most times, they violated the constitution of the country. The lawful thing for them is to report suspected criminals to the police, but many times, they take law into their own hands, and we cannot overlook this...”*²⁵ In another view, respondents felt it was risky to work the

22. “Amotekun” is illegal - <https://www.premiumtimesng.com/news/more-news/374141-amotekun-is-illegal-malami-insists.html?tztc=1>

23. Engagement meeting with residents and stakeholders in Lagos -- November, 2022.

24. Ibid.

25. Interview with key informant: police personnel – November, 2022

26. Interview with key informant: vigilante person – November, 2022

NPF as their identities might be exposed, leading to further harm. Members of vigilantes have been attacked by criminal as being responsible for disclosing facts leading their arrests. A respondent said: *"...we cannot totally entrust suspects and our community to the police. We have situations where suspected criminals were released without any investigation and prosecution. Not only that, corrupt police personnel give hints to these convicts about key vigilante members behind their arrests, and these criminals go all-out for them after their unlawful freedom from the police custody..."*²⁶

These show that police-vigilante relationship could be tense sometimes, and this is due to the fact that they have both had suspiciously negative encounters (e.g. human right abuse, extrajudicial killings, among others). Hence, the police sometimes view vigilantes as competitors and inhibiting their official work. They particularly object when vigilantes assume the full role of policing, using firearms and/or other lethal force. For their part, vigilantes sometimes distrust the police because they perceived them as corrupt. The mutual suspicion undermines prospects for the multi-sectoral collaborations necessary to fight crime. Furthermore, while traditional justice systems provide a valuable supplement to the criminal justice system in the Lagos context, some residents argued that their activities sometimes do not comply with human rights and equity standards. Whereas "mai-guards" showed a remarkable level of knowledge about their socio-physical environments, findings show that this local knowledge can be two-edged, and petty stealing, aiding and abating thefts by some "olode and mai-guards" are some of the more common problems of this approach.

3.6 Moving Forward

Given a wide and reasonable perception that co-creation contributes to filling security gaps across Lagos, the practices in their varying forms are clearly a continuing necessity for internal stability as the NPF is overwhelmed, infiltrated and corrupt. Nevertheless, there is a compelling need for policy responses to address the challenges highlighted in this paper, moving forward. A general lack of trust in co-creation of crime prevention, especially in relation to vigilante-police collaboration implies that building trust will require addressing perceptions of corruption, partiality, abuse of power and human right violation. Besides, both the NPF and vigilante members must see the need to maintain the truth and secrecy of the whistle-blowers as a way to foster smooth cooperation and protect each other from reprisal attacks from criminals. Since vigilantes often have more legitimacy with the citizenry, the state should leverage this acceptance, and collaborate more with vigilantes to help communities devise measures to deal with some of the underlying reasons for crime, such as political negligence, poverty and inequality that often sparks frustration and response through crime.

There is a convincing need for policy responses to curb the proliferation of vigilantes in the short run and for plans to improve NPF services in the long-run. Importantly, whether NPF, vigilantes or CCs are able to deliver effectively on their obligations is a function of the political support that they receive. In the short-run, politicians should work to better institutionalize, regulate, support and shape vigilantes. The framework should address issues relating to operations, firearms, oversight functions, basic training standards, recruitment, and code of conduct, protocols of engagement and the modalities for finance. In the long run, government must focus on improving the police service through comprehensive reform of concentrated security governance and devolution of police power to the state under dispersed power configurations. The goal should be to reverse the proliferation of vigilantes and reach a point where their members who have the required qualifications can be absorbed into official decentralized NPF roles while others are released from the policing service and, where suitable, helped to secure another jobs.

The state in partnership with communities should periodically organize Community Accountability Town Hall Meeting (CATHM) which will serve as fora where vigilantes and other actors meet with the residents to address complaints and discuss security issues. Also, it is strongly recommended that the state considers including performing vigilante groups among the beneficiaries of the state security funds. Moreover, there is the need to closely monitor the CC systems and incorporating



them officially into the state legal framework. The state should progress carefully to ensure that the CC system do not lose their positive aspects, that the authority of the CC actors is not undermined and that human rights and equality are respected in proceedings before such proceedings. A legal framework providing for state recognition should provide the option for the accused to oppose their participation and have the matter tried in the formal courts, particularly in cases where a fundamental right protected by the constitution is concerned. There is also a need to domesticate the CC across Lagos traditional level by deploying judicial officers for the resolution of their civil case. To protect against petty stealing, “olode and mai-guard” should only be able to obtain their positions after a comprehensive background checks and personal connections, which makes them easy to trace to their places of origin.

4. Conclusion

In the specific context of Lagos, this article presents a critical analysis of the specific forms of politics being used to tackle crime with the involvement of multi-sector collaborations. It has examined why this collaboration thrives, and how it has created a more enabling environment for crime prevention, and what may need to change for multi-sector collaboration to be able to generate more inclusive forms of security service delivery. It is evident that the NPF no longer have, nor can they claim, a monopoly on policing in Lagos. Regardless of state police, the prevention of crime is achieved locally through police-community collaborations. Policing has become pluralized, particularly, outside the elite spaces, crime prevention is co-produced and sought after by informal communities who do not always have the political investment to demand for NPF proactive protection.

What the Lagos experience teaches us is that crime reduction through co-creation is more likely to emerge and endure. This is the case even in a political settlement, where police power is narrowly concentrated, and particularly, if there is a viable socio-economic case, such as when crime rates are high; the state police not having the capacity to fight crime or, worse, when the state provides security to some groups but not to others. However, coproduction arrangements may also struggle to realize their various mandates. It is obvious that context matters; precisely, the strength of local politics is significant. The constraints on co-creation opportunities being exploited to their fullest advantage have been noted, with the required political commitment, regulatory and institutional change, besides substantial funding and investment as well as scaling them up.

From the foregoing analysis, it seems clear that the future of police consolidation depends on both reforming the institutional (state and non-state) and constitutional basis of governance in the security sector. The fact remains that the NPF cannot be trusted within neighborhoods if it retains a structure that is only accountable to a centralized command in a “corrupt” culture, instead of a crime prevention approach. If the latter is chosen as the primary purpose, then what gets emphasized is grassroots policing, community participation and co-creation as well as police intelligence.

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The Relevance of Amos' Message on Social Justice in the Context of Pentecostal Churches in Ibadan, Oyo State, Nigeria

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ABSTRACT

The message of Amos on social justice continues to generate significant scholarly interest due to its enduring relevance in contemporary society. However, the depth of social justice themes in Amos' prophecy and their applicability to present-day realities remain underexplored—particularly within the context of Pentecostal churches in Ibadan, Oyo State, Nigeria. While Pentecostal churches are recognized for their dynamic evangelistic efforts, they are frequently criticized for their apparent neglect of the social welfare of their congregants. Issues such as corruption, inequality, and exploitation within these churches highlight a departure from the core values of the gospel they preach. This paper, therefore, investigates the relevance of Amos' message on social justice in the context of Pentecostal churches in Ibadan, Oyo State. It also contextualizes Amos' prophetic message in light of current Pentecostal practices in the region. The paper adopts historical, descriptive and participatory methods, as well as personal interview with some congregants of some of the Pentecostal Churches in Ibadan to achieve its aim. The paper concludes by emphasizing the need for Pentecostal churches—especially in Ibadan—to reengage with the social justice emphasis of Amos' message in order to foster both spiritual renewal and meaningful community impact.

Keywords: Relevance, Social Justice, Context, Pentecostal Churches, Ibadan.

1. Introduction

1.1 Origin and Development of Pentecostalism in Nigeria

Pentecostalism derives its name from the events of Pentecost recorded in Acts 2:1–13, where the early disciples were filled with the Holy Spirit. Any church or movement that emphasizes spiritual experiences and the operation of spiritual gifts is generally categorized as Pentecostal (Burgess, 2008).

The movement gained significant momentum in Nigeria after independence. The loosening of denominational ties, especially among Protestants, led to the rise of independent, evangelical, and Pentecostal churches. From the 1970s onward, thousands of such churches emerged, many of them beginning as small fellowships and later formalizing into denominations (Dairo, 2017).

The socio-economic crises of the 1980s further fueled the expansion of Pentecostalism, attracting the marginalized and frustrated masses. Reports of miracles, healings, and testimonies of divine turnarounds played a pivotal role in drawing large followings to these churches. Pentecostalism has since become a dominant force in Nigerian Christianity, especially due to its messages of healing, prosperity, and hope (Olusola, 2004).

1.2 Injustice in the Book of Amos

Social injustice refers to unfairness in the distribution of societal resources, privileges, and responsibilities. It involves any form of systemic oppression that hinders people from realizing their full potential (Akinrinde, 2010).



In the Book of *Amos*, the prophet's central theme is that worship of God must be accompanied by social and economic justice. Amos denounced corruption, the oppression of the poor, and the greed of the wealthy. He spoke out against the elite in Samaria, whom he described as “cows of Bashan,” for crushing the needy and living in luxury at the expense of the poor (Akande, 2024).

Amos condemned a religion that was heavy on rituals but devoid of righteousness. He emphasized that God is just, and as His people, Israel must uphold justice in all areas of life. The prophet warned that religiosity without justice would invite divine judgment (Akande, 2024).

1.3 Injustice in Pentecostal Churches

Although Pentecostal churches are celebrated for their missionary zeal, they are often accused of neglecting the practical and social concerns of their members. Unfortunately, many of the congregants are ignorant of these forms of exploitation and injustice because they have been brainwashed by their sweet mouthed pastors that true Christianity follows after their doctrines. Majority of these Churches' congregants are learned and are of middle class. However, small percentage are semi- illiterate and of lower class. Several forms of injustice are observable within their structures, including:

1. Financial Exploitation: Members are often burdened with excessive tithes, offerings, pledges, and sacrificial giving.
2. Lack of Transparency: In many cases, church leaders are not accountable in handling church finances and decision-making processes.
3. Marginalization: Poor or less-influential members may be excluded from leadership and resource distribution (Akande, 2024).

1.3.1 Exploitation in Pentecostal Churches

The exploitation of the poor manifests in several forms:

1. Aggressive Fundraising: Unrealistic financial targets are imposed on congregants, sometimes leading to hardship.
2. Commercialization of Sacred Items: Items such as “anointed water,” oils, or handkerchiefs are sold at exorbitant prices (Ajayi, personal interview, 2 March, 2025).
3. Manipulative Preaching: Promises of breakthroughs or healing are tied to financial contributions (Olajide, personal interview 3 March, 2015).
4. Unpaid or Underpaid Labor: Church workers and volunteers are often overworked and undercompensated (Price, 2008).

1.3.2 Inequality in Pentecostal Churches

Inequality is evident in:

1. Class Segregation: Preferential treatment in seating, parking, or access to resources is often based on wealth.
2. Gender Discrimination: Women are sometimes restricted from leadership roles.
3. Limited Access to Resources: Despite contributing to church-run schools or universities, many members cannot afford their fees.
4. Leadership Favoritism: Power is often centralized among wealthy or influential members (Akande, 2024).

1.4 Injustice in Pentecostal Churches in Ibadan

As part of this research, the author attended four Pentecostal churches in Ibadan—three as a visitor once a while, and one as a member and employee for three years (2016–2019). Though the mode of data collection was unstructured, however, through participation and interviews I was able to get some firsthand information. Observations revealed concerning their practices are:

1. In one church, in a Sunday service, members were asked to sacrifice their first month's salary as their first fruits that is to be given to the Lord. He quoted the book of Proverbs 3:9-10 to back up his point that God has promised blessings to all that give their first fruits to Him.



This exploitative sacrifice was on January when the previous year's salary might have been exhausted during Christmas and new year's expenditures. The sweet-mouthed pastor initiated the collection through pledges and collection of phone numbers of the people concerned for follow-up. Yes, it is scriptural to give the first fruits, but it is not to be forced to pledge for let alone followed up. This has become a form of extortion.

2. In the second Church, at a prayer meeting, the Pastor told the members to sow financial seeds into the life of their pastor to hasten divine answers to prayers offered. I then asked myself, where did God request for financial motivation in the Bible before prayers are answered? Definitely nothing like that in the Bible! It was a form of tactics to siphon the hard earned finances of the congregants.
3. In another instance, the pastor asked the congregants to give prophetic offerings to facilitate their expected miracles like miracle jobs, visas outside the country, miracle bank alert and other good fortune. While I am not against giving, especially to men of God, however, giving should be willingly and free from any attachment. This also was a scheme to getting money from these innocent congregants due to the situation of the country economically.
4. Moreover, in the Church where I worked and attend for nearly three years, tithes and "University sacrifices" were deducted automatically from staff salaries before been paid at the end of the month without consent. My agitating question throughout my experience in the Church was that, should tithe and offerings be forcefully removed from someone's income without consent? The answer is no! This act is a form of exploitation of employees to increase church finances. The unfortunate thing was that, when the church eventually established its university, it is not accessible to majority of the members that sacrificed for it because its tuition fees were too high for most members .

These examples reflect an exploitative system where religious teachings are used to financially burden already struggling adherents.

1.5 Amos' Message in the Context of Pentecostal Churches in Ibadan

If Amos were alive today, his rebuke of Israel's elite would resonate strongly with the practices in many Pentecostal Churches in Ibadan. Religious activities are often more ceremonial and materialistic than transformative. Some church buildings, funded by ill-gotten wealth, church leaders who bless corrupt politicians without questioning the sources of their wealth (Nejo, 2019).

The glorification of wealth, aggressive financial demands, and commodification of spiritual blessings parallel the injustices that Amos condemned in ancient Israel. Wealthy church leaders live in opulence—owning mansions, private jets, and vacationing abroad, while their members live in dire poverty (Akande, 2024).

This materialistic culture undermines the core gospel message and perpetuates social inequality. Like in the time of Amos, God rejects any worship not grounded in justice and righteousness.

Church leaders in Pentecostal Churches, especially in Ibadan should live exemplary lives like Prophet Amos in the eighth century, and transform their sound doctrine, as claimed into practical lifestyle characterized by discipline, honesty, justice, and self – control (Akande, 2024).

Furthermore, Pentecostal Church leaders in Ibadan should inculcate the message of Amos, and imbibe the virtue of transparency to their congregants. They should endeavour to render clear account of their stewardship not only to God, but also to their congregants. Transparency will serve as a tool to eliminating corrupt practices and achieving unity in the Church. This is because transparency and accountability inspire confidence and trust in the leaders and among the adherents (Akande, 2024).



2. Conclusion and Recommendations

From the foregoing, while Pentecostal Churches in Ibadan are vibrant and dynamic in their gospel proclamation, many are plagued by practices that reflect social injustice, exploitation, and inequality. The infusion of business principles into church operations, excessive financial demands, and ostentatious lifestyles of leaders are troubling trends.

As Fragell (2005) critically observed, some Pentecostal churches operate on a framework of deception and manipulation. On a final note, all these practices of the Pentecostal Churches, especially in Ibadan are reminiscent of Amos' message in the eighth Century Israel. Therefore, the paper recommends that, to restore integrity and spiritual relevance, these Pentecostal Churches must return to biblical foundations— particularly the prophetic call of Amos for justice, fairness, and compassion so as to foster both spiritual renewal and meaningful community impact. Secondly, Churches must actively work to uplift the marginalized, promote economic justice, and reflect God's character in both word and deed. Lastly, the members themselves should endeavour to have cordial relationship with God they claim to serve in order to be free from deception. This can be done by studying His word and discover the privileges given to them as Christians (Jn. 8:32).

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PAPER PRESENTATIONS

SUB-THEME 1: Economic, Social Outlook
& Environment

SUB-THEME 2: Hospitality and Tourism
Management

Unmet Need for Family Planning in Lurambi sub-County, Kenya

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ABSTRACT

As part of ensuring health and wellbeing of all, the United Nations target universal access to sexual and reproductive healthcare services come 2030. It is at this backdrop that this study sought to establish the determinants of unmet need for family planning in Lurambi sub-County, Kenya. The study used cross-sectional survey data obtained from a sample of women aged 15 to 49 years in Lurambi sub-County, Kakamega County, Kenya, from December 2022 through to January 2023. Descriptive analysis involved frequencies and cross-tabulation. Inferential analysis involved correlation and regression analyses. Results of cross-tabulation analysis indicated that geographical area of residence ($\chi^2 = 28.061$; $p = 0.000$), marital status ($\chi^2 = 38.048$; $p = 0.000$), work status ($\chi^2 = 9.837$; $p = 0.002$), current age ($\chi^2 = 10.041$; $p = 0.007$), number of living children ($\chi^2 = 13.600$; $p = 0.001$), and number of health facilities ($\chi^2 = 16.732$; $p = 0.000$) present in an area were significantly related to the contraception need. Results of correlation analysis indicated that education qualifications ($r = -0.760$; $p = 0.003$), number of health facilities ($r = -0.907$; $p = 0.047$) and distance to the nearby health facility ($r = 0.520$; $p = 0.030$) were significantly related to unmet need in Lurambi sub-County. Results of regression analysis indicated that unmet need to delay childbearing was significantly explained by marital status ($aOR = 0.305$; $p = 0.05$), current age ($aOR = 0.716$; $p = 0.05$) and number of health facilities present in an area ($aOR = 0.355$; $p = 0.01$). Number of living children ($aOR = 1.435$; $p = 0.05$) was associated with unmet need to space childbearing while marital status ($aOR = 1.129$; $p = 0.05$), current age ($aOR = 1.265$; $p = 0.05$), and number of living children ($aOR = 1.075$; $p = 0.01$) were associated with unmet need to limit childbearing. There exists need to invest in women education and increase the number of well-stocked health facilities so as to increase insightful knowledge on contraception and ease access to contraception services. Efforts should be made to reach out to women and their partners at multiple stages in their reproductive lives so as to satisfy the changing needs for contraception.

Keywords: Unmet need for delaying; Unmet need for spacing; Unmet need for limiting; Total unmet need; Lurambi sub-County.

1. Background

Averagely, the wanted and actual fertility rates in Kakamega County stand at 3.0 and 3.7, respectively (KNBS & ICF, 2023). The about 23.33 percent gap between the wanted and the actualized points to the extent of mistimed and unintended pregnancies among the populace due to unmet need for contraception. A woman is said to have an unmet need for contraception if she is sexually active, not currently pregnant, not amenorrheic, states that she does not desire to become pregnant yet she is not using any contraception for reasons unrelated to sub-fecundity (Omedi & Nyauchi, 2015; Nyauchi & Omedi, 2014). It also includes women who are currently pregnant/ postpartum amenorrheic but their current pregnancy/ last birth was either unwanted or mistimed (Bradley et al., 2012). Such a woman may not wish to conceive, or she may wish to space or limit pregnancies yet she fails to realise her intentions of either postponing or preventing another pregnancy (Omedi & Nyauchi, 2015). Unmet need is not a one-time event but fluctuates due to shifts in fertility desires that occur in response to changing life circumstances, among them, entering a serious relationship and changes in household finances (Sennott & Yeatman, 2012). A larger majority of unplanned pregnancies in Kenya occur among women who wish to avoid pregnancy but are not using an effective contraception method (Population Reference Bureau, 2014).



A study done in Papua New Guinea found a 32.2 percent overall unmet need for contraception (Agyekum et al. 2022). There were higher odds of unmet need for contraception among cohabiting women (aOR = 1.25, 95% CI = 1.01, 1.56), women with 1–3 births (aOR = 1.57, 95% CI = 1.18, 2.08), and women with ≥ 4 births (aOR = 1.06, 95% CI = 1.13, 2.27). Further, a higher probability of unmet need was found among women whose partners decided on their healthcare as compared to those who decided on their own healthcare (aOR = 1.35, 95% CI = 1.066, 1.71). There was a decrease in the likelihood of unmet contraceptive need with an increase in wealth status. With regards to region, women in the Mamose region had greater likelihood of unmet contraceptive need compared to those in Southern region (aOR = 1.33, 95% CI = 1.09, 1.63). Age, level of education, and current work status were insignificantly related to unmet need for contraception. The study, apart from using secondary data, did not investigate whether there existed any relationship between unmet need and number of living children, number of health facilities present, and distance covered to reach a health facility.

Teshale (2022) assessed factors associated with unmet need for family planning in sub-Saharan Africa. The study found the prevalence of unmet need as 15.81 percent, 7.90 percent and 23.70 percent for spacing, limiting and total, respectively. Inferential results found women's age, education, age at cohabitation, parity, number of under-five children, heard of family planning through media, knowledge about modern contraception, place of residence, community level of women illiteracy, and region to be significantly related to unmet need for family planning. Further, household size and visiting the health facility in the last calendar year were associated with unmet need for spacing, while husband education level was associated with unmet need for limiting childbearing. The study however failed to assess unmet need to delay childbearing.

A study done in East Africa found out that younger women, and those women without formal education, from the poorest households, who had ever experienced child death, whose husbands desired more children than them, and who had no access to family planning messages were more likely to experience unmet need for contraception (Kabagenyi et al., 2024). A different study that found a 24.66 percent magnitude of unmet need for family planning identified age 40-49 years (aOR = 0.76; 95%CI = 0.58-0.99), rural residence (aOR = 1.17; 95%CI = 1.02-1.34); female household head (aOR = 0.66; 95%CI = 0.61-0.73), women having 4-6 children (aOR = 1.76; 95%CI = 1.55-1.99); and women with no desire for fertility (aOR = 1.52; 95%CI = 1.36-1.67) as the determinants of unmet need for family planning in East Africa (Alie et al., 2022). There was no significant relationship between working status of a woman and unmet need, an observation that the current study sought to investigate.

Locally, Otieno and Mwakudisa (2024) used 2022 Kenya demographic and health survey (KDHS) data to assess factors that contributed to unmet need for family planning among women in Kenya. The study established that older women had lower odds of experiencing unmet need compared to women aged 20-24 years, and that women with at least six children had higher odds of experiencing unmet need compared to their counterparts with a single child (aOR = 2.7; 95%CI = 1.9, 3.7). Further, with reference to Christians, Islam had higher odds of unmet need (aOR = 1.4; 95%CI = 1.0, 1.8), and that women who had underwent female genital cut were less likely to report unmet need. Generally, unmet need significantly reduced with increase in wealth index. Place of residence, marital status, and highest level of education were insignificantly related to unmet need for family planning. The study excluded work status, number of health facilities and their proximity from its analysis.

Clearly, studies have been done on unmet need for contraception. Besides relying on secondary data, most of these studies were country-specific (Otieno & Mwakudisa, 2024; Agyekum et al., 2022), others regional (Kabagenyi et al., 2024; Phiri et al., 2023; Alie et al., 2022). Some studies considered unmet need for modern contraception (Teshale, 2022), others unmet need among married women (Kabagenyi et al., 2024; Phiri et al., 2023), while others considered unmet need in rural areas (Lasong et al., 2020; Nyauchi & Omedi, 2014). Within-country regional studies are minimal (Uthman et al., 2022). With worldwide unmet need for family planning projected to be beyond 10 percent come



2030 (Alkema et al., 2013), studies on unmet need remain relevant today. Using primary data, this study sought to establish the determinants of unmet need for family planning in Lurambi sub-County, Kenya. Findings of the study guides in meeting the population's felt need for family planning (Cleland et al. 2006), reveals the characteristics of potential market for contraception (Omedi & Nyauchi, 2015), and allows population analysts to project how much fertility decline could be reported suppose the additional need for family planning was met (Ashford, 2003). A suppressed unmet need will contribute to reduced maternal and infant mortalities, increased opportunities for employment and education among the youths who might drop out of school due to pregnancies, increased control over women's reproductive health, and sustainable development (Otieno & Mwakudisa, 2024; Omedi & Nyauchi, 2015; Nyauchi & Omedi, 2014; Bradley et al., 2012).

2. Methodology

2.1 Study design and setting

This was a cross-sectional survey that established the determinants of unmet need for family planning in Lurambi sub-County, Kenya. Structured questionnaires were administered through face-to-face interviews to obtain primary data from the respondents between December 2022 and January 2023. The inclusion criteria were women of reproductive ages (15-49 years) who had an experience of a childbirth in the ten-year period that preceded the survey: 2013-2022. The design allowed the use of a minimum sample size of 384, guided by Fisher (1983) formula, and this enhanced the validity and generalizability of the study findings. Principal researcher trained bilingual research assistants on: seeking informed consent from the study participants, administration of structured questionnaire, and ensuring completeness and reliability of collected data. Ethical considerations of informed consent and confidentiality were observed throughout the survey period.

2.2 Study variables

The outcome variable was unmet need for contraception measured as: unmet need to delay childbearing; unmet need to space childbearing; and unmet need to limit childbearing. Each of these was coded as a binary variable: no=0; yes=1. The explanatory variables were: geographical area of residence (rural, urban); marital status (single, married, widowed/divorced/separated); education qualification (no education, primary education, secondary+ education); work status (not working, working); current age (<20; 20-39; ≥40); number of living children (0, 1-3, ≥4); number of health facilities (few, moderate, many); and distance to the health facility (short, moderate, long).

2.3 Data validity and reliability

Data validity was measured by computing Content Validity Ratio (CVR), whose value is in the range: $1 \leq r \leq 1$. Positive values show that no less than 50 percent of the subject matter expert raters (SME) rated the data collection tool as necessary (Lawshe, 1975). The procedure used to obtain the CVR was as follows:

$$CVR = (ne - N/2) \div N/2$$
, where: CVR – Content Validity Ratio; ne – number of subject matter expert panellists indicating the tool as essential; N – total number of subject matter expert panellists.

11 out of 13 SMEs engaged indicated the questionnaire tool as essential.

Thus,

$$CVR = (11 - 13/2) \div 13/2 = 0.7$$

Data reliability was measured using Cronbach's alpha coefficient of internal consistency. Study variables considered in the inter-item correlation matrix were: total unmet need; geographical area of residence; marital status, education qualifications; work status; current age; number of living children; number of health facilities present in an area; and distance to the health facility. The gauge yielded a Cronbach's alpha value of 0.844 with a Cochran's Q value of 77.36 at $p = 0.000$, a coefficient that was good to allow data analysis (George & Mallery, 2003). The results were as tabulated in Table 1.



Table 1: ANOVA with Cochran's Reliability Test

		Sum of Squares	df	Mean Square	Cochran's Q	Sig
Between People		132.378	160	0.827		
Within People	Between Items	271.806	9	30.20	77.36	0.000
	Residual	292.194	640	0.457		
	Total	564	644	0.876		
Total		696.378	804	0.866		
Grand Mean = 1.4671						
Cronbach's Alpha = 0.844						

2.4 Data analysis and presentation

Data were analysed descriptively and inferentially on the Statistical Package for Social Sciences (SPSS) computer software programme. Descriptive analyses involved frequencies and cross-tabulation. Inferential analyses involved Pearson's product moment correlation and multinomial logistic regression. Analysed data were presented in tables and figures.

3. Findings

3.1 Background information of the study population

Frequencies were run to establish the background information of the study population. The results were as indicated in Table 2.

Table 2: Background information of the study population

Variable	Count	Percent
Geographical area of residence		
Rural	156	36.97
Urban	266	63.03
Marital status*		
Single	70	16.71
Married	314	74.94
Widowed/Separated/Divorced	35	8.35
Education qualification		
No education	49	11.61
Primary education	190	45.02
Secondary+ education	183	43.36
Work status		
Not working	172	40.76
Working	250	59.24
Current age		
Under - 20 years	14	3.32
20 - 39 years	352	83.41
40+ years	56	13.27
Number of living children		
None	48	11.37
1 - 3 children	295	69.91
4+ children	79	18.72



Number of health facilities

Few	120	28.44
Moderate	60	14.22
Many	242	57.35

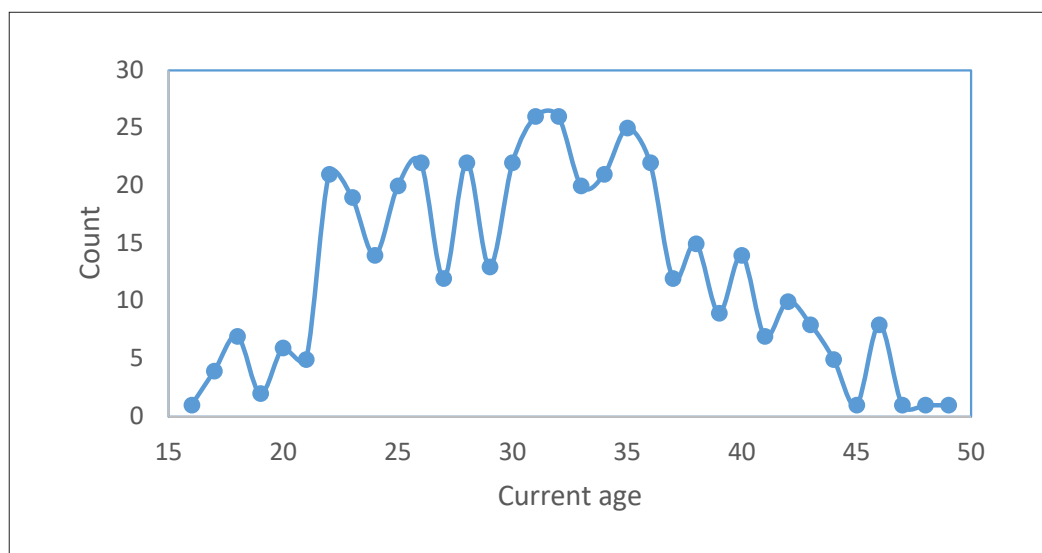
Distance to the health facility*

Short	162	38.57
Moderate	164	39.05
Long	94	22.38
TOTAL	422	100

*values not adding up to 422 due to some unreported cases

Findings in Table 2 indicated that majority of the respondents were of urban residence (63.03%), married (74.94%), of primary education qualifications (45.02%), working (59.24%), aged 20 to 39 years (83.41%), mothers with 1 to 3 living children (69.91%), in areas with many health facilities (57.35%) and who covered a moderate distance to reach the nearby health facility (39.05%). A scatter gram was used to present the current age of the respondents in single years as shown in Figure 1.

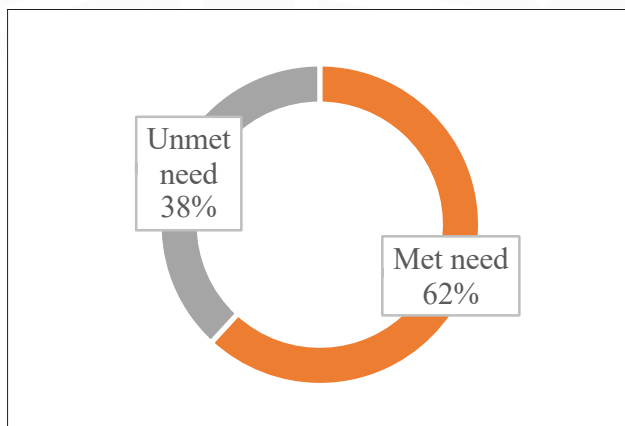
Figure 1: A scatter gram showing current age of respondents in single years



Clearly, respondents were aged 16 to 49 years. The peak ages were 18, 20, 22, 26, 28, 31, 32, 35, 40, 42, and 46. Majority of the respondents, about 6.1 percent, were aged 31 and 32 years, while the least number of respondents were aged 16, 45, 47, 48, and 49 years (0.2%).

A doughnut was used to present the need for contraception in Lurambi sub-County as shown in Figure 2.

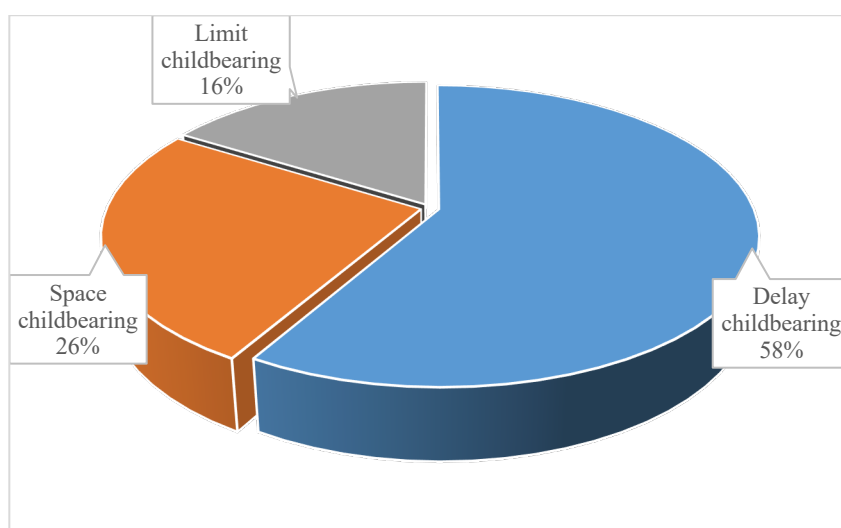
Figure 2: A doughnut showing the need for contraception



From Figure 2, about 38 in every 100 reproductive women reported having an unmet need for contraception. Such unmet needs contribute to unsafe abortions, sexually transmitted infections, increased fertility rates connected to poverty, high maternal and infant mortality rates, and low opportunities for education and employment (Omedi & Nyauchi, 2015; Bradley et al., 2012). However, this prevalence was higher than what has been reported elsewhere: 33% - Burundi; 32.2% - Papua New Guinea; 24.6% - East Africa; 18% - Northern Nigeria; 17% - Indonesia; 16.2% - Ethiopia; 12.7% - Egypt; and 11.5% - Mexico (Kabagenyi et al., 2024; Agyekum et al., 2022; Alie et al., 2022; Solanke et al., 2019; Tadele et al., 2019; Juarez et al., 2018; Hassan et al., 2017; Ayuningtyas & Oktaviana, 2015). KNBS and ICF (2023) reported a total unmet need for contraception as 9.9 percent for all women, 13.9 percent for currently married women, and 19.2 percent for sexually active unmarried women. Counterintuitively, higher prevalence of 58.2 percent and 51 percent have been reported in Ilesha-Southwest Nigeria, and West and Middle Africa, respectively (Uthman et al., 2022; Westoff, 2012). The variation in prevalence relative to earlier studies is explained by varied target groups, sample size, data collection time, and social, cultural and economic norms surrounding contraception. There is also the possibility of varied policies and programmes focusing on access to family planning.

To enable a clear understanding of the subject of study, the researcher presented unmet need for contraception on a divided circle as shown in Figure 3.

Figure 3: A divided circle showing unmet need for contraception



From Figure 3, the study concluded that unmet need to delay childbearing (58%) was the leading, followed by unmet need to space childbearing (26%), with unmet need to limit childbearing being the least (16%). As much as most studies have excluded unmet need to delay childbearing (Phiri et al., 2023; Teshale, 2022), a significant number of studies have agreed that unmet need to space outweighs unmet need to limit childbearing (Kabagenyi et al., 2024; Phiri et al., 2023; Teshale, 2022). With an overall prevalence of 23.70 percent, the prevalence for spacing and limiting were 15.81 percent and 7.90 percent, respectively (Teshale, 2022). Analysis of unmet need should incorporate all the three levels of unmet need: delay, space, and limit childbearing.

3.2 Prevalence of the need for contraception

Table 3: Prevalence of the need for contraception in Lurambi sub-County

	Met need		Unmet need		
Variable	Count	Percent	Count	Percent	χ^2 ; ρ
Geographical area of residence					
Rural	122	78.21	34	21.79	χ^2 - 28.061 ρ - 0.000
Urban	139	52.26	127	47.74	
Marital status*					
Single	21	30.00	49	70.00	χ^2 - 38.048 ρ - 0.000
Married	218	69.43	96	30.57	
Widowed/Separated/Divorced	20	57.14	15	42.86	
Education qualification					
No education	28	57.14	21	42.86	χ^2 - 2.553 ρ - 0.279
Primary education	112	58.95	78	41.05	
Secondary+ education	121	66.12	62	33.88	
Work status					
Not working	91	52.91	81	47.09	χ^2 - 9.837 ρ - 0.002
Working	170	68.00	80	32.00	
Current age					
Under - 20 years	3	21.43	11	78.57	χ^2 - 10.041 ρ - 0.007
20 - 39 years	223	63.35	129	36.65	
40+ years	35	62.50	21	37.50	
Number of living children					
None	20	41.67	28	58.33	χ^2 - 13.600 ρ - 0.001
1 - 3 children	198	67.12	97	32.88	
4+ children	43	54.43	36	45.57	
Number of health facilities					
Few	92	76.67	28	23.33	χ^2 - 16.732 ρ - 0.000
Moderate	30	50.00	30	50.00	
Many	139	57.44	103	42.56	

Distance to the health facility*					
Short	103	63.58	59	36.42	χ^2 - 0.416 ρ - 0.812
Moderate	101	61.59	63	38.41	
Long	56	59.57	38	40.43	
TOTAL	261	57.70	161	42.30	

*values not adding up to 261 and 161, respectively, due to some unreported cases

Cross-tabulation analysis was conducted to bring out the prevalence of the need for contraception in Lurambi sub-County. Pearson's chi-square statistic was used to determine the magnitude of the relationship between the outcome variable and the exposure variables, and show the strength of the observed relationship at statistical significance levels of 0.05, 0.01 and 0.001. The results were as presented in Table 3.

