KAIMOSI FRIENDS UNIVERSITY

FIRST ANNUAL

INTERNATIONAL CONFERENCE AND INNOVATION WEEK 2026

THEME

Science, Innovation and Digital Transformation for Sustainable Socio-Economic Development

21st – 23rd OCTOBER 2026	KAIMOSI FRIENDS UNIVERSITY

THE BOOK OF ABSTRACTS

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KAIMOSI FRIENDS UNIVERSITY

Spring of Knowledge

BOOK of ABSTRACTS

1st INTERNATIONAL CONFERENCE AND INNOVATION WEEK 2026

"Science, Innovation and Digital Transformation for Sustainable Socio-Economic Development"

Dates: 21st – 23rd October 2026

Editors:

Dr. Victor Shikuku, AMRSC

Dr. Lilian Ronoh

A PRODUCT OF

KAIMOSI FRIENDS UNIVERSITY

Directorate of Research Innovation and Outreach (DRIO)

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THEME

"Science, Innovation and Digital Transformation for Sustainable Socio-Economic Development"

Dates: 21st – 23rd October 2026

OBJECTIVES

The KAFU 1st International conference and Innovation Week seeks to provide an international platform for knowledge exchange, innovation showcasing, networking, and collaboration towards sustainable development and societal transformation.

Specific Objectives

- Disseminate cutting-edge research findings and innovations.
- Promote collaboration among academia, industry, government, and development partners.
- Strengthen research commercialization and technology transfer initiatives.
- Showcase innovative solutions addressing local and global challenges.
- Enhance capacity building among students, researchers, and innovators.
- Foster dialogue on policy, governance, and sustainable development.
- Strengthen linkages between research institutions and industry.

THEMATIC AREAS / SUB-THEMES

Authors are invited to submit abstracts under (but not limited to) the following thematic areas:

1. Science, Technology and Innovation (STI)

- Emerging technologies and innovation ecosystems
- Applied sciences for development
- Research commercialization and technology transfer
- Intellectual property and innovation management

2. Digital Transformation, ICT and Artificial Intelligence

- Artificial intelligence, machine learning and data science
- Cybersecurity and digital governance
- Digital transformation in education, health, agriculture and industry
- Smart systems and digital infrastructure

3. Sustainable Agriculture, Food Security and Bioeconomy

- Climate-smart agriculture
- Agri-innovation and value addition
- Bioenergy, biofuels and bioproducts
- Food systems resilience and nutrition

4. Climate Change, Environment and Natural Resource Management

- Climate change mitigation and adaptation
- Biodiversity conservation and ecosystem services
- Environmental chemistry and pollution control
- Renewable energy and circular economy

5. Health Sciences, Public Health and Biotechnology

- Public health innovations and policy
- Biotechnology and biomedical research
- Environmental and occupational health
- One Health approaches

6. Education, Pedagogy and Curriculum Innovation

- STEM education and competency-based education
- Digital learning and educational technologies
- Quality assurance and higher education reforms
- Research supervision and postgraduate training

7. Governance, Leadership and Socio-Economic Development

- Public policy and governance
- Entrepreneurship, MSMEs and innovation-driven growth
- Gender, equity and social inclusion
- Community engagement and sustainable livelihoods

8. Interdisciplinary Research and Industry–Academia Collaboration

- Cross-disciplinary research approaches
- University–industry partnerships
- Research-to-policy and research-to-practice pathways

WORD FROM THE VICE-CHANCELLOR



It is my great pleasure to welcome all delegates, researchers, scholars, innovators, industry representatives, policymakers, students and partners to the Kaimosi Friends University 1st International Conference and Innovation Week 2026.

This conference provides an important platform for the exchange of knowledge, presentation of research findings, demonstration of innovations and development of partnerships that respond to contemporary societal challenges. At a time when the world is navigating complex challenges in climate change, food security, public health, technological transformation and sustainable development, universities have a responsibility to generate relevant knowledge and translate it into practical solutions.

At Kaimosi Friends University, we recognize research, innovation and collaboration as essential pillars of institutional growth and national development. We are committed to nurturing a vibrant research culture that encourages interdisciplinary scholarship, supports emerging researchers, strengthens engagement with industry and communities, and promotes the translation of scientific discoveries into products, services and policies that improve lives.

The participation of local and international scholars, institutions, industry players and other stakeholders demonstrates the importance of collective action in advancing knowledge and innovation. I encourage all participants to use this opportunity to establish meaningful partnerships, exchange ideas, identify emerging research opportunities and develop collaborations that extend beyond this conference.

I commend the organizing committee, our sponsors, partners and all contributors for their dedication to making this event possible. I also appreciate the authors whose scholarly contributions form the foundation of this Book of Abstracts.

As we deliberate, share discoveries and showcase innovations, let us remain committed to research excellence, ethical scholarship, creativity and solutions that contribute to sustainable development.

I wish all participants fruitful deliberations and a memorable experience at Kaimosi Friends University.

Prof. Peter N. Mwita, Ph.D.
Vice Chancellor

WORD FROM THE DEPUTY VICE-CHANCELLOR (ACADEMIC AND STUDENT AFFAIRS)



I am delighted to welcome all participants to the Kaimosi Friends University 1st International Conference and Innovation Week 2026.

Research and innovation are integral to quality higher education. They enrich teaching and learning, strengthen postgraduate training, cultivate critical thinking and problem-solving and prepare graduates to respond creatively to the changing needs of society. This conference therefore provides an important opportunity to strengthen the relationship between research, academic practice and the development of relevant knowledge and skills.

The abstracts presented in this volume reflect the diversity of scholarly inquiry and the commitment of researchers to advancing knowledge across disciplines. They provide a valuable foundation for academic dialogue, interdisciplinary engagement and the identification of emerging research questions. The accompanying innovation activities further demonstrate the importance of moving beyond knowledge generation to practical application and value creation.

At Kaimosi Friends University, we continue to encourage a learning environment in which students and staff engage in inquiry, collaborate across disciplines and uphold the highest standards of academic integrity. Strengthening research-led teaching, supporting postgraduate research, mentoring early-career scholars and creating opportunities for student innovation remain important priorities in building a responsive and competitive university.

I encourage participants to engage actively in the conference sessions, exchange perspectives, challenge existing ideas constructively and explore opportunities for collaborative research and academic partnerships. I particularly urge students and emerging researchers to take advantage of this platform to learn from experienced scholars and develop networks that will support their academic and professional growth.

I congratulate the organizing committee, authors, sponsors and partners for their contributions to this important academic event. May the discussions and collaborations arising from this conference enrich scholarship, strengthen our academic community and contribute to meaningful societal transformation.

I wish you all productive deliberations and a successful conference.

Prof. Fred Amimo
Deputy Vice-Chancellor (Academic and Student Affairs)

WORD FROM THE DIRECTOR OF RESEARCH, INNOVATION AND OUTREACH



It is my pleasure to welcome you to the Kaimosi Friends University 1st International Conference and Innovation Week 2026 and to present this Book of Abstracts, which captures the breadth of research, scholarly inquiry and innovation contributing to this year's event.

The conference is designed to provide a platform for researchers, academics, innovators, students, industry representatives, policymakers and development partners to share knowledge, showcase discoveries and explore collaborative approaches to addressing pressing societal challenges. It also reinforces the importance of connecting research to innovation, enterprise, policy and community needs.

As the Directorate of Research, Innovation and Outreach, our mandate extends beyond supporting the production of scholarly publications. We seek to foster a research culture that promotes scientific integrity, interdisciplinary collaboration, competitive grant acquisition, intellectual property development, technology transfer and meaningful engagement with communities and industry. We recognize that research achieves its greatest value when credible evidence informs decisions, innovations respond to real needs, and partnerships enable promising ideas to progress towards practical application.

The abstracts compiled in this volume represent the intellectual contributions of researchers working across diverse fields. They offer insights into emerging knowledge, innovative methodologies and potential solutions that can inform further research, public policy and sustainable development. I encourage readers to view these contributions not merely as summaries of completed studies, but also as opportunities for new questions, partnerships and pathways for impact.

I sincerely thank the authors for submitting their work, the organizing committee for its dedication, and our sponsors and institutional partners for their support. Their collective efforts are essential to building a vibrant and impactful research and innovation ecosystem at KAFU.

As we engage throughout the conference and innovation week, let us commit to collaboration, research excellence, responsible innovation and the translation of knowledge into tangible benefits for society.

Welcome to Kaimosi Friends University. I wish you inspiring discussions, productive collaborations and a successful conference.

Dr. Victor O. Shikuku, AMRSC
Director, Research, Innovation and Outreach

WORD FROM THE CHIEF GUEST - PROF. DICKSON ANDALA



Prof. Dickson Andala is the CEO of the National Research Fund (NRF), leading efforts to mobilize resources for research, capacity development, and innovation to drive sustainable national development. He is also an Associate Professor of Materials/Inorganic Chemistry at Multimedia University of Kenya, specializing in Nanomaterials and Nanotechnology for applications in sensors, catalysis, and environmental remediation.

With research support from the National Commission for Science Technology and Innovation (NACOSTI), the Organization for Prohibition of Chemical Weapons (OPCW), Grand Challenges Canada, and The World Academy of Sciences, Prof. Andala has received numerous accolades, including recognition by the African Academy of Sciences, Kenya National Academy of Sciences, and OPCW.

At NRF, he has spearheaded strategic global partnerships with institutions such as the Science Granting Councils Initiative (SGCI Africa), NRF South Africa, IDRC Canada, and UK International Development programs, among others. He currently serves as a board member at NACOSTI and Kenya National Innovation Agency (KeNIA), He has held various senior leadership/management positions including having been a Director to the Kenya Nuclear Regulatory Authority (KNRA), African Materials Research Society (AMRS) boards, Executive Committee Member to Africa Crystallographic Association (AfCA); Membership to various Professional Associations including African Academies of Science (AAS), Kenya National Academy of Sciences (KNAS).

His contributions to science, policy, and international collaborations continue to shape Kenya's research landscape.

Prof. Dickson Andala
CEO, National Research Fund (NRF)

WORD FROM THE KEYNOTE SPEAKER- PROFESSOR KISILU KOMBO



Academic Profile

Professor Kisilu Kombo is a distinguished Kenyan scholar and Professor of Sociology of Education at Kenyatta University, whose career spans more than four decades of academic scholarship, educational research, university leadership and engagement in education policy and reform. A respected contributor to teacher education and educational development in Kenya, his work bridges sociological perspectives on education with practical concerns relating to curriculum transformation, teacher professional development, educational quality, gender equality and equitable access to learning opportunities. Throughout his career, he has combined teaching, research, institutional leadership and professional service to advance educational knowledge and strengthen educational systems. His experience in university administration, national curriculum review, quality assurance and teacher professional development positions him as a valuable contributor to scholarly and policy dialogues on contemporary educational challenges in Kenya and beyond.

Academic Qualifications and Professional Experience

Professor Kombo holds a Ph.D. (1998) and a Master of Arts in Education (1992) from Kenyatta University, and a Bachelor of Education degree with Second Class Honours (Upper Division) from the University of Nairobi (1985). He began his career as a secondary school teacher before joining

Kenyatta University in 1989 as a Tutorial Fellow. He subsequently progressed through the academic ranks of Lecturer, Senior Lecturer and Associate Professor before becoming a Full Professor. He has held several leadership positions at Kenyatta University, including Assistant Director of the Institute for Open Learning, Chairperson of the Department of Educational Foundations, Director of Teaching Practicum Assessment, Associate Dean of the School of Education, and Acting Dean of the School of Education from November 2017 to September 2022.

Research and Scholarly Contributions

Professor Kombo's research interests include sociology of education, curriculum development and implementation, teacher professional development, gender equality, educational quality, school management, drug and substance abuse, sexual harassment in educational institutions, and education for sustainable development. He has led and participated in research and consultancy assignments involving organisations such as Windle International Kenya and the National Gender and Equality Commission, as well as initiatives supported by UNESCO and international research funding bodies.

Education Policy and Quality Development

Professor Kombo has contributed to national education initiatives in curriculum reform, teacher education and quality assurance. His professional engagements include service on the Kenya

Institute of Education Academic Board and appointment as a Quality Assurance Expert for National Curriculum Review Instruments. He also played a leadership role in Kenyatta University's work on accrediting service providers for the Teacher Professional Development Programme for registered teachers in Kenya. His institutional engagements have encompassed curriculum implementation, academic programme harmonisation, teacher training and university development.

Publications and Professional Recognition

Professor Kombo has authored and co-authored numerous books, journal articles and research reports. His notable publications include Sociology of Education (2006) and Proposal and Thesis Writing (2006). His scholarship addresses competency-based curriculum implementation, teacher capacity development, gender and education, student performance, and equitable access to quality education. His professional contributions have received recognition through certificates and letters of appreciation for research, academic engagement, guest speaking, committee service and institutional development.

Professor Kombo's career reflects the integration of scholarship, educational leadership and public engagement, with contributions to teacher education, higher education development and the advancement of educational quality in Kenya. His experience and research offer valuable perspectives for international dialogue on education reform, teacher development and equitable learning opportunities.

Prof. Kisilu Kombo
Keynote Speaker

MEMBERS OF THE ORGANISING COMMITTEE



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Chair



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Member



Dr. Lillian Ronoh-
Member



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THEMATIC AREA 1: INTERDISCIPLINARY RESEARCH AND INDUSTRY–ACADEMIA COLLABORATION







1. Where Climate Becomes the Body: The Climate–Place–Body Nexus at the Intersection of Medical Anthropology and Medical Geography in Kenya

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Abstract

Climate change is increasingly affecting health through floods, droughts, extreme heat, changing disease patterns, food insecurity, displacement and disruptions in access to health services. Yet climate-health research often separates spatial environmental exposure from the social, cultural and embodied processes through which climate risks become health inequalities. This paper examines the intersection of medical anthropology and medical geography in understanding climate-related health inequalities in Kenya and proposes the Climate–Place–Body Nexus as an interdisciplinary framework. It argues that climate-health inequalities arise not from exposure alone, but through interactions among climate hazards, place, social differentiation, cultural mediation and embodiment. The framework's distinctive contribution is to conceptualize climate risk as becoming embodied through spatial exposure, social difference and cultural interpretation, thereby explaining why similar hazards produce different health experiences among different populations and places. Empirically, the paper draws on documented Kenyan climate-health evidence, including evidence from the 2024 floods on changes in geographical healthcare accessibility, national climate-health policy, and research on socially differentiated vulnerability. Methodologically, it advances a spatial–ethnographic approach that brings GIS and spatial analysis into dialogue with ethnography, life histories, participatory mapping and health narratives. This approach connects mapped patterns of exposure and accessibility with lived experience and community knowledge. The paper contributes a framework for analysing climate-health inequalities across Kenya's diverse ecological, livelihood and healthcare landscapes and for informing climate-resilient health planning that is geographically targeted, socially differentiated and responsive to Indigenous and local knowledge. It links where climate risk occurs with how it is experienced and translated into health outcomes.

Keywords: *Climate change; medical anthropology; medical geography; health inequalities; embodiment; place; Indigenous knowledge; climate adaptation.*

2. Effect of Operational Efficiency of Commercial Banks on Financial Performance of Commercial Banks in Kenya

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[1]Masinde Muliro University of Science and Technology, Kenya
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Abstract

The primary role of commercial banks is financial intermediation by mobilizing deposits from surplus units and channeling them to deficit units through productive lending and investment. Efficient financial intermediation enables banks to improve profitability and strengthen financial stability by minimizing operational and transaction costs and maximizing returns. However, despite ongoing investments in operational improvements, Kenyan commercial banks continue to experience declining financial performance. Accordingly, this study examined the effect of operational efficiency, as a dimension of financial intermediation efficiency, on the financial performance of commercial banks in Kenya. Operational efficiency

was measured using the Operating Expense Ratio (OER) and Operating Expenses to Total Assets Ratio (OETAR), while financial performance was measured using Return on Assets (ROA) and Return on Equity (ROE). Guided by the Theory of Financial Intermediation, the study adopted a positivist research philosophy and a causal longitudinal research design. Secondary panel data were collected through a census of 36 commercial banks covering the period 2015–2024. Data were analysed using STATA Version 15, employing descriptive statistics, diagnostic tests, correlation analysis, and panel regression models. Fixed-effects regression was applied to the ROA model, while random-effects regression was used for the ROE model based on the Hausman specification test. The findings revealed that the OER positively and significantly influenced ROA ($\beta = 1.5336$, $p < 0.05$) and ROE ($\beta = 0.1258$, $p < 0.05$), indicating that improved cost management enhances profitability and shareholder returns. Similarly, the OETAR had a positive and significant effect on ROA ($\beta = 0.5219$, $p < 0.05$) but a positive yet statistically insignificant effect on ROE ($\beta = 0.0724$, $p > 0.05$). The study concludes that operational efficiency is a critical driver of financial performance. It recommends that commercial banks strengthen cost management, optimize operational processes, and leverage digital technologies to improve financial performance.

Keywords: *Operational Efficiency, Financial Performance, Commercial Banks, Financial Intermediation Efficiency*

3. The Impact of Social Sustainability Reporting on the Financial Performance of Firms Listed on the Nairobi Securities Exchange, Kenya: The Moderating Role of Firm Size

Opiyo James[1], Charles Tibbs[1], Maniagi Musiega[1]

[1]Masinde Muliro Universities of Science and Technology, Kenya

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Abstract

The financial performance of firms listed on the Nairobi Securities Exchange (NSE) remains an important concern, particularly given the increasing emphasis on corporate sustainability and stakeholder accountability. This study examined the impact of social sustainability reporting on the financial performance of firms listed on the Nairobi Securities Exchange, Kenya, with particular emphasis on the moderating role of firm size. A causal research design was adopted, targeting 65 firms listed on the NSE, with census sampling employed. Secondary data were obtained from audited annual reports covering a ten-year period from 2015 to 2024. Financial performance was measured using return on assets (ROA) and return on equity (ROE). Panel data were analysed using descriptive statistics, correlation analysis and random-effects generalized least squares regression. The findings established a positive and statistically significant relationship between social sustainability reporting and financial performance. For ROA, social sustainability reporting had a positive and significant effect ($\beta = 0.742$, $p < .001$), while the interaction between social sustainability reporting and firm size was positive and statistically significant ($\beta = 1.530$, $p < .001$). The interaction effect was also positive and significant when financial performance was measured using ROE ($\beta = 1.762$, $p < .001$). The findings further showed that the inclusion of firm size increased the explanatory power of the ROA model from 15.17% to 45.67%, while the ROE model increased from 2.25% to 6.65%. The study concludes that social sustainability reporting significantly improves financial performance and that firm size positively moderates this relationship. The study recommends that NSE-listed firms strengthen social sustainability disclosure, particularly in employee welfare, workplace safety, training, community engagement and corporate accountability, while leveraging firm resources to enhance the financial benefits of sustainability reporting.

Keywords: *Social sustainability reporting, financial performance, firm size, sustainability reporting, Nairobi Securities Exchange, Kenya.*

THEMATIC AREA 2: EDUCATION, PEDAGOGY AND CURRICULUM INNOVATION







4. Digital literacy and academic performance of junior secondary school students in vihiga sub-county, kenya

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Abstract

This study examined the correlation between digital literacy and level of academic performance of students in junior secondary school in Vihiga Sub-County in Kenya. A Correlational research design was adopted. The target population was 978 students from 15 junior secondary schools. The Krejcie and Morgan table of 1970 was used to get a sample of 285 students by simple random sampling technique. Questionnaire was administered to students to collect data. Cronbach's Alpha Coefficient was used to get the reliability of the questionnaire yielding a coefficient value of 0.79 that indicated a high level of internal consistency. Statistical Package for Social Sciences Software Version 20 was used to analyze the quantitative data collected descriptively by frequency and percentage. It was also analyzed inferentially by Pearson Product Moment Correlation to predict if a correlation existed between digital literacy and academic performance. The findings showed that slightly over half of the students (57.5%) had a low level of digital literacy while half of them (51.9%) met expectation in their grade 9 examination. The results also showed that a strong positive statistically significant correlation existed between digital literacy and academic performance because the p-value obtained (that is 0.000) was below 0.05. The conclusion made from the rejection of the null hypothesis was that the low level of digital literacy affected students' academic performance. It was recommended that the government should provide digital facilities in junior schools. Teachers should also guide students on how to use digital tools positively. The study suggested that further research should be done to determine the correlation between digital literacy and academic performance across different gender, grade levels and subjects.

Key words: *Academic Performance, Digital literacy, Junior Secondary Schools*

5. To Explore the Experiences of First years Nursing Students Regarding the Use of Gamification (kahoot) in Learning Abdominal Physical Examination Skills in Universities in Western Kenya .

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Abstract

Gamification (kahoot) has increasingly been integrated into health profession education as an innovative strategy to enhance student engagement and learning outcomes .In Nursing education, abdominal examination skills are essential competencies for effective patient assessment .This study aims to explore the experiences of First Year Nursing Students regarding the use of gamification (kahoot) in learning abdominal physical examination skills in universities in Western Kenya .The study will be conducted in two universities , Kaimosi Friends University and Masinde Muliro University of Science and Technology . The study will employ descriptive design in exploring the lived experiences of students and use purposive sampling involving 130 students as well data will be analysed thematically. Findings from this study will contribute to the current perceptions and acceptability of gamification (kahoot) as learning and teaching method.

Key words: *Gamification, kahoot , Abdominal Examination, Nursing students, Experiences*

6. Nursing Students' Clinical Experiences and Perceived Placement Quality at Kaimosi Friends University, Kenya

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Abstract

Clinical practice is an essential component for nursing education and facilitates the integration of theoretical knowledge with practical skills and professional competence. However, in resource constrained health care settings such as sub-Saharan Africa, systemic bottlenecks exist. Studies linking student clinical experiences to placement quality such as inadequate supervision, resource constraints and sub optimal learning environments remain scarce. The study explored clinical practice experiences of Bachelor of Science in Nursing (BScN) students and their association with perceived quality of clinical placements at Kaimosi Friends University (KAFU), Kenya. A descriptive cross sectional mixed method study was conducted among 80 third- and fourth-year participants who had completed at least once clinical concentration period. Stratified random sampling was used to identify participants basing on year of study and structured self-administered questionnaire administered while qualitative data was administered using interviews on lived experiences. Employing SPSS Version 25, descriptive and inferential statistics analyzed quantitative data employing chi square and Pearson correlation test ($p< 0.05$) while themes were employed in quantitative arm. Over 75% respondents agreed that supervision was adequate in as much as majority (52.5%) lacked assigned mentors. there was a statistically significant positive relationship between adequacy of clinical supervision and overall perceived placement quality ($r=0.6244$, $P < 0.001$) and mentorship availability and overall satisfaction $x^2 =14.82$, $p=0.001$). Key challenges from thematic analysis: preceptor deficit, resourse scarcity and clinical overcrowding. However, majority (67.5%) reported good to excellent quality placement. Whereas clinical placements enhance nursing competencies and clinical confidence, gaps in supervision consistency, facility infrastructure and mentorship structures persist. Strengthening institutional partnerships, enforcing recommended student instructor ratio and using formal preceptorship models are key in enhancing nursing education globally.

Key words: *Clinical placement quality, clinical supervision, mentorship, Bachelor of Science in Nursing*

7. Relationship between Level of Teacher Training and Implementation of Continuous Assessment Tools: Case of Senior School Science, Technology, Engineering and Mathematics Teachers in Kakamega-North Sub-County, Kenya

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Kenya's transition from the 8-4-4 system to Competency-Based Education (CBE) emphasizes continuous assessment tools (CATs) over traditional examinations, placing STEM teachers at the forefront of curriculum implementation. This study examined the relationship between professional training and CAT implementation among Senior School STEM teachers in Kakamega-North Sub-County. Using a descriptive design, data were collected from 125 teachers through stratified random sampling, questionnaires, and observation checklists. Results showed that while 58.33% of teachers had attended Teacher Professional Development (TPD) workshops, most sessions lasted fewer than three days, limiting acquisition of practical skills. Mean scores across key assessment concepts—including rubric construction, portfolio evaluation, and digital score entry—fell within the low preparedness range (1.75–2.25). Regression analysis revealed a significant relationship between TPD attendance and effective CAT implementation ($\beta = .723$, $p = .008$). The findings highlight that short-term training compromises teachers' ability to design and administer authentic assessments, risking regression to traditional methods. The study recommends sustained professional development, investment in digital infrastructure, and standardized resources to strengthen CBE implementation.