Findings in Table 3 showed higher prevalence of unmet need for family planning among urban (47.74%) and single (70%) women, those with no education level (42.86%), non-working women (47.09%), those aged ≤ 19 years (78.57%), with no living children (58.33%), in areas with moderate health facilities (50%), and who covered long distance to reach the nearest health facility (40.43%). This prevalence was statistically significant for geographical area of residence, marital status, work status, current age, number of living children, and number of health facilities present in an area.

These findings are consistent with findings of other studies that found higher unmet need for family planning among urban women (Omedi & Nyauchi, 2015), unmarried women (Nigeria demographic and health survey, 2018), young women and those with low levels of education (Otieno & Mwakudisa, 2024; Wemakor et al., 2020). Some urban areas, perceived to have many health facilities than their rural counterparts, suffer healthcare gaps in the delivery of critical contraceptive services. Some health facilities experience frequent contraceptive stock-outs as a result of imbalanced demand-supply curve. Thus, urbanization does not universally guarantee better access to contraception. Reduced proportion of rural women experiencing unmet need could be due to diffusion of contraceptive knowledge through media (Kabagenyi et al., 2024). Teshale (2022) explained that media assisted women in learning about and understanding available and accessible family planning options.

Non-working women generally have reduced contact with contraception because of their inability to afford the cost of contraception. Otieno and Mwakudisa (2024) found obtaining money for treatment as the leading challenge in accessing contraception healthcare. It is therefore imperative to address economic disparities among the populace so as to reduce unmet need for family planning. The higher unmet need among young than older women could be explained by younger women being highly productive (Pradhan & Dwivedi, 2015), and less likely to have achieved their fertility goals (Teshale, 2022). They are also less likely to possess deeper understanding of contraceptive needs. The significantly higher unmet need among women with no surviving child might be contributed to by the sexually active unmarried women who are unready for childbearing.

3.1 Determinants of unmet need for contraception

Inferential analysis was done at two levels (correlation and regression) to bring out factors that were associated with unmet need for contraception in Lurambi sub-County of Kakamega County in Kenya.

3.3.1 Results of correlation analysis

Pearson product moment correlation analysis was used to investigate the relationship between unmet need for contraception and education qualification, current age, number of living children, number of health facilities, and distance to the nearby health facility. The results were as presented in Table 4.



Table 4: Correlation analytical results

		Exposure variable				
		Education qualification	Current age	No. of living children	No. of health facilities	Distance to the health facility
Total unmet need	r	-0.760**	-0.068	0.027	-0.907*	0.520*
	p	0.003	0.158	0.565	0.047	0.030

**p<0.01; *p<0.05

Results in Table 4 showed the existence of significant negative linear relationships between education qualification ($r = -0.760$; $p = 0.003$) and number of health facilities ($r = -0.907$; $p = 0.047$), and unmet need for contraception. Moreover, there existed a significant positive linear relationship between distance covered to reach a health facility and unmet need for contraception ($r = 0.520$; $p = 0.030$). There was no linear relationship between current age and number of living children a woman had, and unmet need for family planning.

These findings indicated that the higher the education qualification of a woman, and the more the health facilities in an area, the lower the unmet need for family planning. Again, the longer the distance covered to reach a health facility (for family planning services) the higher the unmet need for family planning. Generally, about 58 percent, 82 percent and 27 percent of variation in unmet need for family planning could be explained by education qualification of a woman, number of health facilities present, and distance covered to reach a health facility in Lurambi sub-County.

Education has been documented as a significant explainer of unmet need (Otieno & Mwakudisa, 2024; Getaneh et al., 2020), with higher educational attainment correlating with reduced likelihood of unmet needs (Kabagenyi et al., 2024, Asif & Pervaize, 2019; Nzokirishaka & Itua, 2018). Otieno and Mwakudisa (2024) and Lasong et al. (2020) concluded that it was important to improve female access to education so as to empower women to make informed decisions about their sexual and reproductive health and increase contraceptive knowledge and use. Other studies have reported lack of access to contraception due to long distance to reach health facilities and insufficient health facilities as explainers for contraceptive non-use (Khoury & Salameh, 2019; Population Reference Bureau, 2014). About 23.8 percent of the respondents indicated that they could not access contraception healthcare due to the overwhelming distance to the health facility (Otieno & Mwakudisa, 2024).

1.1.1 Results of regression analysis

Multinomial logistic regression analysis was done to establish the effect of explanatory variables on unmet need in Lurambi sub-County. The odds of a woman experiencing unmet need for family planning were estimated for delaying, spacing, and limiting childbearing, respectively. The results were as shown in Table 5.

Table 5: Results of multinomial logistic regression analysis

Variable	Delay childbearing		Space childbearing		Limit childbearing	
	Exp(β)	95%CI	Exp(β)	95%CI	Exp(β)	95%CI
Geographical area of residence						
Rural	1.000		1.000		1.000	
Urban	1.270	0.05-11.22	1.371	0.09-21.08	1.341	0.08-23.46
Marital status						
Single	1.000		1.000		1.000	
Married	0.305*	0.26-6.48	0.766	0.15-3.81	0.333	0.06-1.92

Widowed/Separated/Divorced	3.171	0.50-20.28	0.315	0.05-2.02	1.129*	0.01-1.38
Education qualification						
No education	1.000		1.000		1.000	
Primary education	1.200	0.44-3.25	0.834	0.31-2.26	0.638	0.17-2.39
Secondary+ education	0.952	0.20-4.46	1.05	0.22-4.92	0.479	0.06-3.58
Work status						
Not working	1.000		1.000		1.000	
Working	0.236	0.47-3.23	0.809	0.31-2.12	1.047	0.29-3.80
Current age						
Under - 20 years	1.000		1.000		1.000	
20 - 39 years	0.716*	0.13-5.67	0.368	0.02-7.55	0.000	0
40+ years	0.297	0.53-10.03	0.435	0.10-1.90	1.265*	0.06-1.22
Number of living children						
None	-		-		1.000	
1 - 3 children	-		1.000		0.000	
4+ children	-		1.435*	0.12-1.60	1.075**	0.02-0.35
Number of health facilities						
Few	1.000		1.000		1.000	
Moderate	0.355**	0.36-5.09	0.738	0.20-2.77	0.738	0.11-4.95
Many	0.939	0.06-4.91	1.065	0.07-16.92	0.213	0.01-4.99
Distance to the health facility						
Short	1.000		1.000		1.000	
Moderate	0.932	0.22-3.88	1.073	0.26-4.47	2.874	0.42-19.68
Long	1.011	0.30-3.40	0.989	0.30-3.32	0.684	0.11-4.16

**p<0.01; *p<0.05

Results in Table 5 indicated that unmet need for delaying childbearing was explained by marital status (aOR = 0.305; 95%CI = 0.263-6.484), current age (aOR = 0.716; 95%CI = 0.132-5.671), and number of health facilities present in an area (aOR = 0.355; 95%CI = 0.361-5.087). Unmet need for spacing childbearing was due to number of living children (aOR = 1.435; 95%CI = 0.118-1.601). Unmet need to limit childbearing was as a result of marital status (aOR = 1.129; 95%CI = 0.012-1.378), current age (aOR = 1.265; 95%CI = 0.058-1.218), and number of living children (aOR = 1.075; 95%CI = 0.016-0.354). Geographical area of residence, education qualification, work status, and distance covered to reach a health facility were insignificantly related to unmet need for family planning.

The finding that married women were 69.5% less likely to experience unmet need to delay childbearing is acceptable. Childbearing is generally an acceptable preserve for the married. The society anticipates a childbirth in the early years of a couple's marriage. A study by Taghizadeh et al. (2015) documented that women wanted to have children right after their marriage so as to strengthen their relationship. The lower likelihood of unmet need among married women was however inconsistent with findings of a study done in Hungary (Klinzing, 2012). Moreover, the widowed/separated/divorced women were 0.129 times more likely to report unmet need to limit childbearing. Being out of formal marriage makes such women not to want an extra birth.

Current age showed mixed patterns with unmet need: older women were 28.4 percent less likely to report unmet need to delay childbearing while they were 26.5 percent more likely to report unmet need to limit childbearing. The less likelihood of unmet need to delay childbearing among women



aged 20 to 39 years is because it is at such ages that women are ripe for childbearing, most likely, new in marriage and wants to prove their fertilities. The findings for limiting childbearing were consistent with findings of a study done in sub-Saharan Africa (Teshale, 2022). The study by Teshale (2022) found women aged 40-44 and 45-49 years to be 2.27 and 1.43 times, respectively, more likely to experience unmet need for limiting childbearing. Such women are more likely to have attained their desired family sizes and currently in no need of an extra birth.

The higher likelihood of unmet need among women with beyond-3 surviving children is consistent with other studies (Agyekum et al. 2022; Alie et al., 2022; Teshale, 2022; Barrow et al., 2021). Hailemariam and Haddis (2011) explained that as the number of children upsurges, people's craving to have more children decreases. Also, having beyond-3 surviving children might point to a woman having attained her desired number of children and hence more likely to experience higher unmet need to space or limit childbirth (Teshale, 2022). The positive association between unmet need and number of living children is further explained by increased women's exposure to family planning and getting more information about family planning among parous women.

Consistent with findings of this study, other studies have failed to establish any significant association between geographical area of residence (Otieno & Mwakudisa, 2024), education qualification (Otieno & Mwakudisa, 2024), and work status (Agyekum et al., 2022; Alie et al., 2022) and unmet need for family planning. The insignificant association between distance to the nearby health facility and unmet need for family planning might be as a result of improved means of transportation that ensures quick access to health facilities for family planning services. A study by Omedi (2024) found approximate distance to a healthcare facility to be unrelated to the uptake of antenatal care services in Kakamega Central sub-County of Kenya.

4. Conclusion

This study sought to establish the determinants of unmet need for family planning in Lurambi sub-County, Kakamega County, Kenya. Unlike most of the existing studies that gave focus on currently married women, this study considered all women: single, married, widowed/divorced/separated who were within the reproductive ages and had an experience of a childbirth in the period 2013-2022. Results of correlation analysis indicated that education qualifications, number of health facilities and distance to the nearby health facility were significantly related to unmet need in Lurambi sub-County. Results of regression analysis indicated that unmet need to delay childbearing was significantly explained by marital status, current age and number of health facilities present in an area. Number of living children was associated with unmet need to space childbearing while marital status, current age, and number of living children were associated with unmet need to limit childbearing.

The study findings point to the need to invest in women education and increase the number of well-stocked health facilities so as to increase insightful knowledge on contraception and ease access to contraception services. Efforts should be made to reach out to women and their partners at multiple stages in their reproductive lives so as to satisfy the changing needs for contraception. Reducing unmet need is important in reducing maternal and infant mortalities, increasing opportunities for employment and education, increasing control over women's reproductive health, and sustainable development.

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Home-School Communications and Pre-Primary School Learners' Acquisition of Core CBC Competencies in Kisii County, Kenya

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ABSTRACT

This paper presents findings from a study conducted in Kisii County, Kenya, aimed at examining the relationship between home-school communication and the acquisition of CBC's core competencies among pre-primary school learners. Yet, effective acquisition of competencies during pre-primary stage of schooling is critical for learners' academic success in both current and future educational levels. Epstein's (2005) theory of parental involvement provided the theoretical framework for the study. An ex post facto research design was adopted and implemented through quantitative approach. The study targeted a population of 702 public PP2 schools and teachers, along with 25,105 parents of PP2 learners. Through cluster, stratified and simple random sampling techniques, the researcher selected a sample comprising 248 teachers and 378 parents, from whom data were collected using questionnaires. The data collection instruments were pre-tested in seven PP2 schools to ensure reliability and validity. Content validity and the split-half method were applied, resulting in a reliability correlation coefficient of 0.8. Quantitative data were summarized and organized using descriptive statistics such as frequencies. To test the study's hypothesis, inferential statistics including Pearson Moment Correlation and multiple regression analysis were employed to examine both the relationship and its strength between the independent and dependent variables. The results revealed a positive and statistically significant correlation between parental home-school communication and learners' acquisition of core competencies ($r = .639$, $n = 369$, $p < .01$). Based on these findings, the study concluded that effective home-school communication significantly contributes to the acquisition of CBC core competencies among PP2 learners. Consequently, the study recommends that key stakeholders in the education sector should create more opportunities for parental involvement in home-school communication. Furthermore, workshops should be organized to sensitize parents on how to effectively engage with home-school communication activities, thereby supporting improved acquisition of core competencies among young learners.

Keywords: Parental, Home-school communication, Pre-primary school, Core competencies, Competence-based curriculum

1. Introduction

The Competency-Based Curriculum (CBC) is a system of education that nurtures definite key abilities in learners as explained by the Kenya Institute of Curriculum Development (KICD) in 2017. These competencies enable an individual learner to demonstrate proficiency in a given area as a result of having a given amount of facts that can be assessed (Haddouchane et al. 2017). Competency-Based Curriculum can be viewed as learning framework that focuses on developing specific skills and abilities. These competencies are embedded in education which plays a significant role in ecological protection, financial, societal and technological development as well as employability (Bichi et al., 2019). The 21st century market need individuals who possess these abilities as Mulenga and Kabombwe (2019) rightfully affirm since the possession of these competencies help to produce life-long learners who are self-motivated, productive, independent, holistic and confident, with the values, skills and knowledge which permit them to be successful in school as well as in life (Zulu, 2015). Therefore, it



was essential to investigate how different countries implemented CBC and the degree to which pre-primary school learners acquired these basic competencies.

Sadeq, et al. (2021) who conducted a study to explore the implementation of Competency-Based Curriculum (CBC) in Kuwait found that the implementation of CBC did not meet the expectations of both policymakers and teachers. In addition, Alajmi (2021) who explored Implementation Difficulties of Kuwait National Competency-Based Curriculum found weaknesses in professional development and training, the assessment process, use of instructional technology, financial supplies, and teacher guides. The present study on the other hand was conducted to solicit more detailed information pertaining to parents' involvement in pre-primary school children's acquisition of Kenya's CBC's core competencies namely; Communication and collaboration (CC), Critical thinking, and problem-solving (CTPS), Creativity and imagination (CI), Citizenship (C), Digital literacy (DL), Learning to learn (LL) and Self-efficacy (SE).

In Tanzania, the implementation of CBC was facing a myriad of challenges hindering its effective execution thus affecting learners' performance (Kimario & Otieno, 2022). Besides, teachers had a limited capacity to implement CBC (Nkya et al. 2021) since they could not clearly interpret the competency-based curriculum (Machange, 2022). Also, it was discovered that Tanzanian citizen's employability was hampered by factors related to inadequate implementation of Competency-Based Education and Training curriculum (Mgaya (2022).

Although the Government of Kenya's has a bid to actualise the Competency Based Curriculum (KICD, 2017), its implementation has to some extent, remained ineffective (Ondimu, 2018). This was attributable to school and teacher factors (Ngeno, 2022), namely; inadequate resources, lack of specialized teacher training, large classes sizes, poorly printed books, unclear assessments rubric guidelines (Cheptoo & Ramdas, 2020), inability of teachers to incorporate technology in their lessons (Murithi & Yoo, 2021) and teacher attitude (Ngeno, et al., 2021). In addition, other factors include; scarcity of material, human resource, use of inappropriate teaching and learning approaches, poor public participation, teachers lacking sufficient understanding and application of formative assessment techniques, leading to the conclusion that, the CBC was haphazardly implemented (Akala, 2021; Otieno & Machani, 2022). These concerns therefore, necessitated the need for the present study.

In Kisii County, low performance in learning has been witnessed in the curriculum areas. Karogo et al. (2020) clarified that some years after implementation of CBC, NASMLA 2020 survey showed that majority of grade 3 learners in Kisii County performed dismally in Mathematics, English and Kiswahili. In mathematics, 85.9% were at level one, 56.9% were at level two, 26.9% were at level three while 1.9% were at level four. In English, 4.5% were at level one, 48.6% were at level two, 32.2% were at level three while 26.9% were at level four and in Kiswahili, 3.8% were at level one, 69.8% were at level two, and 67.4% were at level three while 35.5% were at level four. The low performance could be an indicator that such a paradigm shift in terms of the new curriculum, may not be easy to achieve after years of teacher-centered learning. The present study was therefore necessary, to complement government efforts to improve implementation of CBC.

As recommended by Mwita et al. (2022), the government has increased the number of CBC in-service training sessions for teachers. In addition, there have been efforts in developing and providing tailored educational and training programmes for college students (Kwon 2020), apart from providing guidelines on the content (Cheptoo & Ramdas, 2020) and infrastructural development (Ngeno, 2022). However, since CBC in Kenya is not yet fully established, it was still not clear on the influence of parents' involvement in their children's acquisition of CBC's core-competencies.

Naite (2021) in a study conducted in the Thailand affirms parental involvement plays a significant role in children's academic achievement. Thus, parents have an obligation to take responsibility for



their children's learning process (Bhamani et al., 2020). For example, parents are charged with the responsibility of developing open lines of communication on learners learning progress as well as in the making of educational plans (Olivar & Naparan, 2023).

Muthami (2022) revealed that there was a positive and significant association between parental communication and academic performance. Ikhlas and Mokhtar (2022) in their study in Malaysia, did not provide accurate outcome of whether parental participation contributes to educational outcomes. Additionally, Albarico et al (2023) show that there was no influence of parental involvement on academic performance. The present study was therefore crucial, in order to harmonize the above observed inconsistencies.

A number of recent studies have been conducted on CBC learning outcomes in Kenyan primary schools including Cheptoo and Ramdas (2020) who focused on general aspects of teachers as the Competency-Based Curriculum implementers. Murithi and Yoo (2021) focused on teachers' use of ICT in implementing CBC. Akala (2021) focused on the degree to which the implementation of CBC is being hindered and Ngeno (2022) explored determinants of schools' preparedness for the implementation of the CBC in grade one.

Therefore, there was a need to unearth the influence of parental home-school communication on pre-primary two (PP2) learners' acquisition of core competencies in Kenya. The hypothesis for the study was; "H₀ There is no statistically significant relationship between home-to-school communications and pre-primary learners' acquisition of CBC core-competencies in pre-primary schools."

2. Literature Review

Joyce Epstein's Theory of Parental Involvement

Epstein (2005) argues that home-school communication plays a critical role in a child's learning and development. Communicating entails increasing interactive operatives between home and school. This theory provides a more specific approach to pre-primary school learners' acquisition of CBC core competencies. Specifically, as Epstein accentuates, the school, family, and community are an important influence on children's learning as well as development. Thus, Epstein provides a more holistic approach towards the acquisition of CBC core competencies, if the framework is applied by incorporating the elements in the theoretical model. These constitute an environment that fosters communication strategies that bind the home and school together.

Synthesis of Literature on Home-School Communication

Home-school communication entails developing open lines of communication on students' learning progress as well as in the making of educational plans between schools and parents (Olivar & Naparan, 2023). Home-school communication assists parents to gather important information about progress of their children and develop ways of supporting their learning (Desforges and Abouchaar, 2003). When homes and schools communicate responsively and frequently, students gain from a more coordinated and nurturing learning environment.

In England, Levy (2023) conducted a qualitative study to investigate the influence of parent-teacher communication on learning of primary school learners during corona period. Findings of the study showed that the pandemic facilitated a great deal communication and partnership between home and school. Also, respondents reported that they had developed a better understanding of one another and that this had positive implication for the learning. Ovaningsih et al. (2023) in their study in Indonesia established that school-home communication enhanced parental participation.

Although these findings were promising, Pek and Mee (2020) conducted a study in Malaysia to explore parental engagement on primary school children's learning at home during Covid-19 pandemic found



that although teachers had a strong passion for parental engagement, parents on the contrary did not indicate a desire for better communication with teachers nor involvement in children's education. Also, Beilmann et al. (2023) found a number of challenges faced in home school communication in enhancing the learning.

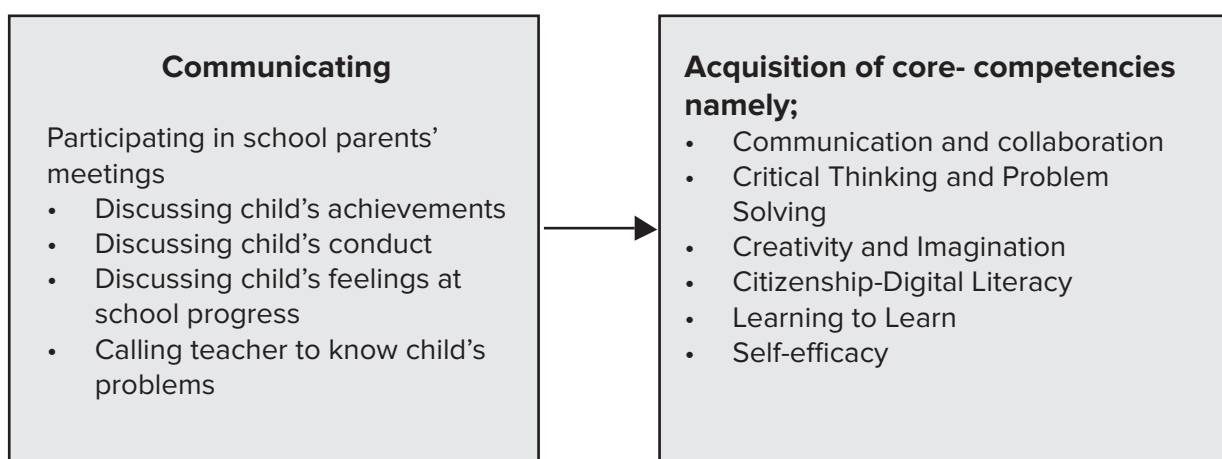
The above studies were, however, conducted in developed countries and among high school and primary school learners, leaving out pre-primary schools. Thus, the present study investigated the involvement of parents in terms of home-school communication and its influence on pre-primary school learners' acquisition of CBC core-competencies, to close down the gap.

In Sierra Leone, Fofanah and Patrick (2025) conducted a study to investigate how school-home communication affected public primary school learners' academic achievement. The study targeted approximately 60 participants of which parents, teachers, and pupils selected from (5) primary schools. Purposive sampling method was employed to obtain the sample. Results of the study indicated that school-home communication influence learners' academic achievement. Also, the study revealed that majority of teachers' poor communication led to low parental involvement. Although the reviewed study was related to the current one it focussed on primary school, while the current one was done in Kenyan pre-primary schools. Lastly, the reviewed investigation focused on the association between parental involvement and learners' academic performance as opposed to the current one which centred on the correlation between parental involvement and learners' acquisition of CBC core competencies.

Narrowing down the focus to Kenya Kaptich et al. (2019) conducted a study to examine the influence of hone-school communication on grade 8 primary school learners' performance in Ainabkoi Sub-county. Findings of the study showed a positive and significant relationship between parent-teacher communication and academic performance. The above-reviewed study was conducted in Ainabkoi Sub-County, Kenya, which is a small rural geographical and administrative unlike the current investigation which was conducted in Kisii County, a larger geographical and administrative area.

Conceptual framework and hypotheses

The hypothesis for the study was "***Ha*** There is a statistically significant relationship between home-to-school communications and pre-primary learners' acquisition of CBC core-competencies in selected pre-primary institutions in Kisii County."



3. Research Methodology

Ex post facto research design was used to investigate cause-effect associations between independent variable, home- school communication which already existed prior to the study, thus, it could not be manipulated as Kumatongo and Muzata (2021) state and was capable of affecting the dependent variable, which is “Pre-primary school pupil’s acquisition of CBC core competencies”.

The use of parents’ questionnaire enabled the parents to report their extent of involvement in their children’s learning while teachers’ questionnaire enabled teachers to provide data on the extent to learners’ acquired of CBC core competencies. Conformity to appropriate standard, confidentiality was ensured by making available the data collected to only those directly involved in the study. Respondents’ anonymity was assured by using codes. Lastly, consent of the respondents to participate in the study was also sought.

The study employed a quantitative approach. Face and content validity were used to test validity of the research instruments whereas split-half method was used to determine the reliability.

The study was conducted in Kisii County targeting 702 pre-primaries two (PP 2) teachers (1 per school), and 25,105 parents of 25,105 PP2 children from 702 pre-primary schools attached to public primary schools. Using Krejcie and Morgan (1970) sampling table, with a 95% confidence level and 5% margin error, a sample of 248 PP2 teachers and 378 parents of PP 2 learners was obtained. Of parents, 369 responded.

Quantitative data was summarised and presented in form of percentages and tables and analysed using Pearson moment correlation coefficient and multiple regressions utilising SPSS Version 20.

4. Result and Discussion

The study reviewed parents’ views on Parental Home-School Communication. Descriptive statistics involving percentages were used to summarize the data obtained. Parents had to rate their involvement in their children’s education using the rating scale SA=Strongly Agree, D=Disagree, UD=Undecided, A=Agree, and SD=Strongly Disagree as indicated in table 1.

Table 1: Parental views on home-school communication activities

SN	Description	SD	D	UD	A	SA	N
		%	%	%	%	%	
i.	I participate in school parents' meetings & air my views	20.3	3.0	3.5	24.7	48.5	369
ii.	I discuss with the teachers, my child’s school achievements	12.2	15.7	4.3	24.7	43.1	369
iii.	The teacher tells me about my child’s conduct	12.5	12.2	5.1	21.4	48.8	369
iv.	I talk with the teacher regarding the child's feelings at school	13.3	15.7	8.9	21.7	40.4	369
v.	I call the teacher directly to communicate my child’s problems	24.4	8.4	5.7	27.4	34.1	369

The first indicator sought to establish the extent to which parents participated in school parent’ meetings & aired their views. Findings in table 1 shows that almost three-quarters (73.2%) of parents agreed that they participated in school parents’ meetings, almost a quarter (23.3%) disagreed almost one in twenty (3.5%) were undecided. The majority of the parents participated in school a parent meeting which is a good practice for enhancing learning. This implies that parent meetings are significant in enhancing learning.



The second item sought to establish the extent to which parents discussed with the teachers, their child's school achievement. It was revealed that slightly more than one in ten (12.2%) strongly agreed that they discussed with teachers, the child's school achievements, almost a fifth (15.7%) disagreed, almost one in twenty (4.3%) were undecided, almost a quarter (24.7%) agreed and slightly more than two-fifths (43.1%) strongly agreed. In brief, almost seven in ten (67.8%) of the parents agreed that they discussed with the teachers their children's school achievement. A round a quarter (27.9%) of the parents disagreed that they discussed with teachers their children's school achievement and almost one in twenty (4.3%) were undecided. The majority of the parents, therefore, discussed with teachers, their children's school achievement. This means that discussing with teachers regarding children's school achievement was an important exercise that helps both the teacher and parents to understand learners well thus improving their acquisition of CBC's core competencies.

Item number three sought to establish the extent to which the child's teacher told parents about their children's conduct. It was revealed that marginally, more than one in ten (12.5%) strongly agreed that the teacher tells me about their child's conduct, slightly more than one in ten (12.2%) disagreed, to some degree more than one in twenty (5.1%) were undecided, moderately more than a fifth (21.4%) agreed and almost a half (48.8%) strongly agreed. In summary, slightly more than seven in ten (70.2%) of the parents agreed that teachers told them about their children's conduct. Almost a quarter (24.7%) of the parents disagreed that their children's teachers told them about their children's conduct and slightly more than one in twenty (5.1%) were undecided. The majority of the teachers told parents about their children's conduct which suggests it is an operation that helps to check children's behaviours thus enhancing learning.

The next item which is number iv in Table 1, sought to establish the extent to which the child's parent talked with the teacher regarding the child's feelings at school. It was revealed that slightly more than one in ten (13.3%) strongly disagreed that they talked with the teacher regarding the child's feelings at school, almost a fifth (15.7%) disagreed, about one in ten (8.9%) were undecided, slightly more than a fifth (21.7%) agreed and slightly more than two-fifths (40.4%) strongly agreed. In a nutshell, slightly more than three-fifths (62.1%) of parents agreed that they talked with teachers regarding their children's feelings at school, slightly more than two-fifths (42.3%) of the parents disagreed, and almost one in ten (8.9%) were undecided. This is a connotation that a parent talking with teachers regarding their children's emotions at school is a helpful procedure to teachers in identifying what learners like or fear at school in which case, appropriate steps can be taken to enhance learning.

The fifth item sought to establish the extent to which the child's parent calls directly to inform the teacher about the child's problems. It was revealed that slightly more than a quarter (24.4%) strongly disagreed that they called the teacher directly to communicate the child's problems, almost one in ten (8.4%) disagreed, slightly more than one in twenty (5.7%) were undecided, slightly more than a quarter (27.4%) agreed and slightly more than a third (34.1%) strongly agreed. In short, slightly more than three-fifths (61.5%) of parents agreed that they called teachers directly to inform them about their children's problems. However, almost a third (32.8%) of the parents disagreed that they called teachers directly to inform them about their children's problems and almost one in ten (5.7%) were undecided. Hence, the majority of the parents called teachers directly informing them about the learner's problems. This indicates that this action, helps teachers to handle learners' problems professionally thus improving learning.

Table 2: Statistical Relationship between Parental Home-School Communications and Learners' Acquisition of CBC Core-Competencies

Communication	Pearson Correlation	.639**
	Sig. (2-tailed)	.000
	N	369
Overall Core Competencies	Pearson Correlation	1
	Sig. (2-tailed)	
	N	369

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2 indicates the coefficient correlation between parental home-school communications and learners' acquisition of CBC core competencies. The findings show that there was a positive statistically significant association ($r=.639$, $n=369$, $p<.01$) between parental home-school communications and learners' acquisition of CBC core competencies. Given that the correlation was statistically significant, the null hypothesis was rejected. It was therefore concluded that home-school communication significantly correlated to the overall acquisition of CBC core competencies among pre-primary school learners. This connotes that parental home-to-school communications influence learners' acquisition of core competencies, a practice that enhances learning.

The finding of this study is supported by Kelley (2022) who found out that two-way communication built on trust is a pillar of a successful school-parent partnership. However, the finding of this study conflicted with that of Ikhlas and Mokhtar (2022) who showed contradicting findings on the influence of parental involvement on learners' academic performance.

Table 3: Correlation between home-school communication and individual aspects of learners' acquisition of CBC core competencies

		CC	SE	CTPS	CI	C	DL	LL
Communication	Pearson Correlation	.385**	.907**	-.466**	-.464**	.777**	.195**	.995**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000
	N	369	369	369	369	369	369	369

Findings on Table 3 show that there was a statistically significant ($p<.05$) relationship between parental home-school communication and all the seven aspects of CBC core competencies. However, some were positive and others negative. On positive correlations, learning to learn reflected the highest correlation ($r=.995$), while digital literacy had the least correlation ($r=.195$) to parental home-school communication. On the side of negative correlations, Critical Thinking and Problem Solving reflected the highest correlation ($r=-.466$), while Creativity and Imagination had the least correlation ($r=-.464$) on parental home-school communication. In summary, learning to learn reflected the highest correlation ($r=.995$) on the positive, and Critical Thinking and Problem Solving ($r=-.466$) reflected the highest correlation on the negative. This finding concurs with that of Ikhlas and Mokhtar (2022) who showed contradicting findings on the influence of parental involvement on learners' academic performance.

Table 4: Home-school Communications and Learners' Acquisition of CBC Core-Competencies' Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639 ^a	.408	.406	26.657

a. Predictors: (Constant), Communication



The model on Table 4 shows that parental home-school communication alone accounted for 40.8% (Coefficient $R^2 = .406$) of the variation in overall acquisition of CBC core competencies among pre-primary school learners and 59.2% of the variations can be explained by other factors. In addition, a coefficient of parental home-school communication and learners' overall core- competencies (Table 5) was further computed.

Table 5: Coefficient of parental home–school communication and learners' overall CBC core-competencies

Model B	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Std. Error	Beta			
1 (Constant) 154.668 4.136				37.397	.000
Communication	2.091	.131	.639	15.901	.000

a. Dependent Variable: Overall Core Competencies

Regression equation: $Y = 154.668 + 2.091X_1 + \epsilon$

Where Y is the overall CBC core competencies and X_1 is parental home school communication. It is evident from Table 5 that if parental home-school communication as a parental involvement aspect was improved by one standard deviation, then perceived scores in the level of acquisition of CBC core competencies in children would improve by .639 standard deviation units. On the same note, if home-school communication increases by one unit then the level of overall acquisition of core- competencies would improve by 2.091units; this is a substantial effect from a single dependent variable. Additionally, the p-value was 0.000 which is less than .05, confirming a statistically significant influence of home-school communication on an overall acquisition of CBC core competencies among pre-primary school children.

5. Conclusion and Recommendation

Findings revealed that home-school communication influenced the acquisition of CBC core-competencies among pre-primary school learners. Findings revealed that high percentage of parental engagement in home-school communication activities led to high and positive acquisition of CBC core-competencies. This is shown in positive statistically significant association between parental home-school communications and learners' acquisition of CBC core-competencies. It was recommended that parents create more time to be engaged in home-school activities so that children can optimally acquire the much needed CBC's core competencies. Policy Makers in the Ministry of Education to conduct workshops with parents and teachers to enlighten them on the significance of home school communication on enhancing the acquisition of core competencies.

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Integrating Multimodal Approaches in Language Learning for Teacher Training in the Digital Era

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ABSTRACT

The integration of multimodal approaches in language learning is vital in teacher training, particularly in this digital era. This study explores the adoption of multimodal strategies to equip teacher trainee in language instruction at Universities in Kenya. The aim is to examine the effectiveness of adoption of multimodal strategies in language instruction in enhancing pre-service teachers' pedagogical competencies. Grounded in Multimedia Learning Theory, the study investigates how textual, visual, auditory, and interactive digital resources contribute to language learning and instructional effectiveness. A descriptive research design with qualitative and quantitative approaches employing semi structured interviews, and questionnaires were used to gather data. Data was collected from language department and trainee teachers in two public Universities and three private Universities purposively sampled in Kiambu County, Kenya. Findings indicate that incorporating multimodal approaches can foster learner engagement, improve comprehension, and enhance instructional delivery. However, challenges such as limited digital literacy of multimodal approaches in language learning and infrastructural constraints were noted. The study recommends digital training on multimodal approaches in language learning for educators, improved technological infrastructure, and curriculum adaptation to support multimodal integration. These findings contribute to the ongoing discourse on innovative teacher training methodologies, underscoring the need for adaptive teaching strategies in contemporary education.

Keywords: *Multimodality, Language learning, Teacher training, Digital era, Pedagogical competency.*

1. Introduction

this study, multimodal approaches in language learning refer to teaching and learning strategies that use multiple modes or channels of communication to enhance language acquisition. These modes can include visual (e.g., images, videos, graphs), auditory (e.g., spoken language, music, sound effects), Gestural (e.g., body language, facial expressions), spatial (e.g., layout), and organization of information)

Textual (e.g., written or printed words). Universities play a central role in preparing future educators by incorporating innovative methodologies that align with evolving educational demands. Imran and Almusharraf (2024) explain that the rapid advancement of digital technology has transformed various aspects of education. In contemporary classrooms, traditional instructional methods are increasingly being supplemented or replaced by multimodal approaches that integrate textual, visual, auditory, and interactive digital resources (Hilton, 2023).

As explained by Rohi and Nurhayati (2024), these multimodal strategies offer diverse learning experiences that cater to different learner needs, fostering engagement, comprehension, and instructional effectiveness. In the context of teacher training, Tour and Barnes (2022) suggest that the adoption of multimodal approaches is crucial in equipping pre-service teachers with the pedagogical competencies required for effective language instruction.

In Kenya, the integration of multimodal strategies in teacher training programs remains an area of growing interest, particularly in institutions within Kiambu County. Grounded in the Multimedia Learning



Theory, this study examines the effectiveness of multimodal strategies in language instruction among teacher trainees in selected public and private universities in Kiambu County, Kenya. By employing a descriptive research design with qualitative and quantitative approaches, the study explores how multimodal techniques contribute to instructional effectiveness and the challenges that educators face in their adoption.

1.1 Statement of the Problem

The increasing shift toward digital learning in education necessitates the integration of diverse instructional strategies to enhance language teaching. However, despite the recognized benefits of multimodal approaches in improving learner engagement, comprehension, and instructional effectiveness, their adoption in teacher training programs remains limited in many institutions. In Kenyan universities, particularly in Kiambu County, there is a gap in the effective implementation of multimodal strategies in pre-service teacher training for language instruction. Without proper training and institutional support, teacher trainees may struggle to effectively utilize multimodal strategies, ultimately affecting their pedagogical competencies and the quality of language instruction they provide.

This study, therefore, seeks to investigate the extent to which multimodal strategies are integrated into language instruction in teacher training programs in Kiambu County. It aims to assess their effectiveness in enhancing pre-service teachers' pedagogical skills and identify the barriers to their implementation. Addressing these gaps contribute to the development of more effective teacher training methodologies, ensuring that educators are well-equipped to utilize multimodal techniques in contemporary language classrooms.

1.2 Objectives of the Study

1. To examine the extent to which multimodal strategies are integrated into language instruction in teacher training programs at the universities in Kiambu County, Kenya.
2. To assess the effectiveness of multimodal approaches in enhancing the pedagogical competencies of pre-service language teachers the universities in Kiambu County, Kenya.
3. To Explore the challenges faced by pre-service language teachers in adopting multimodal strategies for language instruction in Kiambu County, Kenya.

2. Literature Review

Muttairi et al. (2025) examine the integration of visual, auditory, and textual elements in digital media with a focus on quality education. The study explores the integration of various modalities in English as a Second Language (ESL) instruction. The research emphasizes the significance of combining visual, auditory, and textual elements to enhance language learning, aligning with the objectives of the current study. While the study provides valuable insights into multimodal communication in ESL learning, it does not specifically address the extent to which these strategies are integrated into teacher training programs. This presents a knowledge gap, particularly concerning the practical application and training of multimodal strategies within local teacher education programs the current study addresses.

The study by Grapin (2024) investigates pre-service teachers' (PSTs) beliefs regarding multimodal instruction and assessment for English learners (ELs). The findings show that while PSTs generally held favorable views toward multimodal instruction, their beliefs about multimodal assessment were more varied. Notably, PSTs often perceived nonlinguistic modalities primarily as compensatory tools to support English language development, rather than as integral components of disciplinary meaning-making. While Grapin explores pre-service teachers' beliefs about multimodal instruction and assessment, the study does not empirically assess how multimodal approaches actually impact the development of pedagogical competencies in pre-service language teachers. Specifically, there



is limited understanding of the effectiveness of multimodal strategies in enhancing PSTs' practical teaching skills, instructional design, and reflective practices. Moreover, the perception of multimodal elements as merely compensatory rather than integral to meaning-making suggests a conceptual gap in teacher training programs that needs to be addressed through applied pedagogical interventions which the current study explores.

Despite the advantages of multimodal approaches, several barriers hinder their effective adoption in teacher training programs. Phulpoto *et al.* (2024) examine enhancing teacher performance in e-learning. The study focuses on addressing barriers and promoting sustainable education in public universities of Pakistan. The findings point to limited digital literacy among educators as a primary challenge. In the Kenyan context, while universities recognize the value of digital learning, there might be possible factors that hinder seamless multimodal integration which the current study examines. Multimodal learning leverages various modes of communication to enhance language acquisition. According to Kress and van Leeuwen (2001), multimodal instruction facilitates deeper comprehension by engaging learners through multiple sensory channels.

Research Gaps and Justification for the Study

While extensive research exists on multimodal learning, limited studies focus specifically on its application in teacher training programs in Kenyan universities. Most studies on multimodal approaches have been conducted in Western contexts, with little emphasis on how these strategies can be adapted to local educational settings. Furthermore, there is a need to examine the specific challenges that Kenyan universities face in implementing multimodal strategies in language instruction. This study seeks to address this gap by exploring the integration, effectiveness, and challenges of multimodal approaches in teacher training programs in Universities within Kiambu County.

3. Theoretical Framework

This study is grounded in Cognitive Theory of Multimedia Learning (CTML) by Mayer (2005). This theory envisages the idea that learners learn more effectively from words and pictures combined than from words alone. The theory integrates principles from cognitive science and multimedia design to explain how people process and retain information when presented in a multimodal format. Three tenets of this theory are used for data analysis in this study. The first one is multimedia principle which is used to examine the extent to which multimodal strategies are integrated into language instruction in teacher training programs. The tenet posits that learners understand better from words and pictures than from words alone. This concept is used to assess whether language learning instructions in teacher training programs combine visual, textual, and auditory elements.

The second tenet is the Redundancy Principle, which was employed to assess the effectiveness of multimodal approaches in enhancing the pedagogical competencies of pre-service language teachers. This principle, derived from Mayer's Cognitive Theory of Multimedia Learning, posits that individuals learn more effectively when information is presented through graphics and spoken narration rather than through a combination of graphics, narration, and on-screen text. The rationale behind this principle is that redundant input across multiple channels, especially when spoken and written text present the same content, can overload the learner's cognitive capacity, leading to diminished learning outcomes. The tenet was used to evaluate effectiveness based on optimized combinations of input modes.

The third tenet is contiguity principles to explore the challenges faced by teacher trainees and their institutions in adopting multimodal strategies for language instruction. This tenet alludes to the technological or instructional challenges that prevent simultaneous or spatially-aligned presentation of corresponding words and visuals. People learn better when they know the names and characteristics of concepts. Mayer's theory supports the use of multimodal approaches in teaching such as combining



text, images, audio, and video but emphasizes that their cognitive alignment with how learners process information is essential for effectiveness. Poorly designed multimodal content can lead to cognitive overload and hinder learning.

4. Materials and Method

This study adopted a descriptive research design incorporating both qualitative and quantitative approaches. This mixed-methods approach allowed for an in-depth understanding of how multimodal strategies can enhance pre-service teachers' pedagogical competencies while identifying the challenges faced in their adoption. The research was conducted in Kiambu County, Kenya, focusing on universities that offer teacher training programs in language instruction. The study targeted both public and private universities to provide a comprehensive perspective on the integration of multimodal approaches across different institutional settings. The study population included fourth year pre-service language teachers enrolled in teacher training programs and lecturers from the language departments of selected universities.

A purposive sampling technique was used to select universities and participants based on their relevance to the study. The sample consisted of two public universities and three private universities offering language teacher training programs, one language department lecturer per institution, and five pre-service teachers selected from each university to ensure diverse representation. Semi-structured interviews were conducted with language department lecturers to gather qualitative insights on the effectiveness and challenges of multimodal strategies in teacher training. Questionnaires were administered to pre-service teachers to collect quantitative data on their experiences with multimodal learning and its impact on their pedagogical skills.

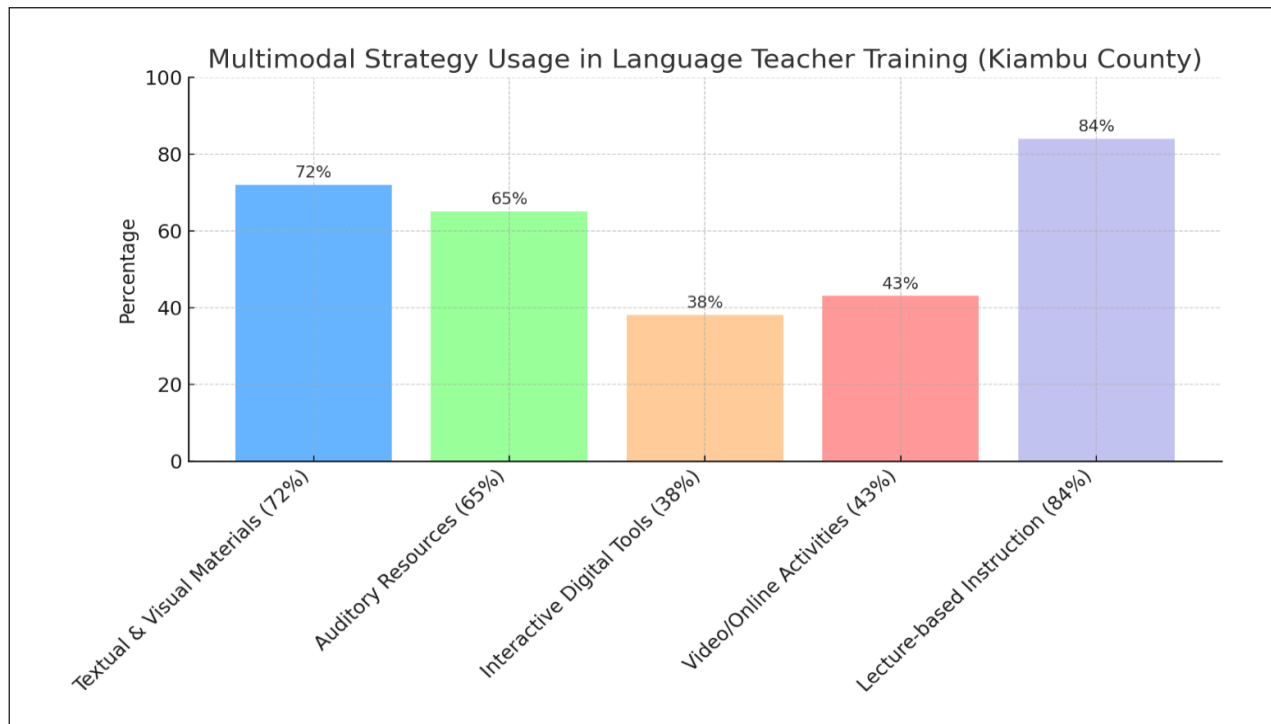
Qualitative data was analyzed using thematic analysis, identifying key themes related to multimodal integration, challenges, and instructional effectiveness. Quantitative data from questionnaires was analyzed using descriptive statistics in percentages to measure the extent of multimodal strategy adoption and its impact on pre-service teachers' competencies. Participants were briefed on the study's purpose, and their voluntary participation was ensured. Personal data was anonymized to maintain privacy. Permission was sought from relevant university authorities before conducting data collection. This methodological approach ensures a comprehensive assessment of how multimodal strategies can influence teacher training in language instruction within Kenyan universities.

5. Findings and Discussion

5.1 Integration of Multimodal Strategies in Teacher Training

The study intended to find out how multimodal strategies are employed in teacher training, with a specific focus on understanding the extent to which different modes such as textual, visual, auditory, interactive, and digital tools are integrated into instructional practices. The following is a data collected from fourth years pre-service language teachers enrolled in teacher training programs, presented using bar chat.

Figure 1. Multimodal Strategies Employed in language Teacher Training at Universities in Kiambu County, Kenya



The data in the bar chat indicate that universities in Kiambu County have partially integrated multimodal strategies into their language teacher training programs. Approximately 72% of pre-service teachers reported regular exposure to textual and visual materials, such as printed notes, slides, and infographics, while 65% confirmed the use of auditory resources, including audio recordings and video lectures. However, only 38% indicated access to interactive digital tools like educational apps, online simulations, or digital storytelling platforms. Although 43% of preservice teachers hinted that their institutions had incorporated videos and online-based activities, lecture-based instruction remained the predominant method in 84% of the interviewed informants.

These findings align with Muttairi *et al.* (2025), who underscore the effectiveness of integrating visual, auditory, and textual elements in enhancing language learning. Nevertheless, the relatively low adoption of interactive resources points to a critical gap in fully leveraging multimodal approaches to improve pre-service teachers' instructional competencies and adaptability to diverse learning environments. This confirms the multimedia principle of Cognitive Theory of Multimedia Learning Theory by Mayer (2005), which posits that learners understand better from words and pictures than from words alone.



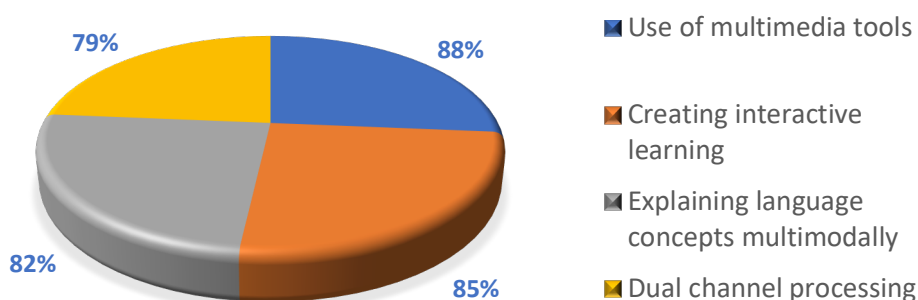
The study findings indicate that some universities in Kiambu County have partially integrated multimodal strategies into their language teacher training programs. Most pre-service teachers reported exposure to textual, visual, and auditory learning resources, but interactive digital tools were less frequently utilized. While some institutions incorporated videos, online simulations, and digital storytelling, traditional lecture-based instruction remained dominant. These findings align with Hilton (2023) who claims that in contemporary classrooms, traditional instructional methods are increasingly being supplemented or replaced by multimodal approaches that integrate textual, visual, auditory, and interactive digital resources. However, the limited use of interactive resources suggests a gap in fully harnessing the potential of multimodal approaches to enhance pre-service teachers' instructional competencies.

Informants (Lecturers from the Department of Languages) were asked to reflect on the extent to which they employ multimodal strategies in teacher training within language education. Many respondents acknowledged that while multimodal strategies can be effective, developing coherent and pedagogically sound content is both time-consuming and demanding. As a result, they tend to use these strategies less frequently. Some responses indicated that, without careful planning and thoughtful integration, multimodal approaches risk overwhelming trainees rather than enhancing their learning. These observations are consistent with the findings of Phulpoto et al. (2024), who identify limited digital literacy among educators as a significant barrier to the effective adoption of multimodal strategies in teacher training programs.

5.2 Effectiveness of Multimodal Strategies in Enhancing Pedagogical Competencies

Some responses from the informants interviewed indicates that some pre-service teachers who engaged with a variety of multimodal resources such as a combination of visual, auditory, and textual elements reported improved teaching skills, particularly in structuring lessons. This increases ability to create interactive and engaging learning experiences, which improves the ability to explain language concepts. The application of redundancy principle of Multimedia Learning Theory by Mayer (2005) was evident, as pre-service teachers benefited from dual-channel processing, where both verbal and visual elements reinforced understanding. This indicates that the modality principle (using audio instead of only text) and the multimedia principle (combining text and visuals) significantly enhances lesson delivery. This finding is in agreement with the findings of the study by Grapin (2024), showing that pre-service teachers perceive nonlinguistic modalities primarily as compensatory tools to support English language development, rather than as integral components of disciplinary meaning-making. In order to find out perceived effectiveness of various multimodal strategies in enhancing the pedagogical competencies of pre-service teachers. Quantitative data was analyzed from the responses of the informants interviewed (Preservice teachers), which is presented in figure 2. The outcomes are rated based on their percentage effectiveness, suggesting how strongly each strategy was associated with improved teaching ability in the given breakdown

Figure 2: Perceived effectiveness of multimodal strategies among the pre-service teachers.



From Figure 2, the effective use of multimedia in lessons emerged as the highest-rated skill at 88%, indicating that pre-service teachers consider multimedia a vital tool for planning, sequencing, and delivering content-rich, engaging lessons. Similarly, the ability to create interactive learning environments (85%) and explaining language concepts multimodally (82%) received high ratings. These results underscore the value placed on student engagement and enhanced comprehension through the use of diverse sensory channels, such as text, images, and audio.

Notably, dual-channel processing (79%), a concept central to Mayer's Cognitive Theory of Multimedia Learning, scored a bit low. This concept supports the view that integrating verbal and visual inputs can improve memory retention and conceptual understanding. The slightly lower ratings recorded for this multimedia principles although theoretically sound, may be less immediately visible or tangible in classroom practice.

The data indicates that pre-service teachers prefer practical, visible strategies like using digital media and promoting interactivity over abstract theoretical concepts. This points to a disconnect between theory and practice, emphasizing the need for more targeted training to bridge this gap. This finding aligns with Muttairi *et al.* (2025), who highlight the importance of integrating visual, auditory, and textual elements to support language learning. As such, teacher education programs should embed cognitive principles into hands-on activities to help trainees apply them effectively in real classroom settings.

Some lecturers from the Department of Languages acknowledged that when teacher trainees use videos, audio recordings, and visual aids in their micro-teaching sessions, they tend to explain concepts more clearly and creatively. This suggests that such tools not only enhance learner engagement but also encourage deeper reflection on teaching practices. However, there is a need to ensure that the use of multimodal strategies is properly aligned with language learning objectives in teacher training programs. This alignment can guide pre-service teachers in the effective and purposeful application of multimedia approaches. These findings support Rohi and Nurhayati (2024), who argue that multimodal strategies offer varied learning experiences that meet diverse learner needs, thereby enhancing engagement, comprehension, and overall instructional effectiveness.

5.3 Challenges in Adopting Multimodal Approaches

Despite the well-documented benefits of multimodal approaches in teacher education, several challenges were found to hinder their widespread adoption, particularly among pre-service teachers and lecturers. One of the most significant obstacles is the limited technological infrastructure available in many universities and teacher training institutions as reported by the language department lecturers interviewed. Some of the informants claimed that in numerous cases, institutions lack modern digital tools such as multimedia-equipped classrooms, projectors, interactive whiteboards, and reliable audio-visual systems. Furthermore, unreliable or inconsistent internet access often restricts the ability to stream educational content, access cloud-based teaching tools, or engage in virtual collaboration. These infrastructural deficiencies not only impede the integration of multimodal strategies into the learning process but also create disparities between institutions with advanced technological setups and those without. This finding aligns with Phulpoto *et al.* (2024), who emphasize the need to address barriers to promote sustainable education in public universities in Pakistan. However, while their study highlights limited digital literacy among educators as a primary challenge, the present study identifies inadequate infrastructure as a more pressing concern.

Another major challenge lies in the design of the teacher training curriculum itself. In many cases, the curriculum is not fully adapted to support the integration of multimodal instruction. Multimodal strategies are frequently treated as supplementary or optional components rather than being embedded as core pedagogical practices. This limits the opportunities for pre-service teachers to engage in hands-on experiences with multimodal resources such as podcasts, infographics,



collaborative digital platforms, and interactive videos. Without a curriculum that explicitly emphasizes multimodal pedagogical frameworks and offers structured opportunities for practice, innovation in teaching methods remains stifled. This is in line with Tour and Barnes (2022) who suggest that, the adoption of multimodal approaches is crucial in equipping pre-service teachers with the pedagogical competencies required for effective language instruction.

Further, institutional and policy-level barriers further complicate the situation. Responses from the informants interviewed indicates that many institutions lack clear policies or strategic plans that promote the use of multimodal approaches in teacher education. Some of the informants posited that budgetary constraints often prevent the acquisition of new technologies or the implementation of professional development programs aimed at upskilling educators in this area. Moreover, the absence of continuous training opportunities for lecturers means that even those willing to adopt multimodal strategies may struggle due to outdated skills or unfamiliarity with evolving digital trends.

These challenges are consistent with the findings of Phulpoto, Oad, and Imran (2024), who identified digital literacy gaps and infrastructural deficiencies as key barriers to the adoption of technology-enhanced learning. Their research underscores the need for systemic investment in both infrastructure and professional development. Without such investment, efforts to integrate multimodal strategies into teacher education are likely to remain fragmented and ineffective.

6. Conclusions and Recommendations

The study underscores the transformative potential of multimodal strategies in language teacher training. It highlights their ability to enhance engagement, comprehension, and instructional effectiveness by catering to diverse learning styles through visual, auditory, and textual elements. These strategies provide pre-service teachers with versatile tools for dynamic classroom application. However, the full impact of multimodal learning is limited by challenges such as insufficient infrastructure, institutional policy, and outdated curricula. To address these challenges, the study recommends the following:

Implementation of Targeted Digital Literacy Programs

Universities should design and implement structured digital literacy programs tailored specifically for both pre-service teachers and lecturers. These programs should go beyond basic ICT skills to include training on how to effectively use various modes such as text, images, audio, video, and interactive content in pedagogical contexts. By doing so, educators can be better equipped to plan, deliver, and assess lessons that engage learners across multiple sensory channels.

Enhanced Access to Digital Infrastructure

Institutions should prioritize investment in infrastructure that supports multimodal learning environments. This includes equipping classrooms with interactive whiteboards, projectors, audio-visual equipment, and computer labs. Establishing well-resourced multimedia centers and ensuring high-speed internet connectivity across campuses can further enable both students and faculty to access and produce multimodal content seamlessly.

Curriculum Reforms to Embed Multimodal Strategies

Educational policymakers and curriculum developers should revise teacher training programs to systematically integrate multimodal instructional strategies. This entails incorporating modules that focus on multimodal theory, design principles, and practical applications within different subject areas. By embedding these elements into the core of teacher education, institutions can cultivate a new generation of educators who are not only digitally literate but also competent in leveraging multimodality to enhance language learning outcomes.

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The Role of University Governance in Sustaining Academic Quality in Kenyan Universities: A Systematic Review

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ABSTRACT

This systematic review explores the role of university governance in sustaining academic quality within Kenyan universities, an increasingly critical concern amid ongoing higher education reforms. University governance encompasses institutional leadership, policy formulation, regulatory compliance, stakeholder engagement and resource management, all of which are recognized as pivotal to academic excellence and institutional resilience. Kenyan universities face mounting pressure to align with national quality standards while maintaining institutional autonomy and accountability. This review investigates how governance structures influence academic quality, drawing actionable insights from empirical studies and proposing policy directions to strengthen governance in support of long-term educational excellence. Using the PRISMA methodology, the study systematically identified and evaluated peer-reviewed literature published between 2000 to 2025, sourced from academic databases including Scopus, ERIC, Web of Science, and JSTOR. Studies were selected based on their relevance to governance structures and their impact on strategic planning, internal quality assurance, leadership models, and performance monitoring in the Kenyan context. Findings reveal that transparent decision-making, participatory governance, regulatory compliance, and robust internal quality assurance systems consistently enhance faculty performance, student satisfaction, and institutional adaptability. Conversely, challenges such as politicized appointments, financial mismanagement, weak leadership, and inadequate quality assurance units undermine sustainability. Notably, universities with participatory governance frameworks demonstrated stronger faculty performance, student satisfaction, and adaptability to educational reforms. This review concludes that university governance is a strategic instrument for sustaining academic quality in Kenyan universities.

Keywords: University Governance, Academic Quality, Higher Education, Kenya

1. Introduction

The concept of university governance in Kenya is rooted in a blend of historical legacies, national policy directives and evolving global best practices. Historically, public universities in Kenya operated under a highly centralized model, with significant government control over appointments, funding, and policy. However, reforms initiated in the late 20th and early 21st centuries aimed at granting universities greater autonomy while simultaneously enhancing accountability (GOK, 2012). Key legislative frameworks, such as the Universities Act (2012) and subsequent amendments, define the structure of university governance in Kenya, typically comprising a University Council Senate and Management Board. These structures are tasked with strategic planning, financial oversight, human resource management, and ensuring academic integrity. In the evolving landscape of higher education, university governance has emerged as a pivotal determinant of academic excellence. Governance mechanisms influence not only the formulation and implementation of strategic goals but also the degree of inclusivity, transparency, and accountability in university operations (OECD, 2021).

1.1 Research Objectives

- i. To identify Governance Practices that influences the Sustainability of Academic Quality in Kenyan Universities.
- ii. To explore Institutional Governance Challenges which affect Academic Quality in Kenyan Universities.



2. Literature Review

Governance Practices Influencing the Sustainability of Academic Quality in Kenyan Universities
University governance is a cornerstone of academic quality, particularly in the context of Kenya's rapidly expanding higher education sector. Strategic planning has emerged as a key governance practice, with the Commission for University Education (CUE) emphasizing its role in aligning institutional goals with national development priorities. The CUE Strategic Plan 2024–2028 advocates for international benchmarking, stakeholder engagement, and performance-based management to enhance academic standards (Commission for University Education [CUE], 2024).

Institutional autonomy and academic freedom are also critical governance elements. The Universities Bill 2024 reinforces these principles, granting universities the flexibility to innovate while maintaining accountability to regulatory bodies (Ministry of Education, 2024). This autonomy enables institutions to tailor academic programs to societal needs while adhering to national quality benchmarks.

Quality assurance mechanisms are another vital governance practice. University councils are mandated to oversee curriculum development, faculty performance, and accreditation processes. The revised Universities Act (2024) outlines the responsibilities of these councils in maintaining academic integrity and ensuring compliance with standards set by the CUE (Kenya Law, 2024). These governance structures collectively contribute to the sustainability of academic quality by fostering transparency, accountability, and continuous improvement.

Institutional Governance Challenges Affecting Academic Quality in Kenyan Universities
Despite the presence of governance frameworks, Kenyan universities face persistent challenges that undermine academic quality. Leadership and management gaps are among the most pressing issues. Frequent transitions in university leadership and politicized appointments disrupt strategic continuity and weaken institutional stability. Poor coordination between university councils and executive management often leads to misaligned priorities and ineffective decision-making (CUE, 2024).

Funding constraints further exacerbate governance challenges. The differentiated unit cost model introduced to standardize program funding has not been uniformly implemented, resulting in disparities in resource allocation across institutions. This inconsistency affects the quality of academic programs and limits the ability of universities to invest in infrastructure, faculty development, and research (Kenya Law, 2024).

Regulatory overlap and bureaucratic inefficiencies also hinder effective governance. Universities report difficulties in navigating the mandates of multiple oversight bodies, including the Ministry of Education and the CUE. These overlapping responsibilities can delay reforms and stifle institutional innovation (Ministry of Education, 2024). Additionally, weak data and information systems limit evidence-based governance. Although the Universities Bill 2024 proposes a centralized University Management Information System to address this gap, implementation remains incomplete (Ministry of Education, 2024).

These challenges highlight the need for governance reforms that prioritize leadership stability, financial sustainability, regulatory coherence, and data-driven decision-making to safeguard academic quality in Kenyan universities.

Conclusion and Research Gap

The reviewed literature confirms that governance practices are central to the sustainability of academic quality in Kenyan universities. Good corporate governance, stakeholder engagement, and strong quality assurance systems are critical enablers, while politicization, underfunding, and weak internal controls are significant challenges. While there is a wealth of research on the general relationship



between governance and performance, a more recent and comprehensive **systematic review** that synthesizes the most up-to-date findings is still needed. This study will contribute by providing an updated, synthesized perspective on the specific practices and challenges unique to the Kenyan university system.

3. Research Methodology

This review employed PRISMA guidelines (Page et al., 2021). Searches were conducted in Scopus, Web of Science, ERIC, and JSTOR for studies published between 2000 and 2025, using keywords such as “university governance,” “academic quality,” “Kenya,” and “higher education governance.” Inclusion criteria required studies to be peer-reviewed, written in English, and specifically address the link between governance and academic quality within the Kenyan context. The review included studies that examined various governance dimensions, such as strategic planning, leadership, and institutional autonomy. Excluded were non-scholarly publications, studies outside the specified timeframe or geographical context, and those not directly linking governance to academic quality. A narrative synthesis was employed to group and analyse findings, identifying key themes.

4. Results and Discussions

4.1 Overview of Included Studies

From an initial pool of 207 articles retrieved from academic databases and institutional repositories, 36 studies were excluded due to failure to meet inclusion criteria. A total of 171 empirical and conceptual studies were included in the final analysis.

Characteristics of Included Studies

Characteristics of Included Studies(N=171)			
Characteristics	Category	Frequency	%
Articles by Year	2000-2009	17	10
	2010 – 2014	24	14
	2015-2020	60	35
	2021 -2025	70	41
Publication Outlets	African Journal of Higher Education Studies	64	37
	International Journal of Educational Policy Research and Review	56	33
	Kenya Education Review	24	14
	government policy reports	17	10
	institutional self-assessment reviews	10	6
Thematic Categorization	Leadership and Strategic Governance	50	29
	Regulatory Frameworks and Policy Compliance	43	25
	Participatory and Shared Governance	39	23
	Quality Assurance and Accountability Mechanisms	39	23

Key: N = Number of Studies

4.2 Distribution of Articles by Year

The distribution of articles spanned the study period from 2000 to 2025, with the majority (41%) published between 2021 to 2025, suggesting increased scholarly interest in university governance as a determinant of institutional performance. A steady increase was observed in publication volume, particularly after 2010, coinciding with key higher education policy reforms in Kenya. Peak publication



years were 2014, 2018, and 2023, reflecting heightened scholarly attention toward university governance amidst evolving institutional accountability frameworks.

4.3 Distribution by Publication Outlet

From a total of 171 articles, 120 (70%) were in journals, 24 (14%) in Kenya Education Review, while government policy reports and institutional self-assessments had 27 (16%)

4.4 Distribution by Thematic Category

The reviewed studies were clustered into four thematic categories which included: Leadership and Strategic Governance (29%), Regulatory Frameworks and Policy Compliance (25%), Participatory and Shared Governance (23%) and Quality Assurance and Accountability Mechanisms (23%)

4.5 Governance Practices Enhancing Academic Quality

Leadership and Strategic Direction

Visionary and strategically aligned leadership plays a pivotal role in sustaining academic quality. Effective governance is characterized by clear institutional missions, measurable academic indicators, and proactive planning. Studies by Kariuki et al. (2021), Wawire and Ouma (2020), and Mutula and Omino (2018) emphasize the importance of university councils and senates in setting strategic direction, investing in academic infrastructure, and promoting a culture of research and innovation.

Financial Management and Resource Allocation

Sound financial governance is essential for maintaining academic quality. Transparent budgeting, responsible allocation of resources, and diversification of funding sources—beyond tuition fees are critical. Mismanagement and corruption, often linked to weak governance structures, can erode educational standards and institutional credibility

Human Resource Management and Staff Development

Governance of human resources directly affects teaching quality and research output. The rapid expansion of student enrolment has not been matched by proportional growth in academic staff, resulting in high student-to-lecturer ratios and diminished instructional quality. Merit-based recruitment, fair promotion practices, and investment in faculty development are essential. Poor working conditions and limited professional growth opportunities contribute to brain drain and staff demotivation (Kariuki et al., 2022).

Participatory and Transparent Governance Structures

Universities with well-defined board mandates, competitive selection processes, and transparent decision-making frameworks demonstrate stronger management effectiveness and academic performance (Kariuki et al., 2024). Governance that includes external stakeholders—such as industry partners, alumni, and community representatives—enhances institutional responsiveness and accountability (Kanjari, 2023).

Internal Quality Assurance (IQA) Systems

Many Kenyan universities have established dedicated quality assurance directorates responsible for monitoring academic programs and institutional processes. These units develop policies, conduct evaluations, and ensure compliance with national standards, contributing to a sustained culture of academic excellence.

Data-Driven Governance

The use of analytics and data systems for planning, evaluation, and performance monitoring supports evidence-based decision-making. Institutions that leverage data effectively are better positioned to implement reforms and track academic outcomes.



Regulatory Compliance and Oversight

The Commission for University Education (CUE) has set minimum standards for academic programs, faculty qualifications and infrastructure. Universities that comply with these regulations demonstrate higher graduate employability and international recognition. However, some institutions bypass these standards, especially in postgraduate programs, leading to compromised supervision and irregular degrees ((CUE, 2023).

Institutional Autonomy

Autonomy in academic, financial, and administrative decisions enables universities to innovate and respond to emerging needs. Universities with higher autonomy, such as Strathmore and Aga Khan University, demonstrate better curriculum relevance and research output (Muga, 2024). Conversely, government interference in public universities has curtailed leadership flexibility, leading to misaligned priorities and bureaucratic delays (The Conversation, 2023).

Performance-Based Management

The adoption of Key Performance Indicators (KPIs) tied to teaching quality, research output, and student satisfaction has enhanced institutional accountability. Performance contracts for senior administrators have led to more focused leadership and efficient resource utilization (Kagondou & Marwa, 2017).

Summary Table: Governance Practices & Their Impact on Academic Quality

Governance Domain	Practice & Mechanism	Influence on Academic Quality
Regulatory Oversight (CUE)	Licensing, accreditation, audits, IQA mandates, peer-review mechanisms	Enforces baseline standards, ensures compliance, maintains accountability
Internal Governance	Council leadership, merit-based appointments, strategically aligned leadership	Drives institutional integrity, strategic direction, and reduces politicisation
Financial Governance	Transparent budgeting, funding diversification, corruption oversight	Supports infrastructure, staffing, and research; reduces resource misuse
Internal Quality Assurance (IQA)	Institutional policies, structures, reporting requirements	Fosters a sustained culture of quality and continuous improvement
Stakeholder Engagement	Inclusive governance, industry alignment, student feedback mechanisms	Enhances relevance, buy-in, and dynamic responsiveness
Strategic Planning & Data Management	Planning, KPIs, evaluations, data systems	Promotes evidence-based decision-making and institutional learning
Research & Collaboration Networks	Alliances	Enhances research capacity and quality through pooling resources and training

Governance Challenges Undermining Quality

Kenyan universities face several institutional governance challenges that directly impact academic quality. These challenges often stem from a lack of autonomy, financial mismanagement, and ineffective human resource practices.

Governance Instability and External Interference

Persistent external interference undermines merit-based appointments and compromises objective decision-making, thereby eroding academic integrity (Musyoka, 2021). Such interference curtails

leadership flexibility, resulting in misaligned institutional priorities, bureaucratic delays, and strategic discontinuity. The cumulative effect is uneven institutional growth and diminished responsiveness to academic needs (MoE, 2024).

Weak Leadership and Strategic Planning

Strategic leadership is essential for institutional coherence and academic excellence. However, some university leaders lack the requisite management skills to navigate complex socio-economic environments. The absence of robust strategic plans has led to fragmented academic programs and poor graduate outcomes (Kiboiy & Wosyanju, 2022).

Financial Mismanagement and Inadequate Funding

Financial instability remains a critical governance challenge. Insufficient public funding, coupled with opaque resource allocation, has led to underinvestment in academic infrastructure and research (Wanjiru, 2019). The increasing reliance on student fees as a primary revenue source has incentivized enrolments expansion at the expense of academic standards (GOK, 2016). Poor financial governance affects staffing levels, research support, and learning facilities, directly undermining the quality of education

Ineffective Human Resource Management

Human resource governance influences academic outcomes. Key challenges include:

A disproportionate increase in student enrolment without corresponding growth in academic staff (Oketch, 2011).

Poor working conditions, limited professional development opportunities, and inadequate remuneration (Oanda, 2011)

Non-merit-based promotions and appointments, which demotivate high-performing staff

Prolonged academic staff strikes in 2024, which disrupted semester calendars and compromised teaching and research supervision

These issues contribute to low staff morale, reduced instructional quality, and weakened institutional capacity.

Lack of Stakeholder Participation and Accountability

Effective governance requires inclusive stakeholder engagement. However, in many institutions, student and staff representation in governance structures is nominal, limiting their influence on decisions that affect academic quality (Sifuna, 2012). The absence of robust accountability mechanisms fosters a culture of impunity, weakening institutional transparency and trust.

Weak Internal Quality Assurance Units

Despite policy mandates, many universities lack functional Internal Quality Assurance (IQA) departments. Where IQA units exist, they are often under-resourced and lack the autonomy to enforce standards. This results in superficial audits and unchecked academic malpractices. Inadequate reporting structures and the absence of whistleblower protections further diminish transparency (Nyandoro & Oluoch, 2025). Financially constrained institutions struggle to implement consistent QA practices, with some studies noting symbolic compliance with external audits rather than genuine improvement efforts (Maina & Kinyanjui, 2021).

Privatization Pressures

The expansion of higher education through privatization has introduced commercialization pressures which compromise academic rigor. The prioritization of profit over quality has led to concerns about the dilution of academic standards (Onyango & Waweru, 2015).



Conflict of Interest and Nepotism

Instances of conflict of interest and nepotism in hiring, promotions, and student admissions undermine meritocracy and institutional integrity. These practices demotivate faculty, erode public trust, and compromise academic standards (Oketch, 2022).

Balancing Autonomy and Accountability

The tension between institutional autonomy and regulatory accountability remains a persistent governance dilemma. While autonomy is critical for academic freedom and innovation, it must be balanced with effective oversight to prevent mismanagement and ensure public confidence (Kariuki & Koskei, 2022; Awuor & Meche, 2020).