Keywords: *Competency-Based Education (CBE), Continuous Assessment Tools (CATs), Teacher Professional Development (TPD), STEM Education, Kakamega County, Educational Reform, Assessment Competence*

8. Effect of Psychosocial Experiences on the Learning Outcomes of Student Mothers in Public Universities in Western Region, Kenya

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Abstract

The academic success of undergraduate student mothers in public universities in Western Region, Kenya is significantly influenced by their psychosocial experiences. Balancing motherhood and academic responsibilities present unique challenges that can hinder their ability to perform at the same level as their peers. The objective of the study was to establish the effect of psychosocial experiences on learning outcomes of undergraduate student mothers in public universities in Western Region, Kenya. Despite existing research on student mothers, there remains a gap in understanding how psychosocial challenges. This study sought to bridge that gap by offering a comprehensive analysis of these factors. The study was conducted among government-sponsored undergraduate student mothers in public universities in Western Region, Kenya. It was grounded in role conflict theory. A correlational and descriptive survey research design was employed. The target population comprises one thousand three hundred and thirteen (1313) respondents. This consists of thousand two hundred and seventy-three (1273) student mothers, four (4) Deans of students, four (4) officers in charge of the gender and mainstreaming committee, four (4) Officers in charge of halls of residences, and four (4) Officers in charge of health facilities from each university and twenty-four (24) Chair of Departments. Simple random sampling were used to select 304 student mothers. Purposive sampling was used to select four (4) Deans of students, four (4) officers in charge of the gender and mainstreaming committee, four (4) Officers in charge of halls of residences, and four (4) Officers in charge of health facilities from each university and twenty-four (24) Chair of Departments. Data were collected through questionnaires, document analysis guides, and interview schedules. The validity and reliability of the research instruments were tested through a pilot study. Descriptive statistics such as means, frequencies, and percentages were used for analysis, alongside inferential statistical techniques, including multiple regression. The descriptive statistics findings and the information obtained during interview showed that psychosocial experiences influence the student motherhood performance. The findings indicated that psychosocial experiences negatively affect student mothers' learning outcomes, with a regression coefficient of -1.213. Conversely, academic resilience. The study concluded that psychosocial challenges hinder the academic performance of student mothers. It recommended that universities implement financial assistance programs such as scholarships and stipends, provide flexible academic schedules and online learning options. The study's

findings may inform targeted intervention strategies to support student mothers and have implications for shaping educational policies within Western Region, Kenya public universities.

Keywords: *Kenya, Learning Outcomes, Psychosocial Experiences, Public Universities in Western Region, Student Mothers*

9. Education Is A Journey: A Conceptual Metaphor Analysis of Student Discourse in Kenyan Universities

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Abstract

This study explores how Kenyan university students conceptualize higher education through the lens of Conceptual Metaphor Theory, focusing specifically on the primary metaphor EDUCATION IS A JOURNEY. Using a qualitative, discourse-analytic approach centered on Kaimosi Friends University, the research pursues three main objectives: to identify student metaphorical expressions and map their source-to-target domain alignments; to examine how these conceptual mappings shape student perceptions of identity, success, and failure; and to contribute a context-specific analysis of Kenyan university discourse to cognitive linguistics. Data were gathered through semi-structured interviews, naturally occurring classroom interactions, and student social media discourse on platforms including WhatsApp and X. Findings reveal that conceptualizing education as a physical journey actively mediates student engagement, personal resilience, and institutional navigation. Ultimately, the study demonstrates how language both reflects and constructs the academic experience, offering practical implications for pedagogical strategies and student support systems in multilingual higher education settings.

Key words: *Metaphor, education. Cognitive, multilingual*

10. Digital Infrastructure and the Implementation of Science, Technology, Engineering, and Mathematics Subjects in Public Junior Schools in Kitui County, Kenya

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Abstract

This article is an extract of a PhD thesis that investigated the influence of digital resource integration and the implementation of STEM subjects in junior public schools in Kitui County, Kenya. Digital resources have gradually become important in enhancing curriculum implementation in all educational levels, and their integration plays a key role in implementing the STEM curriculum. The study investigated the influence of the adequacy of digital infrastructure and the implementation of STEM subjects in junior public schools in Kitui County, Kenya. The study was guided by the Technological Pedagogical Content Knowledge (TPCK) theory of digital integration by Mishra and Koehler (2006). The study adopted the embedded mixed-method

research design. The study target population was 3661 junior school teachers, 1102 headteachers and 19 Sub-County Quality Assurance and Standards Officers (SCQASOs). A sample of 670 respondents, including 294 headteachers, 360 teachers and 16 SCQASOs was sampled. Data was collected by use of structured questionnaires for headteachers and teachers, while interview schedules were used to collect data from Sub-county Quality Assurance and Standards Officers. Data was presented in descriptive statistics such as frequencies, tables, percentages, graphs, means and Standard deviation. Quantitative data was analysed aided by Statistical Package for Social Sciences (SPSS) software program version 28. Qualitative data from open-ended questions, opinions and interviews were analysed using the content analysis technique. The findings from interviews were reported and transcribed into themes and presented in narrations and direct quotes. A Pearson product-moment correlation was conducted to examine the relationship between independent and dependent variables, while regression was used to test the hypothesis. The study found that mobile phones and tablets were relatively available but science laboratories, ICT laboratories, smart boards, interactive boards, reliable internet connectivity and standby power systems were found to be inadequate. While some schools had access to basic digital tools, such as mobile devices and tablets, the general state of these digital infrastructures in the majority of the public junior schools was inadequate for the successful implementation of STEM subjects. The study findings showed a strong positive correlation of 0.702 between the adequacy of digital infrastructures and the implementation of STEM subjects. The study therefore concluded that STEM subjects are not well implemented in junior schools due to failures and inadequate digital infrastructures in a majority of public junior schools in Kitui County.

11. Beyond Blended Learning: Harnessing Artificial Intelligence and Emerging Technologies to Transform Pedagogy, Learner Engagement and Educational Outcomes

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Abstract

The rapid advancement of artificial intelligence (AI) and emerging digital technologies is reshaping the landscape of teaching and learning, necessitating a shift from conventional blended learning toward more adaptive, personalized, interactive, and learner-centered educational ecosystems. This paper examines how AI and emerging technologies can be harnessed to transform pedagogy, enhance learner engagement, and improve educational outcomes within blended learning environments. Specifically, the paper seeks to (a) examine the pedagogical opportunities presented by AI and emerging technologies in blended learning; (b) analyze their potential contribution to learner engagement, personalization, collaboration, and learner autonomy; (c) explore how technology-enhanced pedagogies can improve learning outcomes and competency development; and (d) identify key challenges and conditions for effective, ethical, inclusive, and sustainable integration of AI in blended learning. The paper adopts a conceptual and integrative review methodology, drawing on recent scholarly literature and theoretical perspectives on AI in education, blended learning, digital pedagogy, learner engagement, and educational technology. Relevant literature is critically synthesized to develop an integrative framework illustrating the relationships among AI-enabled technologies, innovative pedagogical practices, learner engagement, and educational outcomes. The anticipated outcomes suggest that strategically integrated AI can facilitate adaptive and personalized learning, intelligent learning support, timely feedback, collaborative knowledge construction, and data-informed pedagogical decision-making. However, these benefits depend on teacher digital and AI competencies, appropriate curriculum alignment, digital infrastructure, learner digital literacy, ethical safeguards, and equitable access. The paper proposes a transformative model of AI-enhanced blended learning that positions technology as an enabler of pedagogical innovation rather than a replacement for teachers. It concludes that moving beyond blended learning requires human-centered, competency oriented, ethical, and context-responsive approaches to educational technology integration.

Keywords: *Artificial intelligence; blended learning; digital pedagogy; emerging technologies; learner engagement; educational outcomes*

12. Shaping the Digital Classroom: A Competency Framework for Kenya's Early Childhood Educators

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Kenya's Competency-Based Curriculum requires digital literacy integration from Pre-Primary Two onwards, yet no standalone, empirically derived digital competency framework exists for early childhood development (ECD) teachers in Kenya. This paper reports the third objective of a ten-month study (June 2025 to April 2026) funded by ESSA and the REAL Centre (Grant Reference ECDAFRICA001), which developed the Digital Competency Framework for ECD Teachers in Kenya (DCF-ECD Kenya). This paper aimed to derive and validate a weighted digital competency framework for the effective implementation of the CBC curriculum. The framework was built from empirical data collected across six Kenyan counties (Nairobi, Kisumu, Bungoma, Kakamega, Turkana and Samburu). Its derivation is traced in full: from descriptive statistics, through inferential testing, to factor extraction, and final weighting. 51 ECD teachers first took part in school-level Focus Group Discussions (FGDs), before subsequently completing a structured questionnaire measuring digital integration challenges, essential digital competencies, and effective curriculum implementation. Normality tests justified Spearman's rho for inferential testing, and principal component analysis was applied separately to each construct to extract sub-constructs, each reported with its Kaiser-Meyer-Olkin measure, Bartlett's test, and component loadings. Digital integration challenges showed no statistically significant relationship with effective curriculum implementation (rho = .171, p = .230), while essential digital competencies showed a moderate, significant, positive relationship (rho = .567, p < .001). The five sub-construct loadings were summed by construct and divided by their grand total to produce three effective weights summing to 1.000: Essential Digital Competencies (.395), Digital Integration Factors (.391), and Effective CBC Implementation (.214). The DCF-ECD Kenya framework was validated at a stakeholder conference attended by 24 participants, who confirmed its structure and terminology without dissent, providing Kenya's Ministry of Education and teacher training institutions with an empirically grounded tool for guiding digital competency development in the early years sector.

Keywords: *Digital Competency Framework; Factor Analysis; Framework Derivation; Early Childhood Development; Kenya*

13. Reimagining Kenyan University Curricula for the 21st-Century Learner

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Abstract

Kenya's university education should be responsive to the rapid technological and climate change, demographic transformation and economic restructuring. However, many university curricula are characterized by highly compartmentalized disciplines, heavy content loads, lecture-dominated pedagogy,

limited practical exposure and assessment systems that reward memorization instead of application, creativity and problem solving. With the first cohort of learners taught through Competency based approaches set to join university in 2029, there is urgent need to rethink how teaching is conducted, how knowledge is organized, how learning occurs, how competence is assessed as well as how university education connects with Kenya's economic, social and cultural aspirations. This paper examines how university curricula in Kenya can be reimagined to respond to the needs of the 21st-century learner while simultaneously advancing national development, employability, innovation, social responsibility, cultural identity and global competitiveness. The paper adopts a qualitative conceptual research design based on critical analysis of scholarly literature, Kenyan education policy, legislation, qualifications frameworks and emerging policy developments in competency-based university education, digital transformation and artificial intelligence. The theoretical framework adopted integrates constructivism and transformative learning theory. The analysis reveals the need to shift from content coverage to demonstrable competences; mainstreaming of digital and artificial intelligence literacy; interdisciplinary and problem-based learning; authentic and continuous assessment; stronger university-industry-community partnerships; and flexible lifelong-learning pathways. The paper proposes interconnected dimensions under the University Curriculum Reimagination Framework (KUCReF). The paper argues that curriculum transformation is not merely adding new courses to existing programmes but rather, a systemic redesign of curriculum architecture, pedagogy, assessment, academic staff roles, quality assurance and university-community relationships. It recommends that Kenyan universities must move from degree-centred education towards competency-rich, digitally enabled, socially responsive and globally competitive learning ecosystems capable of producing graduates who can create value, solve complex problems, participate ethically in society and continue learning throughout their lives.

Keywords: *Reimagining, Curricula, 21st Century learner, compartmentalized and Competency Based Approaches*

14. Student -Led Literary Frameworks: Nurturing Emerging Authors and Enhancing Campus Literacy through Nafsi Writers Foundation

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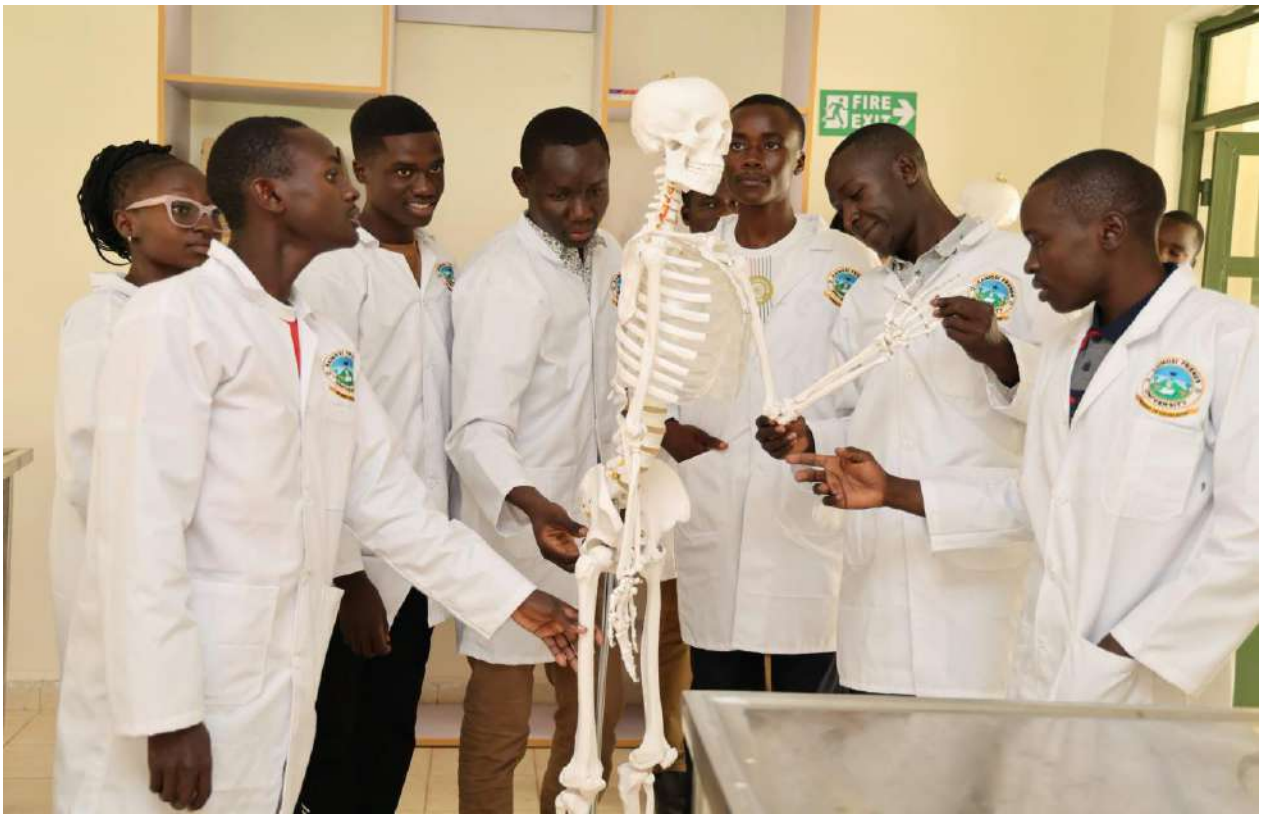
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Abstract

While academic settings heavily focus on formal text analysis, students and youth often lack a pear-supported, practical pipeline that transitions them from creative writers into published authors. So they have abilities with no direction to empower their capabilities. Spearheaded by a KAFU student, the Nafsi Writers Foundation seeks to establish an accessible framework on campus that coaches emerging writers. It coordinates collective youth publishing projects and host dynamic, interactive text discussions that make, literature beyond books. The model utilizes a student- centric, three tiered approach: peer to peer creative writing coaching, crowd sourced and collaborative publishing workflow and open- floor discussion circles designed to make literary debate highly engaging and accessible to the University community. By plotting this framework within the student ecosystem, Nafsi Writers Foundation demonstrate how student - led initiatives can actively boost institutional literacy, give young writers professional publishing experience and foster a vibrant reading culture. This project serves as an innovative blueprint for student-driven cultural and pedagogical growth within higher education institutions.

THEMATIC AREA 3: HEALTH SCIENCES AND BIOTECHNOLOGY







15. Knowledge, Role and Support Needs of Community Health Promoters in the Early Identification and Referral of Non-Communicable Diseases in Kisii County, Kenya.

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Abstract

Non-communicable diseases (NCDs), including hypertension, diabetes, cancer, cardiovascular and chronic respiratory diseases, are major causes of morbidity and mortality in Kenya. Community Health Promoters (CHPs) are strategically positioned to support prevention, early identification and referral of NCDs. However, evidence on their knowledge, role, challenges and support needs in Kisii County remains limited. Rationale and Gap: Despite their integration into primary healthcare, gaps remain regarding CHPs' preparedness to identify and refer NCD cases and the barriers affecting their performance. This study generated evidence to strengthen community-based NCD prevention and referral. Main Objective: To assess the knowledge, role and support needs of CHPs in the early identification and referral of NCDs in Kisii County, Kenya. Methods: A quantitative cross- sectional study was conducted among 363 CHPs. Data were collected using a structured questionnaire assessing NCD knowledge, identification and referral practices, challenges and support needs. Descriptive statistics summarized findings, while Chi-square tests assessed associations between selected variables. Statistical significance was set at p<0.05. Results: Most CHPs (63.1%) had more than six years' experience, while 97.8% were familiar with NCDs. High self-rated knowledge (levels 4–5) was reported by 67.7%. Awareness was highest for diabetes (89.5%) and hypertension (88.2%), followed by cancer (75.8%), but lower for chronic respiratory (31.7%) and cardiovascular diseases (28.9%). Experience was significantly associated with awareness of NCD categories (p=0.014). Most CHPs (97.2%) had identified suspected NCD patients, mainly through screening (65.6%), and 99.2% reported referring suspected cases to health facilities. Experience was associated with having identified NCD patients (p=0.010) and frequency of encountering suspected cases (p=0.002). Multiple referral challenges were reported by 53.4%, while regular training (28.7%) and screening equipment (12.1%) were key support needs. Conclusion: CHPs demonstrate high awareness of major NCDs and an important role in identification and referral. However, gaps in awareness of selected NCDs and multiple logistical and resource constraints may limit effective service delivery. Regular competency-based training, adequate screening equipment and strengthened referral linkages are recommended.

Key words: Community Health Promoters; non-communicable diseases; NCD knowledge; early identification; referral; primary healthcare; Kisii County; Kenya.

16. Effects of Pregnancy on Mental Health Among School Going Adolescents in Sub-Saharan Africa: A Systematic Review

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Abstract

Pregnancy among school going adolescents remains a major public health and social challenge in Sub-Saharan Africa. It affects both the physical, emotional, and mental wellbeing of adolescent girls. Pregnant girls experience stigma, discrimination, school dropping, financial problems and lack of social support. This predisposes them to develop mental illnesses. Mental health issues among pregnant adolescents often receive very little attention in healthcare and educational systems despite the growing burden. The goal of this review was to evaluate the effects of pregnancy on mental health among adolescents in Sub-Saharan Africa and to find out the key issues contributing to mental distress among this group. This was a systematic literature review covering the period from 2021 up to 2026. The review aimed to synthesize evidence regarding the mental health and emotional well-being of school going pregnant adolescents in Sub-Saharan Africa. A comprehensive search was performed across major electronic databases including Google Scholar, PubMed, ScienceDirect, ResearchGate, African journals Online (AJOL), published articles and reports. Studies were included if they were peer-reviewed full-text articles in English that specifically evaluated the effects of pregnancy on the mental health of school going adolescents in Sub-Saharan Africa. The review excluded articles that did not focus on mental health outcome among school-going pregnant adolescents in the targeted region. Further exclusions were made for reports where participants did not meet the desired age and were not currently school going. PRISMA was used and a total of 115 articles were identified from the databases, 83 were duplicates, 29 records marked ineligible by automation and 3 records were removed for other reasons were excluded and this left 20 records. Out of the 20 records, 6 reports could not be retrieved leaving 14 reports to be assessed for eligibility. After excluding 4 reports that did not meet age or school going criteria were excluded, a final of 10 studies were included. The literature consistently shows that pregnancy is a powerful trigger of significant mental health problems like depression, anxiety, low self esteem, hopelessness, stress, emotional distress. Key contributing reasons included inadequate access to mental health services, dropping out from schools, stigma, lack of partner support, rejection by family and peers and poverty. Majority of pregnant girls struggled to balance pregnancy and education, leading to emotive trauma and poor school performance. Based on this review it was concluded that the mental health of school-going adolescents in Sub-Saharan Africa is suggestively affected by pregnancy. There is demand for quality mental health services, psychosocial support and school-based involvement to support pregnant and adolescents well being and enable them to continue with their education.

Keywords: *Mental health, school going adolescents, adolescents and Sub-Saharan Africa*

17. Impact of Training Bachelor of Clinical Medicine Professionals in Kenya and Its Implications for Africa and Global Health Systems: A Systematic Review

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Abstract

Training of Bachelor of Clinical Medicine (BCM) professionals in Kenya has emerged as a strategic response to healthcare workforce shortages. These mid-level providers play a vital role in expanding access to healthcare services, particularly in underserved regions. Objective: To evaluate the impact of BCM training in Kenya and examine its relevance for Africa and global health systems. Methods: A systematic review was conducted following PRISMA 2020 guidelines. Literature was searched in PubMed, Scopus, ScienceDirect, Google Scholar, and ResearchGate for studies published between 2010 and 2025. A total of 312 articles were identified, and 22 studies met inclusion criteria. Results: BCM professionals significantly improve healthcare access, reduce physician workload and provide cost-effective care. However, challenges including policy gaps, limited career progression and training variability persist. Strategies such as curriculum standardization and policy reforms have might improve training and clinical practice outcomes. Conclusion: BCM training represents a scalable and sustainable solution to healthcare workforce shortages. Strengthening this model is critical for achieving Universal Health Coverage not only in Kenya but Africa and the globe at large.

Keywords: Clinical Medicine, Task Shifting and Health Workforce.

18. Evaluating the Impacts of Social Media on Mental Health of Undergraduate Students

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Abstract

This study evaluated the impacts of social media on the mental health of undergraduate students at Kaimosi Friends University and Amref International University. Using a cross-sectional descriptive design, 342 students were selected through stratified random sampling and assessed with validated Rosenberg Self-Esteem Scale and Kessler Psychological Distress (K10) tools. The majority of respondents were aged 21-23 years, with WhatsApp, Instagram and TikTok being the most used platforms. Findings revealed a significant dose-response relationship between duration of use and psychological distress, with students spending over six hours daily reporting markedly higher distress scores and lower self-esteem than light users. Female students reported significantly higher social comparison stress, while heavy night-time use was strongly associated with sleep disruption and daytime fatigue. Despite these challenges, students also reported positive benefits including social connection and access to health information. The study proposes the KAFU Digital Wellness Model anchored on three pillars: digital-aware counselling, digital literacy during orientation, and the peer-led #ScrollSmart KAFU campaign. This low-cost, scalable innovation leverages existing university structures to promote mindful digital habits and strengthen student mental wellness, ultimately supporting academic excellence and retention.

Keywords: *Social media, mental health, undergraduate students, digital wellness, KAFU*

19. Variations in Ligamentum Flavum Thickness Across Lumbar Spinal Levels in Relation to Age and Gender in Chronic Low Back Pain: A Systematic Review of MRI Studies

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Abstract

The ligamentum flavum (LF) is a key structure for spinal stability, but age-related thickening, or hypertrophy, can lead to lumbar spinal stenosis, a condition causing chronic low back pain (CLBP). While age and gender are thought to be significant factors, their correlation with LF thickness has been inconsistent in the literature. A clear understanding of these variations is vital for accurate diagnosis and effective treatment of CLBP. Thus, the aim of this review was to synthesize existing MRI findings on lumbar LF thickness and its relationship with age and gender. Following PRISMA guidelines, five major databases on LF thickness through MRI assessment in relation to age and gender published between 2009 and 2025 were searched. From an initial 309 articles, seven were selected for inclusion. Results: The review found a consistent and critical finding: LF thickness increases with age, most prominent at the L4-L5 lumbar spinal level. The correlation between LF thickness and gender was discrepant, with some studies showing thicker LF in males while others found no significant difference. Differences in MRI protocols and measurement techniques likely contributed to the variability in reported thickness values and gender-related findings. This systematic review

confirms that age is a consistent and essential factor in the increase of ligamentum flavum thickness, particularly at the L4-L5 level. This highlights specific spinal level's vulnerability to degenerative changes and its role in CLBP. Conversely, the role of gender remains indefinite due to the conflicting evidence. The findings emphasize the urgent need for standardized MRI protocols and measurement techniques in future research to improve diagnostic precision and guide targeted therapeutic interventions.

Keywords: *Age-related degeneration, Chronic low back pain, Ligamentum flavum thickness, Lumbar spinal stenosis, Lumbar spine, Magnetic resonance imaging*

20. Factors Influencing Cataract Surgery Uptake Among Adults in Rural Settings: A Systematic Review

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Abstract

Leading cause of avoidable blindness worldwide is cataract and strangely affects adults living in rural and underserved areas. Despite surgery for cataract being the safest and most affordable medical interventions, the uptake of surgery among diagnosed patients in rural communities remains low. The study meant to identify, analyze and synthesize evidences on the factors affecting uptake of cataract surgery among adult patients in rural areas. The review was anchored on the Socio-Ecological Model (SEM), which explains health-seeking behaviors as a result of interactions among individual, interpersonal, community, organizational and broader structural factors. The framework guided the synthesis of factors influencing cataract surgery uptake, including patients' knowledge and perceptions, family and social support, cultural beliefs, socioeconomic circumstances, geographical accessibility, transportation, availability and quality of eye-care services and health-system factors. A systematic search of published literature conducted using electronic databases including; PubMed, Scopus, Google Scholar and Web of Science for studies published the year 2007 to 2026. The review included quantitative, qualitative, and mixed-method studies that investigated determinants, barriers and facilitators of cataract surgery uptake among adults in rural populations. Relevant studies were screened based on predefined inclusion and exclusion criteria. The review found that uptake of cataract surgery in rural settings is influenced by multiple related factors. Common challenges identified across studies are; financial constraints, transportation difficulties, long distance to surgical facilities, lack of awareness about cataract and its treatment, fear of surgery, poor understanding importance of surgery, gender disparities, cultural beliefs and lack of family support. Health system related barriers included shortage of trained eye care personnel, limited outreach services, long waiting times and concerns about surgical quality and outcomes. The study concludes that the uptake of cataract surgery among adults in rural settings is affected by socio-economic, cultural, demographic and health-system factors. Addressing these barriers through affordable eye care services, strengthened outreach programs, improved accessibility, health education and community engagement is essential to improve cataract surgery uptake and reduce avoidable blindness in rural populations. Further research is recommended to evaluate context-specific interventions that can enhance utilization of cataract surgical services in underserved communities.