5. Conclusion and Recommendations

5.1 Conclusion

University governance in Kenya is a decisive factor in sustaining academic quality. Institutions that embrace inclusive governance, strategic planning, and performance-based management consistently outperform those with opaque or politicized structures. However, systemic challenges particularly politicization, financial mismanagement, and weak internal controls continue to erode academic integrity and institutional credibility. The review underscores the need for a governance paradigm that balances autonomy with accountability, promotes meritocracy, and institutionalizes stakeholder engagement. Without these reforms, the sustainability of academic quality in Kenyan universities remains precarious.

5.2 Recommendations

Based on the synthesis of the reviewed literature, the following recommendations are put forth to strengthen university governance and thereby enhance academic quality in Kenyan

University Administrators

Strengthen independent quality assurance units, institutionalize transparent and merit-based appointments and promotions, participatory decision-making, strengthen financial governance and diversify income streams.

Policymakers (Government and CUE)

Enforce compliance with CUE regulations.

Targeted funding to support under-resourced universities.

Develop policies that safeguard institutional autonomy while ensuring effective oversight.

Whistleblower protection mechanisms to report corruption and governance malpractice.

Stakeholders (Industry, Alumni, Civil Society)

Collaborate with universities to co-develop industry-relevant curricula and research, hold leadership accountable, and partnership and financial support.

Future Research

Comparative case studies between well-governed and poorly governed universities

Longitudinal analysis of governance reforms and their impact on academic outcomes.

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Rethinking the Code of Conduct and Ethics for Pre-service Teachers in Competency-based Education: A policy Framework for Kenya

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ABSTRACT

This study aims to offer a useful policy of code of ethics (CoE) and code of conduct (CoC) for pre-service teachers (PSTs) of Kenyan universities in line with competency-based education values. The specific objective are to identifying challenges faced by pre-service teachers, to find out existing codes of conduct and ethics at Kenyan universities, examine the values of competency based education (CBE) to be embodied by PSTs and propose guidelines for policy framework for ethics in teaching practice in line with CBE values. The absence of ethical codes and conduct, along with a lack of awareness among pre-service teachers, presents potential risks to loss of trust and damage of reputation to the teaching profession. This literature-based study, grounded in applied ethics, used qualitative analytical methodology which entailed application of content analysis to examine relevant books, research studies, and scholarly articles on CoE and CoC. The study revealed that Kenyan universities lack codes specifically related to teaching practices and instead utilized codes intended for the broader university environment. Moreover, when codes for teaching practices are present, they frequently lack official status within the university, are not publicly accessible, and contain variations among different universities. As a result, the ethical challenges faced by pre-service teachers during their teaching practice remain unaddressed by these codes. This situation necessitates the creation of guidelines for a policy framework that outlines the essential components of these codes and methods to enhance awareness. It is recommended that universities incorporate distinct CoE and CoC into the teaching practice handbook to boost pre-service teachers' understanding of the values and morals anticipated from them and to direct their behavior during teaching practice as exemplified in the CBE values.

Keywords: teaching practice; code of conduct and ethics; competency based education; pre-service teachers; policy framework.

1. Introduction

Teaching is profession that entails risks and responsibilities that demands a great deal of ethical conduct from those who enter it (Teachers of tomorrow, 2025). In the same vein, Kenya's competency-based education expect pre-service teachers to acquire desired knowledge, skills, attitudes and values to enable them cope with life challenges. Some of the ethical values pre-service teachers are anticipated to embody and instil include, integrity, social justice, patriotism, unity, peace, love, respect, and responsibility (Okeyo & Kanake, 2021). These statements underscore the importance of preparing pre-service teachers for the ethical challenges they will likely face in teaching environment. The issue of unethical behaviour linked to teaching is accentuated by other researchers who affirm that, in some instances, pre-service teachers are guilty of unethical behaviour such as social media misconduct, unprofessional conduct, exploitation of students, neglecting responsibilities, discrimination and bias, and lack of professionalism (Wang, Wang, Li, Zhao, Liu & Ye, 2021). These actions can negatively impact learners, the profession and the wider society.

As pre-service teachers temporarily join the teaching profession during their teaching practice (TP), due consideration needs to be given to preparing them for and guiding them through ethical challenges that occur during TP. In research studies conducted in Lesotho, Australia and the Sweden (Tlali,



2021; Bjelobaba & Cronqvist, 2022; Boon, 2023) it was found that initial teacher education, including Bachelor of Education (B.Ed.) degrees at universities do not place enough emphasis on ethics. Even though ethics can be integrated throughout the teacher education curriculum, the teaching of ethics seems to be a rare occurrence (Tlali, 2021). In this study the non-emphasis of teaching ethics in universities is exacerbated by the absence of established code of ethics and code of conduct for teaching practices at the traditional Kenyan universities which may raise significant issues regarding the effective ethical preparation of pre-service teachers (PSTs) for TP. Further, pre-service teachers may also not acquire desired competency-based education (CBE) values to enable them cope with the ethical challenges during TP.

Against this backdrop, this study interrogates the extent literature coupled with authors' experiences and insights explicates the significance of the policy framework for ethics for the university pre-service teachers in promoting values and professional ethics enshrined in Kenyan competency based education. Given this, the study intends to provide answers to the following research questions:

1. Which ethical challenges do university pre-service teachers encounter during teaching practice (TP)?
2. What are the existing code of ethics and code of conduct for the university pre-service teachers during teaching practice?
3. What are the ethical values of competency based education (CBE) that are anticipated to be embodied by Kenyan pre-service teachers?
4. What guidelines are necessary for the development of a Kenyan policy framework for ethics in teaching practice in line with CBE values?

In this paper applied ethics is discussed as the underlying theoretical framework of the study. This is followed by a review of literature focusing on CoC and CoEs related to pre-service teachers during TP. The research process included a comprehensive review of relevant literature, as well as the use of analytical methodology for analyzing existing scholarly literature, policy frameworks, and reform reports related to code of conduct and code of ethics CoC and CoEs for pre-service teachers.

The conclusions and recommendations are presented by considering the main aspects identified in the guidelines for the development of a policy framework for ethics in TP.

1.1 Theoretical Framework

This study is anchored in applied ethics as the underlying theory of the study. Applied ethics also referred to as practical ethics, is the application of ethics to real world issues and situations (The University of Texas, 2025). In the context of this study, applied ethics in teacher education focuses on preparing educators to navigate complex moral landscape of the profession (Kriel, Livingston & Kwenda, 2023). It is the opinion of the researcher that the strength of applied ethics in education entails providing educators with a framework for addressing controversial moral challenges in education. As observed by Dsouza (2017) applied ethics in the field of education refers to the interaction between ethical theories and ethical practice within the profession by setting the principles such as code of ethics and conduct that teachers are expected to consider and reflect on when making and justifying ethical decisions involving their experiences in a school.

It can therefore be inferred that applied ethics not only emphasize learning about rules and principles of code of conduct and ethics but also cultivates a deep-seated commitment to ethical conduct as well as fostering a culture of ethical awareness within the educational community. Applied ethics is hence concerned with the application of moral procedures and could be used to assist preservice teachers regarding moral behaviour they are expected to exhibit during teaching practice (Kriel et al, 2023). In that regard the theory could be applied by pre-service teachers to address moral issues and challenges related to conflicts and professional challenges in schools. The theory could therefore lay the foundation for advancing a culture of inculcating CBE values of integrity, social justice, patriotism,



unity, peace, love, respect, and responsibility among PSTs. The aim with this study was to establish a policy framework that will motivate universities to create a CoE and CoC for TP in line with CBE values. The CoE or CoC should guide ethical decision-making and course of action of pre-service teachers. This is consistent with the theory of applied ethics, which espouses the view that a CoE and CoC unique to TP could assist in dealing with ethical challenges that pre-service teachers encounter during TP.

2. Literature Review

Ethical challenges in teaching practice

Ethical challenges during teaching practice could be complex, stemming from conflicting expectations or conflicts between ideals and reality (Lindqvist, Thornberg & Colnerud, 2020). Pre-service teachers face an array of ethical challenges and many studies have highlighted them. They may include: navigating idealistic views of teaching with the realities of the classroom, conflicts with experienced teachers and administrators, addressing bullying and harassment among learners, maintaining student confidentiality while adhering to school rules and regulations, determining appropriate disciplinary measures for student misbehaviour, balancing personal values with profession expectations, tension between providing supportive environment for learners and maintaining appropriate professional boundaries (Copyleaks, 2025).

Similarly, Teachers Institute (2023) highlighted the challenges as lack of competence of PSTs; unfair treatment of learners; bullying between PSTs and mentor teachers; inadequate lesson preparation by PSTs; unfair assessment of learners; an obligation to teach sensitive curriculum content; and adherence to contrasting values held by PSTs and schools. Other ethical challenges that are mentioned in Wang, Liu, Liu (2022), include inappropriate relationships between PSTs and learners or between PSTs and teachers in schools; sexual harassment of PSTs by other teachers, or of learners or mentor teachers; cultural intolerance of PSTs; and PSTs' personal conduct in public spaces. These are just some of the ethical challenges that have been identified in the study.

In Kenya, few studies have highlighted professional malpractices in schools with a dearth of studies that have delved into ethical challenges related pre-service teachers (Oduol & Cornforth, 2019). In that regard, this study aims to develop a Kenyan policy for ethics in the context competency based education values to address ethical challenges among pre-service teachers.

Code of ethics and code of conduct for teaching practice

According to Clark (2025) a code of ethics outlines the moral principles and values that guide an organization's or individual's behaviour, while a code of conduct specifies the expected actions and behaviours of individuals within an organization. It can therefore be inferred from Clark (2025) that a code of ethics provides a broad framework for ethical decision making, while a code of conduct offers specific guidelines for acceptable behaviour.

Some international universities for example Western Sydney University have code of ethics (CoE) for their students and pre-service teachers that are specific to TP. These CoE for PSTs highlight the core values expected of the teachers or PSTs, which are typically centred around integrity, respect, responsibility, professional, ethical and legal protocols. (Western Sydney University, 2025). Code of conduct (CoC) appear to include professional conduct, referring to relationships with learners, parents or caregivers, and colleagues; personal conduct; and professional competence, referring to the subject, pedagogical and didactical knowledge, assessment, and reflection practices (International University of Monaco, 2025). It is further explicated in Western Sydney University (2025) that pre-service teachers are required to sign the national CoC binding them to the same rules as regular teachers. Further, these Code of ethics and Code of conduct intend to prevent unethical behaviour, while also providing guidance when ethical challenges are encountered. The codes also typically stipulate the protocol for reporting ethical challenges during TP.



In some international universities, PSTs and other stakeholders in TP, such as the mentor teachers and principals who are expected to abide by CoE and, CoC are made aware of them (Curtin University, 2025; Western Sydney University (2025). These universities aim to ensure that their PSTs are aware of these codes by setting prerequisites for TP, such as requiring PSTs to complete ethics training and sign the CoE and/or CoC. In South Africa many universities provide TP handbook and include guidelines for TP in their course content, however, PSTs do not necessarily take note of these guidelines (BRIDGE, 2019).

Universities in Kenya provide handbook for teaching practice which outlines the expectations, responsibilities and ethical guidelines for student teachers during their teaching practice, ensuring they are well prepared and uphold professional standards (Pwani university, 2023; Murang'a University of technology, 2025). The researcher observes that even though these codes for teaching practices are present, they frequently lack official status within the university. In some cases, they are not publicly accessible to TP stakeholders, and contain variations among different universities.

In same vein, Kenya Law (2022) asserts that teachers including pre-service teachers are expected to adhere to specific CoE and CoC outlined by the Teachers Service Commission (TSC). This code emphasizes professionalism, integrity and ethical behaviour in all aspects of their duties, both within and outside the classroom. However, Kenyan university pre-service teachers are not required to sign the TSC Code of ethics and Code of conduct binding them to the same rules as TSC registered teachers. Many pre-service teachers are therefore unaware of the expectations stipulated code of conduct and code of ethics. This scenario justifies this study since the subject of Kenyan policy of ethics for pre-service students during TP is largely unexplored by scholars, especially in the university teacher education.

Ethical values of competency based education (CBE)

While highlighting the case studies of some America schools, Juraschka (2021) accentuates that one of the key components of competency based education is emphasis of school cultural values. Consequently, the school cultural values include inclusiveness, equity, empowerment, and flexibility. Cardinal Education Network (2025) observes that competency based education in the Kenyan context promotes several ethical values, including love, responsibility, respect, unity, peace, patriotism, social justice, and integrity. Ongowo (2022) expounds on these values whereby; love fosters a caring and supportive learning environment; responsibility encourages accountability and ownership of learning; respect promotes mutual respect among students and between students and teachers; unity emphasizes collaboration and a sense of community; peace creates a harmonious and conflict-free learning environment; patriotism fosters a sense of national pride and civic responsibility; integrity promotes honesty, ethical behaviour and trustworthiness; social justice promotes an inclusive and equitable learning environment where every student has the opportunity to succeed, regardless of their socio-economic background. These values are intended to be integrated into learning process, shaping student's character and preparing them to be responsible, and ethical citizens.

The researcher discovers a deficit of literature on values in the milieu of competency based education in Kenya and globally. This implies that the idea of ethical values integrated in the policy ethics for pre-service teachers on TP seems to be isolated, peculiar, and likely not fully adopted by universities training teachers in Kenya.

Development of policy framework for ethics in teaching practice

According to Ngware (2024) ethics policy framework for teaching practice outlines the principles, guideline, and procedures for teaching practice, fostering trust and professionalism within teacher training institutions and schools. This framework could help in fostering a culture of ethical conduct, promote pre-services teachers well-being, and enhance the overall quality of education (Cronqvist, 2024). It is further explicated in Ngware (2024) that the development of the policy is a process which



entails; identifying the stakeholders involved in ethics policy development for teaching practice, preparation of pre-service teachers for ethics in teaching practice, defining ethical principles, developing common code of conduct and ethics, establishing reporting mechanisms, and providing on-going professional development related to ethics.

According to Kriel (2023), the primary stakeholders should include universities (staff and students), schools (principals, mentor teachers and other teaching staff) and national stakeholders (such as teachers' employer, department of basic education, and devolved education units). It is confirmed in Hadijah (2024) that each identified stakeholder could contribute to the policies that form part of the policy framework for ethics in teaching practice. Although all stakeholders should be involved in the development of ethics policies for TP, the universities should be centrally situated in the development of these policies as they are responsible for the training and behavioural regulation of their preservice teachers (Kriel, 2023).

Some of the practices employed by certain universities to prepare PSTs for ethics in TP include; an orientation of TP documents before the onset of TP and the integration of the study of ethics into the curriculum (Kriel et al 2023; Moswela & Gobagoba, 2014). Studies by Boon (2023) in Australia, and Moswela and Gobagoba (2014) in Botswana, however, revealed that lecturers, school TP coordinators and especially PSTs confirmed a need for ethics to be presented as a standalone subject in teacher education. They argue that PSTs are underprepared for ethics in TP and that a standalone subject can enhance teacher discipline and respect in the profession. Furthermore, in interviews with education lecturers in a study of five South African universities, participants explained that ethics can be included in the daily activities on campus (e.g. on timely submission of assignments and integrity in assessments) to foster a culture of ethical behaviour, preparing them for future teaching (Rusznayak, 2018). As for requiring of PSTs to sign a CoC for TP, which includes disciplinary procedures, is common at universities internationally (Walters, Heilbronn & Daly, 2018). However, the absence of codes specific for TP at certain Kenyan universities is of great concern (Somba & Zigama, 2025). The insight of Somba and Zigama (2025) reveals lack of a common policy for ethics for TP which could undervalue the successful implementation of CBE values in Kenyan universities.

Chatfield & Singh (2025) identifies key ethical principles as; clear set of core values, professionalism including appropriate interactions with students, colleagues and parents, prioritizing students' welfare that ensures safe and supportive learning environment. In Kriel et al (2023), the ethical standards for teaching profession are identified as; care which includes compassion, acceptance, interest and students' potential development; trust which embodies fairness, openness and honesty; respect for spiritual and cultural values, social justice, confidentiality, freedom, democracy and environment; integrity which embodies honesty, reliability and moral action.

The next aspect of the ethics policy framework is developing a code of conduct. According to Kriel et al (2023) the code of conduct development should entail three aspects; first, having specific guideline pertaining to teacher behaviour, classroom management, professional relationships, assessment practices and use of social media; secondly, providing specific examples both the ethical and unethical conduct to illustrate the application of the code; and lastly, ensuring accessibility of the code of conduct to all teachers, including pre-service teachers, and that it is regularly reviewed and updated.

The next phase of ethics policy framework is establishing reporting mechanisms. The three components of reporting system are about; developing clear procedures for reporting ethical concerns or violations. This should include designated reporting channels and a process for investigating complaints; emphasis of the importance of confidentiality and ensuring that all reports are handled sensitively and appropriately; and provision of protection to individuals who report ethical concerns in good faith (Lee, 2025).



The last phase is provision of ongoing professional development. According to Cronqvist (2024) professional development has three components; provision of regular training sessions on ethics and professional conduct for all teachers; using case studies and scenarios to facilitate discussions about ethical dilemmas and decision making; and encouraging teachers to engage in reflective practice to examine their own ethical conduct and identify areas for improvement.

Three other key factors which should also be considered for the development of the policy as underscored in Osesi, Moeng and Blignaut (2025) are; adapting the framework to the specific context of the educational setting, considering the unique challenges and opportunities of the local environment; ensuring the framework is inclusive and sensitive to the diverse needs of students, teachers, and the wider community; and collaboration with the teachers, administrators and other stake holders in the development and implementation of the framework.

The aforementioned studies have explicated the general policy framework for ethics in teaching practice across the globe, whereas this study specifically investigates the development of ethics policy for teacher trainees in line with CBE values at Kenyan universities as a knowledge gap to fill up.

3. Methodology

This study adopts a qualitative analytical methodology for analyzing and synthesising existing scholarly literature, policy frameworks, and reform reports related to code of conduct and code of ethics for pre-service teachers. Qualitative analytical methodology involves the systematic examination and interpretation of non-numerical data, like texts and observations, to identify patterns, themes, and meanings (Content square, 2024). Within the paradigm of qualitative analytical research methodology, the content analysis is utilized to enabled a systematic and thorough evaluation, interpretation, and analysis of qualitative secondary data sources (Okanda, 2024). Content analysis is performed on key documents, policy papers, and educational reports concerning code of conduct and code of ethics for student teachers during teaching practice.

4. Conclusions and Recommendations

4.1 Conclusion

This study was steered by the question of what guidelines needed to be considered for the development of a policy framework for ethics in TP. First, it is concluded from the literature review that the ethical challenges of preservice teachers could be classified as; those affecting relationship with a teacher and administration. For example, conflicts with experienced teachers and administrators, inadequate preparation for lessons and professional misconduct. next is to do with relationship with learners. For instance, sexual harassment cases, unfair treatment of learners, and bullying among learners. Last category is relationship with a parent/ caregiver or the community. This could be cases of complaints by parents about disciplinary measures for students' misbehaviour, intolerance of PSTs to the culture of the community and lastly, personal conduct such as inappropriate dress code and lateness.

Secondly, certain universities have Teaching practice (TP) handbook containing Code of Conduct and ethics for their pre-service teachers. TP handbook is supplied by universities before the onset of TP to ensure that the pre-service teachers are fully aware of the expectations of TP. It is further suggested from the literature that the TP handbook should contain academic, curricular, extracurricular and ethical expectations of pre-service teachers during TP. Other matters that could be included in the code of conduct are related to sexual harassment, religion, physical assault, corporal punishment, verbal assault, duty of care, teaching and learning, power relationships, reporting of ethical challenges, as well as bribes and gifts. Within the TP handbook there should be signing a memorandum of understanding (MoU) that could facilitate the formalisation of partnerships between stakeholders in TP such as the mentor teachers and school administration. The MoU should raise awareness with all parties of the



various code of conduct and ethics policy that they were expected to abide by. This could enhance ethical behaviour and relationships during TP. Transparency in expectations between pre-service teachers and mentor teachers can be achieved by making all code of conduct and ethics policies available on an online portal. The mentor teachers guide could include guidelines on supervision, mentoring, evaluation of PSTs, a CoC and CoE for mentor teachers, and an (MoU) for all.

Third, Kenyan competency based education promote core ethical values which include; love, responsibility, respect, unity, peace, patriotism, social justice, and integrity. These values are intended to be integrated into learning process, aiming to equip pre-service teachers with values and dispositions needed to foster responsible, and ethical citizens. However, the integration of these values into the policy of code of conduct and ethics for university pre-service teachers on TP has not been fully realised in Kenya.

Lastly, the process and components of the development of code of conduct and ethics policy for pre-service teachers at university level entails; identifying the stakeholders involved in ethics policy development for teaching practice, preparation of pre-service teachers for ethics in teaching practice, defining ethical principles, developing common code of conduct and ethics, establishing reporting mechanisms, and providing on-going professional development related to ethics.

4.2 Recommendations

It is recommended that Kenyan universities should consider establishing a code of ethics for TP to guide PSTs regarding the values and morals expected of them during TP in line with CBE values. This would guide PSTs make sound decisions when faced with ethical challenges.

A code of conduct and code of ethics are recommended to provide specific guidelines to PSTs on how they are expected to behave during TP. A TP handbook could also be included in the framework to ensure that all PSTs are aware of what is expected of them during the TP period – not only regarding ethical decision-making and behaviour, but also regarding academic, curricular and extra-curricular expectations.

It is also recommended that a mentor teacher guide could be provided to all mentor teachers to inform them of what is expected of them during the TP period in terms of supervision, mentoring, evaluation of PSTs and their own conduct. This mentor teacher guide could include a code of conduct specific for mentor teachers. Finally, it is recommended to include a memorandum of understanding between the university, TP stakeholders and the school, as well as an MoU between the principal, mentor teacher and pre-service teacher in the framework for ethics for TP. The aim of an MoU should be to formalise the partnerships between TP stakeholders and direct the ethical behaviour of all stakeholders during TP.

This research also revealed the importance of including ethics training for student teachers and mentor teachers in the framework for ethics in TP, to encourage ethical behaviour during TP. The training for all parties should involve the orientation of ethics policies, such as the CoE and CoC for TP, to ensure that all parties know what is expected of them regarding ethical behaviour during TP. Additional training on should also be considered to heighten the general ethical awareness of PSTs as well as develop mentor teachers' ethical supervision and mentoring skills.



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Influence of Leaders' Collaboration and Empowerment on Resilience to Violent Extremism among Boys' Secondary Schools in the North Eastern Counties of Kenya

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ABSTRACT

The purpose of the study was to assess the influence of leaders' collaboration and empowerment on resilience to violent extremism among boys' secondary schools in the north eastern counties of Kenya. The study utilized a cross-sectional approach that collated both qualitative and quantitative data to meet the purposes of the study. The large study sample included 5,870 male secondary school learners, 18 Directors of Education, 18 Deputy County Commissioners (DCCs), and 108 school administrators spread across Garissa, Wajir, and Mandera counties. To obtain 375 study subjects, stratification and simple random methods were used on the entire population. A pre-test study was conducted in Lamu County. SPSS version 26.0 was used for purposes of analysis. The quantitative data was examined through statistical description methods incorporating frequencies, percentages, and table representation. Moreover, correlation examined cross-relationships between study variables. On the other hand, qualitative data was examined through thematic analysis, thus ensuring its alignment with research objectives. The study reveals strong student-school leader collaboration on safety and peace, fostering trust, open dialogue, and student empowerment. While schools promote resilience against extremism, gaps remain in mentorship, unity-focused activities, and community partnerships. Interview respondents recommend institutionalizing student engagement and multi-stakeholder collaboration for stronger preventive frameworks. The findings affirm that leaders who practice collaboration and empowerment foster a collective sense of ownership in the fight against violent extremism. Empowered staff members and students are more alert, proactive, and engaged in maintaining the safety and unity of the school environment. By involving staff in decision-making and sharing responsibility, school leaders build a culture of shared leadership and vigilance. School leadership should prioritize collaboration and empowerment by creating opportunities for teachers and students to take part in decision-making processes. Training and development programs that emphasize collaborative skills, teamwork, and shared responsibility should be implemented.

Keywords: Leaders' Collaboration and Empowerment, Resilience to Violent Extremism, Boys' Secondary Schools, North Eastern Counties, Kenya.

1. Introduction

Inclusive leadership plays a crucial role in mitigating the influence of violent extremism in schools. Americas. In Brazil, inclusive leadership has gained attention in both educational institutions and corporations, where leaders focus on developing policies that embrace diversity in the workplace and schools, leading to a reduction in discriminatory practices (Silva & Costa, 2021). The emphasis on inclusion not only improves the overall environment but also builds resilience among minority groups. Similarly, in Canada, inclusive leadership has contributed to the strengthening of peer support networks, offering marginalized students alternatives to extremist ideologies (Eldor et al., 2022). These examples demonstrate that inclusive leadership in the Americas is pivotal for fostering inclusive communities that promote social cohesion and counteract exclusionary practices. In France, schools have adopted inclusive leadership models that encourage civic education and the integration



of democratic values through teacher-led initiatives, fostering greater student engagement and resilience against extremist ideologies (Dubois & Martin, 2020).

In Egypt, Hassan and El-Badry (2020) demonstrated that promoting religious tolerance and strong institutional support played a key role in countering extremist ideologies. These efforts indicate that inclusive leadership is a fundamental strategy for social cohesion and resilience in Africa, helping to counter radicalization and promote sustainable peace. In Tanzania, Moshi and Juma (2021) emphasized the importance of peace education and inclusive school leadership in preventing radicalization. In Somalia, community-based educational programs led by inclusive school administrators have been successful in promoting social cohesion and critical thinking, which countered the appeal of extremist groups (Hassan & Mohamed, 2020). These examples show that in East Africa, inclusive leadership not only promotes diversity but also offers an essential framework for combating the spread of violent extremism in vulnerable communities.

In Kenya, inclusive leadership has played a significant role in reducing vulnerability to violent extremism, particularly in schools and community institutions. Ngugi and Wekesa (2021) found that inclusive leadership, characterized by participatory decision-making and equitable treatment, helped lower the incidence of extremist ideologies in schools. Similarly, Mutunga and Otieno (2022) demonstrated that perceived organizational support, such as mentorship programs, significantly enhanced students' sense of belonging, thereby reducing radicalization tendencies. Kenya's educational and community-based leadership practices focus on creating environments of trust, equity, and inclusivity, which act as buffers against the influences of extremist groups. These practices have been vital in creating a cohesive society, where individuals from different backgrounds feel valued and supported. In the northeastern region of Kenya, community-led initiatives focusing on mentorship and psychosocial support have been shown to strengthen resilience against radicalization, offering alternative narratives to youth susceptible to extremist ideologies. These leadership practices are key to enhancing social cohesion and preventing the spread of violent extremism in the region, where local dynamics are particularly susceptible to destabilization.

1.1 Problem Statement

Although models of effective school leadership in other parts of Kenya demonstrate that collaborative and empowering practices lead to improved student engagement, resilience, and academic performance (Mukonyi, 2020), many schools in the north-eastern counties fall short. Reports highlight the lack of participatory leadership, weak school-community relations, and underdeveloped mechanisms for empowering students and staff (Koech, 2021). These gaps contribute to increased school dropout rates, learning disruptions, and the gradual erosion of safe learning environments. Violent extremism continues to infiltrate schools, undermining not only education but also community stability and national security.

This study seeks to address this critical gap by examining the influence of leaders' collaboration and empowerment on the resilience of students to violent extremism in boys' secondary schools in North Eastern Kenya. Understanding how leadership practices contribute to or mitigate susceptibility to radicalization is essential for informing future interventions and strengthening school-based prevention strategies in high-risk regions.

1.2 Purpose of the Study

To assess the influence of leaders' collaboration and empowerment on resilience to violent extremism among boys' secondary schools in the north-eastern counties of Kenya.

1.3 Research Hypothesis

H₀1: Leadership collaboration and empowerment have no significant influence on resilience to violent extremism among boys' secondary schools in the north-eastern counties of Kenya



2. Literature Review

2.1 Theoretical Review

Transformational Leadership Theory, originally conceptualized by Burns (1978) and further developed by Bass (1985), portrays leadership as a dynamic force that empowers and energizes individuals, encouraging them to rise above personal interests in pursuit of a collective vision that benefits both the organization and society at large. The theory suggests that transformational leaders create profound change by fostering trust, inspiring commitment, and developing individuals' potential within a group. Unlike transactional leadership, which emphasizes rewards and punishments, transformational leadership nurtures innovation, self-efficacy, and intrinsic motivation (Bass & Riggio, 2006). This approach has been widely applied in various organizational settings, including education, business, and social institutions, to explain how leaders influence individuals' attitudes, behaviors, and resilience in challenging environments. In education, transformational leadership is especially relevant as school leaders play a crucial role in shaping students' values, attitudes, and behaviors (Leithwood & Jantzi, 2005).

2.2 Empirical Review

Azmeraw et al. (2024) explored transformative pedagogy for peace and resilience and how leadership strategies influence students' resistance to radicalization. The study used a quasi-experimental design to test leadership-driven interventions in educational settings, finding that school leadership fostering collaborative learning and student-led peace initiatives significantly enhances resilience against violent extremism. However, the study focuses primarily on pedagogy and does not deeply explore the role of decision-making and joint problem-solving among institutional leaders.

Gogogwute & Musa (2024) examined collaborative security strategies employed by the Nigerian Armed Forces in countering violent extremism. Using a mixed-methods approach, findings indicated that joint military-civilian decision-making, inter-agency coordination, and community-driven security initiatives improve counter-extremism outcomes. However, the study does not assess the long-term sustainability of such collaborative strategies beyond government interventions.

Kanu et al. (2024) explored the role of education in countering Boko Haram's influence in Northeast Nigeria, emphasizing the importance of school leadership in resilience-building. Using longitudinal data, the study found that collaborative school leadership efforts, including mentorship programs and joint curriculum development, significantly deter extremist influence on students. However, a gap exists in understanding how leadership empowerment directly contributes to school-wide counter-extremism success.

Ari (2024) conducted a case study on women leaders in peacebuilding efforts in Plateau State, Nigeria, analyzing how collaborative leadership and community engagement initiatives reduce radicalization risks. The study highlighted that female leaders play a crucial role in conflict mediation and problem-solving, creating grassroots networks that strengthen resilience. However, the research does not evaluate the frequency and effectiveness of communication between these leaders and youth populations at risk of radicalization.

Mesok (2022) examined counterinsurgency and community participation in Kenya's counter-extremism efforts, revealing that collaborative decision-making between security forces and local leaders significantly enhances intervention success. The study used policy analysis and interviews to demonstrate that joint problem-solving fosters community trust, reducing susceptibility to extremist recruitment. However, the study lacks a quantitative assessment of how collaborative leadership directly impacts long-term resilience-building.

3.



4. Methodology

The study utilized a cross-sectional approach that collated both qualitative and quantitative data to meet the purposes of the study. The large study sample included 5,870 male secondary school learners, 18 Directors of Education, 18 Deputy County Commissioners (DCCs), and 108 school administrators spread across Garissa, Wajir, and Mandera counties. To obtain 375 study subjects, stratification and simple random methods were used on the entire population. A purposive sampling method was also used to find DCCs, sub-county education directors, and school administrators in the above-mentioned three counties. The study utilized questionnaires and structured interviews as its main data collection methodologies. The major data collection method was through self-administered instruments, which included surveying the students with questionnaires and interviewing educational directors, DCCs, and school administrators. A pre-test study was conducted in Lamu County, whereby 38 learners, 2 Directors of Education, 2 Deputy County Commissioners (DCCs), and 11 school administrators, which was 10% of the sample size. Following the data collection process, the accumulated data were critically examined to evaluate their comprehensiveness before encoding and feeding it into SPSS version 26.0 for purposes of analysis. The examination involved both quantitative and qualitative aspects. The quantitative data were examined through statistical description methods incorporating frequencies, percentages, and table representation. Moreover, correlation examined cross-relationships between study variables. On the other hand, qualitative data was examined through thematic analysis, thus ensuring its alignment with the research objectives.

5. Results and Discussion

5.1 Response Rate

The study sampled 375 learners, 18 Directors of Education, 18 Deputy County Commissioners (DCCs), and 108 school administrators spread across Garissa, Wajir, and Mandera counties. The learners were issued the questionnaires while the other respondents were interviewed. The Table provides the response rates.

Table 1

Response Rate

Respondents	Sampled	Response	Percentage
Directors of Education	18	18	
Deputy County Commissioners	18	18	
School Administrators	108	108	
Learners	375	375	
Total	519	519	100%

As per Table 1, the study obtained a 100% response rate from all categories of the respondents. This was in agreement with Mugenda and Mugenda (2003), who indicated that as long as the responses were above 70%, they were considered excellent. Therefore, the response rate of 100% indicates excellent results.



4.2 Reliability Results

The study conducted a pre-test study in Lamu County, and the outcome is provided in Table 2.

Table 2
Reliability Results

Instrument	Cronbach's Alpha
Leadership Openness and Accessibility	0.822
Violent Extremism	0.921
Average	0.859

According to Table 2, the average Cronbach Alpha coefficient was 0.872, which was more than 0.7. This is in accordance with Creswell and Plano (2018) who revealed that coefficients from 0.7 to 1 indicate that the instruments are highly reliable.

4.3 Leaders' Collaboration and Empowerment

This section aims to understand the participatory nature of leadership in school environments and how that influences students' attitudes and resistance to extremist ideologies. The responses were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The findings were analyzed and summarized on Table 3.

Table 3
Leaders' Collaboration and Empowerment

	N	Mean	Std. Deviation
School leaders (teachers, principals, and community leaders) communicate regularly about the dangers of violent extremism.	375	4.475	0.614
I feel comfortable discussing security and safety concerns with my school leaders.	375	4.383	0.867
School leaders provide timely and clear information on how to avoid radical influences.	375	4.241	0.939
There is an open and respectful dialogue between students and school leaders on issues affecting our community.	375	4.604	0.712
I receive guidance from school leaders on making safe and informed choices regarding extremist influences.	375	4.184	0.698
School leaders involve students in discussions about security and community safety.	375	4.522	0.762
My opinions are valued when discussing ways to prevent violent extremism in school	375	4.241	0.685
Students and school leaders work together to identify and address security concerns.	375	4.487	0.830
School leaders encourage student-led initiatives that promote peace and tolerance.	375	4.506	0.674
I feel empowered to contribute ideas and solutions to prevent violent extremism in my school.	375	4.266	0.788
My school organizes activities that promote unity and discourage violence.	375	4.003	0.732
Leaders in my school work together with parents and the community to create a safe learning environment.	375	4.275	0.625
There are mentorship programs where older students or teachers guide younger students to resist radical influences.	375	3.937	0.814



Our school collaborates with religious and community leaders to teach peace and coexistence.	375	3.896	0.694
I have participated in events or programs designed to build resilience against violent extremism.	375	4.067	0.755

Based on the study findings, respondents strongly agreed that there is an open and respectful dialogue between students and school leaders on issues affecting the community (Mean = 4.604, Std. Deviation = 0.712). This suggests a high level of trust and open communication in schools, which is crucial for fostering an inclusive environment where students feel heard and respected. Similarly, respondents strongly agreed that school leaders involve students in discussions about security and community safety (Mean = 4.522, Std. Deviation = 0.762), indicating participatory leadership practices that empower students to take part in shaping their school environment and resilience strategies.

Participants also agreed that school leaders encourage student-led initiatives that promote peace and tolerance (Mean = 4.506, Std. Deviation = 0.674), reflecting efforts to nurture leadership and active citizenship among students. This aligns with the broader goal of building student agency in preventing violent extremism. Furthermore, respondents agreed that students and school leaders work together to identify and address security concerns (Mean = 4.487, Std. Deviation = 0.830), pointing to a collaborative culture where both parties share responsibility for school safety.

Respondents affirmed that school leaders regularly communicate about the dangers of violent extremism (Mean = 4.475, Std. Deviation = 0.614), indicating proactive engagement by leaders to inform and protect students against radical influences. The statement “I feel comfortable discussing security and safety concerns with my school leaders” also received high agreement (Mean = 4.383, Std. Deviation = 0.867), suggesting strong relational dynamics between students and school leaders, which is key for early detection and prevention of extremist threats.

Respondents agreed that leaders provide timely and clear information on how to avoid radical influences (Mean = 4.241, Std. Deviation = 0.939) and that their opinions are valued when discussing ways to prevent violent extremism in school (Mean = 4.241, Std. Deviation = 0.685), highlighting both the clarity of communication and the importance placed on student input.

Likewise, students felt empowered to contribute ideas and solutions to prevent violent extremism (Mean = 4.266, Std. Deviation = 0.788), showing that schools are cultivating a sense of agency and responsibility in their students. Respondents also acknowledged that leaders work with parents and the community to create a safe learning environment (Mean = 4.275, Std. Deviation = 0.625), underlining the collaborative effort between schools and external stakeholders to foster safety and peace.

In addition, respondents agreed that they receive guidance from school leaders on making safe and informed choices regarding extremist influences (Mean = 4.184, Std. Deviation = 0.698) and have participated in events or programs designed to build resilience against violent extremism (Mean = 4.067, Std. Deviation = 0.755), demonstrating efforts to build students’ awareness and resilience through both leadership and programming.

However, relatively lower mean scores were observed in statements about school organizing activities that promote unity and discourage violence (Mean = 4.003, Std. Deviation = 0.732), mentorship programs for resisting radical influences (Mean = 3.937, Std. Deviation = 0.814), and collaboration with religious and community leaders to teach peace and coexistence (Mean = 3.896, Std. Deviation = 0.694). These areas suggest room for strengthening school-community linkages and structured peer-support systems to further support student resilience.



The findings indicate that schools have largely fostered a culture of collaboration and empowerment, with strong support for student involvement in discussions about peace and security. Nonetheless, increased efforts in community partnerships, mentorship programs, and unity-promoting school activities could enhance the resilience framework against violent extremism even further. In addition, a sub-county director of education emphasized that leadership collaboration and empowerment thrive where school administrators deliberately create platforms for student involvement beyond the classroom. He pointed out that,

“In several schools, peace clubs and student councils were instrumental in facilitating dialogue between learners and administrators on matters of community safety and radicalization risks. These structures not only foster student voice but also build a shared sense of responsibility, with learners proposing actionable ideas such as peer-awareness campaigns and safe reporting mechanisms.”

A school principal from one of the participating schools echoed this sentiment, stating that, *“When students feel valued in decision-making processes, they develop a heightened sense of ownership and become more alert to early signs of extremist behavior, often acting as the first line of detection in school environments.”*

Moreover, a Deputy County Commissioner (DCC) highlighted the importance of inter-agency collaboration, noting that in schools where leadership is open to engaging external actors—including religious leaders and community elders—students benefit from a multi-dimensional support system. The DCC stressed that,

“Such collaborations allow students to receive holistic mentorship and resilience training that extends beyond academic spaces. However, in some schools, these partnerships were either ad hoc or underutilized due to limited administrative initiative or resource constraints. I would therefore recommend that schools institutionalize mentorship programs and establish routine dialogues with parents and local influencers, ensuring that empowerment is not just a leadership philosophy but an embedded practice in school-community safety strategies.”

4.4 Experience of Collaboration in Preventing Violent Extremism

Respondents were asked to indicate specific instances where school leaders worked together with students or community members to prevent violent extremism. Many respondents described positive experiences involving joint initiatives, such as peace clubs, dialogue forums, or community outreach programs. These accounts demonstrate how collaborative leadership fosters a shared responsibility for security and promotes a culture of peace within the school environment. The involvement of multiple stakeholders, including parents and religious leaders, was noted as strengthening the school's resilience against extremist influences.

However, some respondents indicated limited or no experience with such collaboration, highlighting potential gaps in communication and community engagement. These responses suggest that in some schools, collaboration efforts may be insufficiently visible or inclusive, which could undermine students' sense of empowerment and collective efficacy in combating extremism. The findings underscore the importance of enhancing participatory approaches that actively involve students and community partners in security and resilience-building efforts.

4.4.1 Suggestions for Empowering Students against Radical Influences

Respondents were asked to indicate ideas on how school leaders could further empower students to resist radical influences and support peaceful coexistence. Common suggestions included increasing student-led activities, providing more mentorship programs, and creating safe spaces for open discussions about extremist threats. Many respondents emphasized the need for continuous education on critical thinking, conflict resolution, and intercultural understanding to equip students with practical skills to counter radical narratives.

Other responses called for stronger partnerships between schools, families, and community organizations to reinforce these efforts beyond the classroom. Some students also highlighted the importance of recognizing and valuing their contributions, which can boost motivation and ownership in peacebuilding initiatives. These qualitative insights highlight the potential for schools to develop more comprehensive empowerment strategies that nurture proactive, resilient learners capable of rejecting violent extremism.

4.5 Pearson Correlation of Leaders' Collaboration and Empowerment and Resilience to Violent Extremism

Correlation analysis was conducted to examine the strength and direction of the linear relationships between leaders' collaboration and empowerment and resilience to violent extremism.

Table 4

Pearson Correlation of Leaders' Collaboration and Empowerment and Resilience to Violent Extremism

		Resilience to Violent Extremism	Leaders' Collaboration and Empowerment
Resilience to Violent Extremism	Pearson Correlation	1	.594**
	Sig. (2-tailed)		0.01
	N	375	375
Leaders' Collaboration and Empowerment	Pearson Correlation	.594**	1
	Sig. (2-tailed)	0.01	
	N	375	375

** . Correlation is significant at the 0.01 level (2-tailed)

The results of the Pearson correlation analysis indicate significant positive relationships between leaders' collaboration and empowerment and resilience to violent extremism. Leaders' collaboration and empowerment have a strong and significant positive correlation with resilience to violent extremism ($r = 0.594$, $p < 0.01$).

4.6 Summary

The study reveals strong student-school leader collaboration on safety and peace, fostering trust, open dialogue, and student empowerment. While schools promote resilience against extremism, gaps remain in mentorship, unity-focused activities, and community partnerships. Interview respondents recommend institutionalizing student engagement and multi-stakeholder collaboration for stronger preventive frameworks.

5. Conclusion and Recommendations

5.1 Conclusion

The findings affirm that leaders who practice collaboration and empowerment foster a collective sense of ownership in the fight against violent extremism. Empowered staff members and students are more alert, proactive, and engaged in maintaining the safety and unity of the school environment. By involving staff in decision-making and sharing responsibility, school leaders build a culture of shared leadership and vigilance. Therefore, collaborative leadership is essential not only for strengthening school operations but also for building social resilience against extremist threats.

5.2 Recommendations

School leadership should prioritize collaboration and empowerment by creating opportunities for teachers and students to take part in decision-making processes. Training and development programs



that emphasize collaborative skills, teamwork, and shared responsibility should be implemented. By empowering staff and students, school leaders can create a more resilient school community that collectively works towards countering extremism. Regular workshops and peer-led initiatives could promote a shared vision of resilience and strengthen the school's defense against extremist ideologies.

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Influence of Parental Involvement on Children's Academic Performance in Thika Sub-County, Kiambu County

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ABSTRACT

Education has over time been considered a social equalizer. Focusing on financial support, homework supervision, and collaboration with teachers, this study sought to investigate the influence of parental involvement on children's academic performance in Thika sub-County, Kiambu County, Kenya. Statistical data were analysed descriptively and inferentially. As much as financial assistance was insignificantly related to academic performance ($r = 0.056$; $p = 0.433$), the study found that majority of the children whose parents supported them financially were more likely to meet expectations (50.54%), with 39.78% of them exceeding expectations. The study found a strong positive relationship between homework supervision and academic performance ($r = 0.187$; $p = 0.008$). Majority of the pupils whose parents always supervised their homework met expectations (53.33%) with 29.33% exceeding expectations. Further, there was a strong positive relationship between attending parents-teacher associations and academic performance ($r = 0.383$; $p = 0.01$). About 71.43% and 14.29% of pupils who met and exceeded expectations, respectively, had their parents attending parents-teacher associations annually. The study findings are a call to create awareness amongst parents on the need to supervise their children's homework and induct them on how to do the supervision, and participate in Parents-Teacher Associations. With government initiative of free education, then the significance of parental financial support on their children's education is fading with time.

Keywords: Financial Support; Homework Supervision; Parent-Teacher Collaboration; Academic Performance

1. Introduction

Parental involvement is the active, ongoing participation of a parent or primary caregiver in the education of a child (Annie, 2022). It also refers to the active participation of parents in their children's learning and development during the critical early childhood years (Brand, 2023). Parents can demonstrate involvement at home by: reading with children; helping with homework; discussing school events; attending school functions, including parent-teacher meetings; and volunteering in classrooms (Annie, 2022). It is considered one of the important aspects of children's ongoing learning process and development success (Sobri et al., 2022).

Research has found parental involvement in a child's early education to be positively associated with a child's academic performance (Stevenson & Baker, 1987; Hara & Burke, 1998; Marcon, 1999; Hill & Craft, 2003). Specifically, children whose parents are more involved in their education portray higher levels of academic performance than children whose parents are involved to a lesser degree (Topor et al., 2010). These studies however failed to explain the specific mechanisms through which parent involvement exerted its influence on a child's academic performance.



Parent-child interactions, specifically stimulating and responsive parenting practices, are important influences on a child's academic performance (Christian et al., 1998; Committee on Early Childhood Pedagogy, 2000). Further, a study by Sudheer (2020) noted that parental involvement for motivating kids to learn at home and for giving them access to educational possibilities, home- school communication, home visits, phone contacts, parent-teacher conferences, home tutoring, homework assistance and a home educational environment helped parents to improve their children's learning abilities.

According to a study by Froiland and Davison (2014), families with low socioeconomic status have poorer educational expectations for their children. Studies done elsewhere found parent's level of education, income, availability of reading materials at home, and number of siblings to have significant effects on the academic achievement of their children (Akhtar, 2012; Siah et al., 2018; Sudheer, 2020). A study by Sudheer (2020) indicated that parents were their children's first and lifelong teachers: they assisted their children in learning to read. Children who were academically helped by their parents showcased greater improvement in their studies than those children whose parents were less-involved in the academic journey (Sudheer, 2020). Such academic help can better come from educated than non-educated parents. Low academic achievement of parents generally made them not to expect much from their children matters academic excellence. Such low parental expectations affected the development of the expectations that the children had about their own academic future (Tan, 2017).

Family involvement, more so at teacher-parent-learner level, is predictive of student's school attendance rate. Evidence suggests that increasing engagement among the community of parents and children's care-givers is linked with better school attendance, improved academic achievement and more positive classroom behavior (McConnell & Kubina 2014; Goodall 2017). Lack of effective engagement between parents and their child's school was reported to be a cause of many cases of poor attendance referred to education welfare officers (Mellish, 2019). Lack of contact may be through parents not reaching out to their school to seek support for their child's absence, or due to them not being aware of their school's expectations initially (Hornby & Blackwell, 2018). A study by Msengi (2007) suggested that a lack of shared understanding among parents, children, and teachers regarding perceptions of students' reading abilities and activities was related to students' actual reading levels. When the families and teachers were in agreement, students' reading levels were at or above the class average.

A number of researches have accumulated on parental involvement in education, covering various domains related to homework practices (Nguyen et al., 2021). Among them, a modest proportion focusing on homework confirms its relationships to positive pupils' attitude about homework and school learning, pupils' self-perceptions, and effective pupils work habits and self-regulation. A study by Hoover-Dempsey et al. (2011) stated that parents believed that it was important, necessary and permissible for them to be involved in their children's homework. Ryan (2005) reported that academic achievement of pupils was more related to having parents who inculcated values at home. This underscores the influence that supervision of homework plays in the implementation of the curriculum hence the need to ensure parents supervise their children's homework. It is during such a time that parents can find out how their children are progressing with the lessons as well as their discipline, practices which are necessary to make them spend reasonable amount of time studying. Studies have demonstrated a positive relationship between homework supervision and parental involvement and a range of school-related outcomes, including academic achievement, school engagement and socio-emotional adjustment (Lee & Bowen, 2006; Izzo et al., 2008). Such parental involvement activities include checking homework, communicating about school and reading with their children.

From these literature, parents are involved in the academic journeys of their children through being models to their children, providing monetary support, acquiring learners' academic gears, ensuring that their children attend school, supervising homework, motivating their children, and collaborating with teachers on their academic performance (Steinmayr et al., 2020). These roles are integral to a child's educational success, as parental modeling of positive behaviors fosters a love for learning and commitment to academic goals. Additionally, financial support and acquisition of learning materials provide children with the tools necessary for effective study, while active engagement in schooling through teacher collaboration helps parents address academic challenges promptly (*The Relationship of Parents' Support to Children's School Achievement on JSTOR*, n.d.). The purpose of this study was to examine the influence of parental involvement on children's academic performance, analyzing specific forms of engagement: financial support, homework supervision, and parent-teacher collaboration. This study further identified challenges parents faced in supporting their children's education. The study findings are of benefit to educational policymakers as insights into the types and effects of parental involvement can inform policies that encourage family engagement. For school administrators and teachers, this study provides an understanding of the ways parents contribute to student success. These insights can help educators develop more effective strategies for engaging parents, fostering a cooperative relationship that supports children both at home and in school. By identifying specific actions - such as homework supervision, financial support, and collaboration with teachers - that have an impact on academic performance, this study empowers parents to take practical steps to enhance their children's success in school.

2. Data and Methods

2.1 Research Design

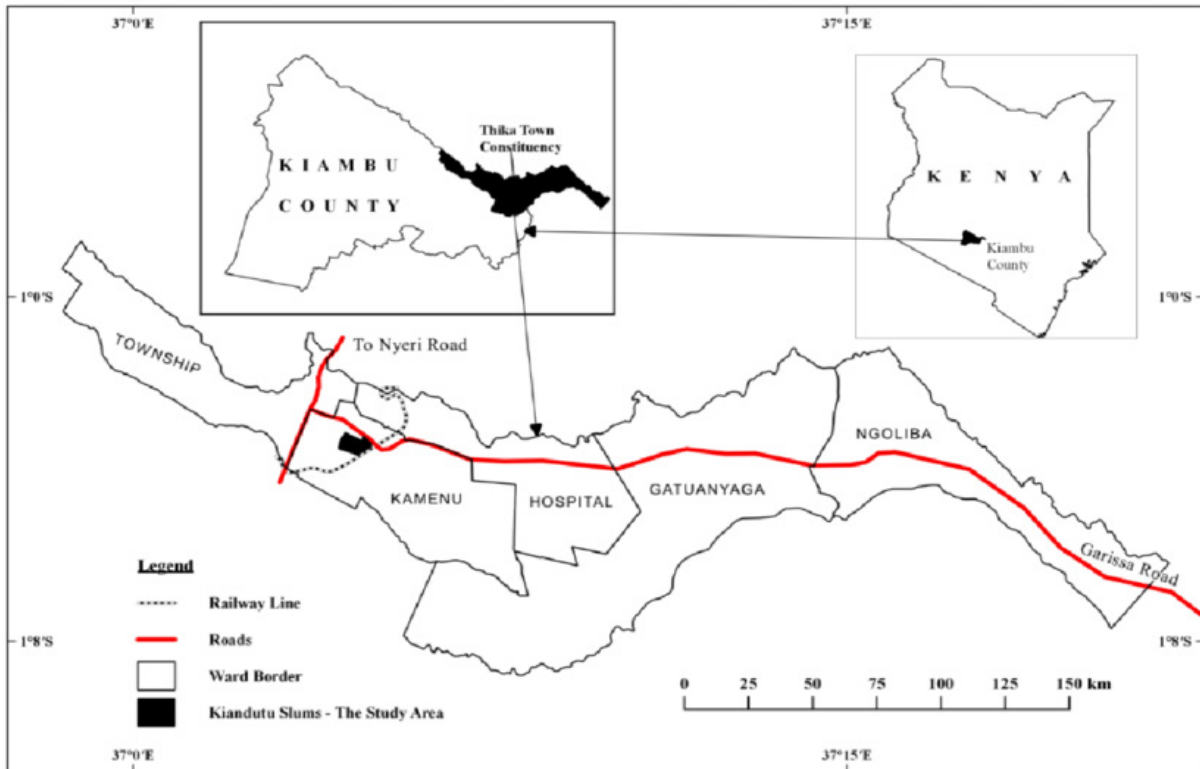
The study employed a cross-sectional design, integrating both quantitative and qualitative approaches. This design was particularly suitable for the study as it facilitated a comprehensive understanding of parental involvement by allowing for the collection of both numerical and narrative data through structured questionnaires. The quantitative aspect focused on measuring the extent of parental involvement and its relationship to children's academic performance, while qualitative interviews explored parents' perceptions, attitudes, and experiences regarding their support for their children's education. This combination of methods enabled a nuanced analysis of the various dimensions of parental engagement, providing a holistic perspective on how these factors influenced academic outcomes. The unit of analysis was parents to children enrolled in primary, junior and senior schools of learning in Thika sub-County.

2.2 Study Area

The study was conducted in Thika, Kenya, a vibrant urban center known for its diverse socio-economic backgrounds and educational environments. The sub-County is made up of five administrative wards: Township, Kamenu, Hospital, Gatwanyaga, and Ngoliba Wards. Thika was chosen as the study location due to its rich tapestry of varying levels of parental involvement in education. The study area's educational landscape encompassed a wide range of schools, from public to private institutions, and offered a unique opportunity to investigate how these factors contributed to parental engagement and subsequently affected children's academic performance.



Figure 1: Map of the study area



2.3 Sampling Techniques and Sample Size Determination

To ensure a representative sample, a stratified random sampling technique was employed. Parents were categorized based on the education level of their children: primary school, junior school, senior school. By conducting random selection from each category, the study aimed to enhance the representativeness of the sample and minimize potential biases in the findings. This sampling method was crucial for capturing the diverse experiences of parents across various socio-economic strata, thereby provided a comprehensive understanding of how different factors influenced parental involvement and its effects on academic performance.

To accurately determine the sample size for the study, Yamane's (1967) formula was applied on a target population of 73,000 learners as follows:

where n = the required sample size; N = the total population size; and e = the margin of error (expressed as a decimal). Thus;
 $n = 398$

2.4 Reliability of Measurements

The reliability of the measurements was assessed using Cochran's Alpha Coefficient, computed on the SPSS (Statistical Package for the Social Sciences) software. The assessment considered the independent variables of financial assistance, homework supervision, and parent-teacher association, alongside the dependent variable of academic performance. The study yielded a reliability coefficient of 0.790 at $p < 0.001$. The output was as indicated in Table 1.

Table 1: ANOVA with Cochran reliability test

		Sum of Squares	df	Mean Square	Cochran's Q	Sig
Between People		77.395	199	0.389		
Within People	Between Items	513.405	3	171.135	331.586	<0.001
	Residual	415.595	597	0.696		
	Total	929	600	1.548		
Total		1006.4	799	1.26		
Grand Mean = 2.2775						
Cronbach value = 0.790						

2.5 Data Analysis

Data analysis employed a combination of statistical techniques for quantitative data and thematic analysis for qualitative data. For the quantitative data, descriptive statistics (frequencies, percentages and crosstabs) and inferential statistics (correlation analysis) were used to analyze numerical responses and identify patterns and relationships. For the qualitative data, thematic analysis was utilized, involving coding responses to identify patterns and themes related to parental involvement. This process allowed for a deeper understanding of the nuanced experiences and perceptions of parents. The analysed results were presented in tables followed by a discussion of the same in order to enhance clarity and comprehension of the findings to a broader audience.

2.6 Ethical Issues

Ethical considerations focused on obtaining informed consent from participants, ensuring confidentiality, and allowing participants the right to withdraw from the study at any time. Ethical approval was sought from Gretsia University's Directorate of Research and Publication prior to data collection to ensure compliance with ethical research standards. All participants were assured that their responses were kept confidential and used solely for research purposes, fostering an environment of trust and openness throughout the study.

3. Findings and Discussion

3.1 Demographic characteristics of the study population

Univariate analysis was done to bring out the distribution of the study respondents based on their demographic characteristics. The results were as indicated in Table 2.

Table 2: Demographic characteristics of the study population

Variable name	Count	Percent
Gender		
Male	103	51.5
Female	97	48.5
Age group		
≤25 years	27	13.5
26-35 years	44	22.0
36-45 years	77	38.5
>45 years	52	26.0
Highest education level attained		
None	43	21.4



Primary	41	20.4
Secondary	45	22.4
Tertiary	71	35.3
Ward of residence		
Township	26	12.9
Kamenu	38	18.9
Hospital	64	31.8
Gatuanyaga	36	17.9
Ngoliba	36	17.9
TOTAL	200	100

From Table 2, majority of the respondents were male (51.5%), female was about 48.5%. The respondents who were below 25 years (13.5%) and between 26-35 years (22%), majority were between 36-45 years (38.5%) and above 45 years (26%). About 21.4% of the respondents had no education, 20.4% had attained primary level of education, 22.4% had attained secondary level, while 35.3% had tertiary level education qualifications. About 12.9% of the respondents were from Township Ward, 18.9% were from Kamenu Ward, 31.8% from Hospital Ward, 17.9% were from Gatuanyaga Ward and 17.9% from Ngoliba Ward.

3.2 Effect of parental financial support on children's academic performance

The study sought to examine the effect of parental financial support on the academic performance of their children in Thika sub-County. This examination was done by cross-tabulation and correlation analyses.

3.2.1 Results of cross-tabulation analysis

Cross-tabulation analysis was done to examine the distribution of parental financial support according to the academic performance of their children. Pearson chi-square test was done to establish the magnitude of the independent variable on the dependent variable in the study area. Results of cross-tabulation analysis were as presented in Table 3.

Table 3: Results of cross-tabulation analysis

	Academic Performance				TOTAL
	Below expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	
Financial Assistance					
Yes	2.15	7.53	50.54	39.78	100
No	0.00	0.00	57.14	42.86	100
Chi-square value = 1.497; $p = 0.683$					

From Table 3, as much academic performance varied with financial support (2.15% - below expectation; 7.53%- approaching expectation; 50.54%-meeting expectation; 39.78%-exceeding expectation), the magnitude of the relationship was insignificant ($\chi^2 = 1.497$; $p = 0.683$). The finding that pupils whose parents did not provide any financial assistance were able to meet and exceed academic expectations is inconsistent with findings of Roksa and Kinsley (2019) and Clark-Lempers et al. (1990). Roksa and Kinsley (2019) noted that parental financial support in terms of learning materials enabled learners to complete assignments efficiently and engage in self-directed learning, practices that boosted their academic performance. In the current regime, the government provides free primary and day secondary education, an act that is slowly rendering parental financial support insignificant if well-embraced.

3.2.2 Results of correlation analysis

Pearson's product moment correlation analysis was done to examine the relationship between parental financial support and academic performance of their children. The results were as presented in Table 4.

Table 4: Results of correlation analysis

		Financial Support	Academic performance
Financial Support	r	1.000	0.056
	P		0.433
Academic performance	r	0.056	1.000
	P	0.433	

Results in Table 4 showed no significant relationship between financial support and academic performance ($r = 0.056$; $p = 0.433$). The lack of significance could be explained by the declining role of parental financial support in this era of free day secondary education. This was supported by the finding that pupils who lacked parental financial support met expectations (57.14%) and exceeded expectations (42.86%) in their academic journey (Table 3). However, the result did indicate a positive correlation whereby financial support contributed to higher performance indices.

3.3 Influence of parental supervision of homework on their children's academic outcome

The study sought to analyze the influence of parental supervision of homework on their children's academic outcomes in Thika sub-county. This examination was done by cross-tabulation analysis.

3.3.1 Results of cross-tabulation analysis

Cross-tabulation analysis was done to examine the distribution of parental supervision of homework on the academic performance of their children. Pearson chi-square test was done to establish the magnitude of the independent variable on the dependent variable in the study area. Results of cross-tabulation analysis were as presented in Table 5.

Table 5: Results of cross-tabulation analysis

Academic Performance					
	Below Expectations	Approaching Expectations	Meeting Expectations	Exceeding Expectations	TOTAL
Homework supervision					
Never	3.23	0.00	54.84	41.94	100
Occasionally	0.00	4.26	47.87	47.87	100
Always	4.00	13.33	53.33	29.33	100
Chi-square value = 15.061; p = 0.02					

From Table 5, the study learnt that academic performance significantly varied with the frequency of homework supervision ($\chi^2 = 15.061$; $p = 0.02$). About 47.87% and 53.33% of the pupils who met expectations had their homework supervised by their parents occasionally and always, respectively. However, majority of pupils whose homework did not receive any parental supervision were able to meet academic expectations (54.84%). Possible reasons for non-supervision were time constraints and work-related obligations (65.48%), lack of knowledge (17.86%), and child resisting supervision (16.67%) (Table 7).



Time constraint when it comes to homework supervision can be as a result of single parenting. A study by Dronkers et al. (2017) documented that single parent had limited time for direct academic involvement thus hindering a child's academic performance. Furthermore, parents with no/minimal academic knowledge had no confidence in supervising academic work of their children (Retanal et al., 2021). As documented by Yu (2023), parents with limited educational background faced challenges in supporting their children's schooling since they could not understand the curriculum demands. Children perceived homework supervision as a burden and stress thereby frequently express that homework takes them away from leisure activities and is a significant source of stress (Coutts, 2004 and Buell, 2000). Excessive or repetitive homework can lead to frustration, discouragement and emotional reactions thereby leading to poor academic performance.

3.3.2 Results of correlation analysis

Pearson's product moment correlation analysis was done to examine the relationship between parental supervision of homework and academic performance of their children. The results were as presented in Table 6.

Table 6: Results of correlation analysis

		Homework supervision	Academic performance
Homework supervision	r	1.000	0.187**
	P		0.008
Academic performance	r	0.187**	1.000
	P	0.008	

** $p \leq 0.01$

Results in Table 6 showed a significant positive relationship between homework supervision and academic performance ($r = 0.187$; $p = 0.008$). The more the homework supervision, the higher the academic performance index of a pupil. About 3.50 percent of a pupil's academic performance was as a result of their parents supervising homework ($r^2 = 0.034969$). Active homework supervision by parents enhances the academic skills and study habits of children (Hoover-Dempsey et al. 2001), and makes them to be self-disciplined and better time managers in academic matters (Cheung, 2009).

Descriptive statistics were conducted to bring out the frequencies on homework administration, level of supervision, challenges witnessed during supervision, and whether supervision was important. The results were as presented in Table 7.

Table 7: Descriptive statistics on supervision

Variable	Count	Percent
Homework given		
No	29	14.50
Yes	171	85.50
Level of supervision given homework		
Not supervised	5	2.92
Partially supervised	100	58.48
Fully supervised	66	38.60
Challenges witnessed in supervision*		
Lack of knowledge	30	17.86
Child resist supervision	28	16.67
Time constraints and work obligations	110	65.48

Is supervision important?		
No	13	6.50
Yes	187	93.50
TOTAL	200	100

*Values less than 200 due to missing responses

From Table 7, the study realized that majority of pupils were given homework (85.50%), underwent partial homework supervision (58.48%), had their parents constrained by time and work-related obligations to supervise their homework (65.48%), and had their parents perceive homework as important (93.50%). Of the 171 pupils who were given homework, 5 were not supervised by their parents, possibly due to lack of academic background of their parents, child resisting supervision, or time constraints on the parents' side.

3.4 Influence of parent-teacher collaboration on students' academic achievements

This section sought to analyze the extent to which parents engage with teachers through meetings and communication, and how this collaboration may influence the academic success of their children. This examination was done by cross-tabulation and correlation analyses.

3.4.1 Results of cross-tabulation analysis

Cross-tabulation analysis was done to examine the distribution of parent teacher collaboration on student's academic performance. Pearson chi-square test was done to establish the magnitude of the independent variable on the dependent variable in the study area. Results of cross-tabulation analysis were as presented in Table 8.

Table 8: Results of cross-tabulation analysis

		Childs academic performance				
		Below Expectation	Approaching Expectation	Meeting Expectation	Exceeding Expectation	TOTAL
Parent-Teacher Meeting						
	Never	3.33	30.00	16.67	50.00	100
	Rarely	6.98	0	60.67	32.56	100
	Termly	0	2.65	53.98	43.36	100
	Yearly	0	14.29	71.43	14.29	100

Chi-square value = 50.934 $p = 0.000$

From Table 8, the results realized that majority of pupils whose parents attended parent-teacher meeting termly and yearly (53.98%, 71.43%) met expectations, respectively and (43.36%, 14.29%) exceeded expectations, respectively. Moreover, about 1 in every 3 pupils whose parents never attended parent-teacher meetings were unable to meet academic expectations.

Owusu (2017) found that children whose parents attended school meetings and maintained contact with teachers showed higher levels of academic motivation and discipline, as parental involvement underscored the importance of their schooling. Regular communication between parents and teachers enhanced children's academic performance (Syuraini et al., 2022) by keeping parents informed about their children's academic progress and enabling timely interventions and support (Fu et al., 2022).



3.4.2 Results of correlation analysis

Pearson's product moment correlation analysis was done to examine the relationship between parent-teacher collaboration and student's academic performance. The results were as presented in Table 9.

Table 9: Results of correlation analysis

	Parent Teacher Meeting	Child's academic performance
Parent-Teacher Meeting	r 1.000	0.383**
	P	0.010
Child's academic performance	r 0.383**	1.000
	p 0.010	

** $p \leq 0.01$

Results in Table 9 showed a significant positive relationship between parent-teacher collaboration and academic performance with ($r = 0.383$, $p = 0.01$). Regular communication and cooperation between parents and teachers contribute positively to students' academic outcomes. About 14.67% of pupil's academic performance was as a result of their parent teacher collaboration. ($r^2 = 0.146689$).

Descriptive statistics were conducted to bring out the frequencies on teacher parent communication and level of involvement. The results were as presented in Table 10.

Table 10: Descriptive statistics on parent-teacher collaboration

Variable	Count	Percent
Frequency of communication		
Never	18	9.00
Occasionally	120	60.00
Regularly	62	31.00
Level of involvement		
Low	26	13.00
Moderate	101	50.50
High	73	36.50
TOTAL	200	100

From Table 10, the study realized that the frequencies of communication between parents and teachers were as follows; never (9%), occasionally (60%) and regular (31.00%). There were low (13%), moderate (50.5%) and high (36.5%) levels of parental involvement in school events, respectively. Parental involvement and collaborations are evident in attending parent-teacher meetings, participating in school events and education programs. Such involvement has been found to enhance students' academic performance (Syuraini et al., 2022; Owusu, 2017)

4. Conclusion and Recommendations

This study sought to investigate the influence of parental involvement on children's academic performance. Guided by the research objectives, the study concluded that financial support positively but insignificantly influenced children's academic performance ($r = 0.056$; $p = 0.433$). Homework supervision significantly influenced children's academic performance ($r = 0.187$; $p = 0.008$) through enhancing children's academic skills, habits and self-regulation. Parent-teacher collaboration significantly influenced children's academic performance ($r = 0.383$; $p = 0.01$) and allowed parents to stay informed about their children's progress, challenges and achievements, enabling timely interventions and support.



Based on the findings, the study recommends the need to organize parent training workshops to equip parents with basic skills for academic support at home, particularly in supervising homework. There is need for a longitudinal study to explore the long-term effects of consistent parental involvement on students' learning outcomes and behavior. Further, a study should explore gender-specific parental roles to understand how mothers and fathers contribute differently to their children's academic development more so in this era where single parenting is a norm.

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Understanding Master's Students' Intention to Stay in Tanzanian Public Universities through Support Systems

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ABSTRACT

Student retention remains a key challenge in higher education globally. However, the factors affecting master's students' decisions to stay or leave are unexplored in sub-Saharan Africa, where more than 50% master's students in these regions do not complete their degrees in public universities. This study aims to address a significant gap by investigating the factors that influence master's students' intentions to stay or leave their studies at Tanzanian public universities. Using grounded theory, with purposive and snowball sampling, the study involved 48 participants, including master's students, supervisors, Heads of Department, program coordinators, and the Director of Postgraduate Studies. Data collection and analysis followed rigorous grounded theory procedures, involving theoretical sampling and iterative coding, to develop a new emergent theory. The findings indicate that institutional, supervisory, financial, and social support dimensions collectively impact students' intentions to stay or leave. Additionally, academic ability and commitment, whether high or low, affect this relationship, with self-efficacy serving as a reinforcing factor. The study suggests that students' intentions to stay can be predicted by available support, although personal issues may lead to different outcomes. This model offers the first theoretical framework for understanding how and why master's students intend to stay or leave in Tanzanian public universities, emphasising the importance of comprehensive support systems.

Keywords: Master's degree students; intention to stay; student support systems; grounded theory methods; public university; Tanzania.

1. Introduction

Student retention remains a key challenge in higher education globally (Vossensteyn et al., 2015). However, the factors affecting master's students' decisions to stay or leave are unexplored in sub-Saharan Africa, where more than 50% master's students in these regions do not complete their degrees in public universities. Specifically, Tanzanian public universities face specific challenges in keeping master's degree students enrolled, with many failing to complete their degrees despite substantial institutional and national investments (Muneja & Ndenje-Sichalwe, 2016; Mwapachu, 2010; Simbakalia). This issue persists despite decades of research on undergraduate retention in Western countries, highlighting a significant gap in context-specific knowledge about what helps or hinders master's students from continuing their studies.

Current understanding of student retention mainly derives from Western theoretical frameworks (Bean, 1980; Bean, 1985; Tinto, 2012; Tinto, 1975, 1993, 1997), which focus on social integration and institutional commitment but may not fully capture the unique experiences of master's students in Tanzanian universities. Some African studies have noted systemic issues like poor supervision and funding shortages (Ishengoma, 2017; Luhanga, 2009), though they often test existing theories rather than develop new, locally grounded insights, so fail to bring some unique understanding or explanation on the phenomenon.

Therefore, this study aims to develop a substantive theory that explains the factors influencing master's students' intentions to stay or leave their studies at Tanzanian public universities by utilising grounded



theory methodology, which is ideal for exploring understudied phenomena where existing theories may not align with local realities (Charmaz, 2014).

2. Literature Review

2.1 Institutional Support Systems

Extensive research has documented the infrastructural and administrative challenges African higher education faces, such as inadequate facilities, limited research resources, and bureaucratic issues (Ishengoma, 2017; Mkunde & Dachi, 2023) confirms these systemic problems, especially in postgraduate programs. However, there is little research on how support services, such as advising, libraries, or funding, affect student retention. This gap hinders universities from implementing effective strategies to retain master's students.

2.2 Student Characteristics and Experiences

The literature on African higher education mainly explores undergraduate experiences, largely ignoring postgraduate populations (Alshawi, 2023; Braxton, 2000; Wood, 1994). Most studies on master's students focus narrowly on academic or personal factors, missing how these interact. Mwakyusa's research on motivation is among the few to explore Tanzanian postgraduates (Mkhai, 2023). However, it has limited scope, analysing overall motivation without linking it to students' intentions to stay or complete degrees. No studies examine how variables like academic prep, research skills, or career goals influence persistence.

2.3 Supervisory Relationships

Supervision quality is crucial in postgraduate education (Adebayo, 2018; Chikte, 2016). In Tanzania, research mainly focuses on supervisor shortages (Amani et al., 2022; Istoroyekti & Hum, 2016). Literature points to systemic issues like high supervisor-student ratios and inconsistent feedback. However, little is known about how supervision styles, meeting frequency, or mentor-mentee relationships influence students' willingness to stay. Despite supervision's vital role, no studies examine if specific supervisory methods more effectively promote persistence among Tanzanian master's students or how supervision interacts with other support systems affecting retention.

2.4 Financial Support Mechanisms

Financial constraints challenge African higher education research (Chukwu, 2016; Otieno, 2017). Tanzanian scholars studied the impact of loan programs on postgraduate access in Tanzania, but only addressed access, not retention (Elia & Ndenje-Sichalwe, 2022). The literature lacks a systematic analysis of how financial support types, like scholarships, stipends, or research grants, affect students' desire to stay.

2.5 Social and Peer Support Networks

While research on undergraduate retention often highlights social integration (Tinto, 1993), few studies focus on postgraduate retention in African contexts. Mwaitete explored academic social networks in Tanzania, noting their presence (Mwaitete, 2024) but not their purpose or impact. The study does not examine if these networks influence students' decisions to continue, which is crucial as postgraduate research is more isolating than undergraduate courses. Master's students often work independently, making peer support essential. Yet, there is little research on how departmental cultures, peer mentorship, or academic communities affect persistence.