Keywords: *Cataract Surgery Uptake, Barriers to Surgery, Rural Health Services and Avoidable Blindness.*

21. Informal Coping Mechanisms and Nursing Workarounds in Public Hospitals in Kenya

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Abstract

In low-resource health systems, structural resilience is frequently sustained not by formal governance mechanisms, but by the organic, unmapped adaptive behaviors of frontline clinicians. When structured tools like Nursing Care Plans (NCPs) collapse under chronic systemic strain, nurses deploy informal workarounds to preserve patient survival. Objective: To document, categorize, and structurally model the informal coping mechanisms and operational workarounds adopted by frontline nurses when formal care coordination tools become unviable due to chronic resource and human workforce limitations. Methods: A web-based, convergent parallel mixed-methods study was conducted across public Level 4, 5, and 6 hospitals in Kenya. Quantitative data from N = 412 frontline nurses were captured using a mobile-optimized electronic survey via Redcap to model the structural predictors of workaround reliance. Concurrently, qualitative data from n = 24 virtual Key Informant Interviews (KIIs) and n = 6 electronic Focus Group Discussions (e-FGDs) were thematic-mapped using the Systems Engineering Initiative for Patient Safety (SEIPS 2.0) framework. Results: Nurses faced a mean night-shift workload of 34.1 ±11.4 patients per individual. Quantitative modeling showed that the reliance on unauthorized communication workarounds was heavily predicted by high patient-to-nurse ratios ($\beta = -0.68$, $p < 0.001$) and elevated Structural Bottleneck Index scores ($\beta = -0.34$, $p < 0.001$). Qualitative synthesis revealed three highly structured, informal subsystems: Cognitive Task Pruning, The Paper Shadow System and defensive retrospective back-filling. Conclusion: Informal workarounds represent a form of grass-roots absorptive capacity that keeps overstretched wards functional. However, they create systemic risks by fragmenting clinical data and inducing hidden quality variances. Building resilient health systems requires transformative governance that standardizes, streamlines, and digitalizes these informal adaptive strategies rather than penalizing them.

22. Monitoring and Evaluation Practices and Performance of Maternal Health and Family Planning Projects: Evidence from the NPI EXPAND Project in Narok County, Kenya

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Abstract

Monitoring and evaluation (M&E) is central to project learning, accountability, and evidence- informed decision-making. Yet, there is limited empirical evidence on how M&E practices relate to the performance of maternal health and family planning (MH/FP) projects implemented in pastoralist and culturally conservative settings. This study examined the relationship between M&E practices and the performance of the New Partnerships Initiative (NPI) EXPAND Project in Narok County, Kenya. Project performance was assessed through maternal health outcomes, family planning uptake, service accessibility, and stakeholder satisfaction, consistent with the operationalization adopted in the study. Guided by the Results-Based Management Framework, the study employed a mixed-methods approach combining cross-sectional descriptive survey and correlational designs. Data were collected from 292 Community Health Volunteers, healthcare providers, and project team members using structured questionnaires, key informant interviews, and focus

group discussions. M&E practices recorded a composite mean of 3.76, indicating implementation to a large extent, although monitoring planning and design were comparatively weaker than the use of monitoring results. The findings revealed a strong positive relationship between M&E practices and project performance ($r = .897$, $p < .05$), with M&E accounting for 80.5% of the observed variation in performance ($R^2 = .805$, $p < .05$). The findings highlight the importance of systematic monitoring, effective feedback mechanisms, and timely use of evidence in improving programme quality and responsiveness. These lessons extend beyond MH/FP programming to quality assurance and evaluation systems in community and health education programmes where continuous monitoring, learning, and evidence-informed improvement are essential. The study recommends strengthening M&E planning, feedback mechanisms, and the systematic use of monitoring evidence to enhance programme performance and quality.

Keywords: *Monitoring and Evaluation; Project Performance; Quality Assurance; Maternal Health; Family Planning; Community Education*

23. Effectiveness Of Kenyan Government Strategies in Vaccinating Girls 9-14 Years with the Human Papilloma Virus Vaccine: A Systematic Review

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Abstract

Despite being the second most common cancer in women, cervical cancer remains a significant public health concern in Kenya. The most significant reason for vaccination is the prevalence of high-risk HPV strains which in turn leads to persistent infection. Kenya's immunization program for young girls that included the HPV vaccine in 2019 still falls short of the WHO elimination targets. Objective of systematic review: Evaluate coverage of HPV vaccination, strategies for implementation, barriers and facilitators in the transmission of the disease to girls between 9-14 years old in Kenya. Methods: The analysis followed the PRISMA 2020 guidelines and employed a systematic approach that included searches of electronic databases such as PubMed, Google Scholar or grey literature from Ministry of Health-Kenya and WHO reports. Kenyan HPV vaccination programs were examined in studies published between 2015 and 2026. A total of 13 studies and policy documents were deemed eligible for inclusion. Results: Findings indicate that HPV vaccine adoption in Kenya is still low with rural areas experiencing the highest rates of use. School-based vaccination programs had a good impact on the proportion of eligible girls covered but did not reach the entire population because of regular absenteeism and because out-of-school adolescents were not vaccinated. Facility-based approaches enabled girls who are not in the classroom but were hindered by logistical and infrastructural issues. The main challenges reported included vaccine refusal, lack of information about fertility and safety concerns, underdeveloped health care infrastructure and financial difficulties, and lack of public education. Other important barriers, though, existed. A single-dose HPV vaccination schedule was suggested to improve vaccine coverage and alleviate logistical challenges by 2025. Conclusions: The review indicates that Kenya's cervical cancer elimination targets can be accomplished via community outreach, school visits, better health systems and policy implementation. The government's continued efforts and intersectoral cooperation will play a critical role in enhancing HPV vaccine uptake and reducing the morbidity and mortality due to cervical cancer.

Keywords: *HPV vaccination, Kenya, implementation strategies, coverage, cervical cancer and outcomes.*

24. Myopia And Teacher-Rated Behavioural Outcomes Among School-Going Adolescents in Western Kenya: A Cross-Sectional Study

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Abstract

Myopia may limit access to distant classroom information and influence participation in learning. Evidence on teacher-rated multidomain behaviour among African school-going adolescents remains limited. To assess associations between myopia and overall and domain-specific teacher-rated behavioural outcomes among students in western Kenya. This school-based cross-sectional study included 151 students from six schools. Myopia was defined as spherical equivalent refraction of −0.50 dioptres or more negative in at least one eye. Classroom teachers completed a 20-item instrument measuring an Overall Behavioural Score and five domains: cognitive abilities, attentiveness, social interaction, classroom engagement and outdoor engagement. Linear regression estimated mean differences, adjusting for age, sex and school fixed effects and using HC3 robust standard errors. A sensitivity analysis was restricted to ages 13–19 years. Participants had a mean age of 16.35 years; 74.8% were female and 56 (37.1%) had myopia. Mean Overall Behavioural Score was 55.43 in the myopia group and 58.04 in the non-myopia group. The adjusted mean difference was −2.88 points (95% confidence interval [CI], −6.72 to 0.95; p=.139), with the CI including no difference. All five domain estimates were negative. Outdoor engagement showed the largest adjusted difference (−1.17; 95% CI, −2.18 to −0.16; nominal p=.024), followed by social interaction (−0.83; 95% CI, −1.68 to 0.02; nominal p=.055); neither remained statistically significant after Holm adjustment. Among participants aged 13–19 years (n=141), the adjusted overall difference was −4.17 points (95% CI, −8.03 to −0.31; p=.034). Myopia was associated with consistently lower teacher-rated behavioural scores, but the primary estimate was imprecise and does not establish causality. School eye-health programmes should evaluate functional participation alongside vision screening and spectacle provision. Prospective studies should use cycloplegic refraction, validated behavioural measures and systematic documentation of spectacle wear and correction adequacy.

Keywords: *adolescents; behavioural outcomes; myopia; school eye health; teacher rating; Kenya*

25. Headache and the Eye: Ophthalmic Misattribution, Diagnostic Pitfalls, and Interdisciplinary Care in Africa and Low- and Middle-Income Countries

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Abstract

Headache is a common neurological complaint encountered in general medical, emergency, and ophthalmic practice. In Africa and other low- and middle-income countries (LMICs), the widespread belief that headaches are primarily caused by visual problems often influences care-seeking behaviour and contributes to ophthalmic referrals in patients without visual symptoms or ocular pathology. Although some eye disorders

cause headache, most headaches are primary neurological disorders, particularly migraine and tension-type headache. To critically review the relationship between headache and ocular disease, distinguish genuine ophthalmic causes from neurological and systemic disorders with ocular manifestations, and propose a practical interdisciplinary diagnostic framework relevant to African and other LMIC settings. A critical narrative review was conducted using literature from ophthalmology, neurology, emergency medicine, and primary care. Relevant publications were identified through PubMed, Google Scholar, and Scopus using terms including *headache, migraine, neuro-ophthalmology, ocular pain, refractive error-associated headache, and digital eye strain. E*mphasis was placed on diagnostic challenges, red flags, resource limitations, and healthcare realities in LMICs. Primary headache disorders account for most headache presentations in eye clinics. Migraine may produce visual symptoms that mimic ocular disease and is frequently underrecognised. Genuine ocular causes include acute angle-closure glaucoma, uveitis, scleritis, keratitis, and optic neuritis, but are considerably less common than perceived. Evidence linking refractive error to chronic headache remains limited. Increasing screen exposure, psychosocial stress, and sleep disruption may further contribute to headache burden. Headache management in LMICs requires structured interdisciplinary neuro-ophthalmic pathways rather than routine attribution to ocular disease. Clinicians should distinguish primary headache disorders from vision- and life-threatening conditions while strengthening public and professional education to address misconceptions about headache and eyesight.

26. Impact of Group Social Support on Reducing Mental Health Related Symptoms Among Dialysis Patients in Kenya: A Systematic Review.

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Abstract

Kidney diseases are gaining momentum as pressing public health concerns not only in Kenya but globally. Patients on routine dialysis experience depression, anxiety and psychological distress as a result of long-term nature of treatment, financial constraints and low quality of life. Effective group-based social support approaches have become a major psychosocial intervention for improving emotional stability among dialysis patients. This systematic review intended to assess the effects of peer-based social support approaches on mental health-related manifestations among dialysis patients in Kenya. A systematic literature review was executed using Google Scholar, PubMed, Scopus and Web of Science. Studies published between 2015 and 2025 encompassing adult dialysis patients were included. Keywords related to social support, dialysis, depression, anxiety, mental health and Kenya were utilized during the search process. Eligible studies assessed psychosocial or group-based support interventions and reported findings such as depression, anxiety, coping, stress and quality of life. The review identified a high prevalence of depression and anxiety amidst dialysis patients with depression rates ranging from 32.4% to 72.5% and on the other hand anxiety affecting up to 45% of patients. Group-based social support interventions that includes peer support groups, psychoeducation, counselling and stress management activities were related with reduced psychological distress, improved coping skills, better treatment adherence and improved social connectedness. Strong peer and family support also contributed to improved mental health outcomes. However, psychosocial support services in a majority of Kenyan dialysis units remain inadequately integrated into routine renal care. Group-based social support interventions enhances psychological well-being among dialysis patients in Kenya. Substantial integration of psychosocial care into dialysis services and extra research on structured support interventions are recommended.

Keywords: *Chronic kidney disease (CKD), haemodialysis, group-based social support, depression, anxiety and Kenya.*

27. Beyond Clinical Signs: Integrating Symptom Burden, Ocular-Surface Findings and Lens-Wear Characteristics in Contact Lens After-Care in Western Kenya

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Abstract

Contact lens discomfort is a major barrier to successful and sustained lens wear, yet symptom burden may not be fully explained by routine clinical signs alone. Evidence from African settings remains limited. This study synthesised findings from a clinic-based investigation of contact lens wearers in Kisumu County, Kenya, to examine how symptom burden relates to ocular-surface findings and lens-wear characteristics. A cross-sectional study was conducted among 118 established contact lens wearers attending after-care services in Kisumu County. Contact lens discomfort symptom burden was assessed using the Contact Lens Dry Eye Questionnaire-8 (CLDEQ-8). Clinical assessments included blink rate, lid-parallel conjunctival folds (LIPCOF), meibomian gland function, Schirmer's test and tear breakup time, alongside lens type and wearing characteristics. Associations with CLDEQ-8 symptom burden were examined using multivariable regression approaches. Participants demonstrated a substantial burden of contact lens-related symptoms. Higher LIPCOF was associated with greater CLDEQ-8 symptom burden, whereas routine tear-film measures showed no clear independent relationship with symptoms. Lens-wear characteristics, including lens modality and daily wearing duration, also showed potentially important associations with symptom burden, although these findings require cautious interpretation because of possible adaptation, prescribing indication and wearer-selection effects. Contact lens discomfort in routine after-care appears to reflect an interaction between symptoms, ocular-surface findings and lens-wear characteristics rather than any single clinical marker. Integrating structured symptom screening with targeted ocular-surface assessment and lens-wear review may strengthen contact lens after-care in resource-constrained settings.

Keywords: *Contact lens discomfort; CLDEQ-8; LIPCOF; ocular surface; contact lens after-care; Kenya*

28. Outcome of Peer-Led Psychosocial Support on Adherence to Antiretroviral Therapy Among Adolescents and Young People Living With Human Immunodeficiency Virus in Africa: A Systematic Review

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Abstract

Adolescents and young people living with HIV experience inimitable psychosocial and mental health challenges that negatively affect adherence to antiretroviral therapy (ART), retention in care and overall treatment outcomes. Researchers increasingly recognize Peer-led psychosocial support interventions as among adolescent-friendly approaches that may improve adherence behaviors and overall mental and social well-being in this population. This systematic review sought to evaluate the outcome of peer-led psychosocial support on adherence to ART among adolescents and young adults living with Human Immunodeficiency Virus in Africa. This study systematically examined the relevant literature using electronic databases, including PubMed, Google Scholar, Sage Publications and ScienceDirect. We restricted the literature search to articles published in English between 2021 and 2026 using predefined keywords and Boolean operators related to HIV, adolescents, peer-led support, mental health and ART adherence. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Eight studies qualified for inclusion in this review. The findings revealed that peer-led psychosocial support interventions, including peer mentorship, adherence clubs, youth support groups and community-based counseling, positively influenced ART adherence, clinic attendance, retention, care, viral suppression and psychosocial outcomes. Participants receiving peer support reported improved self-esteem, emotional well-being and coping strategies, as well as reduced stigma and social isolation. However, challenges of inadequate funding, limited training of peer supporters, stigma and sub-optimal integration of mental health services within HIV programming were identified. The review concludes that peer-led psychosocial support is an effective strategy for improving ART adherence and psychosocial outcomes among adolescents and young adults living with HIV. Strengthening integration of peer-led psychosocial support services within HIV care systems is recommended to improve long-term treatment outcomes.

29. Covid-19 and Essential Non-Covid Health Service Delivery in Lmics: Disruptions, Continuity and Resilience

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Abstract

COVID-19 disrupted health systems globally, but its indirect effects on essential non-COVID health services were especially consequential in low- and middle-income countries (LMICs), where pre-existing workforce, financing, supply-chain, governance, and data-system weaknesses shaped service continuity. Evidence remains fragmented across service domains, countries, and study designs. This scoping review aimed to map evidence on COVID-19-related disruptions to essential non-COVID health service delivery in LMICs from 2019 to 2026, identify continuity strategies used to sustain services, and synthesise health-system resilience mechanisms and gaps.

A scoping review approach guided by JBI methodology and PRISMA-ScR principles was used. Quantitative, qualitative, mixed-methods, routine-data, implementation, and eligible review studies were charted using a structured extraction template covering study characteristics, service domains, disruption outcomes, continuity strategies, resilience mechanisms, limitations, and implications. Findings were synthesised descriptively and thematically across service areas.

Preliminary extraction identified 59 charted records, of which 58 were provisionally included for final data charting. Evidence was concentrated in reproductive, maternal, newborn and child health, immunisation, HIV/TB/malaria, non-communicable disease care, mental health, surgery, and primary health care. Disruptions included reduced service use, delayed care, missed follow-up, medicine and commodity shortages, workforce redeployment, reduced outreach, referral delays, and fear-driven non-attendance. Continuity strategies included community outreach, CHW-supported follow-up, telemedicine,

phone/WhatsApp follow-up, appointment spacing, triage, multi-month dispensing, catch-up campaigns, home delivery of medicines, partner support, and local coordination. Resilience was strongest where pre-existing governance, community platforms, data systems, flexible financing, supply-chain capacity, and public–private coordination were already functional. COVID-19 did not affect all essential services uniformly. Some services collapsed, others recovered quickly, and some continued but became delayed, inequitable, or dependent on fragile adaptations. Building resilient LMIC health systems requires institutionalised continuity planning, protected primary care, community-based platforms, workforce support, supply-chain buffers, digital/data systems, and trust-based governance before future shocks occur.

Keywords: *COVID-19; essential health services; low- and middle-income countries; service continuity; health-system resilience*

30. Prevalence, Severity, and Etiological Profile of Low Vision among Eye Camp Attendees in Kakamega County, Kenya: A Cross-Sectional Study

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Abstract

Low vision remains a major public health challenge in low- and middle-income countries. In Kenya, county-level evidence on burden, causes, severity, and service utilization remains limited. This study assessed low vision among outreach eye-camp attendees in Kakamega County. A descriptive cross-sectional study was conducted at seven outreach sites across four sub-counties. Consenting attendees were screened using structured interviews, visual acuity assessment, and ocular examinations. Low vision was defined using WHO criteria as presenting visual acuity worse than 6/18 but equal to or better than light perception in the better-seeing eye, with residual useful vision. Data were analysed using descriptive statistics, Pearson's Chi-square test, Fisher's exact test with Monte Carlo simulation, and ordinal logistic regression. Of 3,334 individuals screened, 160 had low vision, giving a prevalence of 4.80% (95% CI: 4.11–5.59). Prevalence differed significantly across outreach sites ($p<0.001$). Moderate visual impairment was most common (51.2%), followed by severe visual impairment (33.1%), profound visual impairment (8.8%), and legal blindness (6.9%). Cataract was the leading cause (68.8%), followed by glaucoma (6.9%), age-related macular degeneration (5.0%), and corneal opacity (5.0%). Severity differed significantly by cause ($p<0.001$). Formal education was associated with lower odds of more severe low vision (OR = 0.29, 95% CI: 0.13–0.64, $p=0.002$). Service utilization was poor; 94.4% had never used low vision services and 95.0% had no prescribed device. Low vision among outreach attendees was mainly cataract-related, with major rehabilitation gaps. Strengthening cataract services, eye-health education, and low vision rehabilitation may reduce functional visual disability.

31. Determinants of Access, Uptake and Sustained Use of Myopia-Control Interventions among Children and Adolescents in LMICs: A Scoping Review

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Abstract

Myopia is an increasing child and adolescent eye-health challenge. Although several optical and pharmacological interventions can slow progression, their real-world benefit depends on whether children and families can access, initiate and sustain treatment, particularly in low- and middle-income countries (LMICs). To map evidence on determinants of access, uptake and sustained use of myopia-control interventions among children and adolescents in LMICs, with particular interest in sub-Saharan Africa. A scoping review was conducted in accordance with PRISMA-ScR. Scopus, MEDLINE and the Cochrane Library were searched from 17-30 March 2026 for English-language studies published within the preceding 10 years. Two reviewers independently screened records and full texts, resolving disagreements by consensus. Data were charted in Covidence and synthesized descriptively across a five-stage care cascade – awareness/knowledge, access/availability, selection/initial uptake, adherence/follow-up and continued use/retention – and across child/adolescent, caregiver/household, provider and health-system/service-delivery levels. Of 535 records identified, 205 duplicates were removed, 330 records screened and 71 full texts assessed; six studies met the inclusion criteria. Three were conducted in China, one in Türkiye and two were international studies with extractable LMIC-relevant evidence. Evidence was concentrated on awareness, access and initial uptake, with less direct evidence on adherence and retention. Key determinants included child willingness and treatment burden; caregiver knowledge, affordability and support; provider recommendation, confidence and follow-up support; and treatment availability, financing, supply and service-delivery arrangements. Paediatric myopia-control implementation in LMICs is shaped by interacting multilevel determinants across the care pathway. Evidence remains limited and geographically concentrated, particularly for sustained use and sub-Saharan Africa. Prospective, context-specific implementation research is needed to support equitable and sustainable myopia-control services.

Keywords: *Myopia control; Children and adolescents; Low- and middle-income countries; Access to eye care; Treatment uptake; Treatment adherence; Implementation*

32. Dermatoglyphic features of fingerprint patterns among African adults diagnosed with Type II diabetes: Systematic Review

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Abstract

Dermatoglyphics is the study of epidermal ridges on volar aspect of hands and feet forming a variety of pattern configurations. It encompasses assessment and classification of fingerprint patterns for identification. Dermatoglyphic patterns in digital and palmar regions are associated with various diseases, especially of genetic origin, and have been reported by multiple researchers. Recently, type II diabetes cases has been on the rise in most African countries due to lifestyle changes. This review compared fingerprint patterns among patients diagnosed with type II Diabetes Mellitus residing in Africa. A systematic Comprehensive review using Whittemore and Knafl method involving a five-stage process of problem identification, literature search, data evaluation, data analysis, and presentation of findings was employed. Exploration was conducted across five databases (Medline, Pubmed, Scopus, Google Scholar and Science Direct) which aimed to detect related papers published between January 2019 to March 2025. PRISMA framework was used to identify and collate a total of 5/268 (1.87) related articles that were included in the study. They were summarized for similarities and different variables analyzed. This review concluded that, although no specific fingerprint pattern can be definitively recognized as a marker for diabetes, ulnar and radial loops displayed uncertain trends that warrant further investigation. It supports, that dermatoglyphics, together with genetic and clinical data, might aid as an additional non-invasive screening tool, thus reducing the morbidity and mortality related to diabetes. There is need for further studies to be done on larger sample size in different populations so as to validate these findings.

Keywords: *Dermatoglyphics, Type II Diabetes, Finger print pattern*

33. Integrating Emergency Medical Skills Into Community Based Drug Rehabilitation: A Restorative Justice Informed Approach to Recidivism Prevention in Naivasha, Kenya

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Abstract

Drug abuse recidivism presents continuing challenges for community-based rehabilitation, particularly where relapse and intoxication may be accompanied by injuries, falls, seizures, self-harm, or interpersonal conflict. Rehabilitation approaches commonly emphasize recovery and reintegration, yet the preparedness of peers and other immediate community members to respond safely to acute emergencies may receive limited attention. This proposed study will explore how emergency medical skills training could complement restorative justice-informed community-based drug rehabilitation and contribute to safer reintegration in Naivasha, Kenya. The study will use a mixed-methods design involving participants in community-based rehabilitation programmes and relevant rehabilitation, health, and community stakeholders. Data are expected to be gathered through questionnaires and interviews, with qualitative responses analysed thematically and quantitative data summarised descriptively. A small pilot study will be conducted before the main data collection to assess the clarity, relevance, and feasibility of the research instruments and proposed procedures; pilot findings will be used to refine the tools rather than treated as evidence of intervention effectiveness. Conceptually, restorative justice provides a framework for strengthening accountability, supportive relationships, participation, and reintegration, while basic emergency-response training may improve recognition of urgent situations and appropriate first response pending professional assistance. The study will examine stakeholder views on the feasibility, acceptability, and potential value of integrating first-aid and emergency-response skills into rehabilitation activities, as well as perceived links to safety and recidivism prevention. As this is proposed research, no empirical results are reported. The study is expected to inform a practical, community-oriented framework for connecting restorative rehabilitation with emergency preparedness, while identifying safeguards, training needs, and areas requiring further evaluation.

34. Poison on the Plate: Heavy Metals in Kenyan Vegetables and the Urgent Need for Chemical Regulation

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Abstract

Heavy metal contamination in vegetables has been widely documented by numerous studies, raising serious concerns about food safety and public health. Research conducted in Kenya and other regions has consistently reported elevated levels of lead (Pb), cadmium (Cd), arsenic (As) and mercury (Hg) in commonly consumed vegetables such as Sukuma wiki, spinach, onions and tomatoes. These findings highlight the consequences of excessive use of fertilizers, pesticides and contaminated irrigation water in local farming systems. For instance, studies have shown that leafy vegetables like Sukuma wiki and spinach tend to accumulate higher concentrations of cadmium and lead due to their large surface area and rapid uptake mechanisms, while onions and tomatoes exhibit contamination through root absorption and translocation into edible tissues. Such contamination not only compromises nutritional quality but also poses long-term health risks to consumers. The presence of heavy metals in these staple vegetables has been linked to gastrointestinal

disorders and increased susceptibility to infections such as Helicobacter pylori (H. pylori). Chronic exposure to contaminated food can weaken mucosal defences, alter gastric physiology and create favourable conditions for H. pylori colonization, thereby elevating risks of gastritis, ulcers and even gastric cancer. These findings underscore the urgent need for critical measures to regulate and control the use of farm chemicals in Kenya and East Africa. Current reliance on chemical-intensive farming practices without adequate monitoring has created a pathway for toxic elements to enter the food chain, threatening both local consumers and regional trade. This study calls for the establishment of integrated regulatory frameworks that combine routine elemental analysis with rapid spectroscopic screening to monitor contamination levels in vegetables at points of entry and local markets. Strengthening enforcement of chemical use regulations, promoting sustainable farming practices, and investing in validated rapid screening tools are essential steps toward safeguarding public health. By addressing these challenges, Kenya can ensure safer food supplies, reduce the burden of diet-related diseases and align its agricultural practices with international food safety standards.

THEMATIC AREA 4: CLIMATE CHANGE, ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT







35. Rapid Fluoride Adsorption onto a MIL-53(Al)-Functionalized Bamboo Hydrochar Composite: Surface Chemistry, Parameters, Regeneration and Cost Analysis

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Abstract

Unlike traditional pyrolyzed biochars, hydrochars retain abundant oxygen-containing functionalities making them attractive yet underexploited platforms for the synthesis of high performing hybrid adsorbents. In this work, MOF-hydrochar composite was prepared using bamboo hydrochar and aluminium based metal organic framework (MOF) MIL-53 (Al) to produce a hydrochar-functionalized MIL-53(Al) (BF-MIL-53(Al)) to enhance fluoride removal from water. Adsorption dynamics followed pseudo-second order (PSO) kinetics. The fluoride adsorption rate, denoted by k_2, on the composite exhibited a five-fold enhancement relative to pristine MOF rate owing to enhanced porosity architecture and interfacial mass transfer. Adsorption equilibrium was best described by the Langmuir model with maximum monolayer adsorption density of 140.43 mg/g. The marginal difference (<3%) in Langmuir adsorption capacity denote the composite's improved kinetic advantage without compromise in adsorption capacity. In terms of adsorption energetics, the process was spontaneous ($\Delta G<0$), exothermic ($\Delta H<0$) and physical ($\Delta H<20$ kJ/mol), dominated by electrostatic interactions. Effectiveness of the regeneration solvents was in the order NaOH>NaCl>distilled water. The estimated direct material cost of Ksh. 105.11 (0.81 USD) per 10 L of treated water demonstrates the economic potential of BF-MIL-53(Al) for fluoride remediation. The composite demonstrated above 85% removal efficiency over three regeneration cycles. The hydrochar-MOF composite boasted over 99% efficiency in real fluoride-impacted mine water implying selectivity and robustness for real-world application.

Keywords: *Hydrochar; Fluoride removal; Metal–organic framework; Adsorption kinetics*

36. Nanoscale Zero-Valent Iron-Functionalized Bamboo Hydrochar: Optimized Synthesis and Structural Chemical Characterization for Fluoride Removal.

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Abstract

This study aimed to develop and optimize a method for producing nanoscale zero-valent iron (nZVI)-functionalized bamboo hydrochar and to characterize the resulting material in terms of its chemical and

structural features. Bamboo hydrochar (BHC) was first prepared by hydrothermal carbonization at 180, 200 and 220 °C, with residence times of 6, 4 and 2 h and solid-to-liquid ratios of 1:5 to 1:10. Based on specific surface area, the optimal conditions were 220 °C, 2 h and a 1:10 ratio (BHC220). Using these conditions, nZVI was loaded in situ by impregnating bamboo powder with $FeCl_3$, carbonizing hydrothermally, and then reducing the iron with $NaBH_4$ in the presence of starch as a stabilizer, giving nZVI-BHC220. Characterization was done by BET, SEM, XRD, TGA and FTIR. Functionalization raised the BET surface area from 10.41 to 46.06 m^2/g and the pore volume from 0.051 to 0.113 cm^3/g. SEM showed granular nanoparticles dispersed across a rough, porous carbon matrix. XRD confirmed α-Fe ($2\theta = 44.8°$) together with iron oxide phases (35.8° and 63°), indicating a core-shell structure, while cellulose-related reflections were partly retained. FTIR showed that hydroxyl, carbonyl and carboxyl groups of the hydrochar persisted alongside Fe–O bands ($\sim 547\ cm^{-1}$). TGA showed a non-zero residue above 550 °C, consistent with the iron content and oxidation of Fe^0 to iron oxides. Overall, the in situ hydrothermal-reduction route produced a stable, porous nZVI-hydrochar composite with a high surface area and favourable surface chemistry, making it a promising adsorbent for water treatment.

Keywords: *Fluoride, bamboo hydrochar, nanoscale zero-valent iron, adsorption.*

37. Isolated Attosecond Pulse Generation Via Spatially Inhomogeneous Three-Color Laser Field.

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Abstract

Precise and live surveillance of minor atmospheric gas species remains central to environmental management and climate action where many greenhouse gasses and reactive species like CO_2, CH_4, OH and BrO require an ultra-wide spectrum with high spectral coherence for accurate spectroscopic detection. High order harmonic generation (HHG) has positioned itself as the cutting-edge technique for generating such light sources, underpinning extreme ultraviolet (XUV) and ultraviolet frequency combs that are used in dual comb spectroscopy for remote greenhouse gas detection. However, the efficiency and spectral purity of these sources depend on the ability to generate isolated attosecond pulses that has remained a major longstanding challenge in strong field physics. This work addresses that challenge by theoretically solving the one-dimensional time-dependent Schrödinger equation by split operator approach under the single active electron approximation to model HHG driven by a spatially inhomogeneous three-color laser field. The simulation yields a supercontinuum spanning ~909 eV, extending up to 1021st order from which a single, well defined isolated attosecond pulse of 27.44 as duration was extracted. Such gains in bandwidth and ultra-short lived light bursts are directly relevant to improving the resolution and species selectivity of frequency comb based atmospheric species sensors, offering a foundational physics route toward development of more sensitive, field deployable climate monitoring instruments.

Keywords: *high order harmonic generation; attosecond pulses; spatial inhomogeneity; dual comb spectroscopy; climate monitoring*

38. Mathematical Modelling of Nitrate Transport in River Nzoia With Spatially And Temporally Variable Reaction Rates.

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Abstract

This study develops a three-dimensional advection-dispersion-reaction model with spatially and temporally variable reaction kinetics to simulate nitrate transport in River Nzoia, Kenya, addressing the fundamental limitation of conventional mathematical models that employ constant reaction rate coefficients which fail to capture the inherent spatial and temporal heterogeneity of biogeochemical processes. The model incorporates denitrification rates with temperature coefficient 1.08 and half-saturation constants of 0.3 mg/L for oxygen and 2.5 mg C/L for organic matter, nitrification rates with temperature coefficient 1.06, and uptake rates with light and nitrate limitation functions, parameterized using primary field data from the wet season and secondary data from the literature for dry season conditions, enabling capture of seasonal variability of 15-35% in reaction rates. Mathematical analysis establishes that the model is well-posed with proven existence, uniqueness, and stability of solutions, while dimensional analysis reveals that longitudinal advection dominates with Péclet number 794, requiring full three-dimensional dispersion in lateral and vertical directions. Numerical simulations using the finite volume method demonstrate that the variable-rate model achieves significantly better agreement with field measurements (R^2 = 0.95, RMSE = 0.39 mg/L) compared to constant-rate models (R^2 = 0.88, RMSE = 0.61 mg/L), with spatial variability revealing that denitrification rates are higher in pool sections where anaerobic conditions develop, uptake rates higher in riffle sections with shallower water and better light penetration, diurnal variations in nitrate concentration of up to 10% at the surface driven by light-dependent uptake processes, and sensitivity analysis identifying uptake parameters as the most influential accounting for 42-58% of prediction variance. The findings demonstrate that incorporating spatial and temporal variability in reaction rates substantially improves predictive accuracy and provides critical insights for water quality management, revealing that management interventions should be targeted to specific reaches based on dominant removal processes with upstream reaches prioritized for riparian restoration, pool sections protected as natural denitrification hotspots, seasonal strategies with dry season efforts focusing on enhancing uptake through vegetation and wet season efforts emphasizing loading reduction through improved agricultural practices, and monitoring programs accounting for spatial heterogeneity through multi-point cross-sectional sampling and standardized sampling times to capture diurnal variations. This research contributes a scientifically modelling framework that advances understanding of nitrate dynamics in tropical river systems and provides a transferable approach applicable to similar catchments facing nitrate pollution challenges in Kenya and the East African region, supporting evidence-based decision-making for water quality management, pollution control, and sustainable river basin management

39. Microplastic Contamination in African Freshwater Ecosystems: A Bibliometric and Systematic Review of Occurrence, Fish Exposure, Cross-Compartment Associations and Risk Characterization

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Abstract

Microplastic (MP) contamination in African freshwater ecosystems is documented across dozens of studies annually, yet the polymer-level chemistry needed to trace polymers from water, through sediment, into fish tissue is rarely assembled within one system. This review combined bibliometric mapping with a systematic synthesis of MP occurrence and polymer composition across water, sediment, and fish, prioritizing studies measuring more than one compartment. The results expose a striking disconnect: although the literature has grown six-fold since 2019, only 14 of 59 independent studies (23.7%) sampled two or more compartments, and none paired spectroscopically confirmed, polymer-resolved data closely enough to test how polymers such as polyethylene (PE) or polyethylene terephthalate (PET) partition between compartments, despite density, weathering, and biofouling being known partitioning drivers. Where water and fish were directly compared, the only two datasets available reported Pearson correlation coefficients of opposite sign, leaving the pooled correlation coefficient statistically indistinguishable from zero ($r \approx 0.39$, 95% CI: −0.61 to 0.91), even though fish exposure was far from rare, reaching 92% prevalence in one study. Concerning chemical risk reporting, the acronym PRI is used inconsistently for mathematically unrelated indices, weighting either polymer-specific hazard scores or pollution load concentration, creating terminology ambiguity. The published PRI values are not chemically comparable across the region, invalidating any risk ranking that compares them directly. African freshwater MP research has matured in volume faster than in the polymer-level chemical tracing needed to answer its most basic question: Does contamination in one compartment predict contamination in another?

Keywords: *Microplastics; Polymer identification; FTIR spectroscopy; Africa; Ecological risk indices; Fish biomonitoring*

40. International Environmental Regulations and Firms' Environmental performance: Evidence from Morocco

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Abstract

International trade can shape firms' environmental performance not only through participation in foreign markets but also through the regulatory conditions encountered in destination countries. Yet these two dimensions of international exposure remain insufficiently distinguished, particularly at the firm level in developing economies. This study examines the relationship between export participation, destination markets' environmental policy stringency, and firms' environmental performance in Morocco. Using recent World Bank Enterprise Survey 2023 data, this paper mainly uses Propensity Score Matching applied to assess differences between exporters and comparable non-exporters. The analysis then focuses on exporting firms to examine whether environmental policy stringency in their main destination markets is associated with CO2 emissions monitoring and energy management measures. The results indicate that exporters are 9.3 percentage points more likely, than comparable non exporters, to monitor CO2 emissions, while no statistically significant difference is observed for energy management measures. When considering stringency, among exporters, a one-unit increase in destination-market environmental policy

stringency index is associated with increases of 12.5 percentage points in CO2 monitoring and 2.6 percentage points in energy management measures. Overall, the evidence indicates that export participation is primarily associated with environmental monitoring, whereas exposure to stringent markets is associated with both dimensions of environmental performance. This distinction underscores the relevance of destination-market regulatory conditions in understanding how international trade related to firms' environmental behaviours.

Keywords: *International trade, CO_2 emissions monitoring, Energy management measures, Environmental policy stringency, Environmental regulations, Propensity score matching, Morocco*

41. Harnessing Indigenous Ecological Knowledge Held by Women for Climate- Resilient Agriculture in Kenya

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Abstract

This research examines the historical transformation of agrarian relations in Kenya and the role of women's Indigenous Ecological Knowledge (IEK) in climate-resilient agriculture. Before colonialism, Kenyan women managed local ecosystems under communal land-tenure systems that supported their independent access to land. However, colonial policies, particularly the 1954 Swynnerton Plan, promoted individual land registration, largely in men's names. This weakened women's land rights, marginalized indigenous food systems, and devalued traditional ecological practices. Despite these challenges, rural women have preserved and adapted IEK through grassroots initiatives, including Mwethya groups, Chamas, community seed banks, tree nurseries, and the Green Belt Movement. Their practices contribute significantly to sustainable agriculture, biodiversity conservation, food security, and ecosystem restoration. These include preserving drought-tolerant crops such as sorghum, finger millet, cowpeas, and indigenous vegetables, alongside terracing, composting, agroforestry, water harvesting, and traditional weather prediction. IEK remains relevant to climate-resilient agriculture, particularly in Kenya's arid and semi-arid lands, where prolonged droughts threaten livelihoods. Scholars such as Robin Wall Kimmerer and Kyle Powys Whyte emphasize reciprocity, ecological balance, historical memory, and collective responsibility as essential elements of Indigenous knowledge systems. Nevertheless, women face persistent barriers, including unequal land ownership, limited access to credit and agricultural extension services, institutional discrimination, inadequate representation in climate decision-making, and the exploitation of indigenous knowledge without community consent. The research recommends three key interventions. First, strengthen women's land rights and secure access to communal resources. Second, integrate Indigenous knowledge with scientific research through respectful knowledge-sharing that protects community consent and intellectual property. Third, institutionalize women's leadership in climate governance by incorporating grassroots organizations into national and county climate policies and directing climate finance toward women-led initiatives. Ultimately, sustainable climate adaptation in Kenya requires recognizing women not merely as vulnerable populations but as environmental leaders whose knowledge and practices are essential for equitable development, resilient livelihoods, and long-term ecological sustainability.

Keywords: *Harnessing, utilizing, employing, exploiting*

42. Citizen Science for Kaimosi Forest Ecosystem Management

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Abstract

Kaimosi Forest faces escalating anthropogenic and climate pressures, necessitating localized, adaptive management strategies. Traditional conservation frameworks often overlook the value of community-led monitoring networks. This paper evaluates the operationalization and outcomes of a pilot Citizen Science initiative established in Kaimosi Forest. Over 100 students from Kaimosi Friends University (KAFU) were trained as environmental monitors alongside the community members. These monitors deployed localized field tools to gather real-time qualitative and quantitative metrics on forest health, canopy disturbances, and local biodiversity indicators, integrating academic baseline datasets with local ecological observations. The pilot successfully democratized data collection rights for local environmental stakeholders and created high-impact, hands-on research opportunities for undergraduate science students. The active deployment of student and community monitors yielded comprehensive local forest-monitoring matrices, significantly enhancing community-led surveillance of vulnerable ecological zones. Crucially, this real-time monitoring demonstrated direct conservation impact through the successful identification and rescue of an endangered juvenile primate, highlighting the immediate protective value of field-level interventions. Furthermore, broadcast media engagement and participatory community forums successfully translated these empirical findings into accessible public knowledge, fostering greater regional advocacy. The Kaimosi Citizen Science model demonstrates that structured student-led environmental monitoring offers a scalable, low-cost, and high-fidelity mechanism for tracking ecosystem health and protecting wildlife. By bridging the gap between rigorous scientific institutions and local communities, this framework serves as an effective blueprint for sustainable socio-economic development, community ownership, and resilient climate action in tropical forest blocks.

Keywords: *Citizen science; Kaimosi Forest; ecosystem management; environmental monitoring; primate conservation*

43. Polymer Composition, Pollution Load, and Ecological–Human Risk Assessment of Microplastics in Surface Sediments and *Oreochromis niloticus* from Kisumu Bay, Lake Victoria

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Abstract

Microplastic (MP) pollution poses a growing threat to freshwater ecosystems worldwide, yet polymer-specific composition, pollution loads, and associated ecotoxicological risks remain poorly characterized for Lake Victoria, particularly Kisumu Bay. This study quantified MP abundance, polymer composition, pollution load, and ecological and human health risks in surface sediments and the gastrointestinal tract (GIT) of *Oreochromis niloticus* from Kisumu Bay. Surface sediments were sampled in triplicate at four impacted sites and an offshore control along 0, 50, and 100 m shore-to-lake transects, while *O. niloticus* were obtained

from four landing beaches. MPs were extracted via wet peroxide oxidation and density separation, morphologically classified by stereomicroscopy with hot-needle confirmation, and chemically identified using ATR-FTIR spectroscopy at a minimum 80% spectral match threshold. A Pollution Load Index (PLI) and a qualitative Polymer Risk Index (PRI) were applied to assess contamination intensity and hazard. Sediment MP concentrations ranged from 536.7 to 2164.1 particles 100 g^{-1} dry weight, with significant spatial variability ($p < 0.001$) driven by riverine and wastewater inputs; PLI exceeded unity at all impacted sites, reaching 2.79. Fibers and fragments dominated MP morphology, and polyethylene and polypropylene dominated both matrices, while polystyrene, despite comparatively low abundance, carried the highest hazard score. MPs were detected in all GIT composites, with a mean abundance of 251.2 particles and no significant spatial or size-class variation. A non-significant inverse sediment–fish correlation indicated that fish mobility, rather than local sediment accumulation, governs biological MP burden. Estimated annual human MP intake ranged from approximately 693 to 13,057 particles. Kisumu Bay is therefore a site of substantial, polymer-resolved MP contamination with direct ecological and food-safety implications, underscoring the need for integrated sediment–water–biota monitoring and targeted pollution management in tropical freshwater systems.

Keywords: *Microplastics; Sediments; Fish; Pollution index; Lake Victoria*

44. Recent Advances in Adsorbent Materials for Arsenic Removal from Water: Mechanisms, Sustainability, Artificial Intelligence Applications and Future Perspectives

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Abstract

Contamination of drinking water by arsenic (As) remains a major global health concern, with more than 200 million people exposed to concentrations that exceed the recommended safety limit. Adsorption has become one of the most effective and economically attractive technologies for As removal, driving the rapid development of advanced adsorbent materials. This review provides a comprehensive assessment of the recent progress in conventional and emerging adsorbents, including biochar, hydrochar, metal–organic frameworks (MOFs), geopolymers, nanomaterials, and waste-derived materials. Recent advances in surface characterization and computational techniques have significantly improved our understanding of adsorption mechanisms, revealing the roles of surface complexation, ligand exchange, electrostatic interactions, ion exchange, and redox transformation in As sequestration. This review also highlights the growing contributions of artificial intelligence (AI) and machine learning (ML) in predicting adsorption performance, optimizing operating conditions, and accelerating the design of high-performance adsorbents. In addition to adsorption efficiency, attention has been paid to regeneration, circular economy strategies, techno-economic evaluation, pilot-scale studies, life-cycle assessment, and field-scale implementation, which are essential for translating laboratory findings into sustainable water treatment technologies. The potential impact of climate change on As mobilization and groundwater contamination is discussed further, emphasizing the need for resilient treatment systems. Critical knowledge gaps are identified, and recommendations for future research are provided, aimed at developing scalable, cost-effective, and environmentally sustainable adsorption technologies for long term As remediation. The review clearly stipulates that arsenic removal should go beyond maximization of adsorption capacity alone but to the development of adsorbents that combine

mechanistic effectiveness, sustainability, selectivity, regeneration, affordability, real-water applicability and data-driven optimization.

Keywords: *Arsenic; Adsorption; Advanced adsorbent materials; Artificial intelligence; Sustainability; Climate change.*

45. Kaolin- and Metakaolin-Based Geopolymer Adsorbents for Water Treatment: Chemistry, Engineering, Adsorption Mechanisms, Sustainability and Future Perspectives

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Abstract

The complexity of aquatic contaminants requires adsorbents that are inexpensive, regenerable, stable, have strong contaminant affinity and are compatible with continuous treatment columns. This review consolidates findings from studies on metakaolin-based geopolymers published between 2017-2026. The reviewed studies focus on the application of the geopolymers in the abatement of both legacy and emerging contaminants (ECs) from wastewater. Precursor chemistry, metakaolinization, activation, pore and surface engineering, mechanistic studies, regeneration and sustainability are also assessed. Calcination of kaolinite produces reactive metakaolin. Metakaolin is dissolved in activator alkalis to produce anionic aluminosilicate frameworks with exchangeable alkali cations providing charge balance. However, in addition to geopolymer formation, other factors such as precursor mineralogy, Si/Al ratio, activator composition, residual alkalinity, porosity, functional group density and contaminant speciation affect the adsorptive performance of geopolymers. Unmodified metakaolin-derived geopolymers generally exhibit low surface areas and selectivity for cations. Therefore, modification strategies including acid treatment and incorporation of biochars and metal oxides, have been adopted. Studies have reported improved selectivity, porosity, regenerability and catalytic activity in the modified adsorbents. However, overreliance on isotherms and kinetic models for mechanistic proof by contemporary studies present an inadequacy. Complementary spectroscopic and mass-balance evidence is needed to fully understand their mechanisms of action. Again, the reviewed studies are predominantly batch experiments, with single contaminant systems. Furthermore, inconsistent experimental conditions and regeneration protocols jeopardize cross-study comparisons. Therefore, trials on real wastewaters, competitive adsorption, elemental leaching, treatment costs, continuous flow systems and life cycle impacts remain limited. Future studies must therefore address these gaps.

Keywords: *Geopolymer, Metakaolin, Kaolin, Wastewater*

46. AI-Enabled Climate Intelligence for Adaptive Governance and Sustainable Natural Resource Management in Kenya

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Abstract

Kenya's climate risks increasingly intersect with ecosystem degradation, water stress, biodiversity loss and uneven institutional capacity for adaptive management. Although artificial intelligence (AI) can integrate climate, environmental and socio-economic data, empirical evidence on whether AI-enabled climate intelligence improves adaptive governance in Kenya remains limited. This study therefore examines the contribution of AI-enabled climate intelligence to adaptive governance and sustainable natural resource

management within Kenya's devolved system. Objectives: The study assesses the relationship between AI-enabled climate intelligence and adaptive governance; evaluates the influence of climate-risk analytics on sustainable natural resource management; and examines whether institutional capacity moderates the effectiveness of AI-enabled climate intelligence. Methodology/Approach: The study adopts a quantitative empirical research design based exclusively on secondary panel data for Kenya's 47 counties. Data will be compiled from the Kenya National Bureau of Statistics, National Environment Management Authority, National Drought Management Authority, Kenya Meteorological Department, Ministry of Environment, Climate Change and Forestry, county climate-action documents, World Bank databases, and international climate datasets. AI readiness, climate-information utilization, adaptive-governance capacity, and natural-resource sustainability will be operationalized through composite indicators. Descriptive statistics, correlation analysis and multivariate panel regression will be employed to test hypothesized relationships, with robustness checks applied to alternative model specifications. The empirical analysis is expected to establish whether higher levels of AI-enabled climate intelligence are associated with stronger adaptation capacity and improved natural-resource governance. Attention will be given to differences across counties in climate exposure, digital readiness and governance capacity. The study is expected to demonstrate how AI can move climate governance from reactive response towards evidence-driven, anticipatory and adaptive decision-making. The findings will provide policy evidence for integrating AI-enabled climate intelligence into county planning, climate finance, environmental monitoring and natural-resource governance, contributing to climate resilience and sustainable socio-economic development in Kenya.

Keywords: *Artificial intelligence; climate intelligence; adaptive governance; natural resource management; climate resilience*

47. Fluoride Adsorption Research in Africa: A Systematic, Bibliometric and Critical Review of Materials, Mechanisms, Sustainability and Technological Readiness

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Abstract

Fluoride contamination of groundwater is one of Africa's most critical geogenic water quality challenges, affecting 20-25 million people in the East African Rift Valley, and in the phosphate mining zones of Morocco and Tunisia and the Saharan aquifer belt. Among the available defluoridation strategies, adsorption uniquely satisfies the low-energy, low-cost, local material availability, and operational simplicity requirements of rural African settings. This study aimed to systematically synthesize and analyse the literature on fluoride adsorption in Africa from 1970 to 2026 and only included 241 research papers authored by Africans that were identified by systematic Scopus analysis. In the corpus, South Africa is the leading country by (n=60), followed by Ethiopia (n=37), Egypt (n=35), and Tunisia (n=29). Annual output increased from less than five publications per year before 2010, to a steady 17-20 per year between 2021 and 2025. Three types of adsorbent groups such as natural geological material, biomass-based material and modified synthetic composite are discussed. The mechanisms governing fluoride removal include electrostatic attraction, inner-sphere ligand exchange, hydroxyapatite crystal lattice ion exchange, and surface precipitation. Bicarbonate, is the dominant competitive inhibitor, reducing metal oxide adsorbent capacity by 30-60% relative to synthetic NaF experiments. Less than 15 papers out of 241 offer validation of fixed-bed columns, and less than 5 offer evidence of a 'laboratory to field' translation gap and community field data. For the utilization of abundant laboratory science in Africa's communities to result in sustained health benefits, the following topics for future research are identified as critical: real-groundwater validation, non-linear isotherm regression, dimensionless thermodynamic equilibrium constants and techno-economic analysis.