2.6 The study Gap

Current research reveals gaps in understanding why and how master's students intend or decide to leave or stay in their studies. In Tanzania, Ishengoma (2016) and Luhanga et al. (2018) focus on institutional and supervisory issues, mainly describing them. South African studies identify systemic barriers (Costa, 2018; Gumbo & Gasa, 2023) but lack analysis of how these barriers affect persistence.



Kenyan studies have examined similar issues separately, creating knowledge gaps for Tanzania (Mugendi & Githae, 2021; Muthiani, 2022). Other studies highlight institutional and student factors, but their interactions within Tanzanian universities remain unclear (Mkhai, 2023; Rwejuna, 2013). Similarly, Makulilo's study focused on financial and social factors, but these remain isolated without integration (Makulilo, 2014). Therefore, three key gaps motivate this study: there is no comprehensive framework to explain retention specifically for master's students in Tanzanian public universities. Previous research had mainly used quantitative or deductive qualitative methods, which have overlooked factors specific to the context. Furthermore, university interventions often replicate Western models without evidence of their effectiveness in local settings.

2.7 Research Objective

Develop a theory on how institutional, supervisory, and student factors influence master's students' intentions to stay or leave Tanzanian public universities.

3. Research Methodology

3.1 Research Design

This study employed a qualitative grounded theory approach to investigate the factors influencing master's students' intention to stay or quit Tanzanian public universities. Grounded theory methodology was selected for its ability to generate theory directly from empirical data while accommodating the complexity of institutional, supervisory, and student-related factors (Charmaz, 2014). The approach aligns with the study's exploratory nature and allows for the emergence of context-specific insights that might be overlooked in deductive research designs (Cresswell, 2013). The methodology's iterative process of data collection and analysis enables continuous refinement of concepts as patterns and relationships become apparent through systematic comparison (Braun & Clarke, 2021).

3.2 Sampling and Participants

The study utilised theoretical sampling across three Tanzanian public universities selected to represent regional diversity and varying academic orientations (Robinson, 2014). Participants included 24 master's students, 18 who were still in study and 6 students who quit. 9 Academic supervisors with substantial experience, 9 department heads overseeing postgraduate programs, 3 program coordinators, and 3 directors of postgraduate studies. The sampling strategy combined purposive techniques to identify key informants and snowball methods to access students meeting specific criteria. Data collection continued until reaching theoretical saturation, the point at which new interviews ceased to yield novel conceptual insights. The final participant pool comprised 48 individuals carefully selected to provide multiple perspectives on the phenomenon under investigation.

3.3 Data Collection Instruments and Procedures

Primary data was gathered through in-depth, semi-structured interviews conducted in either Swahili or English according to participant preference. Interview protocols were tailored for different stakeholder groups, with student interviews focusing on personal experiences and challenges, while staff interviews emphasised institutional policies and support systems. All interviews were audio-recorded with consent and transcribed verbatim to ensure accuracy (Kallio et al., 2016). The interview guides underwent pilot testing and refinement to improve question clarity and logical flow before full implementation (DiCicco-Bloom & Crabtree, 2006). This process helped ensure the instruments effectively captured the range of factors influencing students' intention to stay or quit their programs.

3.4 Analysis

The analysis followed grounded theory's constant comparative method, progressing through open, axial, and selective coding phases (Corbin & Strauss, 2008). Initial line-by-line coding identified numerous conceptual categories, which were progressively refined and related through iterative analysis (Charmaz, 2014; Creswell & Creswell, 2017). NVivo software supported data organisation



and management throughout this process. As analysis advanced, connections between categories were mapped to develop a conceptual framework explaining the relationships between institutional, supervisory, and student factors. Team discussions and memo-writing helped refine emerging concepts and ensure analytical rigour. The process culminated in the development of a substantive theory grounded in the empirical data while remaining responsive to the Tanzanian higher education context (Charmaz, 2014).

4. Results

4.1 Staying Enabled by Systematic Supports

The analysis revealed a key process in Tanzanian public university master's students' intentions to stay or leave, involving four support dimensions: institutional, supervisory, financial, and social. These created conditions for staying or leaving based on their presence and effectiveness. Students' ability and commitment influenced how they accessed support. Self-efficacy linked external support to internal confidence. The intention to stay was usually an ongoing judgment of whether the environment provided enough support. When support systems worked, students persisted; if not, even capable students considered leaving.

4.2 Institutional Support Dimension

Institutional support included university services like access to facilities, clear regulations, prompt processing, counselling, and monitoring. When systems functioned well, students felt the university was a reliable partner, as one noted, *"When things worked, like timely thesis approvals, I felt the university was invested in me"* (PMSD2). Another said, *"When I went to the office, they responded quickly and explained what I needed. That helped me move forward."*(PMSA4). However, many faced delays, unclear processes, or inaccessible services, causing frustration and sometimes leading students to consider leaving. One student shared, *"I submitted my documents but waited for months with no update. That delay made me question whether the university cared if I finished or not."* The lack of counselling was a common concern, with some students experiencing emotional distress that affected their academic engagement. One female student explained: *"I am a girl. In my class, there were only two of us, I was the youngest, and my classmate was older and married. I faced unwanted attention and tried to spoil my experience. The constant temptations made it hard to stay engaged, eventually leading me to leave"* (PQMSD1). In contrast, counselling was valued as a lifeline. One student said, *"I felt lost until I learned about the advising centre; now I know where to go for help"* (PMSM1). A Head of Department confirmed its positive impact, *"The counselling unit has helped many students stay in school. I referred several students, and they returned more motivated"* (PHSD3). Overall, support was most effective when proactive, responsive, and well-communicated. Its absence or failure not only slowed progress but also damaged trust, reducing students' desire to stay.

4.3 Supervisory support dimension

Supervisory support was reported as the most meaningful emotional and academic aid. Students view supervisors as vital in their academic journey, either motivating them or causing them to leave. Lack of support, characterised by minimal guidance, delayed feedback, and discouraging language, led to dropouts. One student said, *"There is no room for assistance, I can quit any time because my supervisors are very busy and cannot take the time to teach me or even read my work. It is difficult"* (PMSM4). Another shared, *"I waited for feedback for four months. I sent messages, but received no response. I called, but still no answer. I told myself, a master's degree is not everything. I quit"*(PQMSM1). Heads of departments acknowledged these issues: *"The university offers many facilities, like the library, and we have qualified supervisors. However, supervisors who fail to guide students well cause them to quit or drop out"* (PHDA1).

Cultural norms sometimes worsened these problems, discouraging students from reporting issues: *"After being mistreated, I became humble because she is an important person here at the university..."*



I do not want to cause problems. It hurts a lot because time passes, and I have not finished " (PMSD4). A coordinator explained this, *"Our culture presents a problem for some students. When they face conflicts or delays with supervisors, they quit without informing anyone"* (PCA). Some supervisors reported using that loophole to do as they wish to students, as one said, *"Students must follow my supervision style; no one questions how I supervise. I do as I wish. "* (PSD3). Not only this, but also reported to have discouraged language as some students said *"My supervisor told me, I think you cannot complete your degree at this university; maybe you should try elsewhere"*(PMSD6).

4.4 Financial Support dimension

Financial Support reported to include all monetary aid given to students, such as scholarships, research grants, tuition waivers, and sponsorships from individuals or organisations. Many students reported that they funded their education and faced financial struggles covering tuition, transportation, research supplies, and living expenses. Lack of aid often led to premature withdrawals, with students citing financial hardship affecting their enrollment. One said, *"I quit studying not because of the institution; it was all on me. I became financially weak, and paying my fees became a problem"* (PQMSA2). Others found even basic living costs hard to cover, with one stating, *"My salary is too low to cover even my basic expenses. If I had financial support, I would continue studying"* (PQMSA2). Some only received partial support, which was insufficient, as one explained, *"My teachers contributed money for my living expenses, but I still was not fully satisfied. I wanted fully funded support, not just donations"* (PQMSD2). Costs like research tools could also be prohibitive, as one participant noted, *"I needed resources like a GIS program; borrowing a good computer was difficult"* (PQMSD1).

Similarly, Students also enrolled expecting sponsorships that never materialised. One student said, *"After the first semester, support promised to me never appeared. I could not afford the second semester fees"* (PQMSM2). Such unfulfilled promises often led to dropout. Conversely, accessible financial support motivated students to stay. Some departments secured yearly grants for full-time master's students, helping retain them. A department head said, *"Our department receives yearly grants to support master's students, many benefit from these funds, and they do not drop out"* (PHDD3). These grants could cover research costs, as this student said, *"My scholarship includes the research phase, which motivates me"* (PMSA4). This Support was reported to help students overcome barriers: *"We can arrange for a student to pay one quarter while the project covers three; completing a dissertation without aid is difficult"* (PHDD1). Aid linked to academic performance also motivated persistence: *"I study on a scholarship that requires maintaining a GPA of 4 each semester, or I must repay the funds"* (PMSD5). For many, financial support also had emotional significance: *"Thinking about the over 7 million they paid motivates me to keep trying"* (PMSM2).

4.5 Social Support dimension

Social support found to encompass informal peer networks, friendships, group study sessions, cohort communities, and emotional backing from fellow students, alumni, or staff. A lack of social support also affected students' intentions to leave their studies, as feelings of isolation, unmet expectations, and discouragement were common in environments without peer and academic community involvement. For instance, some students felt disillusioned when they saw no tangible benefits from their degree: *"Students compare themselves with those who have finished their degrees. When they see that others have not secured promotions... they question the value of their efforts"* (PSD 3). One student expressed regret: *"I think I did not think well because our career master does not add anything"* (PQMSA 2). Similarly, the absence of peer engagement left others struggling alone and ultimately found to influence intention to leave studies, as one quitter said, *"I had no study groups, no fellow to assist me, I felt like I was just getting by, not thriving"* (PQMSM 1).

Conversely, strong social support reported to foster the intention to stay in studies. Interactions with peers, study groups, and informal gatherings boosted confidence and lessened feelings of isolation, which helped individuals stay. As one student said, *"Meeting with classmates helped me realise I*



was not alone in my struggles” (PMSM 4). Furthermore, Doctoral candidates also facilitated intention to stay among master's students who were lucky to get encouragement or academic assistance and advice from them, as one student said, *“I am lucky to be close to PhD candidates. When I was about to give up, I found myself two days without writing a single line. They told me everyone faces difficulties; they encouraged me to rest, wake up early tomorrow, and see something new, so I continued”* (PMSM 3). This kind of help was found to extend internationally as another student said, *“I have fellow staff from MUST and others pursuing PhDs at Mlimani. I also have colleagues conducting PhD research; one is in China. I asked someone abroad if they had access to a library where I could get materials easily”* (PMSA4).

Community networks also offered practical support. One Head of Department said, *“There is a place called Survey; it is an industry for producing proposals and dissertations”* (PHDM 1). Although some of this assistance blurred academic integrity boundaries, it helped some students to stay and some graduated already. A supervisor admitted, *“When those students defended their work, I knew it was not their own due to their limited understanding of what they were writing. However, I had no evidence to prove it was not their work, so they were allowed to pass. Based on my experience, it was clear they did not do it”* (PSA3).

4.6 Academic Ability

Findings reported that Students with high performance, robust research skills, and strong pre-entry qualifications often managed to persist even with minimal support. One student stated, *“Yes, my scholarship has expired; there is no more stipend... but my good GPA from coursework keeps me going”* (PMSA4). Another reflected, *“My coursework results were so good; I was the only one among 12 students with a strong GPA, which gave me confidence that I could succeed despite difficulties”* (PQMSM1). Conversely, low performance frequently led to withdrawal, regardless of support, one quitting student said, *“I failed one subject, and even after repeating it, I failed again... I had not yet started writing a proposal”* (PQMSA2). Poor academic performance was also reported to diminish motivation to continue: *“I received three supplementary results in the first semester... if I finish my master's without at least a 4 GPA, it feels like a waste of time and money”* (PQMSD1).

Apart from academic performance, Strong research skills enabled students to persevere despite limited support: *“With my research ability, I can graduate, even if it takes longer”* (PMSD1). However, those with weak research ability, even sometimes with enough support from a supervisor and organisations funded, they quit, as one said, *“I did not know if I had to do research thesis myself, for sure I cannot lie, no way I could finish my thesis”* (PQMSA1).

Furthermore, lower entry qualifications created additional challenges. One supervisor noted, *“Students with lower qualifications struggle from day one in the classroom; a GPA of 2.7... suggests we admit average or weaker students”* (PSM2). The coordinator added, *“these students need more than just support, ha ha ha”* (PCD). A head of department also mentioned, *“This year, we started with 20 students, but only 15 remain, despite everyone paying their fees. Students from low or poor backgrounds cannot progress because the coursework is content-heavy”* (PHDD3).

4.7 Academic Commitment

Findings reported that high commitment often enhanced the benefits of support, while low commitment, due to employment, family responsibilities, or shifting priorities, undermined intention to stay. One dedicated student shared, *“I have self-discipline; I work from morning until evening... I always remind myself that I need to do this”* (PMSDA2). In contrast, work obligations could distract students: *“I left because I was working in another region. I am not the only one; many of us left similarly”* (PQMSA1). Another one added, *“Although completing it was necessary... would it be better to leave my job to continue with a master's degree?”* (PQMSM1). When this happened, even good academic performance could be overshadowed by job opportunities: *“After he got a job, he decided*

to quit school despite having good grades in coursework” (PSD1). Furthermore, Family emergencies also disrupted academic commitment: “After my wife was admitted to the hospital, everything related to school stopped” (PMSD4).

4.8 Self-Efficacy

Participants shared their confidence, influenced by the support they received and their intellectual ability, which in turn influenced their intention to stay. One student said, “The other thing I see myself in is that I have the intellectual ability to finish... I have such competence” (PMSD1). Another student linked their self-belief to external support: “The other thing that is strengthening me is seeing that I get enough support from my supervisor, school and parents... it gives me hope that there will be a day when I will finish” (PMSM1). Based on findings, Students who felt supported strongly developed confidence, which in turn fuelled their persistence despite facing challenges.

Student Support Systems Model

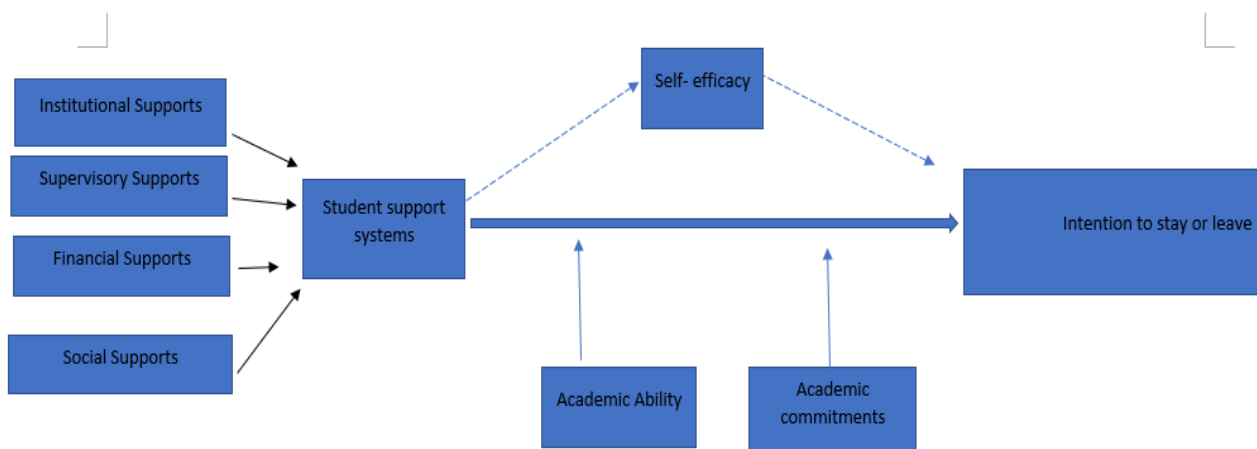


Figure 1: Students’ Support System Model

This model shows that staying is enabled by Support views intention to stay as a dynamic process where institutional, supervisory, financial, and social supports enhance self-efficacy, which then maintains the intention to stay. Academic ability and commitment may strengthen or weaken the relationship.

4.9 Discussions

This study introduces the “Staying Enabled by Student Support Systems” theory, which shows how Tanzanian master’s students remain enrolled through continuous support. Supporting Tinto’s (2012) model and recent research in sub-Saharan Africa (Adebayo, 2018; Amani et al., 2022; Chukwu, 2016), findings indicate that retention relies on coordinated institutional, supervisory, financial, and social support. These boost students’ self-efficacy, vital for effort and consistent with studies across Africa and Asia (Mkhai, 2023; Mugendi & Githae, 2021). At the institutional level, responsive bureaucracy and counselling foster belonging and confidence. Efficient procedures made the university seem dependable, while delays, unclear processes, and unmet expectations harmed trust and retention. This aligns with evidence that administrative inefficiencies reduce retention in resource-limited universities (Muneja & Ndenje-Sichalwe, 2016). However, some studies, like the study of Chikte, found delays did not predict attrition when students had strong peer networks, potentially due to differences in informal academic communities, which may less often compensate for systemic issues (Chikte, 2016).

Supervisory relationships were crucial for postgraduate retention, acting as academic and emotional anchors. Supportive supervision boosts confidence, while absenteeism and poor communication caused students to leave. These findings align with Lee's (2008) model and studies from East Africa (Mwangi, 2023). However, Komba et al. (2024) found supervision had little impact in some Tanzanian STEM programmes, with financial constraints being more influential, suggesting financial support may be more critical where resources are limited (Komba, 2020). This highlighted that Financial aid was seen as recognition of potential and encouraged persistence, crucial for retention, as hardships often led to withdrawals. This supports studies on targeted funding (Chukwu, 2016; Jacob & Gokbel, 2018). Social support through peer and academic networks was also key in maintaining student intent to stay. Isolation caused disengagement and dropout, while active engagement provided reassurance and emotional stability, consistent with Tinto's (2012) findings, highlighting how local context shapes persistence; Tanzanian students rely more on networks to bridge gaps, unlike in more self-reliant environments.

Two factors, academic ability and commitment, influenced how support affects the intention to stay, depending on the level. High achievement and research skills help students persevere despite limited support, while low ability often leads to dropout. High commitment amplifies support benefits, but low commitment, due to work or family, limits impact. Similar trends appear in sub-Saharan Africa studies (Chikte, 2016; Mugendi & Githae, 2021; Muthiani, 2022; Mwangi, 2023). Self-efficacy links support with students' intention to stay; confident students are more resilient with institutional, supervisory, financial, and social support when support was absent, self-efficacy and desire to stay declined, confirmed by many studies (Oliver, 2024; Phan, 2025).

4.10 Practical Implications

The findings have important implications for university leaders, policymakers, and program coordinators. Institutional Support should become part of daily routines, ensuring timely communication, accessible offices, and simplified processes for thesis supervision and exams. Supervisory Support needs professional development, with supervisors trained in research, student engagement, and mentorship. Institutions should monitor supervisory quality and create feedback channels. Financial Support should be more transparent, predictable, and adaptable, with increased bursaries, milestone-linked research funding, or flexible payment plans for part-time students. Social Support requires deliberate efforts, such as peer mentoring, academic writing groups, and postgraduate forums, to reduce isolation and strengthen academic communities. These efforts can shift retention from reactive to proactive and from fragmented to cohesive.

4.11 Theoretical Contributions

This study advances the literature in three ways. It develops a grounded theory of master's student retention driven by external support and internal psychological factors. It questions the relevance of mainstream retention models in the Global South, advocating for more adaptable, context-aware approaches. It proposes a multi-layered model combining institutional, personal, and contextual factors, suitable for future comparative research.

4.12 Limitations and Areas for Future Research

As a grounded theory qualitative study, findings are context-specific and not widely generalizable statistically, but the theory allows transferability to similar higher education settings with comparable challenges. Future research might validate this model quantitatively or through case studies in different countries. Comparative analyses could reveal retention differences based on discipline or resources. Longitudinal studies could examine changes in self-efficacy and support needs from coursework to thesis stages.



5. Conclusions

This study developed the grounded theory, Staying Enabled by Student Support Systems, to explain how Tanzanian master's students form and sustain their intention to stay enrolled in public universities. Findings show persistence depends not just on individual effort but on institutional, supervisory, financial, and social supports, mediated by self-efficacy. Academic ability and commitment significantly influence how students access these supports. The research presents dropout as systemic failure, caused by inefficiencies, inconsistent supervision, financial insecurity, poor peer integration, and cultural norms. While aligning partly with Tinto's and Bean's models, it emphasises financial, supervisory, and socio-cultural factors in postgraduate retention in resource-limited settings.

The model calls for systemic reforms like better institutional coordination, improved supervision, diversified financial aid, and fostering postgraduate peer networks. Digital supervision platforms, clear timelines, early risk detection, and addressing hierarchical barriers are also vital. Although focused on Tanzanian universities, it is relevant across sub-Saharan Africa with similar issues. Limitations include a lack of input from policymakers or private institutions. Future work should test and refine the model elsewhere and evaluate the impact of reforms. Ultimately, retention is a structural, relational challenge requiring coordinated, context-sensitive action. Recognising the interconnected supports and the role of self-efficacy enables universities to implement holistic strategies that help all students persist and succeed.

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A Critical Analysis of Societal Expectations for Male Characters in African Feminist Literature

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ABSTRACT

*Gender inequality remains a persistent challenge in African societies, often addressed through feminist literature focusing predominantly on the representation and empowerment of female characters. Nonetheless, the representation of male identities in feminist works is underexplored, limiting balanced gender narratives key for inclusive and resilient communities. This study examined how male and female African writers portrays societal expectations and male identities within selected feminist texts. The purpose of the study was to critically analyze how societal ideologies define the portrayal of male characters in feminist literature and to recommend approaches towards gender representation for sustainable community development. A qualitative research design using textual analysis was applied to four purposively sampled African novels: *The River and the Source* by Margaret A. Ogola, *The Joys of Motherhood* by Buchi Emecheta, *From a Crooked Rib* by Nuruddin Farah, and *Imaginations of Sand* by André Brink. The analysis was based on feminist and deconstruction theories to interpret cultural and religious ideologies influencing male character portrayal. The findings revealed that male characters were consistently portrayed through stereotypes, emphasizing dominance, violence, and physicality, while their personal struggles and self-identities remained marginalized. It was established that feminist authors focused extensively on female empowerment while neglecting the deeper experiences of male characters, supporting gender biases rather than promoting inclusivity. The study concludes that such representation perpetuates societal stereotypes and hinders the construction of equitable gender narratives. In view of the findings, the study recommends that the Ministry of Education should reassess curriculum novels to ensure balanced gender representation. In addition, societies should address stereotypical gender expectations from early socialization stages, and feminist authors should reconceptualize gender as a shared societal concern affecting both men and women.*

Keywords: *Inclusive Communities, Gender Representation, African Feminist Literature, Male Identity, Sustainable Development*

1. Introduction

The question of gender remains one of the defining markers of identity in human society, defining roles, expectations, and life outcomes. Lange (2008) explains that, from early childhood, individuals are directed toward certain behaviors and attitudes based on gendered social norms. In patriarchal societies, men are typically afforded broader freedoms and positions of authority, while women are expected to occupy supportive, subordinate roles. This social conditioning leads to entrenched gender stereotypes that limit both men and women, curtailing their abilities to perceive life beyond rigidly defined roles. In the context of literature, which reflects societal realities, these gender divisions are equally reflected. While many male authors have supported patriarchal ideologies in their works, a few have sought to support feminist narratives aimed at challenging these historical inequities. Emerging from the late twentieth century, men's studies have evolved significantly, expanding the understanding of masculinity beyond singular definitions.

According to Shefer et al. (2010), researchers word over have examined how masculinities adapt across micro-contexts and intersect with broader social, economic, and cultural conditions. These analyses explains how certain problematic forms of masculinity persist through various expressions,



revealing the performative nature of masculinity and its socio-political consequences. At the same time, they draw attention to alternative male identities that are likely to disrupt conventional patriarchal structures, suggesting pathways towards more equitable gender relations. Connell (2005) argue that, gender roles are not biologically predetermined but are socially constructed through role socialization processes that define how individuals should behave based on their gender. Within many African societies, specific masculine ideals prevail: men are expected to act as family providers, display physical strength, and embody sexual dominance. As Grieve et al. (2019) note, these expectations encourage aggressive behaviors and perpetuate cycles of male dominance and violence.

Men are socialized to pursue prestige and societal respect through adherence to these masculinized standards (Thompson, 1986). Such rigid prescriptions not only harm men but also uphold broader systems of gender inequality, which remain embedded both in society and within the literary imagination. In the field of feminist literary criticism, there is a gap in recognizing male identities as complex and evolving constructs. Lange (2008) notes that many feminist scholars focus predominantly on critiquing patriarchal portrayals of women, neglecting texts that presents balanced or alternative portrayals of male characters. This supports stereotypical narratives of male dominance and inadvertently limits opportunities for exploring how men can redefine themselves in more progressive roles. In a society striving toward gender equality, this failure to critically engage with the portrayal of masculinity in literature represents a missed opportunity to challenge traditional norms and encourage alternative gendered subjectivities.

The African feminist literary movement arose from the need to reframe narratives traditionally dominated by male voices. Orjinta (2011) explains that African feminist writers sought not only to center women's experiences but also to dismantle entrenched male biases that had long characterized African literature. Works such as Sembene Ousmane's *God's Bits of Wood*, Buchi Emecheta's *The Joys of Motherhood*, and Aminata Sow Fall's *L'ex Pere de la Nation* offer critiques of patriarchal societies while exploring women's resilience. Yet, in focusing primarily on women's experiences, African feminist literature has sometimes underrepresented male characters, limiting them to peripheral roles or framing them primarily as oppressors. This one-dimensional portrayal does not reflect the full complexity of male identities in contemporary African societies.

Contemporary scholars like Minna Salami points to the need to re-examine masculine portrayals within feminist narratives. Salami's analysis of Chimamanda Ngozi Adichie's *Half of a Yellow Sun* foregrounds Odenigbo as a male character whose romanticism and vulnerability challenge conventional expectations of African masculinity (Uwakweh, 2012). Despite Odenigbo's central role in the narrative, feminist readings often marginalize his character in favor of focusing on the female protagonist. This pattern depicts a broader trend within African feminist literature where male characters are not explored with the same depth as their female counterparts. Recognizing this gap is key to advancing a more inclusive discourse that appreciates gender as a shared concern for both men and women. The persistence of gender inequality in both society and literature calls for more balanced representations of masculinity and femininity.

Dorius and Firebaugh (2010) argue that true gender equality entails equal representation and equal opportunity, both in social life and in cultural production. Even though much progress has been made in presenting women's narratives, the continued underrepresentation and simplification of male characters in African feminist literature perpetuate stereotypes and impede the broader struggle for gender equity. Against this backdrop, this study examined the societal expectations placed on male characters in African feminist literature. Drawing on four selected novels—*The River and the Source* by Margaret A. Ogola, *The Joys of Motherhood* by Buchi Emecheta, *From a Crooked Rib* by Nuruddin Farah, and *Imaginations of Sand* by André Brink the study explores how African feminist authors depict male identity and whether these portrayals contribute to or challenge prevailing gender stereotypes.



1.2 Statement of the Problem

Despite extensive focus on gender inequality and feminist arguments in literature and cultural studies, the identities and representations of male characters have often been overlooked, more so within African feminist literature. Even though a lot of studies have centered on amplifying women's experiences and addressing their marginalization, male characters frequently remain underexplored or confined to narrow, stereotypical roles. This study sought to analyze how both male and female African writers present societal expectations surrounding masculinity, examining the extent to which male identities are constructed, constrained, or neglected in feminist narratives. Focusing on four selected African novels; Margaret A. Ogola's *The River and the Source*, Buchi Emecheta's *The Joys of Motherhood*, Nuruddin Farah's *From a Crooked Rib*, and André Brink's *Imaginings of Sand*, this study assessed how these texts reflect or challenge prevailing ideas of masculinity and explored whether they advance a more inclusive and equitable literature representation of both genders.

1.3 Research Objective

To examine how African feminist literature portrays male identities and societal expectations of masculinity in selected African novels.

1.4 Research Question

How are male characters and the concept of masculinity represented in African feminist literature, based on the analysis of selected African novels?

2. Theoretical Framework

This study was underpinned by Feminist Theory and Deconstruction Theory. Feminist Theory was developed in its literary form during the 1980s, emerged from earlier feminist critiques that sought to analyze the ways in which literature reinforces or challenges societal power structures based on gender (Code, 2000). This theory states that literature is not neutral but reflects and supports societal power structures, especially those related to gender, class, race, and sexuality. It argues that literature have historically been used to uphold patriarchal values by marginalizing female voices and presenting gender roles as fixed and natural (Salah et al., 2016). Salah et al. (2016) further explains that feminist theory not only critiques patriarchal structures but also advocates for the equitable representation of both women and men in literary works. In this study, Feminist Theory provided a framework for examining how African feminist writers portray male characters and address societal expectations of masculinity, particularly in narratives that traditionally center women's experiences.

Deconstruction Theory was introduced by Derrida in the late 1960s. Deconstruction challenges fixed meanings and binary oppositions within texts, revealing how language constructs rather than merely reflects reality. Derrida's approach questions dominant structures and hierarchies embedded within texts, encouraging readers to uncover hidden assumptions and contradictions (Derrida, 1978). Applying Deconstruction Theory allowed this study to interrogate how male identities and masculine roles are constructed, marginalized, or destabilized in African feminist literature, despite overt feminist themes that seek to empower women. Together, these theories provided a framework for examining how both male and female African writers present societal expectations of masculinity in the four selected novels; *The River and the Source*, *The Joys of Motherhood*, *From a Crooked Rib*, and *Imaginings of Sand*.

2.2 Empirical Review

2.2.1 Societal Expectations for Male Characters

Critics including Mark Stein, claim that literature serves a performative role, allowing a number of new individual's subject roles to be accessible through their very creation, while the novels themselves act as a tool for cultural re-production (Stein, 2007). The authors take their inspiration for their literary



work from the culture around them, and this is reflected in the works that they choose to compose. In today's culture, considerably more worry and attention has been given to the so-called "female kid" as compared to the so called "boy child." The historical subjugation of women has always been a major source of worry on a worldwide scale, which is why this is the case now. Nonetheless, there is a pressing need to become aware of the representation of males in today's society as well as in works of literature.

2.2.2 Cultural Ideologies

The gender structures of a civilisation give some patterns of behavior in a society the label "masculine," while other patterns of behavior in the same group are given the label "feminine." On one level, persons may be described using these patterns as a basis for comparison. As a result, we can remark that a certain man (or woman) is masculine, or that they behave in a way that is stereotypically associated with men. On the other hand, the same patterns may be seen at the collective level as well. The development and upkeep of masculinities are all largely influenced by societal institutions, including but not limited to businesses, armies, governments, and schools. A research conducted in the workplace came to the conclusion that masculinities are collaboratively determined in the working environment. Moreover, according to the results of studies conducted in the field of criminology, masculinities are defined collectively in informal organizations such as street gangs (Mallet, 2015).

There is also the possibility that society may see masculinity in an impersonal manner. For instance, video games do not only propagate cliched ideas of what it means to be a physically dominant and aggressively masculine person. The player is required to make this display of masculinity in order to participate in any aspect of the game. It has been shown that the organizational structure of organized sports, which includes the format of competition, the manner of training, and the stringently hierarchical levels and rewards, contributes to the development of an aggressive masculinity in its participants. While the majority of people only fit very inadequately into the cultural niches that have been so formed, images of this masculinity are widely disseminated through sports media.

According to Jenkins (2016), a cultural study of male identity has to begin with the gathering of present social regulations and expectations, followed by the identification of unique cultural norms and the persons who manage those expectations in the society. It is necessary to take into consideration the many ways in which "masculinities" might be combined with the cultural practices of different persons. As Philip Mallet explains in the preface to his book *The Victorian Novel and Masculinity* (Mallet, 2015), "male identity" can only be comprehended in the framework of a certain social and cultural limit. This makes it challenging for a man to completely know his own male identity. In addition, due to the fact that cultures evolve as a result of changing historical conditions, it might be challenging to completely comprehend one's own masculine identity.

According to Roch (2005), masculinity, like femininity and other gender-related issues, is a social construction. In a manner of speaking comparable to this, it is a method for the production of cultural performances that are carried out by members of the society. The many of ways in which people are unique from one another are reflected in the myriad of ways in which diverse cultures and social ideals of masculinity are unique from one another. In spite of this, there are a wide variety of conceptions of what constitutes masculinity, and the vast majority of the time, these conceptions are linked to other cultural constructions as well as individual expectations for things like gender. Roch in her article; *Representations of Masculinity in 'Things Fall Apart' and 'Wide Sargasso Sea'* (2005), analyzes the representations of masculinity in *Things Fall Apart* by Chinua Achebe and *Wide Sargasso Sea* by Jean Rhys. She examines the manner in which Okonkwo and Mr. Rochester present their masculinity by expressing it and the problems that they confront, all the while attempting to mirror these socially created masculinities in their portrayals of themselves. *Things Fall Apart* introduces Okonkwo, the protagonist of the story, as a guy who is courageous, hard-working, and aggressive right from the beginning of the book.



Okonkwo has a slight stammer and whenever he's angry and can't get his words out fast enough, he's going to use his fists ... He's become well known throughout the nine villages and beyond. His reputation is built on solid personal achievements. Not only is he known for his wrestling skills, he also took two titles and displayed remarkable strength in two inter-tribal wars (Achebe, 1958, p.3).

The majority of Okonkwo's warrior attributes, including as aggressiveness, strength, bravery, and great persistence, were regarded as characteristics that males naturally possess and exhibit. Yet a significant portion of Okonkwo's manliness may be attributed to the fame of his exploits as a warrior. The paragraph provides the audience with information on his courage. It is him who is successful in defeating Amalinze the Cat, a seven-year-old fighter who was previously unbeaten. He is the first warrior in history to carry home the severed head of an enemy warrior killed in an inter-tribal conflict. Roch is a symbol of the disparities that may be seen from one culture to another in terms of the standards and expectations that society has around the notion of masculine identity.

Ibo culture, much like western culture before the advent of feminism, organizes its community practices according to the gender norms that prevail in the society. Thus, attributes such as courage and aggression are seen as characteristics of 'masculine' characters, while characteristics such as gentleness, tranquility, passivity, and meekness are regarded as qualities associated with 'women.' For instance, "Agbala" is not just a name for a woman, but it is also considered to be a term for a guy who is seen to be weak and who has not been awarded to any titles within his clan. Roch provides an analysis of Okonkwo's need to emphasize his masculinity, which he attributes to Okonkwo's father, Unoka. The origin of Okonkwo's manliness is made abundantly evident right at the beginning of the poem.

According to Okonkwo,

Unoka, the father, was a disappointment ... he took no title whatsoever, and is heavily in debt when he dies. And so, Okonkwo was dominated by one passion to hate everything that his dad loved. Softness was one of those things (Achebe, 1958, p.11).

For Okonkwo, he is the opposing kind of masculinity, since he manages to establish his own, "proper" societal notion of male identity. Unoka, the "Agbala," is consequently perceived to express his character characteristics of friendliness, lavishness, musicianship, leisure, and peacefulness. The worry that he would be seen as having a low income informs his masculinity type. This is clear to see, Nwoye, in the manner in which he interacts with his family. According to Okonkwo, Nwoye, much like his grandpa Unoka, has a tendency to be too "feminine." He enjoys music, he respects the oral tales that his mother tells (with which he disagrees in order to make his father happy), and, in essence, he is too intelligent. It is clear that Okonkwo has developed a sense of embarrassment as a result of his son's choice to become a Christian, as seen by the way he greets his other sons:

You have now seen your brother's grand abomination. It's not my son or your brother any more. I'm going to have only one son who's a kid, who's going to keep his head among my men. If any of you prefers being a guy, let him follow Nwoye right now while I'm alive so I can curse him. I'll visit you and break your neck if you turn against me when I'm dead (Achebe, 1958,p.126).

Questions on culture, in Ousmane's perspective, are improper, and Mireille does not have permission to interrogate him more on the issue. They have no option except to assimilate into African culture or give up their way of life altogether. Ousmane eventually takes on the role of a traditional husband, one who subjugates his wife to a position of inferiority inside the home. Mireille, who was formerly an equal partner, the perfect girlfriend, and the "blazing light directing his route," has grown into a nagging, unpleasant, and uncompromising wife who has to be put in her place. This is a significant change from her previous roles (Mutunda, 2009).