Keywords: *Defluoridation, water, adsorption and Africa*

48. Mapping Nature-Based Solutions for Integrated Climate, Biodiversity and Health Outcomes in Kenya's Lake Region Economic Bloc

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Abstract

Background: The Lake Region Economic Bloc (LREB) contains forests, wetlands, river basins, agricultural landscapes and Lake Victoria shoreline ecosystems that support biodiversity, livelihoods and human health. However, climate change, deforestation, pollution, wetland conversion and fragmented governance increasingly threaten these interconnected systems. Nature-based solutions offer opportunities to address these pressures while generating ecological and socioeconomic benefits. This study mapped nature-based solutions and assessed their distribution, thematic orientation, outcomes, governance arrangements and gaps across the 14 LREB counties to inform integrated climate-biodiversity-health action. Methods: A mixed-methods landscape assessment combined desk review of policies, institutional frameworks and project documents; stakeholder mapping; intervention inventory; land-use and land-cover analysis for 2002, 2015 and 2024; and a three-day participatory workshop involving 21 researchers, government officials, practitioners and community representatives. Expert presentations, group exercises, peer learning and a Kakamega Forest field visit supported validation and co-production of findings. Results: Forty-four interventions were mapped. Sustainable agriculture and agroforestry formed the largest category (n=13), followed by integrated water-resource and catchment management (n=10), water, sanitation and urban resilience (n=7), forest and landscape restoration (n=6), aquatic ecosystems and fisheries (n=5), and irrigation and agricultural water management (n=3). Climate-focused interventions represented 47%, biodiversity 42% and health only 11%. Biodiversity conservation was the leading ecological outcome (n=25), followed by ecosystem restoration (n=16); pollution and water-quality improvement (n=7) and afforestation (n=3) remained limited. Social outcomes centred on livelihoods (n=30), health (n=23), education and capacity building (n=18), and empowerment (n=18). Land-cover analysis showed continued tree and wetland loss alongside expanding built-up and degraded land. Conclusion: LREB has a substantial but uneven nature-based solutions portfolio. Stronger health integration, long-term financing, enforcement, cross-sectoral coordination and community ownership are required to scale equitable, biodiversity-positive and climate-resilient development. Priority actions include county biodiversity policies, operational climate funds, monitoring indicators and One Health mechanisms linking environmental and health sectors.

Keywords: *Nature-based solutions; climate change; biodiversity; human health; Lake Victoria Basin; LREB; ecosystem restoration; Kenya.*

49. Mapping Climate and Health Hubs in Africa: Institutional Distribution, Functions, Priorities and Sustainability Gaps

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Abstract

Climate change is intensifying heat exposure, climate-sensitive diseases, food and water insecurity, displacement and pressure on Africa's health systems. Climate-health hubs can connect research, policy, capacity strengthening, financing and locally led action, but their continental distribution and institutional roles remain insufficiently documented. To map climate and health hubs and related platforms operating in Africa and assess their geographic distribution, functions, priorities, operational status and financing arrangements. A structured desk-based institutional mapping reviewed publicly available evidence covering all 54 African countries. Sources included institutional websites, funder databases, programme documents, regional directories, policy reports and peer-reviewed literature. Platforms were included if they had an identifiable institutional structure, a clear climate-health mandate or substantial workstream, and documented engagement in at least one African country. Descriptive analysis examined platform type, location, status, functions, thematic priorities and funding relationships. The mapping identified 31 climate-health hubs, centres, networks, programmes and enabling platforms. Most were active, while a smaller proportion were launching, emerging or under development. Institutional leadership was geographically concentrated: Kenya hosted nine platforms and South Africa seven, followed by Ghana with four and Ethiopia with three. Together, these four countries hosted 23 platforms, representing 74.2% of the mapped landscape. Health-system resilience and adaptation emerged as the dominant thematic priority, followed by heat and extreme weather, policy and climate-health financing, food and water security, and data and early-warning systems. Gender and vulnerable populations received comparatively limited attention. Only four platforms (12.9%) disclosed both funders and award amounts; 14 (45.2%) named funders without reporting amounts. Africa's climate-health institutional ecosystem is expanding but remains geographically concentrated, fragmented and externally financed. A continental registry, shared research priorities, interoperable data systems, stronger African financing and coordinated pathways from evidence to policy and implementation are required to establish an equitable and sustainable African-led climate-health ecosystem.

Keywords: *Africa; climate change; health systems; climate-health hubs; institutional mapping; research networks; climate finance.*

50. Local Knowledge Systems Related to Climate Change in Mogotio Sub-County, Baringo, Kenya

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Abstract

Over successive generations, indigenous communities have systematically cultivated and enhanced their agricultural practices through experiential learning and adaptation. These practices offer potential solutions for enhancing climate change resilience. However, there is an absence of thorough research on how to systematically integrate and utilize these indigenous methods to mitigate climate change impacts in Mogotio sub-County. This study aimed to determine local knowledge systems related to climate change. The study employed a descriptive survey research design to collect and analyze data. The sample size was 384 households. Household questionnaires were the primary data collection tools. Descriptive statistics were employed to analyze qualitative data, while logit regression analysis was applied as the primary statistical technique for data analysis to evaluate the relationships between climate change resilience and local knowledge. The study established that community perceptions and local knowledge systems significantly influenced climate resilience. The study is significant since it shows the significance of locally developed solutions in tackling climate risks and promoting community-based approaches to resilience. The study recommends sensitization programs for residents of Mogotio on the significance and the nutritional values of indigenous crops. Additionally, there is need for enhanced localized programs to promote growing of crops that withstand drought conditions like millet and sorghum and indigenous livestock breeds such as Zebu cattle.

Keywords: *Indigenous communities, climate change, resilience, Local knowledge systems, Mogotio sub-County*

51. Sustainable Re-Utilization of Waste Materials as Adsorbents For Water and Wastewater Treatment in Africa: Recent Studies, Research Gaps, and Way Forward for Emerging Economies

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Abstract

Access to clean water is a fundamental human right. However, due to the rapid urbanization and industrialization in many African countries, the emergence of a plethora of new classes of water contaminants coupled with aging wastewater treatment infrastructure and technologies, access to clean water has remained elusive especially to rural communities. Additionally, most countries in Africa cannot afford the capital investment associated with advanced and specialized treatment technologies. The solution seems to be the valorization of locally-sourced waste materials and their use as adsorbents, flocculants/coagulants, or photocatalysts, to be included in current and future wastewater treatment facilities. The present review presents a concise and comprehensive compilation, and critique of recent research water purification studies in Africa using waste-based adsorbents. While the abundance of industrial and agricultural wastes presents opportunity for sustainable exploitation for water treatment, several gaps warrant further research. Specifically, future research should include life cycle assessment (LCA) of the wastewater treatment plants (WWTPs) and proposed technologies, in-depth cost analysis, use of environmentally relevant concentrations in simulated studies or real wastewaters and examination of removal efficiencies for biological contaminants such as viruses, bacteria among others. Waste materials are shown to be suitable candidates for delivery of effective and techno-economic adsorbents for water purification in African countries.

52. First-Principles Investigation of Cubic Barium Titanate for Photovoltaic and Solar-Energy Conversion Applications

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Abstract

The increasing global demand for clean and sustainable energy, coupled with the environmental and economic challenges associated with fossil fuel consumption, has intensified the search for efficient, environmentally friendly, and sustainable photovoltaic materials. This study presents an ab initio investigation of the structural, elastic, electronic, thermodynamic, optical, and thermoelectric properties of cubic barium titanate () to assess its potential application as a photovoltaic absorber and solar-energy conversion material. The calculations were carried out within the framework of Density Functional Theory (DFT) using the Generalized Gradient Approximation with the PBEsol exchange-correlation functional as implemented in Quantum ESPRESSO. Thermodynamic and thermoelectric properties were further evaluated using thermo_pw and BoltzTraP2 code, respectively. Structural optimization and the Murnaghan equation of state were used to determine the equilibrium structural parameters and stability of the material. The optimized cubic lattice parameter was found to be approximately . The calculated elastic constants were positive and satisfied the mechanical stability criteria, confirming the mechanical stability of the cubic structure. The Pugh ratio indicated brittle behavior, while the calculated Young's modulus was approximately 286.9 GPa, demonstrating the material's high stiffness. The electronic structure calculations revealed a direct band gap of approximately 1.862 eV at the point, indicating that cubic possesses a band gap suitable for interaction with a significant portion of the solar spectrum. The density of states showed significant contributions from oxygen and titanium-derived electronic states near the valence and conduction band edges. Optical analysis revealed appreciable photon absorption, low reflectivity within relevant regions of

the solar spectrum, and favorable dielectric and refractive-index responses, indicating strong interaction with incident electromagnetic radiation. The thermodynamic analysis demonstrated the temperature-dependent behavior of the vibrational and thermal properties of the material, while the thermoelectric calculations showed a Seebeck coefficient of approximately at 300K, increasing to about at 900K. The electronic thermal conductivity at 300K was calculated to be approximately , while the thermoelectric figure of merit reached a maximum value of approximately 0.830 at 950K. These findings demonstrate that cubic exhibits a combination of structural stability, suitable electronic band-gap characteristics, favorable optical absorption, and useful thermal and transport properties. Therefore, the material shows considerable potential for photovoltaic and solar-energy conversion applications. The results provide a comprehensive theoretical reference data for cubic and contribute to the understanding and development of lead-free oxide-based materials for sustainable solar-energy technologies.

Keywords: *Cubic barium titanate; density functional theory; photovoltaic materials; optical properties; thermoelectric properties*

53. Multi-Scale Analysis of Groundwater–Streamflow Interaction under Long-Term Hydroclimatic Variability in a Headwater Catchment

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Abstract

Understanding seasonal behaviour in hydrometeorological systems is essential for managing surface–groundwater interactions under increasing climate variability. This study examined long-term (1993–2022) rainfall, modelled groundwater discharge, and modelled groundwater recharge in the Amboni Basin, Kenya, using an integrated framework of Mann–Kendall trend analysis, Breaks For Additive Season and Trend (BFAST) decomposition, Pruned Exact Linear Time (PELT) change-point detection, and wavelet analysis to identify trends, structural shifts, seasonal variability, and changing hydrological relationships. The results indicate increasing nonlinearity and significant decoupling among rainfall, recharge, and discharge, suggesting a shift from storage-dominated towards increasingly runoff-dominated hydrological dynamics. The weakening correspondence between recharge and discharge indicates that variations in groundwater inputs are not consistently translated into streamflow responses, pointing to changes in groundwater buffering and surface–groundwater connectivity. Cross-wavelet analysis further quantified this relationship, yielding a mean coherence of 0.46, indicative of moderate-to-low coupling between recharge and discharge, while a mean phase lag of 0.37 months indicates a relatively rapid hydrological response and high system transmissivity. The combined temporal and frequency-domain evidence demonstrates that hydrological responses are increasingly complex and asynchronous, with important implications for groundwater contributions to streamflow. These findings suggest declining groundwater buffering capacity and increasing vulnerability to drought and abstraction, highlighting the need for integrated water-resource management that accounts for evolving seasonal behaviour, nonlinear interactions, and changing surface–groundwater connectivity.

Keywords: *Surface–groundwater interactions; nonlinear hydroclimatic responses; recharge–discharge decoupling; wavelet analysis; trend decomposition*

THEMATIC AREA 5: GOVERNANCE, LEADERSHIP AND SOCIO-ECONOMIC DEVELOPMENT







54. The AfCFTA Agreement as a Catalyst for Pan-African Sustainable Supply Chain Growth

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Abstract

The African Continental Free Trade Area (AfCFTA) Agreement represents a transformative framework aimed at eliminating trade barriers, establishing a single market of 1.3 billion people, and driving sustainable, inclusive development across the continent under the African Union's Agenda 2063. Despite possessing significant critical minerals and agricultural wealth, historical trade patterns have consigned Africa to a net importer of finished products, resulting in a severe merchandise trade deficit exceeding US$100 billion. Furthermore, intra-African trade remains under 16%, hampered by logistical inefficiencies, high debt servicing costs, and non-tariff barriers (NTBs) such as stringent Sanitary and Phytosanitary (SPS) measures, technical barriers to trade, and custom hurdles. This paper examines how the AfCFTA acts as a critical engine to shift African supply chains from raw material extraction to high-value addition, with a specific focus on empowering Micro, Small, and Medium Enterprises (MSMEs), which constitute over 90% of the continent's workforce. By analyzing cross-border value chains—such as the agricultural diversification within the beef and dairy sectors—this study illustrates how local processing can optimize regional economic blocks (REBs), mitigate supply disruptions, and build economic resilience. Additionally, the paper addresses the urgency of integrating climate action into African logistics and industrial strategies, given that the continent disproportionately faces annual climate-induced economic losses of $7 to $15 billion. The study concludes that leveraging AfCFTA instruments to streamline policy validation, eliminate NTBs, and foster green industrialization will enable Africa to capture downstream value, bridge macroeconomic gaps, and achieve long-term, climate-resilient pan-African supply chain growth.

Keywords: *African Continental Free Trade Area (AfCFTA); sustainable supply chains; Pan-African trade and integration; non-tariff barriers*

55. Influence of Stakeholder Engagement on the Performance of Public-Private Partnership Road Infrastructure Projects: Case of Nairobi Expressway

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Abstract

Public-Private Partnerships are key to addressing Kenya's infrastructure challenges but suffer from poor monitoring and evaluation, including financial inefficiencies, poor stakeholder engagement, and weak risk governance. The study investigated the influence of stakeholder involvement on the performance of Public-Private Partnership Road infrastructure projects, with a case of the Nairobi Expressway. Stakeholder Theory guided the study. The research design was descriptive correlational, with a population of 50,050 people comprising 50 institutional populations and 50,000 road users. Purposive and simple random sampling were employed to select the final sample of 150 respondents from institutional and road user respondents

respectively. Structured questionnaires with Likert scales and semi-structured interviews with some road users were used for data collection. Data collected from qualitative research were analysed thematically, and quantitative data were analysed thematically, with descriptive and inferential statistics (Pearson's correlation and multiple linear regression). The result showed strong positive correlation with project performance (r=0.718) and explained 51.6% of performance variance (β=0.487, p=0.000). The study concluded that stakeholder engagement significantly influences PPP performance. Limited participation, weak communication, and inadequate feedback mechanisms reduced project acceptance and satisfaction. The study recommended that Amend PPP laws to require mandatory stakeholder consultation throughout project lifecycles. Establish permanent road user forums for ongoing engagement, develop publicly accessible project information portals, and institutionalize community participation in toll pricing reviews to ensure decisions balance financial sustainability with public affordability. The study recommended. The National Treasury - Public-Private Partnerships Directorate should amend Kenya's Public-Private Partnership Act (2021) to include meaningful stakeholder consultation as an enforceable and legally binding requirement throughout the entire lifecycle of PPP projects, from planning through implementation to operations.

Keywords: *Public-Private Partnerships, Nairobi Expressway, and Stakeholder Engagement, Project Performance.*

56. Monitoring and Evaluation Practices and Sustainability of Borehole Water Projects in Baringo North Sub-County, Baringo County, Kenya

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Abstract

The sustainability of borehole water projects is a critical challenge in arid and semi-arid areas, where inadequate monitoring and evaluation practices undermine reliability, safety, and of water services. Baringo North Sub-County faces significant water access challenges. Despite investments evidence indicates that water access in parts of Baringo North remains below 50% raising concerns about the sustainability of these projects. This study examined the influence of M&E practices on the sustainability of borehole water projects in Baringo North Sub-county, Baringo county, Kenya. M&E practices were examined across five dimensions; integration of M&E frameworks, human capacity for M&E, data quality & standardization, technology in M&E, and transparency and accountability. The study was guided by Results-Based Management Theory and employed a mixed method approach integrating descriptive and correlational designs. The study covered 74 boreholes in Baringo North. Data were collected from 260 respondents comprising project management committees, chiefs, ward administrators, water officials, and liaison officials from partnering agencies using structured questionnaires complemented by semi-structured interviews with key informants. M&E recorded a mean of 3.401, indicating extended implementation level, however, use of technology for real-time data collection, funding for M&E activities and use of standardized data collection tools recorded lower means. The findings indicated a positive and statistically significant relationship between M&E practices and sustainability ($r = 0.714$, $p = 0.001$) with M&E explaining 51.0% of the variation in sustainability ($R^2 = 0.510$, $p < .001$). The findings stress the importance of robust M&E practices to improve the sustainability of borehole water projects. It recommends strengthening M&E through early integration, enhancing human capacity, improvement of data quality & standardization, adoption of appropriate technologies, and promotion of transparency and accountability.

Keywords: *M&E, sustainability, borehole water projects, integration of M&E frameworks, human capacity, data quality, standardization, technology, transparency and accountability*

57. Bridging the implementation gap: Challenges and opportunities in evidence-based probation supervision in Kenya

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Abstract

The adoption of evidence-based offender management practices has brought about a significant policy shift in the administration of criminal justice systems worldwide, yet a persistent gap remains between policy aspirations and implementation realities. This paper examines the challenges and opportunities in implementing evidence-based probation supervision in Kenya, drawing on empirical data from probationers and probation officers in the Western Region. The study employed a sequential explanatory mixed-methods design, collecting quantitative data from 319 former probationers and qualitative data through interviews with seven officers in charge of probation stations. Findings revealed that while probation officers demonstrate understanding of evidence-based principles, implementation is constrained by significant systemic challenges including high caseloads, inadequate resources, limited specialized training, and inconsistent application of supervision practices across stations. Qualitative data highlighted the "implementation gap" between policy intentions and frontline practice, with officers struggling to balance administrative demands with meaningful rehabilitation engagement. Key barriers identified include limited financial and material resources, heavy workloads that reduce time for quality interactions, inadequate documentation practices, and reluctance by some officers to follow Standard Operating Procedures. Despite these challenges, opportunities exist through enhanced training, resource allocation, and the development of practical, context-appropriate fidelity monitoring systems. The study concludes that addressing the implementation gap requires a system-wide approach that recognizes the complexity of translating evidence-based principles into everyday practice in resource-constrained settings. Recommendations include investing in probation officer training, developing standardized supervision protocols, and creating accountability mechanisms that support rather than overwhelm practitioners.

Keywords: *Evidence-based practice, probation supervision, implementation gap, correctional reform*

58. Government Regulation and the Transformation of Platform-Based Accommodation in Nairobi County, Kenya

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Abstract

The rapid growth of Airbnb and other sharing-economy accommodation platforms is reshaping urban accommodation markets, raising questions about how effectively existing regulatory systems respond to emerging forms of tourism enterprise. In Nairobi County, this growth has occurred within an evolving regulatory environment characterized by concerns around compliance, taxation, safety and competition. This study examined whether government regulation moderates the relationship between sharing-economy dynamics and accommodation-sector performance. Guided by a pragmatist philosophy, the study adopted an embedded mixed-methods design. Quantitative data were collected from 115 Airbnb hosts in Roysambu and Westlands and analyzed using descriptive statistics and moderated regression analysis, while qualitative evidence was obtained from four industry stakeholders. The findings showed that government regulation did not significantly moderate the relationship between the sharing economy and accommodation-sector performance. The overall interaction effect was statistically insignificant ($B = -0.040$, $p = .734$). Qualitative findings helped explain this result, highlighting weak enforcement, unclear regulatory guidelines, regulatory gaps, taxation concerns, safety issues and uneven compliance. The study demonstrates that the existence of regulation does not necessarily translate into effective regulatory influence where implementation and enforcement remain weak. The findings extend the literature on sharing-economy governance by demonstrating that the effectiveness of regulatory frameworks depends more on implementation and enforcement than on their formal existence. The study highlights the need for clear, coordinated, context-sensitive and enforceable regulatory mechanisms that protect consumers, promote fair competition and support innovation in platform-based accommodation. These findings provide valuable policy and managerial insights for governments and tourism stakeholders in rapidly evolving urban accommodation markets facing similar regulatory challenges

Keywords: *Airbnb; sharing economy; government regulation; accommodation sector; short-term rentals*

59. Governance Failure, Marginalisation, and Violent Extremism: A Criminological Analysis of Radicalization and Counter-Terrorism Governance in Kenya

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Abstract

Kenya's experience of violent extremism, dominated by Al-Shabaab recruitment and attacks since the early 2010s, is conventionally explained through a marginalization thesis that treats socio-economic exclusion and governance neglect in the coastal and north-eastern regions as the primary driver of radicalization. This paper interrogates that thesis through a criminological lens situated within the conference sub-theme of Governance, Leadership and Socio-Economic Development. Adopting a qualitative desk research methodology, the paper synthesizes peer-reviewed criminology, political science, and terrorism studies literature published between 2017 and 2026 alongside Kenya's counter-terrorism legal and policy framework. The analysis draws on two complementary theoretical lenses: Relative Deprivation Theory, which explains radicalization as a response to perceived, rather than absolute, injustice, and Social Identity and Group Processes Theory, which explains how radicalisation unfolds through group belonging and intergroup dynamics rather than individual pathology alone. The literature review shows that while marginalisation narratives dominate Kenyan policy discourse, rigorous empirical evidence is more equivocal, with individual-level psychological and relational factors, rather than macro-level economic or political grievance alone, emerging as strong predictors of radicalisation. The findings further show that Kenya's predominantly securitised counter-terrorism governance has, in some documented instances, reinforced the very grievances it seeks to address, that devolved County Action Plans for preventing violent extremism have expanded participatory governance without resolving underlying trust deficits, and that civil society and youth voice remain marginal to a counter-terrorism discourse still framed in largely top-down terms. The paper concludes

that effective prevention of violent extremism in Kenya requires governance reform that reconciles security imperatives with legitimacy, inclusion, and locally owned leadership, and it closes with six evidence-based policy recommendations directed at strengthening governance-centred approaches to preventing and countering violent extremism.

Keywords: *Governance, Violent Extremism, Radicalisation, Relative Deprivation Theory, Social Identity Theory, Leadership, Socio-Economic Development, Counter-Terrorism, Kenya*

60. Corruption, Weak Governance, and the Political Economy of Crime in Kenya: A Criminological Analysis of Institutional Failure, Leadership Deficits, and Socio-Economic Development

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Abstract

Persistent insecurity and crime in Kenya are frequently analysed as products of individual deviance, poverty, or policing capacity gaps, yet this framing understates the criminogenic role of governance failure and leadership deficits themselves. This paper interrogates the proposition that weak governance, institutionalised corruption, and compromised leadership function not merely as background conditions for crime but as active, structuring mechanisms of criminal opportunity and socio-economic exclusion in Kenya. Adopting a qualitative desk research methodology, the paper synthesises peer-reviewed criminological, public administration, and development literature published between 2017 and 2026, alongside Kenya's constitutional and legislative framework. The analysis is anchored in two complementary theoretical lenses: Institutional Anomie Theory, which explains how the dominance of economic imperatives over regulatory institutions generates pressure toward instrumental, corrupt, and criminal conduct, and Procedural Justice and Legitimacy Theory, which explains how citizens' perceptions of fair and accountable governance shape compliance, cooperation, and trust in the criminal justice system. The findings show that bureaucratic cartels and rent-seeking networks have institutionalised corruption within Kenya's public service, that police corruption constitutes a distinct governance failure with direct security consequences, that youth unemployment and socio-economic marginalisation interact with weak leadership to sustain criminal involvement, and that devolution, while expanding participatory governance structures, has not resolved underlying accountability deficits at the county level. The paper argues that Kenya's crime problem cannot be adequately addressed through conventional law-and-order policing alone; it requires deliberate governance reform, ethical leadership renewal, transparent public resource management, and inclusive socio-economic development. The paper concludes with six evidence-based policy recommendations directed at strengthening institutional accountability, procedural justice, and leadership integrity as instruments of crime prevention and sustainable development in Kenya.

Keywords: *Governance, Corruption, Political Economy of Crime, Institutional Anomie Theory, Procedural Justice, Leadership, Socio-Economic Development, Devolution, Kenya, Criminology*

61. Stakeholders' Perception of the Arming of Private Security Service Providers and its Effect on Crime Prevention in Lurambi Sub-County, Kenya

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Abstract

Private security service providers (PSSPs) have become indispensable actors in crime prevention across Kenya, yet the question of whether they should be licensed to carry firearms remains contentious and largely unregulated. This paper examines stakeholders' perceptions of the arming of PSSPs and its effect on crime prevention in Lurambi Sub-County, Kakamega County, Kenya. Drawing on primary data derived from a descriptive study of 136 respondents comprising private security officers, branch managers, clients, and senior officers of the National Police Service, alongside secondary literature on private security regulation and armed policing, the paper interrogates the extent to which key stakeholders support or oppose arming PSSPs. Findings reveal overwhelming support for arming among private security officers (98.87%), branch managers (83.33%), and clients (88.88%), largely anchored on the need to repel armed criminals, deter terrorism, and reduce the fear of victimisation. Senior police officers were comparatively divided, with 60% in favour and 40% opposed, citing inadequate training and an incomplete regulatory framework as key risks. The paper situates these findings within Routine Activity Theory and Situational Crime Prevention Theory, arguing that firearms would enhance capable guardianship and increase the effort and risk associated with offending, but only where accompanied by rigorous training, vetting, and oversight. The paper concludes that stakeholder opinion in Lurambi Sub-County is broadly favourable to arming PSSPs, but that this support is conditional on reforms to the Private Security Regulatory Act (2016) and the establishment of standardised firearms training. Policy recommendations are offered for regulators, security firms, and the National Police Service.