2.2.3 Religious Ideologies

In *Things Fall Apart*, Chinua Achebe places the Igbo, an agricultural people, in opposition to the colonial system that is dominated by the British. He personifies Igbo ethos by way of the story's protagonist, Okonkwo. Okonkwo is a supporter of traditional male ideals, according to which failure endangers not only the life of the person but also the life of the community. Via Okonkwo Achebe elaborates on the Igbo notion in a fundamental bond, known as "chi," that exists between a human being and God. Chi is a person's destined path in life and is ingrained in them from the moment of creation forward. Chi is an essential component of the character of every single human being. Chi is not God, yet God decides what a person's chi is going to be like. A good Igbo has a goal of reaching a certain level of chi, which can be determined by examining the lines and patterns on a person's palms. The goal of cultivating one's chi will serve as the driving force behind all of an individual's activities throughout their whole life. The individualistic spirit of the Igbo social structure is both expressed and affirmed via the practice of chi.

The Igbo people place a very high value on overcoming challenges since it is ingrained in their culture and seen as a sign of strength. The Igbo believe that predestination is not an unalterable sign of the course that the life of a human being will follow and instead see it as more of a guide. People have the ability to make decisions that can change the direction their lives go. The profound masculinity of Okonkwo's Chi drives him towards an encounter with British imperialists that ends in tragedy. Their Chi has a greater depth than his does. Okonkwo eventually gives in to his Chi, which contributes to the downfall of both himself and his people. The battle is fruitless. Okonkwo wants to establish a sense of distance between himself and what he perceives to be the failings of his family. As a result, Okonkwo has set his sights on being a heroic figure and a powerful man within the framework of traditional Igbo culture. According to Okonkwo, Christianity represents the polar opposite of the Igbo male values. He asserts that the Igbo have managed to maintain these traditionally male characteristics inside their society. Okonkwo said that the Igbo people's cohesiveness is mostly due to their masculinity (Salamone, 2006).

In the book *So Long a Letter* by Mariama Ba, a man is referred to in the culture of the Wolof people as 'jeker k'er, which literally translates to 'husband of the house' and, by implication, the 'first in the house.' This is a title that represents the privileges and responsibilities that a man has toward his family. By walking out on his wife and children, Modou has deprived himself of the ability to be considered a "jeker ker." The Wolof people have always held the belief that this is a dishonorable behavior. There have been documented cases of people taking their own lives as a result of a scandal that made them feel embarrassed. Because of the abundance of material items and money available to them, individuals in today's society lack any feeling of shame or humiliation. At the time of his passing, Modou had not lived up to his responsibilities of providing a secure and prosperous future for his family, as is customary for any respectable man; nevertheless, he had failed to do so (Mutunda, 2009).

3. Research Methodology

This study adopted a textual analysis research design, which involved examining the selected texts to interpret their meaning within social and cultural contexts (Given, 2008). The target population comprised four purposively selected African novels: *The River and the Source* by Ogola, *The Joys of Motherhood* by Emecheta, *From a Crooked Rib* by Farah, and *Imaginations of Sand* by Brink. Data sources included both primary materials (the novels, books, journals) and secondary materials (online documents, theses, magazines). Textual analysis focused on meaning, structure, and cultural elements of the texts. Feminist Theory guided analysis of gender issues, while Deconstruction Theory evaluated how male identities were constructed within the narratives. The study then summarized discussion of findings, conclusions, recommendations, and suggestions for future research.



4. Findings and Discussion

Societal Expectations for Male Characters

The women writers prefer to write about how men in African society are behaving in their relationships with women. Stereotypical characters in the works of these women show how women's viewpoints are shaped by social expectations when writing about men (Mutunda, 2009). Men have been represented with specific personalities and roles, because that is what the society has always expected of them. Hence, feminist authors display these cultural and religious ideologies about male identity, in their texts.

Cultural Ideologies

The society in Ibuza, expects the men to be the bread winners for their families. Nnaife is one of the husbands who struggle to provide for his family by working hard. "... a good husband is expected to pay well for a good girl. That is the way to prove his manhood. If he cannot afford to pay, then he does not deserve a wife." (Emecheta, 1979, p. 232)

However, when Nnaife's job comes to an end, Nnu Ego condemns him for not been man enough to be able to search for other jobs. As observed in the following statement by Buchi; "Not only did life in Lagos rob him of his manhood and of doing difficult work, now it had made him redundant and having to rely on his wife" (Emecheta, 1979, p. 92). At this point, the male character is viewed as a victim of failure in the society. Nnaife withstands the hardships he faces in the war for four years, when he is forced to join the army. And even with these hardships, he is able to provide for his family back in Lagos. However, the text upraises the female character (Nnu Ego) as the mother who struggles to raise her children, which is the source of her joy. However, the representation of the male experiences is not evident in the text and thus, the reader cannot relate with the identity of the male characters. The determination and struggles which the male characters experience, has not been well represented or given emphasis. But rather, much concern is given to the female characters who dominate the entire text.

According to the societal expectations, there are certain features/masculine personalities that only the men are expected to portray. In Brink's text *Imaginings of Sand*, Casper insults Kristen who displays masculine features of bravery, when arguing with her. "He makes an irritable gesture. 'You're too clever by half. You're trying to argue like a man. It doesn't suit you.'... 'That's the last-ditch argument of a loser, Casper, and I won't fall for it. You can't send me to the kitchen, you know.' What are you talking about?" asks Anna, without looking at us. Her eyes are red and puffy. I feel a pang of guilt" (Brink, 1995, p.79). These societal expectations stereotype the male identity, as an expectation and limitation for the men. The male characters should be left out to display their own personalities which defines their identity, but not according to societal expectations.

Religious Ideologies

A critical analysis of Nuruddin Farah's text *From a Crooked Rib*, presents the religious ideologies of Muslim religion that are integrated with gender issues. For Ebla, "she loathed this discrimination between the sexes: the idea that boys lift up the prestige of the family and keep the family's name alive. Even a moron-male cost twice as much as two women in terms of blood-compensation" (Farah, 1970, p.18). These ideologies represent a negative portrayal of the male characters. According to the Muslim religion, it allows polygamous marriage in the society. The grandfather of Ebla had accepted the proposal of an old man who would marry Ebla.

"But none of them was an old man like Giumaleh, the one to whom fate had handed her over. It was yesterday morning that her grandfather had accepted Giumaleh's proposal. He was an old man of forty-eight: fit to be her father. Two of his sons had alternately courted her" (Farah, 1970, p.16). These religious ideologies, initiate a negative portrayal of male characters. This results to the overlook of the male identity and as the author seeks to present the experiences of female characters".



5. Conclusion and Recommendations

5.1 Conclusion

The feminist authors have represented male characters based on the presumed expectations of how a man should behave, rather than their self-identity which they are willing to display as individuals with diverse life experiences. The authors have restricted their portrayal of self-identity, by concentrating on the presentation of women in the society. Firstly, feminist authors have presented the concept of masculinity based on their perception that men should portray certain personalities such as been violent, tough and with muscular body. Male characters who appear to be non-abusive and lack strong muscular body, are regarded as not men enough. These feminist authors fail to construct male identity, by neglecting to represent the men experiences in developing societies and their own acknowledged self-identity.

Secondly, the feminist authors have been influenced by the social ideologies which advocate for superiority of men over the female characters. These are traditional cultural ideologies which are no longer practiced in today's society. Women have now been empowered to fight to their rights both in working places and in marriage life. Still, much concern has also been given on their recognition as opposed to the past. Feminist authors have presented cultural ideologies which display men with a negative image. In certain African societies, cultural ideology such as male dominance, is perceived to promote status of the male characters as this is regarded as male achievement. The authors present the male characters as the source of misery on the female characters.

5.2 Recommendations

In view of the findings, this study make the following recommendations;

The Ministry of Education should assess set books before integrating them into school curricula to ensure balanced representation of both male and female characters. Since gender stereotypes begin at the community level, there is need for targeted awareness programs for parents, teachers, and leaders to redefine societal perceptions of gender and promote equality from early childhood.

Additionally, cultural norms defining rigid expectations of masculinity should be deconstructed to encourage more positive and diverse male identities. Moreover, feminist authors and publishers should strive to adopt inclusive literary practices that portray both genders equitably, ensuring that feminist literature addresses gender as a shared concern and not solely as a women's issue.

5.3 Areas for Further Research Studies

There are certain areas that require further investigation;

Firstly, the dissemination of social male dominance through traditional laws in contemporary society needs to be examined in detail. This research focused on how traditional laws perpetuate male dominance and how it affects society. The study provided insight into the role of traditional laws in shaping gender roles and gender inequality in society.

Secondly, the construction of masculinity represented by Marxist ideology of power and privilege requires evaluation. The study explored the various power structures that shape masculinity and how these structures impact social behavior. Hence, a scholar can analyze how masculinity is constructed through the Marxist theory of power and privilege and how this contributes to gender inequality.

Lastly, a critical analysis of the concept of modern feminism in relation to societal influences needs to be undertaken. This research focused on the current state of feminism and how it is influenced by society. A study can investigate the role of feminism in addressing societal issues such as gender inequality, sexism, and gender-based violence.



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Preparedness for Pandemic Response in Kenya: Lessons from COVID-19 Pandemic

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ABSTRACT

This systematic review evaluates Kenya's pandemic preparedness and response mechanisms, drawing on insights from the country's experience during the COVID-19 outbreak to inform future public health emergency strategies. Following the PRISMA methodology, peer-reviewed literature published between 2020 and 2025 was systematically retrieved from Scopus, Web of Science, PubMed, and JSTOR. Eligible studies focused on key dimensions of pandemic preparedness, including health infrastructure, surveillance capacity, risk communication, supply chain resilience and intersectoral collaboration, with direct relevance to the Kenyan context. The pandemic revealed both notable strengths and persistent vulnerabilities within Kenya's health system particularly in areas such as governance, emergency coordination, community engagement, infrastructure and resource mobilization. The review highlights several successful interventions such as decentralized response systems, flexible information dissemination strategies and decisive leadership during critical phases of the crisis. However, it also identifies significant challenges, including fragmented coordination, under-resourced health facilities, limited integration of pandemic planning into national frameworks, and disparities in public trust. These findings underscore the urgent need for sustained investment in health systems, institutionalization of adaptive governance, and inclusive risk communication strategies that reflect local realities.

Keywords: Pandemic preparedness, COVID-19, Kenya, governance, surveillance, public health infrastructure, legal frameworks

1. Introduction

Pandemics represent one of the most formidable challenges to global health, economic stability, and societal cohesion. The 21st century has witnessed a succession of public health emergencies including SARS, MERS, Ebola, and most recently, the COVID-19 pandemic that have exposed critical vulnerabilities in health systems worldwide. These crises have underscored the urgent need for robust, adaptable, and inclusive pandemic preparedness frameworks capable of mitigating the far-reaching impacts of infectious disease outbreaks.

Developing countries, such as Kenya, face heightened risks due to fragile health infrastructure, constrained resources and socio-economic disparities. The COVID-19 pandemic served as a stress test for Kenya's health system, revealing both commendable strengths and deep-seated systemic challenges. While the country demonstrated agility in implementing containment measures such as border closures, curfews, and the rapid establishment of isolation and treatment centres the scale and complexity of the pandemic placed immense pressure on governance structures, emergency coordination, and public trust.

Kenya's health system operates within a devolved framework, with responsibilities shared between national and county governments. Prior to COVID-19, the country had experience managing localized outbreaks of diseases such as cholera, malaria, and arboviruses. However, the pandemic's unprecedented scope demanded a level of coordination, resource mobilization, and community engagement that stretched existing capacities. The Ministry of Health led the national response, supported by civil society, international partners, and inter-agency collaboration. Public health



campaigns were launched to promote preventive behaviours, and efforts were made to expand testing and accelerate vaccine deployment.

Despite these proactive measures, the pandemic exposed critical gaps. These included fragmented coordination across devolved units, under-resourced health facilities, inequitable access to essential services, and challenges in fostering sustained public trust. As COVID-19 transitions into an endemic phase, it is imperative for Kenya to reflect on its pandemic response and strengthen its preparedness for future health emergencies.

This systematic review synthesizes peer-reviewed literature to assess Kenya's pandemic preparedness through the lens of its COVID-19 experience. The study aims to identify key lessons that can inform policy reform, strategic planning, and investment in health system resilience. Ultimately, the goal is to support the development of a proactive, inclusive, and contextually grounded public health infrastructure capable of safeguarding Kenya's population against future outbreaks.

2. Literature Review

2.1 Global and Regional Perspectives on Pandemic Preparedness

Numerous studies have emphasized the importance of coordinated, multisectoral approaches to pandemic preparedness. Globally, the COVID-19 pandemic catalysed a surge in research examining the effectiveness of surveillance systems, emergency response protocols, and health infrastructure resilience. For instance, studies by Kickbusch et al., 2020 and Lee & Chen, 2021 highlight the role of political leadership and community trust in shaping outbreak outcomes. Regionally, research from sub-Saharan Africa underscores the compounded challenges faced by low- and middle-income countries, including limited laboratory capacity, supply chain fragility, and underfunded health systems (Nkengasong et al., 2020).

Comparative analyses reveal that countries with prior epidemic experience such as Nigeria's response to Ebola demonstrated relatively faster mobilization and coordination during COVID-19. These insights offer valuable benchmarks for Kenya's preparedness trajectory.

2.2 Kenya's Historical Response to Epidemics

Kenya has a documented history of managing infectious disease outbreaks, including cholera, malaria, Rift Valley fever, and sporadic Ebola threats. These experiences have contributed to the development of emergency response protocols and community-based surveillance systems. For example, the 2015 cholera outbreak prompted improvements in water sanitation monitoring and inter-agency coordination.

However, the scale and complexity of COVID-19 far exceeded previous emergencies, revealing structural weaknesses in preparedness planning. Studies by Barasa et al., 2021 and Mbau et al., 2022 emphasize the need for sustained investment in health infrastructure, decentralized response capacity, and inclusive governance models.

2.3 Research Objectives

- i. To review Kenya's Preparedness for Pandemic Response during the COVID-19 pandemic
- ii. To identify Kenya's Emergency Response challenges during the COVID-19 pandemic.
- iii. To analyse Emergency Response Lessons from Kenya's COVID-19 pandemic experience

3. Methodology

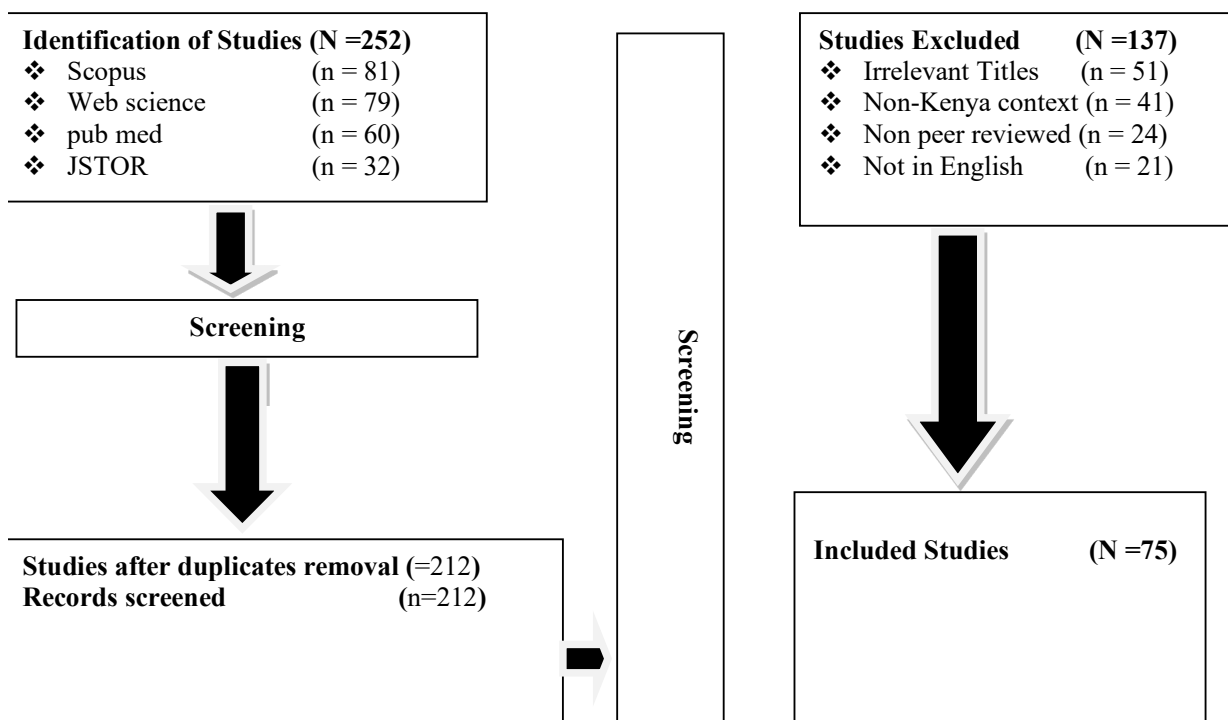
A systematic review was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). Peer-reviewed literature published between 2020 and 2025 was retrieved from Scopus, Web of Science, PubMed, and JSTOR databases. The search utilized specific keywords related to "Kenya," "Pandemic Preparedness," "COVID-19," and various health system components. Studies were included if they were peer-reviewed journal articles, systematic reviews, or meta-analyses, published in English within the specified timeframe and focused on or had applicability to the Kenyan context regarding pandemic preparedness and response components. Excluded were editorials, opinion pieces, conference abstracts without full papers and studies not focused on Kenya. Full texts of eligible studies were assessed and documented through a PRISMA flow diagram. A narrative synthesis approach was employed to identify and categorize recurring themes across studies

4. Results and Discussions

Overview of Included Studies

From an initial pool of 252 articles identified through database searches, 75 studies met the inclusion criteria following a screening and full-text review. The selection process adhered to PRISMA guidelines and methodological integrity. The PRISMA flow diagram (Figure 1) outlines the stages of identification, screening, eligibility assessment and final inclusion.

Figure 1: PRISMA Flow Diagram of Study Selection Process



Characteristics of Included Studies

Characteristics of Included Studies (N=75)			
Characteristics	Category	Frequency	Percentage (%)
Articles by Year	2020-2021	42	56.00
	2022 -2023	19	25.33
	2024 - 2025	14	18.67
Publication Outlets	Peer-Reviewed Journals	60	80.00
	Reputable Journals	15	20.00
Thematic Categorization	Health Infrastructure and Workforce	23	30.67
	Governance And Coordination	19	25.33
	Risk Communication Strategies	16	21.33
	Surveillance/Data Systems	17	22.67

Key: N = Number of Studies

Distribution of Articles by Year

There was a sharp rise in pandemic-related publications post-2020, coinciding with the global disruption caused by COVID-19. This suggests a surge in scholarly attention and urgency around pandemic preparedness, with more than half of the literature (56%) emerging in 2020–2021. The sustained momentum into 2022–2023 reinforces continued relevance and evolving challenges in health systems and emergency responses.

Publication Outlets

A dominant 80% of studies were published in peer-reviewed journals, affirming the academic rigor and credibility of the included research. The remaining 20% appeared in reputable outlets, possibly institutional reports or sector-based publications, which still lend practical insights but may vary in methodological strictness. This distribution signals a strong scholarly consensus on pandemic response strategies, grounded in evidence-based practices.

Thematic Categorization

Health Infrastructure and Workforce was the most studied theme (30.67%), underscoring the centrality of health system capacity in pandemic preparedness. Governance and coordination (25.33%) also featured prominently, highlighting the importance of leadership and institutional frameworks. Surveillance/data systems (22.67%) and risk communication strategies (21.33%) were slightly less emphasized but still represent critical components in managing public health emergencies. The distribution suggests a relatively balanced but health-system-skewed focus across pandemic preparedness dimensions.

Kenya's Preparedness for Pandemic Response

Kenya's response to the COVID-19 pandemic was characterized by a combination of proactive policy interventions and underlying systemic vulnerabilities. While the country demonstrated notable agility in mobilizing multisectoral coordination and deploying digital surveillance tools, its overall preparedness was partial and uneven. Key gaps were evident in financing, health infrastructure, and legal frameworks, which collectively constrained the effectiveness and sustainability of the national response.

Governance and Coordination Preparedness

Governance and coordination mechanisms during the pandemic were largely reactive rather than anticipatory. Although the government swiftly established the National Emergency Response Committee (NERC) and disseminated public health guidelines, there was no pre-existing, rigorously tested national pandemic preparedness strategy at the onset of the crisis (MoH, 2020). This absence



of a foundational framework limited the coherence and timeliness of the response. Coordination between national and county governments was inconsistent, with many counties reporting ambiguity regarding their roles, resource allocations, and operational protocols (Odhiambo et al., 2023). While Kenya had developed strategic documents such as the Health Sector Strategic Plan and the Disaster Risk Management Policy, these frameworks had not been adequately adapted to address the unique demands of a pandemic scenario (Wanjala & Ngugi, 2022). As a result, governance efforts were frequently undermined by delays in decision-making, duplication of responsibilities, and misallocation of critical resources. These challenges were compounded by limited institutional resilience and the absence of prior simulation exercises or contingency planning, which could have facilitated more effective implementation of measures such as lockdowns, social support systems, and risk communication strategies.

This reactive posture reflects a broader gap in systems thinking and integrated emergency planning core principles embedded in global health security frameworks such as the International Health Regulations (WHO, 2022). While Kenya's leadership was prompt in issuing political directives, the lack of operational preparedness and adaptive governance mechanisms hindered the country's ability to mount a coordinated and sustained response.

Health Infrastructure and Supply Chains Preparedness

Kenya's health infrastructure was largely unprepared for the sudden surge in demand for critical care. Before the pandemic, the country faced chronic challenges, including a shortage of specialists, insufficient tertiary care services with intensive care units (ICUs), and a general lack of medical equipment (Mbugua et al., 2023). The pandemic placed immense strain on these limited resources, leading to a diversion of funds and human resources from other vital health programs, such as maternal and child health (Mbugua et al., 2023). The global disruption of supply chains further exposed Kenya's vulnerabilities. The country experienced acute shortages of Personal Protective Equipment (PPE), diagnostic kits, and laboratory reagents, which posed serious risks to frontline healthcare workers and hindered timely diagnosis and containment efforts (Mwakisha, 2023). In response, the government and local industries undertook initiatives to promote domestic manufacturing of PPEs. While these efforts demonstrated adaptability and resilience, concerns were raised regarding the quality and consistency of locally produced items (Mwakisha, 2023). Procurement processes at both national and county levels proved to be rigid and bureaucratic, impeding the timely acquisition and distribution of essential supplies. The lack of streamlined emergency procurement protocols delayed critical interventions and highlighted the absence of a responsive and agile supply chain system (Mwakisha, 2023). This gap in emergency logistics and supply chain management served as a clear indicator of the fragility of Kenya's health infrastructure and supply chain mechanisms, emphasizing the urgent need for strategic investments in health system capacity, local manufacturing capabilities and flexible procurement frameworks to enhance future outbreak readiness.

Surveillance and Data Management Systems Preparedness

Kenya demonstrated significant strengths in its surveillance and data management systems, which were arguably some of the most prepared aspects of its response. The country already had a well-established sentinel influenza surveillance system, which was quickly adapted to monitor SARS-CoV-2 activity (Musyoki et al., 2024). The Ministry of Health successfully expanded its event-based surveillance (EBS) system, using community health volunteers and an electronic tool for real-time data collection (Ochieng et al., 2023).

However, data collection was not without its flaws. A key limitation was the focus on testing symptomatic cases and international travellers, which likely led to an underestimation of the true number of infections within the community (Otwombe et al., 2023). Poor information management and a lack of a clear mechanism for cascading national information to sub-national levels also hampered the real-time implementation of response measures, particularly in resource allocation and healthcare worker



protection (Kamara & Essien, 2022). The absence of a fully operationalized multi-hazard public health emergency preparedness plan prior to the pandemic meant that while data was being collected, the framework for its effective use was still being built on the fly (Doyle & Ikutwa, 2021).

Institutional and Legal Preparedness

Legal and institutional preparedness was one of the weakest links in Kenya's pandemic readiness. The country had existing legal instruments, such as the Public Health Act, that gave the government broad powers to implement public health measures. However, these frameworks were not well-aligned with the realities of a modern, devolved state and a large-scale pandemic. The enforcement of measures like curfews and lockdowns by the National Police Service, while legally sanctioned, led to significant human rights concerns and public outcry (Chrips, 2020). Legal ambiguities over lockdowns, quarantines, and public assembly restrictions led to litigation, further delaying response actions (Omondi, 2022). Additionally, the legal framework lacked clear provisions for emergency funding, inter-sectoral coordination, or protection of marginalized groups during a health crisis (KELIN, 2022). Pandemic preparedness had not been adequately integrated into national legal reforms or health policy instruments prior to 2020, indicating a reactive rather than proactive legal environment. While some emergency executive orders were issued, the absence of legally binding preparedness obligations for counties, schools, workplaces, and religious institutions created an uneven landscape of compliance and enforcement. Therefore, Kenya's institutional and legal infrastructure was not adequately primed for pandemic response, undermining the government's ability to act swiftly and constitutionally.

Financing and Sustainability Preparedness

A fundamental challenge in Kenya's pandemic preparedness landscape lies in the persistent shortfall of sustainable financing. Despite the Abuja Declaration's recommendation that 15% of national budgets be allocated to health, Kenya's health sector has consistently received less than this benchmark. Notably, in the fiscal year 2023/24, pandemic preparedness accounted for less than 1% of the total health budget, an allocation that underscores the limited prioritization of long-term health security.

Between 2016 and 2019, up to 90.2% of surveillance funding was sourced from external donors. While this support was instrumental in bridging immediate gaps, it also exposed the country to significant vulnerabilities, particularly as global funding priorities evolved. The proposed establishment of a National Pandemic Preparedness Fund and the introduction of a health security levy represent commendable steps toward domestic resource mobilization.

Emergency Response Challenges

Kenya's emergency response to the COVID-19 pandemic faced several critical challenges, often stemming from the pre-existing weaknesses.

Multisectoral Coordination

Although national taskforces were established to guide the pandemic response, intersectoral collaboration remained fragmented. Key ministries including Health, Education, ICT, and Transport often operated in silos, resulting in delayed and disjointed interventions (Kimani et al., 2023). These coordination lapses were particularly evident during vaccine rollout and resource mobilization, where inefficiencies undermined equitable access and timely delivery.

Tensions between national and county governments further complicated the response. Overlapping mandates, policy duplications in certain counties, and neglect in others created inconsistencies in implementation and accountability (Muriithi & Kithure, 2021; Odhiambo & Opiyo, 2022). The absence of a unified national pandemic preparedness blueprint exacerbated these challenges, leaving institutions without clear guidance on roles, responsibilities, and escalation protocols.

A comparative lens offers valuable insight: Ethiopia's early development of a National COVID-19 Emergency Preparedness and Response Plan provided a structured framework for multisectoral coordination, delineating responsibilities across government levels and sectors. This approach facilitated more harmonized and efficient action (Bekele et al., 2021).

Institutional Fragmentation

Kenya's institutional landscape during the pandemic was marked by unclear mandates and bureaucratic inertia, which collectively undermined the efficiency of emergency responses. The absence of scenario-based planning and simulation exercises prior to the outbreak contributed to a reactive posture, with decisions often made under pressure and without the benefit of pre-established protocols (Mwakisha, 2023). This lack of foresight and coordination impeded the development of a cohesive national response strategy.

Health Infrastructure and Supply Chain Readiness

The pandemic placed immense pressure on Kenya's public health infrastructure, exposing longstanding vulnerabilities. Health facilities across the country grappled with acute shortages of Personal Protective Equipment (PPE), limited Intensive Care Unit (ICU) capacity, and insufficient oxygen supplies (Wangari & Ochieng, 2022). These deficits were compounded by fragile global and domestic supply chains for essential medical commodities including testing kits, vaccines, and PPE (Karanja & Waithaka, 2022).

Procurement inefficiencies, logistical bottlenecks, and inequitable distribution patterns further strained the system. Kenya's heavy reliance on international donations and its limited bargaining power in competitive global markets underscored the urgent need to invest in localized manufacturing and diversify supply routes.

Despite these constraints, the rapid repurposing of existing health facilities and the strategic deployment of community health workers provided critical support, particularly in densely populated informal settlements (Angwenyi et al., 2023; Chengo et al., 2022). This adaptive capacity demonstrated the resilience embedded within Kenya's health system and emphasized the importance of flexible resource allocation and community-level engagement during public health emergencies. A regional comparison highlights Nigeria's approach: faced with similar global supply chain disruptions, Nigeria leveraged public-private partnerships and local manufacturing to mitigate PPE shortages, showcasing the potential of domestic innovation and collaboration in crisis response (Adepoju, 2021).

Surveillance and Information Systems

The integration of digital tools and mobile contact tracing applications represented a notable advancement in Kenya's disease surveillance and data management capabilities (Muthoni et al., 2022; Ndegwa et al., 2023). These innovations facilitated more efficient tracking of vaccinations and monitoring of disease transmission. However, persistent inconsistencies in data quality and difficulties in harmonizing inter-county data systems significantly impeded the effectiveness of these tools. Despite intensified surveillance efforts, studies highlighted limitations in real-time data collection, analysis, and dissemination across various levels of the health system (Githae & Muthoni, 2021). These gaps hindered the ability to accurately monitor disease progression, identify emerging hotspots, and implement timely, evidence-based interventions. Furthermore, the integration of community-based surveillance data with formal health system records remained a persistent challenge, limiting the comprehensiveness of the national surveillance apparatus.

A comparative example from South Africa illustrates the value of centralized coordination: the National Institute for Communicable Diseases (NICD) played a pivotal role in consolidating surveillance data and integrating digital platforms, thereby enhancing the country's capacity for rapid response and strategic planning (Karim & de Oliveira, 2020).



Risk communication and Public Trust

Risk communication emerged as a vital yet complex element of Kenya's pandemic response. Initial efforts, including regular briefings by the Ministry of Health, were instrumental in building public trust and disseminating critical health information (Wanyama et al., 2021). However, as the pandemic progressed, public confidence eroded due to inconsistent messaging, the spread of misinformation and conspiracy theories, and perceived discrepancies in government communication and enforcement of health policies (Ndung'u & Nyambura, 2024; Owuor & Ochieng, 2023). This decline in trust significantly hindered public adherence to essential health directives, such as mask-wearing and vaccination uptake, complicating efforts to drive behavioural change. A recurring theme in the literature was the absence of inclusive, culturally sensitive communication strategies that engaged trusted community leaders and addressed local contexts (Cholo et al., 2025; Kaduka et al., 2025).

In contrast, Uganda's proactive collaboration with religious and community leaders in public health messaging contributed to improved compliance and community engagement, underscoring the importance of localized participatory communication approaches (Ssekamatte et al., 2022).

Resource Shortages and Supply Chain Vulnerabilities

Kenya faced acute shortages of essential medical supplies during the pandemic, including PPE, ICU beds, and oxygen (Wangari & Ochieng, 2022). The country's heavy reliance on international supply chains exposed it to significant procurement and distribution challenges, particularly amid global competition and export restrictions.

The lack of domestic manufacturing capacity further exacerbated these vulnerabilities, leaving Kenya susceptible to external shocks and delays. These challenges highlighted the urgent need to invest in local production capabilities, strengthen supply chain resilience, and establish strategic reserves to mitigate future disruptions.

Emergency Response Lessons

Kenya's COVID-19 response offers valuable lessons for future preparedness. The country demonstrated adaptability through rapid repurposing of health facilities and mobilization of community health workers, especially in underserved areas (Angwenyi et al., 2023). However, the absence of a comprehensive national pandemic blueprint led to reactive strategies and inefficiencies. Comparative analysis with historical pandemics, such as the 1918 influenza outbreak, suggests that Kenya had not fully internalized past lessons into institutional planning (Gathogo, 20235).

The following key lessons offer strategic guidance for strengthening future emergency preparedness and response:

Comprehensive Multisectoral Planning

The pandemic highlighted the consequences of fragmented intersectoral collaboration, often marked by bureaucratic silos and ad hoc coordination. A comprehensive national pandemic preparedness blueprint is essential one that clearly delineates roles across sectors such as health, education, transport, and ICT, and embeds shared accountability frameworks within national development and economic planning. Regular simulation exercises and capacity-building initiatives should be institutionalized to ensure readiness. Comparative experiences from countries like Ethiopia, Rwanda, and South Africa illustrate the effectiveness of proactive planning and integrated surveillance systems in mounting coordinated responses. Kenya's experience underscores the imperative of investing in systems and structures before a crisis unfolds.

Decentralized Action Requires National Alignment

Kenya's devolved governance model enabled localized and agile responses during the pandemic. However, the effectiveness of decentralization was undermined by the lack of a coherent national

framework. To optimize this model, future preparedness efforts must empower county-level structures while establishing robust mechanisms for coordination, accountability, and policy harmonization between national and subnational governments. This alignment is essential to prevent fragmentation, duplication of efforts

Building Resilient Health Infrastructure and Supply Chains

The pandemic exposed significant vulnerabilities in Kenya's health infrastructure, including shortages of PPE, oxygen, and ICU capacity. A critical lesson is the urgent need for sustained investment in public health systems and the development of domestic manufacturing capabilities for essential medical commodities. Establishing strategic national stockpiles and diversifying procurement channels will be vital to reducing dependency on volatile global supply chains and enhancing national resilience.

Enhancing Integrated Surveillance and Data Management

Digital innovations in surveillance and vaccination tracking demonstrated the potential of technology to improve disease monitoring. However, inconsistencies in data quality and limited inter-county integration hindered real-time decision-making. Future efforts must prioritize the development of a unified national data platform that enables comprehensive, accurate, and timely epidemiological analysis. Strengthening the integration of community-based surveillance with formal health system data is equally crucial for capturing a holistic picture of disease progression. Additionally, Kenya's over-reliance on external funding for surveillance and response presents a sustainability risk that must be addressed through domestic resource mobilization.

Fostering Transparent, Consistent and Inclusive Risk Communication

Public trust emerged as a fragile yet essential component of the pandemic response. Initial gains through Ministry of Health briefings were later eroded by inconsistent messaging, misinformation, and perceived policy contradictions. A key lesson is the importance of transparent, consistent, and culturally sensitive communication strategies. Future preparedness plans must establish unified communication channels, actively counter misinformation, and engage trusted community leaders to disseminate public health messages. Tailoring communication to local contexts and cultural nuances is vital for fostering compliance and sustaining public trust.

3. Conclusion and Recommendations

3.1 Conclusion

Kenya's experience with the COVID-19 pandemic offers profound and invaluable lessons for strengthening future outbreak preparedness. While the country demonstrated remarkable resilience, adaptive capacity, and strong community engagement in specific areas, the pandemic also laid bare deep-seated systemic vulnerabilities within its health system, governance structures, and public trust. Addressing these identified gaps systematically is crucial for building a more robust and resilient public health infrastructure.

3.2 Recommendations

To safeguard public health and significantly enhance national resilience against future pandemics, this systematic review puts forth the following recommendations:

Policy and Governance

Legislative Reform: Enact and regularly review laws to align with Kenya's devolved governance structure, ensuring clarity in roles and responsibilities across national and county levels.

National Preparedness Framework: Institutionalize and routinely update a multi-sectoral National Pandemic Preparedness Plan with clearly defined mandates and accountability mechanisms.



Health System Strengthening: Increase domestic funding for the health sector to meet the Abuja Declaration target of 15%, reduce donor dependency and address health workforce shortages through increased recruitment

Surveillance and Data Management

Integrated Systems: Invest in real-time, interoperable disease surveillance platforms that facilitate seamless data sharing across counties and sectors.

Community Integration: Strengthen the linkage between community-based surveillance and formal health system data to enhance early detection and response.

Risk Communication

Strategic Messaging: Develop transparent, consistent, and culturally sensitive communication strategies to counter misinformation and foster public trust.

Community Engagement: Involve trusted local leaders and institutions in disseminating public health messages tailored to diverse cultural contexts.

Strengthening Supply Chain Resilience:

Implement strategies to enhance national self-sufficiency in essential medical supplies and commodities. This includes promoting local manufacturing, diversifying international procurement sources to reduce reliance on single suppliers, and establishing strategic national stockpiles.

Future Research Priorities

Impact Assessment: Conduct longitudinal studies on the pandemic's effects across different population groups and health system components.

Policy Evaluation: Assess the effectiveness of post-COVID reforms and preparedness strategies.

Regional Comparisons: Promote comparative research across East African countries to identify best practices and foster regional collaboration.

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The Influence of Idea Generation by Non-Teaching Staff on Service Delivery in Secondary Schools in Embu County

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ABSTRACT

The engagement of non-teaching staff in secondary schools is expected to contribute to effective service delivery. However, in Kenyan secondary schools, poor service delivery continues to be reported despite the critical role non-teaching staff play in school advancement. The main focus of the study was on the effect of idea generation by non-teaching staff on service delivery in secondary schools in Embu County. Adopting a cross-sectional survey research design and grounded on pragmatist philosophy, the study employed a mixed-methods approach. The target population included 1,803 non-teaching staff, 208 principals, and 208 Board of Management (BoM) chairpersons. Stratified and proportionate systematic sampling ensured representative selection across school categories and sub-counties. A total of 317 non-teaching staff completed questionnaires, while 10 principals and 10 BoM chairpersons participated in interviews and focus group discussions respectively. Validity and reliability of the instruments were confirmed through construct, content, and face validity, and Cronbach's alpha coefficient. Data analysis involved descriptive statistics (mean and standard deviation), and correlation analysis for quantitative data; and thematic analysis for qualitative data. Results were presented using tables, and themes. The results indicated that idea generation was low with key barriers including fear and intimidation, poor communication channels, lack of confidence and low self-esteem, lack of opportunities and platforms, and resource constraints. However, drivers such as effective communication, inclusive leadership, recognition, collaborative leadership, regular staff development forums and training emerged as essential for fostering innovative work behaviour, trickling down to enhanced service delivery by non-teaching staff. The study concluded that there is a positive and significant relationship between idea generation and service delivery in secondary schools in Embu County. The study recommends that school management, led by principals and supported by Boards of Management (BoM), establish structured and inclusive platforms for harnessing idea generation among non-teaching staff in secondary schools.

Keywords: Idea generation, innovative work behaviour, service delivery, non-teaching staff, secondary schools

1. Introduction

Globally, effective service delivery is recognized as a critical aspect of progressive organizations. Efficient service delivery in institutions of learning is determined by knowledge management of human resources, less time spent in carrying a transaction, high level of responsiveness, stakeholder satisfaction, innovative work behaviour, targets realization and supportive organizational structure and culture (Hussein et al., 2022). The non-teaching staff in secondary schools not only play a fundamental role in the student's achievement but also in ensuring organizational success by facilitating the attainment of goals and objectives.

Service delivery in secondary schools refers to how services from different sections are offered to the clients. These services offered are diverse and are also provided by various offices and sections. For example, teaching services are offered by teaching while auxiliary and maintenance services are



offered by non-teaching staff. Service delivery by non-teaching staff also comprises complementary roles and responsibilities undertaken to support academic achievement and the smooth running of secondary school (Kivindu, 2015). Such roles include maintaining facilities, ensuring a safe and secure environment; cooking, counselling services, and pastoral care; providing library services and financial services among other roles. Some of the support staff required in secondary schools includes; bursars, security officers, librarians, secretaries, matrons, accountants, cooks, procurement officers, storekeepers, sports coordinators, laboratory technicians, Drivers, Nurses/ Clinical Officers, Casuals, artisans, cleaners, herders, canteen operators, and messengers among others (United Kingdom Department of Education, 2021).

The innovativeness of support staff in secondary schools has been described by Hosseini and Shirazi (2021) as a significant contributor to secondary school education competitiveness, learner improvement in academic achievement, and workers' experiences and addresses staff turnover antecedents. In fostering innovativeness and creativity among support staff, researchers have identified that idea generation, creativity, innovation and knowledge management as having contributed significantly to the nature of services rendered in the United Kingdom, Netherlands, Australia, Pakistan, India and United States (Martono et al., 2018).

In African countries, Christopher et al. (2022) reported calls for improving service provision by non-teaching staff in secondary schools in Nigeria, Tanzania, Uganda, South Africa, Ghana and other African nations. Some of the challenges pointed out were poor welfare and management of support staff, little involvement in decision-making, poor conducive working environment and limited skills and professional competencies.

Locally, service provision by support staff in Kenya is fundamental to achieving quality education, students learning achievements, addressing workers' turnover antecedents and improving people's quality of life (Onyango et al., 2022). Like other African countries, secondary schools in Kenya have also attempted to improve efficiency and effectiveness in service delivery with no success. The persistent decline in the efficiency of services delivered by non-teaching staff in secondary schools raises concerns about the role of innovative work behaviour (IWB) in service delivery in secondary schools. This backdrop lays an avenue for research.

1.1 Statement of the Problem

The operational efficiency in secondary schools depends on how services are delivered to stakeholders. The nature of services offered by the non-teaching staff in secondary schools contributes significantly to school advancement. Therefore, the services provided by the non-teaching staff are expected to be sustainable and enhance customer experience continuously. This underpins the indispensable need for service innovation, hence the need to pursue innovative work behaviour of the non-teaching staff (Newman, 2014). Consistent with the above observations, secondary school principals are expected to be on the frontline in creating conducive and enabling environment for non-teaching staff. The Ministry of Education had also mandated the School Board of Management power to recruit, promote, develop, and remunerate supportive staff, and put-up measures that ensure support staff offer efficient services to the learners and other workers. Ideally, these measures are expected to foster efficiency and effectiveness in service delivery in secondary schools. However, poor service delivery by non-teaching staff has continued to be reported in secondary schools by Arungo and Kipkebut (2021). The inefficiency is largely attributed to poor remuneration, late payments, lack of elaborate scheme of service, limited skills and competencies; unfriendly working conditions, lack of involvement in decision-making, and weak policy for non-teaching staff. This study will attempt to fill this gap by examining the effect of idea generation by non-teaching staff on service delivery in secondary schools in Embu County, Kenya through answering the hypothesis; There is no statistically significant relationship between idea generation by non-teaching staff and service delivery in secondary schools in Embu County.

2. Literature Review

Idea generation involves looking for better alternatives for improving the services or products offered through gathering and reorganizing information to solve problems faced in service and product delivery (Bos-Nehles et al., 2017). The study was informed by the dynamic componential model of creativity and innovation in organizations. The model was first developed in 1988 by Teresa Amabile. Based on the theory, two major external environmental factors were also identified as drivers for motivation to innovativeness, there are, resources and leadership practices. Thus, the dynamic model of creativity and innovation in organizations can be adopted in the current study to explain idea generation as a component of innovative work behavior.

Globally, Factors such as leadership, organizational culture, employee engagement and organizational climate of the workplace have been found to influence idea generation to a large extent (Jandy & Eugenio, 2020). Similarly, in developing and African countries, Dorner (2012) observed that Innovative work behaviour directly affects employees' job performance, directly influencing their service delivery. In Kenya, idea generation at the work level is highly facilitated through the creation of an atmosphere for creativity, problem identification, information seeking and problem-solving (Gichohi, 2014).

3. Materials and Methods

The study was conducted in Embu County where the service delivery by the non-teaching staff was described as being unsatisfactory (Arungo and Kipkebut, 2021). The study adopted pragmatism paradigm following its high level of flexibility using numerous dimensions. The approach adopted in this study was a mixed-method research approach. The subjects of the study were drawn from 208 principals, 208 BoM chairs, 1803 non-teaching staff which makes up a total target population of 2226 respondents. In selecting the sampling group from the target population, proportionate simple sampling technique was applied. A sample size of 337 respondents was achieved with 10 principals selected from 5 sub-counties, 10 BoM chairs from 5 sub-counties and 317 non-teaching staff from 140 secondary schools. The study utilized questionnaire tools on the non-teaching staff, an interview guide on principals and focused group discussions for the BoMs. A pre-testing of the research instruments was done in Tharaka Nithi County which has similar characteristics to those in Embu County. The validity of research instruments was done. The reliability in the study was determined by assessing the instruments that were pretested. The collected data was checked for completeness and keyed into SPSS, where the Cronbach alpha values for the study's independent, dependent and moderating variables were computed and evaluated. A threshold Cronbach alpha value of 0.70 is acceptable and reliable. Quantitative data were analysed descriptively (mean, standard deviation) and inferentially (correlation), while qualitative data underwent thematic analysis. Results were presented in tables and themes.

4. Results and Discussion

The study involved distributing 317 questionnaires to non-teaching staff in secondary schools out of which, 258 were returned and accepted representing a response rate 81.3%. For qualitative data the response rate was 100% for both the principals in the interviews and BoM chairs in focus group discussion.

The reliability analysis for the study variables was conducted using Cronbach's Alpha coefficient, which measures internal consistency or the extent to which items within a scale are correlated and thus reliably measure the same construct. The reliability findings indicated a Cronbach's Alpha value of 0.837 which indicated that the variable was acceptable and reliable ($\alpha > .70$).



Background Information of Respondents

The background information of respondents was key to this study. The study was interested on background aspects regarding gender, highest level of academic qualification, years of experience, job title, and department.

The analysis of the gender distribution of non-teaching staff in secondary schools in Embu County revealed that 52.3% were female, while 47.7% were male. These findings indicate a relatively balanced representation of gender among non-teaching personnel. The distribution of academic qualifications among the non-teaching staff in secondary schools in Embu County indicated that the majority of non-teaching staff in secondary schools hold a Diploma, followed by those with a Form Four Certificate, and those with a Standard Eight Certificate. This data suggests that a majority of the non-teaching workforce possess mid-level academic qualifications, with relatively few attaining higher education credentials.

The length work experience of non-teaching staff in secondary school was also ascertained. The data reveals that the largest group of non-teaching staff, 46.1%, have been working in secondary schools for between 1 and 5 years. This shows that the majority of the non-teaching staff have less than 10 years of experience in secondary schools. The department where non-teaching staff works in secondary schools was also of interest in this study indicating that the most populated departments among non-teaching staff in secondary schools in Embu County were Catering/Kitchen/Cafeteria (20%), Security (12%), Administration (12%), Farm (10%), Account/Finance (9%), and Library (8%).

Idea Generation by Non-Teaching Staff for Supporting Service Delivery in Secondary Schools

This was the main objective of the study. The first question in this objective used a five-point Likert scale relating to the main variable. It had choices whose rating scale was Strongly Disagree (SD)=1, Disagree (D)=2, Neutral (N)=3, Agree (A)=4, and Strongly Agree (SA)=5. Key findings and interpretations are outlined in Table 1.

Table 1

Idea generation by non-teaching staff in secondary schools in Embu County

Statements on idea generation (N = 258)	This has never happened (0)	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean	Std. Dev
a. I usually spot problems and get concerned about any problem confronting my work	5(1.9%)	7(2.7%)	17(6.6%)	66(25.6%)	118(45.7%)	45(17.4%)	3.63	1.055
b. I considerably spend a lot of time brainstorming solutions to identified problem by thinking loud on several applicable alternatives	3(1.2%)	18(7.0%)	40(15.5%)	90(34.9%)	83(32.2%)	24(9.3%)	3.18	1.098

c. I carry out research, reading and consulting information sources in order to know the best way to solve a problem that I encounter as I dispense my duty	22(8,5%)	36(14.0%)	32(12.4%)	75(29.1%)	69(26.7%)	24(9.3%)	2.79	1.433
d. I love coming up with very many creative ways of solving problems that we face in the school	2(0.8%)	3(1.2%)	45(17.4%)	92(35.7%)	81(31.4%)	35(13.6%)	3.36	1.009
e. I love sharing new ways, procedures, practices, processes, services and solutions for doing my job better with colleagues	1(0.4%)	16(6.2%)	18(7.0%)	71(27.5%)	102(39.5%)	50(19.4%)	3.58	1.093
f. My suggestions on ways for solving work-related problems are somehow new, unique and different from those presented by my colleagues	3(1.2%)	7(2.7%)	26(10.1%)	98(38.0%)	90(34.9%)	34(13.2%)	3.42	1.008
g. I possess adequate skills and knowhow for identifying new solutions to problems, experiences, inconsistencies and deficiencies as I carry out my job	5(1.9%)	11(4.3%)	29(11.2%)	88(34.1%)	105(40.7%)	20(7.8%)	3.31	1.042



h. Our secondary school atmosphere and working conditions allow me to freely brainstorm creative ways of solving day to day problems	8(3.1%)	29(11.2%)	51(19.8%)	80(31.0%)	67(26.0%)	23(8.9%)	2.92	1.242
i. Our school has a platform to collect existing ideas from non-teaching staff	38(14.7%)	41(15.9%)	51(19.8%)	51(19.8%)	56(21.7%)	21(8.1%)	2.42	1.542

The data presented in Table 1 reveals insightful findings on the extent of idea generation practices among non-teaching staff in secondary schools, specifically in relation to service delivery. One of the most outstanding findings was the high level of concern and problem identification demonstrated by the non-teaching staff. A majority of the respondents, 163 (63.1%), either agreed or strongly agreed with the statement: “I usually spot problems and get concerned about any problem confronting my work,” while only 12 (4.6%) disagreed or strongly disagreed, and 66 (25.6%) were neutral. This suggests that non-teaching staff are actively engaged in identifying challenges in their work environment, aligning with the findings of Mutheu and Oduor (2023), who noted that frontline staff play a critical role in service problem detection in schools.

Another noteworthy result was on the willingness of staff to share innovative practices with a recorded mean of 3.58 (SD = 1.09), reinforcing the perception that idea sharing is embedded within the school culture for many respondents. This finding aligns with the study by Githui and Muathe (2021), which found that collaborative sharing of practices significantly improved operational effectiveness in educational institutions.

In contrast, the statement “Our school has a platform to collect existing ideas from non-teaching staff” recorded low levels of agreement with a combined agreement of only 77 (29.8%), while 79 (30.6%) disagreed and 51 (19.8%) remained neutral. This indicated limited formal mechanisms for idea collection. These findings point to a missed opportunity for institutional learning and innovation, consistent with the work of Mutheu and Oduor (2023), who argued that structured idea platforms significantly enhance staff motivation and engagement.

Another similarly weak area was observed in the response to the statement: “Our school management has ways of inspiring the non-teaching staff to think of new ideas to improve service delivery.” Here, majority of the respondents disagreed with only 67 (26.0%) remaining neutral. This suggests inconsistency in managerial efforts across institutions, which may affect creativity and innovation. Literature affirms that leadership support is crucial for fostering an innovative climate (Odhiambo & Wambua, 2021), and its absence can hinder idea development.

Another moderately high score was recorded on the statement, “I love coming up with very many creative ways of solving problems that we face in the school,” which recorded a mean of 3.36 (SD = 1.01). This high standard deviation indicates general agreement with a low standard deviation, suggesting consistent attitudes among respondents. This reflects a positive individual disposition toward creativity, even in the absence of structured support systems.

The researcher also asked respondents state the ways used by the school management to solicit ideas from the non-teaching staff in secondary schools in Embu County. Their responses were summarized in Table 2.

Table 2

Ways used by the school management to solicit ideas from the non-teaching staff in secondary schools in Embu County

Ways used by school management to solicit ideas from non-teaching staff (N = 258)	This has never happened (0)	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean
a. Face to face brainstorm meetings	10(3.9%)	36(14.0%)	94(36.4%)	82(31.8%)	36(14.0%)	2.38	1.015
b. On-line live brainstorm meetings	208(80.6%)	13(5.0%)	14(5.4%)	10(3.9%)	13(5.0%)	.48	1.095
c. Through online web portal	220(85.3%)	11(4.3%)	11(4.3%)	9(3.5%)	7(2.7%)	.34	.921
d. One-one consultation	20(7.8%)	22(8.5%)	118(45.7%)	61(23.6%)	37(14.3%)	2.28	1.063
e. Through suggestion box	185(71.7%)	13(5.0%)	21(8.1%)	22(8.5%)	17(6.6%)	.73	1.291
f. Regular staff meetings	13(5.0%)	33(12.8%)	87(33.7%)	78(30.2%)	45(17.4%)	2.45	1.098

The results in Table 2 highlight various methods employed by school management to solicit ideas from non-teaching staff in secondary schools (N = 258). Among the methods explored, regular staff meetings emerged as the most frequently used avenue for gathering input from non-teaching staff with a mean score of 2.45 (SD = 1.10), suggesting that staff meetings are a moderately common strategy for collecting ideas. The relatively low standard deviation implies consistency in responses across schools. These results are supported by Mwangi and Kosgei (2022), who found that regular face-to-face forums enhance participation and foster a culture of openness among school personnel.

Face-to-face brainstorming meetings also received relatively high endorsement. The mean was 2.38 (SD = 1.02), which is slightly lower than that of regular staff meetings but still reflects moderate usage. The low standard deviation here similarly points to minimal dispersion, indicating that this method is fairly consistently used across schools.

On the other hand, digital methods for idea solicitation were found to be significantly underutilized. Notably, online live brainstorming meetings, the use of a suggestion box, one-on-one consultations with non-teaching staff showed moderate use recorded extremely low usage. Similarly, the use of an online web portal for idea submission “never happened.” These results are indicative of a substantial digital divide in the use of ICT platforms for participatory management in secondary schools, echoing findings by Odhiambo and Makori (2022), who observed that most Kenyan public schools lack the infrastructure and digital culture required to mainstream ICT-based engagement.

The qualitative data was gathered from open-ended questions, interviews and focused group discussion where the respondents were asked to state what hinders idea generation in secondary schools. The challenges noted included, fear and intimidation, poor communication channels, lack of confidence and low self-esteem, lack of opportunities and platforms, and resource constraints.

Service Delivery by Non-Teaching Staff in Secondary Schools, Embu County

The first question in this objective used a five-point Likert scale relating to the main variable. It had choices whose rating scale was Strongly Disagree (SD)=1, Disagree (D)=2, Neutral (N)=3, Agree (A)=4, and Strongly Agree (SA)=5. Key findings and interpretations are outlined in Table 3.



Table 3***Service Delivery by Non-Teaching Staff in Secondary Schools in Embu County***

Statements on service delivery in secondary schools (N = 258)	This has never happened (0)	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean	Std. Dev
a. The working environment at our school is conducive for non-teaching staff to perform better	6(2.3%)	39(15.1%)	75(29.1%)	88(34.1%)	41(15.9%)	9(3.5%)	2.57	1.104
b. The set mechanisms, structures and systems encourages effective service delivery in our school	11(4.3%)	52(20.2%)	74(28.7%)	69(26.7%)	45(17.4%)	7(2.7%)	2.41	1.191
c. Employee empowerment has improved service performance in our school	18(7.0%)	58(22.5%)	55(21.3%)	82(31.8%)	31(12.0%)	14(5.4%)	2.36	1.292
d. The principal usually challenge non-teaching staff to come up with ideas for improving services delivery at our school	21(8.1%)	52(20.2%)	72(27.9%)	68(26.4%)	28(10.9%)	17(6.6%)	2.31	1.314
e. There is no sluggishness in the way services are offered by the non-teaching staff at our school	19(7.4%)	31(12.0%)	54(20.9%)	69(26.7%)	62(24.0%)	23(8.9%)	2.75	1.376
f. Stakeholders have not been complaining of dissatisfaction with the services offered by the non-teaching staff at our school	13(5.0%)	35(13.6%)	58(22.5%)	61(23.6%)	43(16.7%)	48(18.6%)	2.89	1.459
g. The school management usually allocated sufficient financial resources to support service delivery in the school	15(5.8%)	52(20.2%)	61(23.6%)	60(23.3%)	49(19.0%)	21(8.1%)	2.54	1.370

h. The school management avails infrastructure, equipment and facilities required to improve the delivery of services	10(3.9%)	60(23.3%)	57(22.1%)	88(34.1%)	25(9.7%)	18(7.0%)	2.43	1.250
i. The school management takes customer complaints very serious	4(1.6%)	18(7.0%)	43(16.7%)	67(26.0%)	89(34.5%)	37(14.3%)	3.28	1.196
j. The school management avails resources required to improve the delivery of services	9(3.5%)	23(8.9%)	69(26.7%)	90(34.9%)	52(20.2%)	15(5.8%)	2.77	1.150
k. The school management emphasizes on prompt responsiveness to issues identified	6(2.3%)	27(10.5%)	67(26.0%)	84(32.6%)	58(22.5%)	16(6.2%)	2.81	1.153
l. News ideas embraced and implemented have helped non-teaching staff to improve service in our school	16(6.2%)	27(10.5%)	47(18.2%)	94(36.4%)	55(21.3%)	19(7.4%)	2.78	1.275

The findings of Table 3 provides descriptive statistics on the perceptions of non-teaching staff regarding service delivery in secondary schools in Embu County. One of the most positive findings is that school management appears responsive to customer complaints. This item recorded the highest mean of $M = 3.28$ ($SD = 1.20$), indicating generally favourable perceptions with a relatively low variation. Similarly, the results indicated there was no sluggishness in the way services were offered by non-teaching staff. Efficient service delivery is essential for the smooth running of schools, and these findings align with Njoroge and Gikonyo (2023), who note that workforce agility is a key determinant of school effectiveness.

However, the study revealed notable areas of concern. Leadership culture recorded the lowest among all items at $M = 2.27$ ($SD = 1.22$), reflecting a weak leadership culture in motivating innovation. This suggests a gap in transformational leadership practices, as highlighted by Ochieng and Kiragu (2020), who found that inspirational leadership is critical in fostering innovation and service excellence. Another weak area was the perception of the presence of supportive systems and structures for service delivery. Similarly, the results indicated that availability of infrastructure and facilities in service delivery was wanting. This could significantly hamper the productivity of non-teaching staff.

Qualitative data gathered from open-ended questions, interviews and focused group discussion were provided. All respondents were required to state the barriers to effective service delivery by non-teaching staff in secondary schools. The responses noted major challenges including resources



and financial constraints, poor staff motivation and recognition, insufficient training and poor communication.

The study tested the null hypothesis (H_{01}) that there is no statistically significant relationship between idea generation by non-teaching staff and service delivery. The correlation results are shown in Table 4.

Table 4
Correlations analysis between idea generation and service delivery in secondary schools in Embu County

		Y	X1
Y	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	258	
X1	Pearson Correlation	.189**	1
	Sig. (2-tailed)	.002	
	N	258	258

** . Correlation is significant at the 0.01 level (2-tailed).

Based on the results presented in Table 4, a Pearson correlation coefficient was computed to assess the relationship between idea generation (X_1) and service delivery (Y). The results showed a statistically significant positive correlation, $r = .189$, $p = .002$, $n = 258$. This indicates a weak but positive linear relationship between the two variables. Since the p-value (.002) is less than the significance threshold of .01, the null hypothesis (H_{01}) is rejected. Therefore, there is a statistically significant relationship between idea generation by non-teaching staff and service delivery in secondary schools in Embu County.

5. Conclusion and Recommendations

The study concludes that although the generation of ideas among non-teaching staff in secondary schools is significantly influenced by inclusive communication practices, leadership support, and institutional culture, it was generally low. The statistically significant positive relationship between idea generation by non-teaching staff and service delivery indicates that inclusive management practices have a measurable impact on institutional performance. The act of generating idea among non-teaching staff i curtailed by fear and intimidation, poor communication channels, lack of confidence and low self-esteem, lack of opportunities and platforms, and resource constraints. The study identified drivers for idea generation that need to be embraced. The included effective communication, inclusive leadership, recognition, collaborative leadership, regular staff development forums and training.

Recommendations

The study recommends that school management, led by principals and supported by Boards of Management (BoM), establish structured and inclusive platforms for idea generation among non-teaching staff. This includes regular face-to-face brainstorming sessions, anonymous suggestion systems, and dedicated time during staff meetings to solicit contributions from non-teaching personnel. Additionally, the Ministry of Education and school leadership should invest in continuous professional development, motivational incentives, and team-building initiatives to enhance confidence, creativity, and engagement among non-teaching staff.

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Challenges Facing Education Systems in Developing Regions: Toward Inclusive and Resilient Learning Models

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ABSTRACT

Despite global commitments to achieving equitable and inclusive education by 2030, education systems in many developing regions continue to face persistent and multifaceted challenges. These include inadequate infrastructure, teacher shortages, outdated curricula, and structural inequalities related to gender, disability, and language. The COVID-19 pandemic further exposed and deepened these vulnerabilities, highlighting the urgent need for inclusive and resilient educational models. This paper applies Bronfenbrenner's Ecological Systems Theory to analyze how individual learners, institutional environments, societal structures, and policy frameworks interact to shape educational outcomes. The study employs a qualitative methodology, critically reviewing cross-regional literature, UNESCO and UNICEF reports, and case studies from Sub-Saharan Africa, South Asia, and Latin America published between 2010 and 2024. Findings reveal that educational barriers are multi-layered and interconnected, spanning classroom conditions, community engagement, governance structures, and socio-cultural norms. The paper identifies promising innovations, including community-based learning, competency-based curricula, and technology-enhanced learning platforms, while warning that without addressing the digital divide, such innovations may deepen inequality. The study recommends multi-level interventions, stronger community engagement, inclusive teacher training, bridging the digital divide, and ensuring policy–practice alignment. This contribution aims to inform education policy, institutional practice, and future research in the Global South, aligning with Sustainable Development Goal 4.

Keywords: Education systems, inclusive learning, resilience, developing regions, Sustainable Development Goal 4, digital divide, structural inequality

1. Introduction

Education is widely recognized as both a fundamental human right and a driver of social and economic transformation. Over the past two decades, global initiatives such as the Education for All (EFA) framework and the Sustainable Development Goals (SDGs) have underscored the imperative of ensuring inclusive and equitable quality education for all. SDG 4 explicitly aims to “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” by 2030.

Despite these commitments, education systems in many developing regions remain constrained by systemic barriers. UNESCO (2023) reports that as of 2022, 244 million children and youth worldwide were out of school, with Sub-Saharan Africa and South Asia accounting for over 70% of this figure. Many who are enrolled attend schools lacking basic infrastructure, qualified teachers, and relevant curricula.

The COVID-19 pandemic magnified these issues, disrupting education for an estimated 1.6 billion learners globally in 2020 (World Bank, 2022). In developing regions, prolonged school closures, limited access to remote learning, and socio-economic pressures led to significant learning loss, with girls and marginalized learners disproportionately affected (Plan International, 2021).

Challenges in developing regions are not solely the result of resource constraints; they are also shaped by governance weaknesses, socio-cultural norms, and historical inequalities. For example, colonial



legacies have influenced language-of-instruction policies, often marginalizing local languages and undermining learner engagement (Tikly, 2020). Political instability in fragile states further exacerbates educational inequities by disrupting school operations and diverting resources.

This study focuses on the need to transition from reactive, short-term solutions to sustainable, inclusive, and resilient educational models. Bronfenbrenner's Ecological Systems Theory provides a useful lens for understanding how educational outcomes are shaped by interactions at multiple levels—from individual learner environments to broader socio-political systems. By integrating theoretical analysis with cross-regional evidence, the paper proposes a multi-dimensional approach to educational reform that is both context-sensitive and forward-looking.

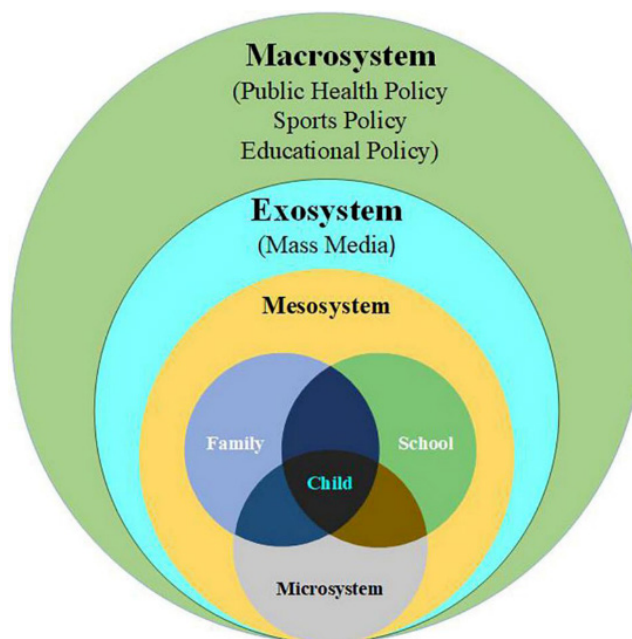
1.1 Theoretical Framework

Bronfenbrenner's Ecological Systems Theory

Bronfenbrenner (1979) conceptualized human development as the product of interactions between individuals and multiple nested environmental systems:

1. **Microsystem** – Immediate environments such as home, classroom, and peer groups. In education, this includes teacher–student relationships, availability of learning materials, and classroom conditions.
2. **Mesosystem** – Interactions between microsystems. For example, how parental engagement with schools influences student achievement.
3. **Exosystem** – External environments that indirectly influence learning, such as local labor markets, government policies, and community resources.
4. **Macrosystem** – Broader cultural and societal values, norms, and laws that shape educational priorities.
5. **Chronosystem** – Temporal dimensions, including historical events and socio-political transitions that affect education over time.

Understanding these interconnected systems provides a holistic framework for analyzing the factors that influence educational outcomes. **Figure 1** below illustrates the nested, interrelated nature of Bronfenbrenner's ecological model, showing how each level interacts to shape individual development and learning experiences.



This framework is particularly relevant in developing regions, where educational challenges cannot be understood solely at the school level but must be examined in relation to community, governance, and historical context.

1.2 Conceptual Framework Diagram Description:

- ❖ A series of concentric circles labeled from microsystem (center) to chronosystem (outer layer).
 - ❖ Examples for each level:
 - Microsystem: Teacher quality, learning materials, peer support
 - Mesosystem: Parent–school collaboration
 - Exosystem: District education budgets, NGO support
 - Macrosystem: Language policy, gender norms
 - Chronosystem: Colonial legacies, COVID-19 pandemic
- This diagram visually maps the interaction between systemic layers and education outcomes in developing contexts.

2. Literature Review

2.1 Infrastructure Deficits

Inadequate infrastructure remains a defining characteristic of education in developing regions. Many rural schools operate without permanent buildings, electricity, clean water, or sanitation facilities (UNICEF, 2023). Lack of adequate learning spaces leads to overcrowded classrooms, which research links to lower learning outcomes (Barrett et al., 2019). Infrastructure deficits disproportionately affect girls, who may miss school during menstruation if sanitation facilities are inadequate.

2.2 Teacher Quality and Shortages

Teacher shortages are both quantitative and qualitative. UNESCO (2021) estimates that Sub-Saharan Africa will need to recruit 15 million new teachers by 2030 to achieve universal primary and secondary education. In many cases, teachers lack formal training in pedagogy, subject content, or inclusive practices. Low salaries, poor working conditions, and limited professional development opportunities exacerbate the problem, leading to high attrition rates.

2.3 Curriculum Relevance and Language Policy

Outdated curricula often fail to equip learners with skills relevant to modern labor markets or community needs. In some countries, the medium of instruction is a colonial language, which may disadvantage learners who speak local languages at home (Brock-Utne, 2017). Recent studies (Gove & Cvelich, 2022) indicate that mother-tongue instruction in early grades improves literacy and overall academic achievement, but policy implementation remains inconsistent.

2.4 Governance and Policy Gaps

Weak governance structures and bureaucratic inefficiencies hinder effective education delivery. Even when progressive policies exist, implementation is often undermined by corruption, inadequate funding, and lack of monitoring (Ozturk, 2022). For example, in some regions, teacher deployment is influenced by political patronage rather than educational need, leading to uneven distribution of qualified staff.

2.5 Socio-Economic Inequalities

Poverty remains one of the strongest predictors of educational access and achievement. Children from low-income households are more likely to engage in child labor, miss school due to fees or associated costs, and experience hunger that impairs learning (World Bank, 2023). Economic shocks—such as inflation or drought—often push families to withdraw children, especially girls, from school.



2.6 Gender, Disability, and Inclusion

Gender disparities persist, especially in rural and conflict-affected areas. Plan International (2021) warns that post-pandemic recovery may reverse gains in girls' education due to increased early marriages. Learners with disabilities are frequently excluded due to lack of accessible facilities, trained teachers, or assistive devices (UNESCO, 2022). Inclusive education policies exist in many countries but are underfunded and poorly implemented.

2.7 Digital Divide

The rapid shift to remote learning during the pandemic exposed and widened the digital divide. According to UNICEF (2021), at least one-third of schoolchildren worldwide were unable to access remote learning during COVID-19 closures. In rural areas of Sub-Saharan Africa, internet penetration rates are often below 20%, and electricity access is unreliable (GSMA, 2022). While mobile-based solutions like Eneza Education offer promise, they cannot fully replace in-person learning where foundational skills are weak.

3. Methodology

Research Design

This study uses a **qualitative conceptual approach**, grounded in Bronfenbrenner's Ecological Systems Theory, to analyze the complex interplay of factors shaping education in developing regions.

Data Sources

Sources were selected based on:

- ❖ Publication date (priority given to 2010–2024 for contemporary relevance)
- ❖ Peer-reviewed status or recognized institutional credibility (e.g., UNESCO, UNICEF, World Bank)
- ❖ Geographic diversity (Sub-Saharan Africa, South Asia, Latin America)

Analytical Process

The literature was coded thematically according to the five ecological system levels. Key patterns, contradictions, and innovative practices were identified, allowing for synthesis into recommendations.

4. Findings and Discussion

Microsystem: Overcrowded classrooms, limited instructional materials, and underqualified teachers undermine learning quality. Case studies from Kenya (Abuya et al., 2015) and Nepal (Dhungana, 2023) show that teacher–student ratios above 60:1 negatively impact engagement.

Mesosystem: Weak links between schools and communities reduce support for learning. In rural Tanzania, parental illiteracy limits home-based support, while in Pakistan, cultural barriers restrict girls' mobility to attend school events.

Exosystem: External factors like district budget cuts, armed conflict, and climate-related disasters disrupt schooling. In Somalia, drought-induced displacement has closed schools in affected districts (Save the Children, 2022).

Macrosystem: National policies often lack local adaptation. For instance, language policies in Ethiopia have improved access in some regions but sparked tensions in linguistically diverse areas (Smith, 2022).



Chronosystem: Historical inequalities, colonial language impositions, and the COVID-19 crisis have long-term implications for system resilience. Post-pandemic recovery efforts risk entrenching pre-existing inequities if not carefully designed.

5. Conclusion and Recommendations

Education in developing regions faces deeply interconnected challenges that cannot be solved through isolated reforms. Applying Bronfenbrenner's Ecological Systems Theory reveals the need for systemic, multi-level interventions that address both immediate classroom needs and broader socio-political contexts.

The path forward lies in inclusive, context-sensitive models that empower communities, leverage appropriate technologies, and ensure that policies translate into meaningful and measurable outcomes in practice. Achieving SDG 4 requires not only adequate resources but also sustained political will, innovative thinking, and local ownership of education reform.

Moreover, efforts must prioritize equity, ensuring that marginalized groups, including girls, rural learners, and displaced populations, are not left behind. Investment in teacher training, curriculum relevance, and culturally responsive pedagogy is essential to nurture critical thinking and problem-solving skills needed for 21st-century challenges.

Collaboration between governments, NGOs, academia, and local communities is critical for creating resilient education systems that can withstand socio-economic disruptions, conflict, or environmental crises. By fostering partnerships, embracing evidence-based policy-making, and integrating local knowledge, education can become a catalyst for broader human capital development and social transformation.

Ultimately, sustainable educational progress will depend on a shared commitment to not only expanding access but also improving quality, relevance, and inclusivity, so that learning becomes a lifelong, empowering process for all.

Recommendations

1. **Adopt Multi-Level Interventions** – Policies must address challenges across all ecological layers, ensuring coherence between classroom practice and national frameworks.
2. **Strengthen Community Engagement** – Establish formal structures for parent–teacher collaboration, community learning hubs, and local monitoring.
3. **Invest in Inclusive Teacher Training** – Focus on inclusive pedagogy, digital literacy, and psychosocial support, supported by incentives to retain skilled educators.
4. **Bridge the Digital Divide** – Combine high-tech solutions with low-tech options like radio, SMS, and print materials to reach underserved areas.
5. **Ensure Policy Coherence and Accountability** – Align reforms with realistic implementation strategies, adequate funding, and transparent monitoring.
6. **Build Back Better Post-Crisis** – Use recovery efforts to transition to flexible, learner-centered models that integrate technology and community resources



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