Keywords: *private security, arming, firearms, crime prevention, stakeholder perception, Lurambi Sub-County, Kenya*

62. Understanding Juvenile Delinquency Through the Family Lens: An International Review of Empirical Findings

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Abstract

Juvenile delinquency remains one of the most persistent and cross-culturally significant social problems confronting families, communities, and justice systems worldwide. Although delinquent behaviour is shaped by an interacting web of individual, peer, school, and neighborhood factors, a substantial and growing body of empirical evidence identifies the family as the most proximal and enduring context within which delinquent trajectories are either cultivated or curtailed. This paper presents an integrative international review of empirical findings on the relationship between family dynamics and juvenile delinquency, drawing on peer-reviewed studies published mainly between 2015 and 2026 across North America, Europe, Asia, Africa, and Latin America. The review synthesises evidence across five interrelated family dimensions: family structure and composition, parenting styles and parental monitoring, family conflict and exposure to domestic violence, adverse childhood experiences, and family socioeconomic status. Findings consistently show that family conflict, neglect, maltreatment, weak parental supervision, and household adversity are among the strongest predictors of delinquent involvement, while parental warmth, authoritative parenting, and strong parent-child attachment operate as robust protective factors. Global statistics indicate that approximately 259,000 children were in detention worldwide in 2024, with pronounced regional disparities that mirror disparities in family stability and socioeconomic conditions. Evidence from family-based

interventions, including multisystemic therapy and functional family therapy, shows modest but meaningful reductions in reoffending, particularly when interventions are sustained and risk-calibrated. The review also highlights an underrepresentation of Global South contexts, including Kenya, in the mainstream empirical literature, despite documented associations between fragmented family structures, poverty, and juvenile offending in African settings. The paper concludes by proposing a family-centred, ecologically grounded framework for delinquency prevention and offers policy and practice recommendations relevant to juvenile justice systems, social work practitioners, and probation services in both high-income and low- and middle-income countries.

Keywords: *juvenile delinquency, family structure, parenting styles, adverse childhood experiences, family violence, socioeconomic status, juvenile justice*

63. The Influence of Statutory Adherence on Operational Effectiveness of Private Security Service Providers in Lurambi Sub-County, Kenya

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Abstract

Private security service providers (PSSPs) have become central actors in crime prevention across Kenya, yet their operational effectiveness is often limited by inconsistent adherence to statutory obligations under the Private Security Regulatory Act (2016). This study examined the influence of statutory adherence on the operational effectiveness of private security service providers in Lurambi Sub-County, Kakamega County, Kenya, guided by Routine Activity Theory and Situational Crime Prevention Theory. Specifically, the study established the extent of statutory resource provisioning, determined levels of statutory training compliance, and examined the statutorily contemplated collaboration between PSSPs and national security organs, relating each to operational effectiveness measured through crime prevention capacity. A descriptive-correlational design targeted 502 respondents, comprising 358 private security officers, six branch managers, 133 clients, and five senior police officers drawn from six licensed firms. Proportionate, purposive, and simple random sampling produced a sample of 159: 136 questionnaire respondents and five key informants. Data were collected via questionnaires and interview schedules, then analyzed in SPSS version 23 using descriptive statistics, Pearson correlation, regression, and ANOVA. Findings revealed pervasive statutory under-compliance: only 24.7% of firms possessed patrol vehicles, 31.5% owned CCTV cameras, and 89.9% lacked full-body scanners, while 64.0% of officers had received no pre-recruitment training. Resource compliance ($r = .681$, $p < .05$), training compliance ($r = .594$, $p < .05$), and collaboration with national security organs ($r = .469$, $p < .05$) each correlated significantly and positively with operational effectiveness, jointly explaining 79.4% of its variance ($R^2 = .794$, $F(3, 295) = 28.170$, $p = .000$). Interviews with senior police officers corroborated resource and training deficits and linked weak collaboration to gaps in the regulatory framework. The study concludes that statutory adherence significantly predicts operational effectiveness and recommends stronger regulatory enforcement, accredited training programmes, and institutionalized liaison between private security and state law enforcement.

Keywords: *statutory adherence; private security service providers; operational effectiveness; crime prevention; Private Security Regulatory Act; Kenya*

64. Community-Based Coping Strategies for Managing Recurrent Floods in Lower Nyando, Kenya: Implications for Innovation and Sustainable Socio-Economic Development

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Abstract

Recurrent floods in Lower Nyando, Nyando Sub-County, Kenya, have caused significant socio-economic disruption, affecting livelihoods and increasing community vulnerability. In response, communities have developed diverse coping strategies based on indigenous knowledge, social structures, and livelihood diversification. This study investigates community-based coping strategies for managing recurrent floods in Lower Nyando. Specifically, it seeks to assess how indigenous knowledge is used in flood management; examine social structures adopted by communities; assess the relationship between livelihood diversification and coping strategies; and assess challenges affecting the implementation of coping strategies. The study is anchored on Resilience Theory and Social Capital Theory, which provide a framework for understanding community adaptive capacity, collective action, and recovery from recurrent floods. A descriptive research design will be adopted, utilizing stratified, simple random, and cluster sampling techniques. The target population comprises 38,460 households, 112 NGO representatives, and 50 government officers, with a sample of 396 households, 50 NGO representatives, and 50 government officers. Data will be collected using questionnaires, focus group discussions, and observation checklists. Validity will be established through expert review, while reliability will be assessed using the test-retest method. Quantitative data will be analyzed using descriptive statistics, while qualitative data will be analyzed thematically through content analysis and triangulation. The study is expected to generate evidence on community-based coping strategies and challenges affecting their implementation. Findings are expected to inform innovative, community-centred approaches to flood risk reduction, strengthen livelihood resilience, support policy development, and contribute to sustainable socio-economic development in Lower Nyando and other flood-prone regions.

Keywords: *Recurrent floods; Indigenous knowledge; Social structures; Livelihood diversification; Community resilience; Sustainable socio-economic development.*

65. Project Planning and Sustainability of Borehole Water Projects in Baringo North Sub-County, Baringo County, Kenya

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Abstract

The sustainability of borehole water projects is a critical challenge in arid and semi-arid areas, where inadequate project planning undermines reliability, safety, and provision of water services. Despite investment in borehole water projects, water accessibility in parts of Baringo North Sub- County remains below 50% raising concerns about the sustainability of these projects. This study examined the influence of project planning on the sustainability of borehole water projects in Baringo North. Project planning was examined across five dimensions; community needs assessment, financial planning, technical planning, risk management and environmental and climate resilience planning. Guided by Systems Theory the study employed a mixed-method approach integrating descriptive and correlational designs. The study covered 74 boreholes in Baringo North, Sub-County Baringo County, Kenya. Data were collected from 260 respondents comprising project management committees and subcommittees, chiefs, ward administrators, county water officials, and liaison officials from various partners using structured questionnaires complemented by semi-structured interviews with key informants. Project planning recorded a mean of 3.613, indicating extended implementation level, however environmental impact assessment, climate-resilient planning and risk mitigation strategies recorded lower means. The findings indicated a positive and statistically significant

relationship between project planning and sustainability (r = 0.761, p < .001) with project planning explaining 57.9% of the variation in sustainability (R^2 = 0.579, p < .001). The findings stress the importance of including all project planning activities to improve sustainability. It recommends strengthening planning processes through rigorous community needs assessment, realistic operation and maintenance cost planning, technical feasibility assessment, risk management, environmental protection measures, and climate-resilient project design.

Keywords: *Project planning, sustainability, borehole water projects.*

66. The Prevalence and Economic Impact of Cystic Echinococcosis in Humans and Livestock in Narok County, Kenya

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Abstract

Cystic Echinococcosis (CE) is caused by the larval stage of Echinococcus granulosus sensu lato associated with substantial but poorly quantified economic losses in livestock sector and human health systems. The objective of this study was to assess the prevalence and direct economic losses of CE in Narok County by incorporating human treatment costs and livestock organ condemnation losses within a dual-sector analysis. The study design was a retrospective cross-sectional survey of 56 CE patients assessed, diagnosed and surgically treated in Kijabe, Tenwek, and Narok County Referral Hospitals. Due to variances in record availability, the data from Tenwek and Narok County Referral Hospitals spanned a 10-year period (2012-2022), while Kijabe Hospital data covered a 4-year period (2019-2022). Additionally, a prospective cross-sectional study was conducted in October 2022 on 654 slaughtered livestock carcasses (212 cattle, 294 sheep, 148 goats) at the five main abattoirs in Narok county namely; Kirempe, Narok Town, Ngoshosh, Mulot, and Ewaso Nyiro. All hospital costs were converted to US dollars at the Central Bank of Kenya's 2022 currency exchange rate. Developed equations were utilized to determine direct economic losses associated with human treatment and cattle organ condemnation. Livestock losses were computed using organ-specific retail market prices. A sensitivity analysis was applied on livestock losses and human costs. The prevalence of sheep was 37.8% (95% CI: 32.6%–43.7%), cattle 31.1% (95% CI: 25.4%–38.0%) and goats 21.6% (95% CI: 15.1%–29.4%). The aggregate direct economic loss for humans due to CE treatment was estimated at USD 45,854.71 (annualized: USD 6,170), while annual direct economic losses for livestock due to organ condemnation were USD 84,610.83. The overall annual direct economic losses were USD 90,780.82, where livestock losses accounted for 93.20% and human treatment costs for 6.80%. CE exerts a considerable financial burden in Narok County. Livestock losses constituted most of the losses, emphasizing veterinary-led approaches like regular deworming of dogs, strict meat inspection and safe depositing of condemned slaughter offal at the slaughterhouses and community training of safe home slaughter practices and prevention of dogs having access to slaughter offal should be considered. Healthcare subsidies and slaughter surveillance should be integrated into Kenya's decentralized county health systems. A comprehensive One Health evaluation, including definitive host surveillance and environmental contamination data, is advised as an essential next step.

Keywords: *Cystic echinococcosis; One Health; livestock; economic losses; Narok County; Kenya*

67. Risk Mitigation Strategies and Financial Performance of General Insurance Companies in Nairobi County, Kenya

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Abstract

Risk management is important within the insurance industry because insurance companies operate in an environment characterized by underwriting risks, claims volatility, operational disruptions, fraud, market uncertainty and emerging risks. Effective risk mitigation strategies are essential for reducing losses, protecting policyholders and maintaining financial performance. This study evaluated the effect of risk mitigation strategy on the financial performance of general insurance companies in Nairobi County, Kenya. The study was guided by Enterprise Risk Management Theory, which emphasizes identification, assessment, response and monitoring of risks. A positivist research philosophy, descriptive and correlational research design, and quantitative research approach were adopted. A total of 225 questionnaires were issued, of which 187 were returned, representing an 83.0% response rate. Data were collected using structured questionnaires. Descriptive analysis involved means and standard deviations, while Pearson correlation and simple linear regression established the relationship and effect of risk mitigation strategy on financial performance. The descriptive findings indicated that risk mitigation strategies were implemented, with an overall mean of 3.70 (SD = 1.28). Consistent adherence to underwriting guidelines recorded the highest mean (M = 3.89, SD = 1.24), while maintaining reinsurance arrangements recorded the lowest mean (M = 3.48, SD = 1.30). Correlation analysis established a strong positive and statistically significant relationship between risk mitigation strategy and financial performance (r = 0.786, p < 0.01). Regression analysis showed that risk mitigation strategy explained 61.8% of the variation in financial performance (R^2 = 0.618). The regression model was statistically significant (F(1,185) = 299.293, p < 0.001), while the regression coefficient confirmed a positive and statistically significant effect (β = 0.786, t = 17.300, p < 0.001). The null hypothesis was rejected. The study concluded that effective risk mitigation strategies significantly influenced financial performance and recommended strengthened regulatory oversight, enhanced underwriting controls, regular risk-management reviews and improved reinsurance arrangements.

Keywords: *Risk mitigation strategy, financial performance, general insurance companies, risk management, underwriting, reinsurance, Kenya.*

68. Effect of Bank deposits on the Profitability of Commercial Banks in Kenya

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Abstract

Purpose: This study examined the relationship between Bank deposits and the profitability of commercial banks in Kenya. Design/Methodology/Approach: The study adopted a positivist, panel approach, analyzing panel data drawn from all 38 Kenyan commercial banks over the period 2014–2023 (380 observations),

using records from the Central Bank of Kenya and published financial statements. Findings: The regression analysis based on the fixed-effects model revealed that bank deposit practices account for 38.66% of the variation in profitability among commercial banks in Kenya with a β=0.0249607, p<0.05 Implications/Originality/Value: The findings highlight the importance of Commercial banks in cultivating an enabling environment that attracts and retains depositors. This includes minimizing service charges and reducing transaction costs associated with deposits.

Keywords: *Bank Deposits; Profitability; Lending Capacity; Commercial Banks; Kenya*

69. Portfolio Diversification Practices and Financial Performance of Registered Fund Managers in Kenya

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Abstract

Portfolio diversification is an important investment management practice for reducing investment risk and improving financial outcomes. This study examined the effect of portfolio diversification practices on the financial performance of registered fund managers in Kenya. The study was motivated by the continued expansion of Kenya's fund-management industry and the increasing volume of assets managed by professional fund managers, which heightened the need for effective investment allocation and risk management. Anchored on Modern Portfolio Theory, the study adopted a positivist research philosophy and a descriptive and correlational research design. A quantitative approach was employed, with data collected using structured questionnaires from respondents drawn from registered fund managers in Kenya. A total of 180 questionnaires were issued, of which 160 were successfully returned, yielding a response rate of 88.9%. Data were analysed using descriptive and inferential statistics, including frequencies, percentages, means, standard deviations, Pearson correlation and simple linear regression. Hypothesis testing was conducted at the 5% significance level. Descriptive findings indicated that portfolio diversification practices were generally adopted, with an overall mean of 3.90 (SD = 1.12). The inclusion of a wide range of financial instruments recorded the highest mean (M = 4.01, SD = 1.10), while regular monitoring and control of portfolio concentration recorded the lowest (M = 3.73, SD = 1.12). Correlation analysis established a strong positive and statistically significant relationship between portfolio diversification and financial performance ($r = 0.756$, $p < 0.001$). Regression results showed that portfolio diversification explained 57.2% of the variation in financial performance ($R^2 = 0.572$), with the model being statistically significant ($F(1,158) = 210.759$, $p < 0.001$). The regression coefficient confirmed a positive and significant effect ($\beta = 0.756$, $t = 14.473$, $p < 0.001$), leading to rejection of the null hypothesis. The study concluded that portfolio diversification significantly and positively influenced financial performance and recommended stronger regulatory guidelines and enhanced diversification practices among fund managers.

Keywords: *Portfolio diversification, financial performance, fund managers, investment management, asset allocation, Kenya.*

70. Strategic Partnerships and Performance of Medical Insurance Companies In Kenya

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Abstract

The Kenyan medical insurance sector continues to experience persistently low penetration despite significant market opportunities arising from inefficiencies in the Social Health Insurance Fund (SHIF) (Asindua, Kerochi & Gitau, 2021). Data from the Kenya Demographic and Health Survey (KDHS, 2022) indicate that the vast majority of the adult population, 74% of women and 73.5% of men, are without any form of medical

insurance. Private medical insurance coverage remains negligible, covering just 3.8% of women and 4.2% of men. This study examined the influence of strategic partnerships on the performance of medical insurance companies in Kenya, with organizational performance measured through customer acquisition. The study was grounded in Resource Dependence Theory, which underpinned the independent variable (strategic partnerships), and Customer Relationship Management (CRM) Theory, which underpinned the dependent variable (organizational performance). A descriptive research design was employed, targeting all 24 medical insurance companies in Kenya. Purposive sampling was used to select 144 managers occupying strategic positions, yielding a response rate of 92.67% (n=132). Data was collected using structured questionnaires and analyzed using descriptive statistics, Pearson correlation, and multiple regression analysis. Diagnostic tests for normality, multicollinearity, and heteroscedasticity confirmed that all regression assumptions were met. The findings revealed that strategic partnerships have a strong positive and statistically significant relationship with organizational performance ($r = 0.846$, $p = 0.000$). Pearson correlation analysis revealed that all four dimensions of strategic partnerships were positively associated with organizational performance. Co-innovation recorded the strongest correlation ($r = 0.677$, $p = 0.000$), followed by knowledge sharing ($r = 0.673$, $p = 0.000$), joint ventures ($r = 0.618$, $p = 0.000$), and strategic alliances ($r = 0.509$, $p = 0.000$). The regression model was statistically significant ($F = 89.220$, $p = 0.000$) and explained 73.8% of the variance in organizational performance ($R^2 = 0.738$). Co-innovation had the strongest effect on performance ($\beta = 0.394$, $p < 0.001$), followed by knowledge sharing ($\beta = 0.339$, $p < 0.001$), joint ventures ($\beta = 0.282$, $p < 0.001$), and strategic alliances ($\beta = 0.135$, $p = 0.011$). Therefore, strategic partnerships are the most significant driver of performance among medical insurance companies in Kenya, with co-innovation and knowledge sharing being particularly critical for customer acquisition. The study recommends that medical insurance companies prioritize strategic alliances with banks, telecommunications companies, and hospitals to bundle products and leverage existing customer relationships. Insurers should establish formal knowledge-sharing mechanisms with partners and engage in joint venture arrangements that facilitate access to new customer segments.

Keywords: Strategic partnerships, knowledge sharing, joint ventures, strategic alliances, co-innovation, customer acquisition, medical insurance, Kenya

THEMATIC AREA 6: DIGITAL TRANSFORMATION, ICT AND ARTIFICIAL INTELLIGENCE





71. A Hybrid Artificial Intelligence Framework for Proactive Detection of Flood-Based Cyber Attacks in Learning Management Systems

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Abstract

Learning Management Systems (LMSs) have become critical digital infrastructure for universities, supporting teaching, assessment, communication, examination administration, and access to academic resources. However, the increasing dependence on LMS platforms exposes universities to cyber threats that can compromise system availability and disrupt academic services. Flood-based cyber-attacks, including Distributed Denial-of-Service (DDoS) attacks, are particularly problematic because they can overwhelm network, processing, or application resources with large volumes of malicious requests. Conventional signature-based security mechanisms may be insufficient for detecting evolving attack patterns, creating a need for intelligent and proactive detection mechanisms. This study proposes a Hybrid Artificial Intelligence Framework for Proactive Detection of Flood-Based Cyber Attacks in Learning Management Systems. The proposed framework combines feature selection, machine-learning classification, and temporal traffic analysis to identify abnormal traffic patterns before they result in significant service degradation. The framework is designed around a hybrid architecture in which complementary artificial intelligence models are combined to improve detection accuracy, reduce false positives, and support timely identification of emerging attacks. The CIC-DDoS2019 dataset is proposed for initial experimental validation because it contains benign traffic and multiple DDoS attack categories generated under controlled but realistic network conditions. The dataset provides more than 80 traffic-flow features suitable for machine-learning-based detection. The study will compare individual machine-learning algorithms with the proposed hybrid model using accuracy, precision, recall, F1-score, false-positive rate, area under the ROC curve, and detection latency. The expected contribution is a practical and adaptable AI-based detection framework that can be subsequently evaluated in university LMS environments. The study provides a foundation for proactive cybersecurity protection of Moodle-based and other LMS platforms deployed by higher education institutions.

Keywords: *Artificial Intelligence, Cybersecurity, DDoS, Flood Attack, Intrusion Detection, Learning Management Systems, Machine Learning, Moodle, Hybrid Model.*

72. Impact of Artificial Intelligence (Chatgpt) In Nursing Education

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Abstract

AI applications like ChatGPT are becoming common in university curriculums, including nursing courses. The use of these technologies can enhance learning efficacy, critical thinking skills, and information accessibility; however, problems usually arise regarding academic integrity, overdependence, and ethics. The objectives of this study will be; to find out the prevalence of utilization of artificial intelligence, to evaluate the impact of artificial intelligence utilization and to determine how its use influences the learning outcomes. A quantitative cross-sectional design was used. All 137 nursing students enrolled in second to fourth-year courses were surveyed using a structured questionnaire. Descriptive statistics, chi-square, t-test, correlation, and regression analysis were performed. It was found that the use of artificial intelligence technology was common (92.7%)

while training was rare (27.0%). Most students had a moderate level of experience using AI software (72.3%). Students viewed artificial intelligence as useful in education quality, motivation, clinical practice, and understanding patient care. Impact scores were generally high (mean = 3.93, median = 4.00) and the impact measure had strong internal consistency reliability (Cronbach's alpha = 0.86). Attitude, knowledge, readiness, and clinical utility were found to be significant predictors of impact, while training and digital literacy were not. Over-reliance, accountability, plagiarism, confidentiality, and bias were among the main obstacles. It was found that the use of AI is common among nursing students and that they perceive it favorably. But there are very few educational guidelines regarding the adoption of AI technology.

73. Large Language Models as Socio-Economic Development Agents: Evaluating AI-Mediated Financial Inclusion and Entrepreneurial Capability in Low-Resource Economies

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The growth of large language models (LLMs) as advisory agents in financial and entrepreneurial domains has generated considerable enthusiasm regarding their developmental potential. Yet the evidentiary basis for such claims remains profoundly underdeveloped. Contemporary LLM evaluations are predominantly benchmark-driven and epistemically situated within high-income contexts, rendering them ill-suited to adjudicating developmental impact in low-resource economies. Critically, no rigorous causal evidence exists concerning whether LLM-mediated advisory interventions ameliorate or exacerbate structural socio-economic inequalities particularly along axes of gender, ethnicity, and linguistic marginalization among micro-enterprise actors in the Global South. This lacuna constitutes a foundational epistemic and methodological gap at the intersection of artificial intelligence evaluation, development economics, and ICT4D.This research addresses that gap by advancing a capability-sensitive evaluative paradigm for LLM-mediated financial inclusion and entrepreneurial capability formation. Drawing upon Sen's capability approach as a normative foundation, the study interrogates three research questions: (i) what is the causal impact of LLM-mediated advisory services on financial inclusion and entrepreneurial capability among micro-enterprises in low-resource economies? (ii) How do LLM outputs encode, amplify, or attenuate structural biases in economic decision-making across intersectional categories? (iii) Can a capability-sensitive evaluation framework be constructed that transcends conventional accuracy metrics to measure realized human functioning? Methodologically, the study employs a sequential mixed-methods design anchored in a multi-site randomised controlled trial across three to five low-resource economies, supplemented by intersectional algorithmic bias audits and qualitative capability assessments via participatory action research. Theoretically, it contributes a novel Capability-Sensitive AI Evaluation Framework (CS-AIEF), synthesizing Senian capability theory with contemporary AI ethics scholarship. The research will furnish the first causal evidence on LLM-mediated financial inclusion in low-resource economies, advance a normatively grounded evaluation framework reconceptualizing AI efficacy in terms of human flourishing, and generate actionable guidelines for fintech institutions, development agencies, and AI laboratories.

Keywords: *Large language models; financial inclusion; capability approach; ICT4D; algorithmic fairness; randomised controlled trial*

74. Digitization of HealthCare System in Kenya: operationalization hurdles, realities, and prospects

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Abstract

The New Healthcare System-Social Health Authority (SHA)was rolled out in 2023, replacing the National Hospital Insurance Fund (NHIF). The NHIF proved inefficient and as a conduit of exaggerated claims especially by private health institutions leading to fleecing of public resources and hence the necessity for the SHA, which was perceived to a better health insurance scheme as compared to NHIF, and that moreover it had potentials toward achievement of Universal Health Coverage (UHC). The purpose of this paper was to Assess the digitization of health insurance in Kenya focusing on hurdles, realities and prospects of its operationalization. Study objectives were: to determine the SHA operationalization hurdles; examine realities and provide prospects towards its effectiveness. While exploring empirical literature the study was underpinned by an Integrated Healthcare Management Information System (HMIS)-anchored by Kenya's Digital Health Agency (DHA) and SHA Taifa Care platform directly drives UHC effectiveness by linking clinical care with transparent health financing. The study established plethora of hitches in the SHA implementation process including: fraud, technical hitches, severe cash flow-reimbursement delays for the hospitals; low premium compliance while today there are 32 million Kenyans registered in SHA, contribution remain largely low, especially among the informal sector community due to affordability issues and skepticism; Legacy debt burdens-billions in unresolved historical debts from the defunct NHIF continue to bedevil healthcare providers who rely on the fund for operational stability ;digital infrastructural gaps –ICT facility show manual transition and complex beneficiary over boarding hinder real time claims processing; public trust deficit-historical corruption scandals from the previous management regime drive a lot of public skepticism regarding the fund management and transparency.

Realities: Massive SHA member registration has clocked 32 million and so far substantial provisions have undergone means-testing to align contribution with household income. High volume utilization –millions of Kenya have access to primary healthcare services and specialized treatments like Kidney dialysis and oncology; Aggressive fraud detection mechanisms that help track possible fraud and save potential loss of public resources. Health provider strain –public and private health facilities have face challenge in financial transition constraining service provision.

Prospects include: fraud reduction through real-time biometric digital tracking. Finance refinement through expanded revenue baseline through dedicating consumption of taxes/increased budgetary allocations could stabilize the health insurance fund and ensure timely pay outs to hospitals; digitization/automation of claim adjudication and publishing transparent and reconciliatory dashboard toward restoring trust with the health care providers. Differentiated informal sector strategies –will ensure tailoring contributions models and community outreach programs can improve retention and regular remittances from informal workers; Long term UHC realization –through legacy debt clearance and tightened governance of the multi-fund structures and critical interests, covering basic health care, social insurance and affordable care nationwide with equity. Better oversighting by the Ministry of Health, innovations like the recently launched Ambulance a phone-call-away from very sick patients through dialing 922, and ensuring health data privacy amongst others.

Key words: *Digitization, healthcare systems, Kenya, operationalization hurdles, realities, opportunities*

75. Mapping Africa's Digital Health Ecosystem: Geographic Distribution, Health-System Functions and Evidence Gaps

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Abstract

Africa's digital-health ecosystem is expanding rapidly, yet fragmented documentation limits policy coordination, investment, interoperability planning and equitable scale-up. This study mapped digital-health platforms operating in or originating from Africa and assessed their functions, geographic reach, ownership, operational status and supporting evidence. The objective of this study was to characterise the distribution and health-system roles of digital-health platforms across Africa and identify geographic, functional and evidence gaps affecting sustainable digital transformation. A continent-wide evidence map was developed using the PATH Africa-based Digital Health Entrepreneurs List as the baseline, supplemented with information from WHO, Africa CDC, Digital Square, HealthTech Hub Africa, government sources and official platform websites. Eligible records comprised named digital tools supporting healthcare delivery, public health, surveillance, health-information management, diagnostics, financing, medicines, logistics, workforce development or clinical decision support in at least one African country. Records were deduplicated and classified by origin, deployment, function, ownership, operational status and evidence confidence. The map identified 231 unique platforms and 698 country-deployment records across 54 African countries. East Africa accounted for 84 platform origins, while West Africa recorded the largest share of deployments (250; 36.1%), followed by East Africa (223; 32.2%). Telemedicine and virtual care represented 66 platforms (28.6%), while electronic medical records, health-management information systems and related information functions accounted for 50 (21.6%). Private or social enterprises operated 208 platforms (90.0%). Only 70 records (30.3%) had high-confidence evidence, while 135 required current-status verification. DHIS2 had the widest documented reach, covering all 54 countries, followed by CommCare and RapidPro in 24 and 19 countries, respectively. Africa has a diverse and geographically extensive digital-health ecosystem, but sustainability is constrained by private-sector concentration, uneven regional visibility and limited verified evidence. A coordinated continental registry, routine verification, interoperability standards and outcome-based evaluation are required to translate platform proliferation into equitable, integrated and resilient health-system transformation.

Keywords: *Africa; digital health; digital transformation; health platforms; interoperability; health systems; evidence mapping.*

76. Climate Diplomacy on X: How Global North and Global South States Used X as a Public Diplomacy Platform during the Africa Climate Summit and COP28

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Abstract

The growing platformization of diplomatic communication has transformed how states communicate foreign-policy priorities to international publics. Yet research on digital diplomacy often treats social media primarily as communication channels rather than as spaces in which states construct strategic narratives, frame international issues, and perform diplomacy before networked audiences. This article examines how Kenya and the United States used X as a public diplomacy platform during the 2023 Africa Climate Summit (ACS) and COP28. Drawing on a comparative thematic analysis of 284 official X posts across four sub-corpora-Kenya ACS, United States ACS, Kenya COP28, and United States COP28-the study examines how states used X to construct strategic narratives, frame climate politics, communicate diplomatic positions, document international engagement, and project national and regional identities. The analysis is guided exclusively by Strategic Narrative Theory, Media Diplomacy Theory, and Framing Theory. The findings demonstrate distinct but overlapping modes of X-based public diplomacy. Kenya used X as a sustained instrument of African leadership construction, solutions-oriented narrative development, climate-finance advocacy, and diplomatic documentation. The United States used X more selectively at ACS and more intensively at COP28, emphasizing climate urgency, domestic policy delivery, technological action, and US leadership. The analysis further identifies a clear evolution in Kenya's communication between ACS and COP28: a shift from normative claims about reform and African leadership toward evidence of investment and implementation. The comparison demonstrates that X does not eliminate differences between Global North and Global South diplomacy. Rather, states use the same platform to articulate strategically differentiated narratives reflecting their diplomatic positions, identities, and objectives.

Keywords: *climate diplomacy; public diplomacy; X; digital diplomacy; strategic narratives; media diplomacy; framing; Xplomacy*

THEMATIC AREA 7: SUSTAINABLE AGRICULTURE, FOOD SECURITY AND BIOECONOMY







77. Innovation-Driven Climate Resilience and Value Chain Transformation in East Africa: A Conceptual Framework and Policy Agenda for Digital Agri-Extension and Early Warning Systems

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Abstract
Sub-Saharan Africa, particularly East Africa, faces mounting threats to food security from climate variability, land degradation, and structurally weak agricultural extension systems. Kenya's extension agent-to-farmer ratio remains far below FAO-recommended benchmarks, constraining the reach of traditional advisory models precisely when climate shocks demand rapid transmission of actionable information. This paper develops an integrated conceptual framework linking Diffusion of Innovation theory, the Technology Acceptance Model, and Results-Based Management governance principles to explain how localized early warning systems (EWS) and digital agri-advisory channels can strengthen smallholder climate adaptation, reduce post-harvest losses, and support bio-economy value addition. Drawing on published experimental and quasi-experimental evidence from Kenya and comparable Sub-Saharan African contexts (including randomized evaluations of SMS-based agricultural advisory programs, national assessments of digital farmer services, and hermetic storage technology trials) the paper synthesizes what is empirically known about digital extension impact and identifies the institutional conditions under which such interventions translate into durable resilience outcomes. It concludes with a four-part policy agenda for institutionalizing last-mile digital agri-extension, scaling decentralized post-harvest infrastructure, embedding Results-Based Management in devolved agricultural governance, and building inter-agency climate resilience coalitions, and proposes a mixed-methods empirical research design (anchored in Difference-in-Differences and Propensity Score Matching estimation) for rigorously testing the framework in Kenya's arid, semi-arid, and high-potential agricultural zones.

Keywords: *Agricultural Governance, Climate-Smart Agriculture, Digital Agri-Extension, Early Warning Systems, Food Systems Resilience, Post-Harvest Loss Reduction, Value Addition.*

78. Greenhouse Farming and Household Food Security: Implications For Rural Transformation In Gucha Sub-County, Kisii County, Kenya

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Abstract
Agricultural innovation and science-based farming technologies are increasingly important for addressing food insecurity and promoting sustainable socio-economic development. Greenhouse farming represents an innovative agricultural technology that enables small-scale farmers to improve production through controlled growing conditions, efficient resource utilization and potentially higher yields. However, the extent to which greenhouse farming contributes to household food security among small-scale farmers remains insufficiently documented in Gucha Sub-County, Kisii County. The study seeks to examine the influence of greenhouse farming on household food security among small-scale farmers in Gucha Sub-County. Specifically, it will assess the adoption of greenhouse farming technology, examine its influence on household food security, and explore the challenges affecting its adoption and utilization. The study will employ a mixed-methods research design. A sample of 120 small-scale farmers, comprising 60 greenhouse farming adopters and 60 non-adopters, will be selected. Quantitative data will be collected using structured questionnaires, while

qualitative information will be obtained through interviews. Quantitative data will be analyzed using descriptive and inferential statistics in SPSS, while qualitative data will be thematically analyzed. The study is guided by the Diffusion of Innovations Theory. The study is expected to establish whether greenhouse farming improves household food security through enhanced agricultural productivity, income generation, food availability, access and stability. It is also expected to identify technological, financial, knowledge and market-related barriers that influence adoption and sustainability. The study is expected to demonstrate how innovative agricultural technologies can contribute to sustainable rural transformation and household food security. Findings will provide evidence for policies and interventions promoting accessible, sustainable and technology-driven smallholder agriculture.

Keywords: *Greenhouse farming; Agricultural innovation; Household food security; Small-scale farmers; Rural transformation; Sustainable development; Technology adoption.*

79. Aflatoxin Contamination in Food Crops in Kenya: A Systematic Review

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Abstract

Aflatoxins produced by Aspergillus flavus and A. parasiticus remain a food-security and public-health problem in Kenya, where maize, groundnuts, sorghum and wheat are staples and the Kenya Bureau of Standards limit for total aflatoxins in food is 10 μg/kg. Chronic exposure is linked to hepatocellular carcinoma, aflatoxicosis, immune suppression and childhood stunting, while rejected grain hits smallholder incomes. This systematic review aggregated evidence on the level and extent of aflatoxin contamination in maize, wheat, sorghum and groundnuts in Kenya. Studies were identified from electronic databases and grey literature and synthesised narratively using PRISMA 2020. Four eligible studies met the inclusion criteria. Maize was the main contaminated staple, and groundnuts were also affected. Reported concentrations often exceeded the 10 μg/kg regulatory limit, including values of 63.79 μg/kg and samples above 100 μg/kg, with very high readings recorded in some surveys. Contamination was high in the Rift Valley and Meru County, and extreme levels in Eastern Kenya were associated with hepatocellular carcinoma risk. Moisture, broken kernels and insect damage were recurring drivers, pointing to both pre-harvest stress and weak drying and storage. The review shows that aflatoxin control is not only a laboratory problem but a community and market problem: safer drying, better storage, biocontrol and enforcement of the existing limit would protect health and keep grain in the food system. The evidence base is still thin, and further crop- and county-level monitoring is needed to target interventions where exceedances are greatest.

Keywords: *Aflatoxin; maize; groundnuts; food safety; Kenya; systematic review; hepatocellular carcinoma*

80. The Smart Student Kitchen Garden Project: A Model for Sustainable Food Security and Agripreneurship Education at Kaimosi Friends University, Kenya

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Abstract

Background: Food insecurity and limited practical agricultural skills undermine the nutrition, academic performance, and employability of many university students in Kenya. Scalable, low-cost interventions that combine food production with entrepreneurial training are urgently needed within higher education institutions to address these intersecting challenges.

Objective: This project proposes a model to address these challenges by establishing a "Smart Student Kitchen Garden" at Kaimosi Friends University. The objectives are to: (1) improve student access to fresh, nutritious vegetables; (2) provide hands-on training in climate-smart agriculture and agripreneurship; and (3) demonstrate the viability of small-space food production for income generation and potential self-employment.

Methods: The model will employ climate-smart techniques including sack, bottle, and container gardening, supplemented by drip irrigation to conserve water. A cohort of 30 students will be purposively selected to participate in a comprehensive 12-week training program cultivating nutrient-dense vegetables such as kales, spinach, and sagaa. The curriculum will also cover composting, pest management, financial record-keeping, value addition, and marketing strategies. A mixed-methods evaluation approach will be utilized, incorporating pre- and post-intervention surveys to measure changes in nutritional knowledge, agricultural competencies, and entrepreneurial attitudes. Additionally, focus group discussions will capture qualitative insights on participants' experiences. Vegetable yield data will be recorded weekly, and income generated from produce sales to the university community will be systematically tracked to assess economic viability.

Expected Results: We anticipate statistically significant improvements in participants' knowledge of sustainable agriculture and agripreneurship practices. The garden is expected to produce a consistent weekly vegetable yield sufficient to supplement the diets of participating students, thereby enhancing their nutritional status. Modest income generated from surplus sales is projected to sustain garden operations and create a revolving fund for expansion. Furthermore, the model is expected to demonstrate high potential for low-cost replication in other resource-constrained university settings across Kenya, contributing to broader youth empowerment and food security agendas.

Conclusion: The Smart Student Kitchen Garden Project provides a practical, integrated framework for enhancing food security, fostering entrepreneurial mindsets, and promoting sustainable agriculture among university youth. Findings from this pilot will offer valuable evidence for scaling such initiatives across Kenyan universities, contributing to student well-being and national food security goals.

81. Pest Threats to Food Security and Economy Within the Kenyan Horizon

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Abstract

Alien pests are increasingly being dispersed around the world through international trade, causing a multitude of negative environmental impacts and billions of dollars in economic losses annually. Once pests have entered and established in a certain area, eradication is extremely difficult, and so prevention by early detection and scanning of new species in horizon seems the only reliable measure, although it is difficult in the face of global mobility. Within the Kenyan horizon, there exists new pest threats that are likely to enter through movement of plant materials. Horizon scanning was conducted using horizon scanning tool (CABI). The major pests identified through horizon scanning include: Banana bunchy top virus (BBTV), Fusarium oxysporum f. sp cubense Tropical Race 4 (Foc TR4), Xylella fastidiosa, Bactrocera zonata, Mango mealybug and Tomato brown rugose fruit virus. Some of these pests have been reported in neighboring countries such as Uganda and Tanzania. With the porous nature of borders and movement of plant materials, the threat of

introduction of these pests is therefore very high. KEPHIS has implemented various measure to prevent the incursion of the identified pests. This includes continuous scanning of the horizon for new pest threats, pest risk analysis (PRA) for identified pests so as to establish management options, institution of emergency actions, inspection of all plant materials entering the country, development and validation of modern diagnostic protocols and tools and importation under post entry quarantine (PEQ). This ensures safe movement of plant materials thereby limiting the risk of pest incursions while facilitating trade. Great efforts are required in focusing research that will enhance phytosanitary regulation and standards to prevent and manage pest threats.

Key words: *BBTV, safe trade, horizon, phytosanitary, pests*

82. Current Fish Feed Status and Development of New Feeding Technologies for Aquaculture Growth and Development in Kenya: Rapid Review

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Abstract

Aquaculture has emerged as a promising sector for addressing the ever-increasing demand for fish protein in Kenya, where over 50% of fish consumption is reliant on imports. However, the sustainable growth and development of aquaculture in Kenya are significantly influenced by the availability and quality of fish feed, which constitutes over 50% of the total production costs. The current fish feed status in Kenya is characterized by several challenges, including limited availability of high-quality feed ingredients, high feed costs, and inconsistent feed quality and nutrient composition. These challenges pose significant constraints to the efficient production of healthy and marketable fish, limiting the full potential of aquaculture growth in Kenya. To address these challenges, efforts are being made towards the development of new feed formulations and feeding technologies that can improve the efficiency and sustainability of fish feed production in Kenya. This includes the utilization of locally available feed ingredients, such as agricultural by-products and aquatic macrophytes, to develop cost-effective and nutritionally balanced feed formulations. Moreover, research is underway to optimize feed processing techniques, such as extrusion, pelleting, and encapsulation, to improve feed quality, stability, and digestibility. Additionally, innovative feeding methods, such as automated feeding systems and precision feeding, are being explored to minimize feed wastage and maximize feed utilization, thereby enhancing fish growth and reducing production costs. The development of new feeding technologies for aquaculture growth and development in Kenya holds great potential to address the challenges associated with fish feed availability, quality, and cost. By optimizing feed formulations, processing techniques, and feeding methods, the aquaculture sector in Kenya can improve its productivity, profitability, and sustainability. However, further research, investment, and collaboration among stakeholders, including government, research institutions, feed manufacturers, and farmers, are essential for the successful implementation and adoption of these new feeding technologies to drive the growth and development of aquaculture in Kenya.

Keywords: *Aquaculture growth; Fish feed status; new feeding technologies*

83. Assessment of Factors Influencing Intra Household Food Distribution in Marachi North Ward -Busia County

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Abstract

Food is essential in human's life hence its availability in terms of quantity and quality for all people is an important factor for a nation to continue its development. Lack of food in long terms will lead to hunger and starvation that can cause death. Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The objectives of the study were to determine the socio economic and cultural practises that influence intra household food distribution and to determine the influence of food distribution systems by various households on the food security status of household members in Marachi North ward in Busia County. Systematic sampling method was used to get a respondent from 50 households. It was hypothesized that socio economic and cultural factors negatively influences intra household food distribution. The core methodological approach was through cross sectional survey using structured questionnaires (quantitative) and interview guides (qualitative) as instruments of data collection. Using SPSS both descriptive and inferential Statistics, data analyzed and interpreted; Correlations at 5% level of significance were generated and used to analyze socio-economic data and effects on nutritional status. The study revealed that 45% of the households were able to produce enough food to last one year; most households did not meet their dietary needs through household domestic production with 19% receiving remittance as supplementary. Educational level reached by an individual positively correlated to individual total monthly income leading to a significant association between the educational level and income in relation to food procurement and individual allocation. Low levels of education, employment and income observed among female (women) constrain household purchasing power and knowledge required to select and distribute nutritious foods. Thus, empowering women has far reaching benefits for nutritional outcomes of children and the entire household.

Key words: *Household, Food distribution, Food security, Nutritious food Practices*

THEMATIC AREA 8: SCIENCE, TECHNOLOGY AND INNOVATION (STI)





84. In Silico Identification of Multi-Target Phytochemicals from Artemisia Annua and Aloe Barbadensis Against Methicillin-Resistant Staphylococcus Aureus

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Abstract

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a leading cause of healthcare-associated infections with limited treatment options due to multidrug resistance. Medicinal plants *Artemisia annua* and *Aloe barbadensis* have demonstrated antibacterial activity, but the specific bioactive compounds and their molecular targets remain largely unknown. This study employed molecular docking to screen 61 drug-like phytochemicals (33 from *A. annua*, 28 from *A. barbadensis*) against eleven MRSA protein targets involved in cell-wall synthesis (PBP2a, MurA, MurB, FemA/FemB, LtaS), DNA replication (DNA gyrase, topoisomerase IV), folate metabolism (DHFR, DHPS), virulence (sortase A), and stress response (ClpP). AutoDock Vina was used to calculate binding affinities, and Lipinski's Rule of Five was applied to assess drug-likeness. Twenty-eight compounds showed binding affinities ≤ −7.0 kcal/mol against at least one target. Aloesaponarin I (from *A. barbadensis*) exhibited the strongest interaction with MurB (−10.5 kcal/mol). Other high-affinity compounds included 7-O-methylaloesin (MurA, −9.4 kcal/mol; LtaS, −8.8 kcal/mol), aloesaponol I (DHFR, −9.3 kcal/mol), and luteolin (sortase A, −7.7 kcal/mol; DNA gyrase, −7.7 kcal/mol). MurA was the most frequently inhibited target (23 compounds with ΔG ≤ −8.0 kcal/mol). All active compounds satisfied Lipinski's criteria, indicating favorable oral bioavailability. These findings identify aloesaponarin I, 7-O-methylaloesin, luteolin, and kaempferol as promising multi-target MRSA inhibitors, warranting further in vitro and in vivo validation. The study recommends that future work should focus on determination of MIC and MBC for the top compounds (aloesaponarin I, 7-O-methylaloesin, luteolin, kaempferol) against MRSA clinical isolates as well as molecular dynamics simulations of the best complexes together with related synergies.

Keywords: *Aloe barbadensis*, *Artemisia annua*, Drug-Likeness, Molecular Docking, MRSA, Multi-Target, MurA

85. Modelling Functional Innovation and Technology Transfer Units for Research Commercialization: A Kenyan Higher Education Perspective

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Abstract

Universities and research institutions are increasingly expected to transform knowledge and research outputs into innovations that generate social, economic, and industrial value. In Kenya, substantial investments have been made in research, innovation, entrepreneurship, incubation, and intellectual property development. However, the translation of research outputs into market-ready technologies, enterprises, policies, and societal solutions remains limited. Innovation and Technology Transfer Units (ITTUs) have the potential to bridge this gap by providing an institutional interface between researchers, industry, government, investors, and communities. Nevertheless, many existing structures operate with fragmented mandates, inadequate resources, weak industry linkages, limited commercialization expertise, and poorly defined performance indicators. This study therefore seeks to develop a functional model for effective Innovation and Technology Transfer Units within Kenyan universities and research institutions. The study conceptualizes an ITTU as an integrated institutional system that facilitates the movement of knowledge and innovations from research

and development to protection, validation, incubation, financing, commercialization, adoption, and societal impact. The proposed model integrates key functional dimensions including institutional governance and policy, innovation identification and assessment, intellectual property management, technology readiness and validation, incubation and acceleration, entrepreneurship development, industry and investor engagement, technology licensing and commercialization, funding mobilization, and monitoring and evaluation. The study will examine the relationships among these functions and the institutional and ecosystem factors that influence their effectiveness. The anticipated outcome is a context-sensitive functional model that can guide Kenyan universities and research institutions in establishing, restructuring, or strengthening ITTUs. The model is expected to enhance coordination of innovation activities, improve research commercialization, strengthen university–industry linkages, increase intellectual property utilization, and improve the socioeconomic impact of publicly funded research. The study will contribute to scholarship and practice by providing an integrated framework for transforming institutional innovation structures from predominantly administrative units into functional engines of research commercialization, entrepreneurship, and technology-driven development.

Keywords: *Innovation and Technology Transfer Units; research commercialization; technology transfer; innovation management; intellectual property; university–industry collaboration; incubation; entrepreneurship; Kenyan universities; innovation ecosystem.*

86. Valorization of Diatomaceous Earth as an Alternative Activator for Pumice-Based Geopolymer Concrete: Experimental and Multiple Linear Regression Modeling

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Abstract

The environmental impacts associated with Portland cement (PC) production have stimulated interest in geopolymer concrete (GPC) as a sustainable alternative. However, the high cost and environmental burden of commercial sodium silicate (CSS) limit its wider application. This study investigated the production, and optimization of pumice-based GPC using diatomaceous earth (DE) as an alternative silica source. Pumice and DE were characterized using X-ray fluorescence (XRF), X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), thermogravimetric/differential thermal analysis (TGA/DTA), and scanning electron microscopy (SEM). The effects of sodium hydroxide (NaOH) concentration, silica-source content, curing temperature, and liquid-to-solid (L/S) ratio on 28-day compressive strength (CS) were evaluated. Pumice contained 76.9% SiO_2, while DE contained 88.12% SiO_2 and exhibited predominantly amorphous characteristics. Increasing NaOH concentration and curing temperature enhanced CS, whereas excessive silica-source content reduced strength. The optimum conditions were 10 M NaOH, 40 g silica source, 70 °C curing temperature, and an L/S ratio of 0.75, producing 4.21 and 4.41 MPa for DE- and CSS-based GPC, respectively. Multiple linear regression models showed strong predictive performance: $CS = 0.390(NaOH) - 0.02308(DE) + 0.03037(T) + 0.45079$ ($R^2 = 0.965$) and $CS = 0.32212(NaOH) - 0.023179(CSS) + 0.03065(T) + 0.41570$ ($R^2 = 0.964$). The optimized GPC is currently suitable for non-structural applications. The findings demonstrate the potential of locally available DE as an alternative silica source for pumice-based GPC.

Keywords: *Diatomaceous earth; geopolymer concrete; pumice; sodium silicate; compressive strength; multiple linear regression.*

87. High-Order Harmonic Generation in Chirped Strong Laser Fields for Ultrafast Photonics

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Abstract

High-order harmonic generation (HHG) provides a powerful route to producing coherent extreme-ultraviolet and ultrashort attosecond radiation for advanced photonic applications. However, simultaneously achieving high harmonic cutoff energies, strong spectral yields and isolated attosecond pulses remains challenging because the HHG response is highly sensitive to laser intensity, chirp and carrier-envelope phase (CEP). This study investigates the control of HHG in strong chirped laser fields using a one-dimensional time-dependent Schrödinger equation solved through split-operator propagation, complemented by wavelet-based time-frequency analysis. The effects of laser intensity, positive and negative chirp, and CEP on harmonic emission and attosecond pulse synthesis are systematically examined. Increasing intensity from 3×10^{14} to 2×10^{15} W/cm² extended the harmonic cutoff from approximately 126 to 648 eV. Negative chirp produced cleaner and more continuous harmonic spectra than positive chirp and enhanced the dominant re-collision contribution. At a wavelength of 1030 nm and intensity of 2×10^{15} W/cm², the optimized chirp parameter $\beta = -0.0009$ increased the cutoff to 689.7 eV, while CEP optimization further extended it to 1267.5 eV at $\phi_0 = 0.75\pi$. Attosecond pulse synthesis under negative chirp produced a shortest pulse of 44 as. These findings demonstrate that controlling chirp and CEP provides an effective computational route for developing high-performance ultrafast photonic sources, contributing to technological innovation and advanced scientific infrastructure.

Keywords: *High-order harmonic generation; chirped laser fields; attosecond pulses; carrier-envelope phase; ultrafast photonics*

88. Mathematical Modelling of the Public Health Impact of RTS,S/AS01 Vaccine on Under-Five Children in Bungoma County, Kenya

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Abstract

Malaria remains a leading cause of morbidity and mortality among children under five years in sub-Saharan Africa. Bungoma County, Kenya, experiences high endemic transmission with 47 deaths recorded in 2024 among this vulnerable population. The RTS, S/AS01 vaccine offers promise, but its population-level impact under realistic coverage, waning immunity, and continued vector exposure requires model-based evaluation. To develop an age-structured SVIRSI compartmental model simulating malaria transmission dynamics with vaccination as a control variable for children under five years' in Bungoma County, Kenya. An SVIRSI model with susceptible (S_h), vaccinated (V_h), infected (I_h), and recovered (R_h) children coupled with susceptible (S_m)

and infected (I_m) mosquitoes was formulated. The effective reproduction number (R_e) was derived using the next-generation matrix method. Positivity, boundedness, existence, uniqueness, local and global stability of the disease-free equilibrium were established. Normalized forward sensitivity analysis, bifurcation analysis (Castillo-Chavez and Song), and fourth-order Runge-Kutta numerical simulations were performed. The computed $R_e = 0.00157 < 1$ confirmed local and global asymptotic stability of the DFE. Sensitivity analysis identified vaccine efficacy (Θ) and mosquito induced death rate (Ψ) as the most influential. Backward bifurcation indicated that reducing R_e below unity may be insufficient for sustained elimination. Model validation achieved AUC = 0.94, $R^2 = 0.965$, and RMSE = 1.12. The 57.1% booster dropout was identified as a critical threat to sustained elimination. The SVIRSI model captures vaccination dynamics and demonstrates current vaccination programme is sufficient for malaria elimination when $R_e < 1$. However, backward bifurcation necessitates maintaining R_e below a subcritical threshold. This framework provides evidence-based support for policy decisions in Bungoma County and similar endemic settings.

Keywords: *Age-Structured Model, Vaccine Efficacy, RTS, S/AS01, Effective Reproduction Number, Numerical Simulations, SVIRSI Model*

89. On the Strict t-norm and Quasi-Copulas in Mathematical Fuzzy Logic

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Abstract

Strict triangular norms (t-norms) and quasi-copulas are key areas of study in mathematical fuzzy logic. They help researchers understand how to join fuzzy sets together. T-norms help model the word "AND" in fuzzy logic systems while Quasi-copulas help link multiple probability distributions together. In the Fuzzy Systems, these ideas help computers make better decisions with vague data. In mathematical fuzzy logic, the interpretation of conjunction is canonically governed by triangular norms (t-norms), which are typically required to be associative. However, when modeling complex interactions and dependence structures such as in imprecise probability theory or relaxed logical consequence, this associativity constraint is frequently a limiting factor. In this era of AI, explicitly translating deep probabilistic outputs into standard human-interpretable fuzzy rules without sacrificing predictive accuracy remains an engineering and architectural challenge. Currently, researchers are building new formulae to connect these two tools. The objectives of the study are to establish standard completeness for logical systems, demonstrate that quasi-copulas provide a robust semantic foundation for graduated conjunction operators and to characterize how strict t-norms serve as fundamental boundary cases in generalized systems. Specifically, the expansion of infinite-valued propositional logics by incorporating connectives interpreted by arbitrary quasi-copulas and their residua is investigated. The methodology involves axiomatic characterization, comparative mapping, algebraic semantics to establish relationships between these mathematical structures and deductive proofs to analyze properties like associativity and monotonicity to connect probabilistic tools with fuzzy system modeling. The results establish standard completeness for these expanded logical systems, demonstrating that quasi-copulas provide a robust semantic foundation for graduated conjunction operators. In real life, the results of this study are applicable in Intelligent Control Systems, Decision Support and Expert Systems, Artificial Intelligence and Machine Learning as well as Consumer Electronics.

90. Simulation-Based Evaluation of Early Life Stress on Mental Health Trajectories in Kenya

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Abstract

Early life stress (ELS) is a major public health concern in Kenya's urban informal settlements, where children face chronic adversity. However, there is limited quantitative evidence on how targeted interventions can alter mental health trajectories in these low-resource settings. This study therefore aimed to evaluate through numerical simulations the effects of early life stress on brain development and mental health trajectories, and to assess the potential impact of intervention strategies. The model integrates environmental, neurobiological, genetic, and resilience factors, with parameters derived from Kenyan sources including NUHDSS, KEMRI, and the University of Nairobi. MATLAB simulations were run over 20 years to assess intervention scenarios. Sensitivity analysis of the Stress Propagation Index (R_0) showed that stress transmission rate (β) and environmental factors (E_f) had the strongest positive influence (+1.000 each), while resilience (R_f) and incubation rate (α) had negative influence (-0.538 and -0.917). Increasing resilience from 0.35 to 0.60 reduced the impacted population by approximately 30% over a decade, while reducing environmental stressors delayed symptom onset. Adolescents ($13-17$ years) were most vulnerable, with prevalence rising from 9.5% to 18.5% by 2030 under baseline conditions. Migration increased cumulative impacted cases by 85%, highlighting the need for migration-sensitive mental health planning. These findings demonstrate that mathematical modeling can guide early screening, resilience-building, and evidence-based mental health policy in vulnerable Kenyan communities.

Keywords: *Early life stress, SEIR model, mental health trajectories, simulation, resilience, Kenya*

91. Mathematical Modelling of Impacts of Behavioral and Environmental Factors on the Mental Well-Being of the Youth.

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Abstract

Mental health disorders among the youth population have emerged as a growing public health crisis, globally and locally, with significant social, educational, and economic implications. In Kenya, youth aged 15–24 account for more than 35% of the population and face numerous challenges that heighten their vulnerability to mental health issues, including anxiety, depression, self-harm, and substance dependence. These challenges are deeply rooted in a combination of environmental factors (poverty, inadequate housing, domestic instability, and limited access to mental health services) and behavioral factors (substance abuse, risky sexual behavior, poor nutrition, and excessive screen time). Although various mathematical models have been developed to study mental health dynamics, most focus on either behavioral or environmental factors in isolation, and few are tailored specifically to youth populations or integrated within an optimal control framework. This study formulates and analyzes a comprehensive Susceptible-Exposed-Infected-Treated-

Recovered (SEITR) mathematical model incorporating both behavioral and environmental risk factors within a unified framework to better understand and control the dynamics of mental health among the youth. The model's well-posedness is established through positivity and boundedness proofs, and the basic reproduction number R_0 is computed using the next-generation matrix approach. Stability analysis demonstrates that the mental illness-free equilibrium is globally asymptotically stable when $R_0 < 1$, whereas a persistent equilibrium emerges and is locally asymptotically stable when $R_0 > 1$. Pontryagin's Maximum Principle is applied to derive optimal time-dependent control strategies for prevention, screening, and treatment. Numerical simulations using MATLAB, with parameter values informed by WHO, UNICEF, and Kenyan sources, reveal that without interventions, the mental health disorder persists at endemic levels. Implementation of moderate constant controls reduces R_0 below 1, leading to disease elimination within 5 to 8 years. Behavioral interventions alone reduce peak infection from 16% to below 8%, while environmental interventions achieve similar reductions; however, the combined optimal control strategy proves most effective, reducing infection to near zero within the simulation horizon. This study establishes a quantitative threshold condition for mental health stability via R_0, enabling prediction of whether disorders will persist or decline. The model provides a structured progression pathway, enabling precise identification of critical intervention points and offering scenario-based predictions relevant to youth populations. The findings inform policymakers, educators, health practitioners, and community organizations about effective evidence-based prevention and intervention strategies, with particular relevance to resource-limited settings like Kenya.

Keywords: *Mental health; Youth; Mathematical modelling; Behavioral factors; Environmental factors; Optimal control.*

PROGRAMMES OFFERED AT KAIMOSI FRIENDS UNIVERSITY

SCHOOL OF EDUCATION AND SOCIAL SCIENCES

Doctoral Programmes

No.	Programme
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2	Doctor of Philosophy in Curriculum and Instruction
3	Doctor of Philosophy in Literature

Master's Programmes

No.	Programme
1	Master of Arts in Comparative Literature
2	Master of Arts in Geography
3	Master of Arts in History
4	Master of Arts in Religion
5	Master of Education in Kiswahili
6	Master of Education in Educational Psychology
7	Master of Arts in Kiswahili
8	Master of Arts in Linguistics
9	Master of Education in English Language

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No.	Programme
1	Bachelor of Education (Arts)
2	Bachelor of Education (French)
3	Bachelor of Education (Science)
4	Bachelor of Social Work
5	Bachelor of Education in Early Childhood Education
6	Bachelor of Disaster Management and International Diplomacy
7	Bachelor of Arts (Criminology and Criminal Justice)

Diploma Programmes

No.	Programme
1	Diploma in Social and Community Development
2	Diploma in Criminology and Criminal Justice

Certificate Programmes

No.	Programme
1	Certificate in Social and Community Development
2	Certificate in Criminology and Criminal Justice

SCHOOL OF BUSINESS AND ECONOMICS

Doctoral Programmes

No.	Programme

1	Doctor of Philosophy in Business Administration

Master's Programmes

No.	Programme
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2	Master of Science in Economics

Undergraduate Programmes

No.	Programme
1	Bachelor of Commerce
2	Bachelor of Science in Accounting
3	Bachelor of Science in Health Finance
4	Bachelor of Science in Banking and Finance
5	Bachelor of Science in Economics and Finance
6	Bachelor of Business Information Technology
7	Bachelor of Science in Economics and Statistics
8	Bachelor of Science in Economics

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2	Diploma in Banking and Finance
3	Diploma in Purchasing and Supplies
4	Diploma in Human Resource Management
5	Diploma in Business Administration
6	Diploma in Insurance and Risk Management
7	Diploma in Marketing
8	Diploma in Entrepreneurship

Certificate Programmes

No.	Programme
1	Certificate in Business Management

SCHOOL OF SCIENCE

Postgraduate Programmes

No.	Programme
1	Master of Science in Microbiology
2	Master of Science in Physics
3	Master of Science in Applied Mathematics
4	Master of Science in Pure Mathematics

Undergraduate Programmes

No.	Programme
1	Bachelor of Science in Agricultural Economics and Resource Management
2	Bachelor of Science in Applied Statistics with IT
3	Bachelor of Science in Mathematics and Economics with IT

4	Bachelor of Science in Mathematics with IT
5	Bachelor of Science in Chemistry
6	Bachelor of Science in Biology
7	Bachelor of Science in Physics with Appropriate Technology

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

Doctoral Programmes

No.	Programme
1	Doctor of Philosophy in Information Systems and Technology

Master's Programmes

No.	Programme
1	Master of Science in Information Technology

Undergraduate Programmes

No.	Programme
1	Bachelor of Science in Information Technology
2	Bachelor of Science in Information Systems and Knowledge Management
3	Bachelor of Science in Computer Science

Diploma Programmes

No.	Programme
1	Diploma in Information Technology

Certificate Programmes

No.	Programme
1	Certificate in Information Technology

SCHOOL OF HEALTH SCIENCES

Doctoral Programmes

No.	Programme
1	Doctor of Optometry and Vision Science

Master's Programmes

No.	Programme
1	Master of Science in Advanced Nursing
2	Master of Science in Clinical Medicine
3	Master of Science in Optometry and Vision Sciences
4	Master's in Public Health

Undergraduate Programmes

No.	Programme
1	Bachelor of Science in Nursing
2	Bachelor of Science in Nursing (Upgrading)
3	Bachelor of Science in Clinical Medicine and Community Health
4	Bachelor of Science in Clinical Medicine and Community Health (Upgrading)

5	Bachelor of Science in Optometry and Vision Science
6	Bachelor of Science in Public Health
7	Bachelor of Medicine and Bachelor of Surgery (MBChB)
8	Bachelor of Science in Physiotherapy

PROFESSIONAL PROGRAMMES

KASNEB

No.	Programme
1	Certificate in Accounting Management Skills
2	Accounting Technicians Diploma
3	Certified Public Accountants
4	Certified Secretaries
5	Certified Investment Financial Analyst
6	Certified Islamic Finance Executive

HRMPEB

No.	Programme
1	Certificate in Human Resource Management (Competence Based)
2	Diploma in Human Resource Management (Competence Based)
3	Certified Human Resource Professional

KISEB

No.	Programme
1	Certified Procurement and Supply Professional of Kenya (CPSP-K)
2	Associate in Procurement and Supply of Kenya (APS-K)

KAIMOSI FRIENDS UNIVERSITY

INTERNATIONAL CONFERENCE AND INNOVATION WEEK 2026

Programs

THEME

SCIENCE, INNOVATION AND DIGITAL TRANSFORMATION, FOR SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT

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VENUE LOCATIONS

- **LAB 1:** Health Sciences & Biotech
- **OLD LIBRARY:** Climate & STI
- **ODEL:** Governance & Agriculture
- **LAB 2:** Education & ICT Training
- **GOVERNOR'S HALL:** Digital & Education

Organized by: Directorate of Research, Innovation and Outreach (RIO)

Kaimosi Friends University, Main Campus

Programme at a Glance

Overview & Structure

1. Thematic Areas by Room (88 Total Presentations)

Room	Thematic Areas	Presentations	Sessions
LAB 1	Health Sciences and Biotechnology; Interdisciplinary Research and Industry–Academia Collaboration	23 + 3 = 26	Health 1–5 (Sessions I–V); Interdisciplinary (Session VI)
OLD LIBRARY	Climate Change, Environment and Natural Resource Management; Science, Technology and Innovation (STI)	18 + 7 = 25	Climate Change 1–4 (Sessions I–IV); STI 1–2 (Sessions V–VI)
ODEL	Governance, Leadership and Socio-Economic Development; Sustainable Agriculture, Food Security and Bioeconomy	16 + 7 = 23	Governance 1–4 (Sessions I–IV); Agriculture 1–2 (Sessions V–VI)
LAB 2	Education, Pedagogy and Curriculum Innovation	6	Education 1–3 (Sessions I–III); Digital 1–2 (Sessions IV–V)
GOVERNOR'S HALL	Education, Pedagogy and Curriculum Innovation; Digital Transformation, ICT and Artificial Intelligence	2 + 6 = 8	Special Sessions

2. Parallel Sessions Schedule Matrix

Session	Day & Time	Room 1 (LAB 1)	Room 2 (OLD LIB)	Room 3 (ODEL)
Parallel Session I	Day 1 – Wed 21 Oct, 11:30 – 13:00	Health Sciences 1 (4)	Climate Change 1 (4)	Governance 1 (4)
Parallel Session II	Day 1 – Wed 21 Oct, 14:00 – 16:00	Health Sciences 2 (5)	Climate Change 2 (5)	Governance 2 (4)
Parallel Session III	Day 2 – Thu 22 Oct, 10:30 – 12:30	Health Sciences 3 (5)	Climate Change 3 (5)	Governance 3 (4)
Parallel Session IV	Day 2 – Thu 22 Oct, 14:00 – 15:40	Health Sciences 4 (4)	Climate Change 4 (4)	Governance 4 (4)
Parallel Session V	Day 3 – Fri 23 Oct, 08:30 – 10:30	Health Sciences 5 (5)	STI 1 (4)	Agriculture 1 (4)
Parallel Session VI	Day 3 – Fri 23 Oct, 10:30 – 12:00	Interdisciplinary Research (3)	STI 2 (3)	Agriculture 2 (3)

** Figures in brackets show the number of presentations in each session. Each presentation is allocated 20 minutes.*







Day 1: Wednesday, 21st October 2026 — Plenary & Opening

Opening Ceremony

Time	Event / Activity	Responsible Person / Facilitator
08:00 – 08:45	Registration	Secretariat
08:45 – 09:00	Ground rules for online conferencing	ICT Team
09:00 – 09:05	**Launch / Official Opening Ceremony**	Prof. Manyali / Dr. Nyambane
09:05 – 09:10	Opening Prayer	Dr. Rodger Wekesi (University Chaplain)
09:10 – 09:20	Welcome Remarks, Director RIO / Chairperson Organizing Committee	Prof. George Manyali
09:20 – 09:30	Remarks by DVC (Academic, Student Affairs & Research)	Prof. Fred Amimo
09:30 – 09:45	Remarks by DVC (Administration, Finance, Planning & Dev.)	Prof. Thomas Kipkurgat
09:45 – 09:55	**Opening Speech by Vice-Chancellor**	**Prof. Peter Mwita**
09:55 – 10:05	Remarks by Invited Distinguished Guest	**Dr. Beatrice Inyangala, CBS** (PS, State Dept. for Higher Education)
10:05 – 10:35	**Remarks by Chief Guest**	**Prof. Dickson Andala** (CEO, National Research Fund)
10:35 – 11:00	**Keynote Speaker Address**	**Prof. Kisilu Kombo**
11:00 – 11:20	Vote of Thanks	Prof. Omieno
11:00 – 11:20	**GROUP PHOTO (On-site Participants) & HEALTH BREAK**	

Day 1: Parallel Session I (11:30 – 13:00)

Wednesday, 21st October

LAB 1: Health Sciences & Biotech 1

Chair: Dr. Anne Asiko | Rapporteur: Ruth Kadenyeka

11:30 - 11:50: Adan Osman Zeytun (Kabarak Univ.) — *M&E Practices & Performance of Maternal Health Projects in Narok*

11:50 - 12:10: Mocha Clifford Nyakundi (KAFU) — *Effectiveness of Kenyan HPV Vaccination Strategies (9-14 yrs)*

12:10 - 12:30: Opicho Dominic Simiyu (Kibabii Univ.) — *Mathematical Modelling of RTS,S/AS01 Vaccine Impact in Bungoma*

12:30 - 12:50: Nicholas W. Barasa (KAFU) — *COVID-19 & Essential Health Delivery in LMICs*

OLD LIBRARY: Climate Change & NRM 1

Chair: Dr. Emily Ngeno | Rapporteur: Douglas Sang

11:30 - 11:50: Kevin Nzyoki (Machakos Univ.) — *Fluoride Adsorption onto MIL-53(Al) Bamboo Hydrochar Composite*

11:50 - 12:10: Veronica A. Okello (Machakos Univ.) — *Nanoscale Zero-Valent Iron-Functionalized Hydrochar*

12:10 - 12:30: Victor Shikuku (KAFU) — *Recent Advances in Adsorbent Materials for Arsenic Removal*

12:30 - 12:50: Elizabeth N. Ndunda (Machakos Univ.) — *Fluoride Adsorption Research in Africa: Systematic Review*

ODEL: Governance & Socio-Economic Dev. 1

Chair: Dr. Linda Mangeni | Rapporteur: Rodney Anami

11:30 - 11:50: Phoebe Aluoch Olooh (Kabarak Univ.) — *Risk Mitigation & Performance of Insurance Companies in Nairobi*

11:50 - 12:10: Fred Wasike (MMUST) — *Effect of Bank Deposits on Profitability of Commercial Banks*

12:10 - 12:30: Partrick Kahura (Kabarak Univ.) — *Portfolio Diversification & Performance of Fund Managers*

12:30 - 12:50: Nurwin Fozia (KAFU) — *AfCFTA Agreement as Catalyst for Pan-African Supply Chains*

LAB 2: Education & Curriculum Innovation 1

Chair: Dr. Robert Opanyi | Rapporteur: Nahashon Wagema

11:30 - 11:50: Jane Amunga (KAFU) — *Reimagining Kenyan University Curricula for 21st-Century Learners*

11:50 - 12:10: John Munyua Mwangi (KAFU) — *Psychosocial Experiences & Outcomes of Student Mothers*

12:10 - 12:30: Kweyu Remjo (KAFU) — *Student-Led Literary Frameworks: Nafsi Writers Foundation*

12:50 – 13:00 Discussion / Q&A | 13:00 – 14:00 LUNCH BREAK

Day 1: Parallel Session II (14:00 – 16:00)

Wednesday, 21st October

LAB 1: Health Sciences & Biotech 2

Chair: Dr. Anne Asiko | Rapporteur: Ezra Korir

14:00 - 14:20: Wandera Belinda (KAFU) — *Effects of Pregnancy on Mental Health in Adolescents*

14:20 - 14:40: Mbera Moraa Dorcas (KAFU) — *Mathematical Modelling of Behavioral Factors on Youth Mental Well-Being*

14:40 - 15:00: Sarah Makong'o (KAFU) — *Social Media Impacts on Mental Health of Undergraduates*

15:00 - 15:20: Jacinta Mutwiwa (Kibabii Univ.) — *Simulation-Based Evaluation of Early Life Stress in Kenya*

15:20 - 15:40: Mutibo Jefferson N. (KAFU) — *Group Social Support for Dialysis Patients in Kenya*

OLD LIBRARY: Climate Change & NRM 2

Chair: Dr. Emily Ngeno | Rapporteur: Allan Kiptoo

14:00 - 14:20: Victor Shikuku (KAFU) — *Kaolin- and Metakaolin-Based Geopolymer Adsorbents*

14:20 - 14:40: Emily C. Ngeno (KAFU) — *Sustainable Re-Utilization of Waste Materials for Wastewater*

14:40 - 15:00: Mark O. Okoth (Maseno Univ.) — *Microplastic Contamination in African Freshwater Ecosystems*

15:00 - 15:20: Mark O. Okoth (Maseno Univ.) — *Risk Assessment of Microplastics in Lake Victoria Sediments*

15:20 - 15:40: Sarah Sikuta (KAFU) — *Mathematical Modelling of Nitrate Transport in River Nzoia*

ODEL: Governance & Socio-Economic Dev. 2

Chair: Dr. Lindah Mangeni | Rapporteur: Ramadhan Ali

14:00 - 14:20: Caleb M. N. Onyinkwa (Kabarak Univ.) — *Stakeholder Engagement in Nairobi Expressway PPP*

14:20 - 14:40: Dennis O. Ongoro (Kabarak Univ.) — *M&E Practices & Sustainability of Borehole Water Projects*

14:40 - 15:00: Dennis O. Ongoro (Kabarak Univ.) — *Project Planning & Sustainability of Water Projects*

15:00 - 15:20: Lorna Riungu (TUK) — *Government Regulation & Platform-Based Accommodation in Nairobi*

15:20 - 15:40: Ahmed Kassim Wangara (KAFU) — *Disability Mainstreaming in Higher Education Globally*

LAB 2: Education & Curriculum Innovation 2

Chair: Dr. Robert Opanyi | Rapporteur: Bonn Ojwang

14:00 - 14:20: Weheliye Liban (KAFU) — *Gamification (Kahoot) in Nursing Abdominal Physical Exam Skills*

14:20 - 14:40: Daisy Chepkemoi (KAFU) — *Nursing Students' Clinical Placement Quality at KAFU*

14:40 - 15:00: Robert Recha (Egerton Univ.) — *Teacher Training & Continuous Assessment in STEM Senior Schools*

15:40 – 16:00 Discussion / Q&A | END OF DAY ONE







Day 2: Thursday, 22nd October 2026 — Plenary Session

Keynote & Special Plenary

Time	Event / Presentation	Responsible / Facilitator
08:00 – 08:45	Registration & Morning Assembly	ICT / Secretariat
08:45 – 08:55	Recap / Remarks by Director – RIO	Prof. George Manyali
08:55 – 09:05	Remarks by Ag. DVC (A&SA), KAFU	Prof. Fred Amimo
09:05 – 09:40	**Keynote Paper 2:** *"Terrorism Threat Notes as Illegal Speech Acts: A Corpus-Based Approach"*	**Prof. Daniel Ochieng' Orwenjo** (Technical University of Kenya)
09:40 – 10:00	Plenary Discussion & Q&A Session	All Participants
10:00 – 10:30	**HEALTH BREAK & GROUP PHOTO SESSION**	

SPECIAL TRACK HIGHLIGHT: ICT AUTHORITY TRAINING SESSION

During Day 2 Parallel Sessions (10:30 – 15:40), **LAB 2** will host a dedicated continuous technical training workshop conducted by officers from the **ICT Authority of Kenya**, focusing on digital skills, e-governance solutions, and AI infrastructure integration for higher education.

Day 2: Parallel Session III (10:30 – 12:30)

Thursday, 22nd October

LAB 1: Health Sciences & Biotech 3

Chair: Lilian Isiaho | Rapporteur: Ruth Kadenyeka

10:30 - 10:50: Kiarie Ken Maingi (Kisii Univ.) — *Emergency Medical Skills in Community Drug Rehab in Naivasha*
10:50 - 11:10: Jacodull Mercy A. (KAFU) — *Peer-Led Support on ART Adherence Among Adolescents in Africa*
11:10 - 11:30: Jane Kuria (Karatina Univ.) — *Clinical Medicine Training Impact on Global Health Systems*
11:30 - 11:50: Ann Asiko (KAFU) — *Informal Coping Mechanisms & Nursing Workarounds in Public Hospitals*
11:50 - 12:10: Peris W. Gikaria (Murang'a Univ.) — *Poison on the Plate: Heavy Metals in Kenyan Vegetables*

OLD LIBRARY: Climate Change & NRM 3

Chair: Dr. Constance Ikhoha | Rapporteur: Douglas Sang

10:30 - 10:50: Mark Otiende Amuko (UoN) — *Indigenous Ecological Knowledge Held by Women in Agriculture*
10:50 - 11:10: Philip K. Mwendwa (Egerton Univ.) — *Local Knowledge Systems & Climate Change in Baringo*
11:10 - 11:30: George Manyali (KAFU) — *Citizen Science for Kaimosi Forest Ecosystem Management*
11:30 - 11:50: Humphrey Agevi (MMUST/Amref) — *Nature-Based Solutions in Lake Region Economic Bloc*
11:50 - 12:10: Humphrey Agevi (MMUST/Amref) — *Mapping Climate and Health Hubs in Africa*

ODEL: Governance & Socio-Economic Dev. 3

Chair: Dr. John Ayisi | Rapporteur: Rodney Anami

10:30 - 10:50: Ahmed K. Wangara (KAFU) — *Stakeholders' Perception on Arming Private Security in Lurambi*
10:50 - 11:10: Okello Clifford — *Corruption, Weak Governance & Crime in Kenya: Criminological Analysis*
11:10 - 11:30: Solomon Mosis — *Governance Failure, Marginalisation, & Counter-Terrorism Governance*

GOVERNOR'S HALL: Education & ICT 3

Chair: Dr. Aggrey Amugune | Rapporteur: Nahashon Wagema

10:30 - 10:50: Reuben Okiya (SEKU) — *Digital Infrastructure & STEM Implementation in Kitui Junior Schools*
10:50 - 11:10: Paul Oduor Oyile (Kibabii Univ.) — *Competency Framework for Early Childhood Educators*
11:30 - 11:50: Humphrey Agevi (MMUST/Amref) — *Mapping Africa's Digital Health Ecosystem*
11:50 - 12:10: Paul Okeyo Ogembo (KAFU) — *Digitization of HealthCare System in Kenya*

12:10 – 12:30 Discussion / Q&A | 12:30 – 14:00 LUNCH BREAK

Day 2: Parallel Session IV (14:00 – 15:40)

Thursday, 22nd October

LAB 1: Health Sciences & Biotech 4

Chair: Dr. Mabonga | Rapporteur: Ezra Korir

14:00 - 14:20: Wangulu Kassaman Daniel (KAFU) — *Factors Influencing Cataract Surgery Uptake in Rural Settings*

14:20 - 14:40: Emmanuel E. Okenwa-Vincent (KAFU) — *Myopia & Teacher-Rated Behavioural Outcomes in Adolescents*

14:40 - 15:00: Odhiambo G.S (City Eye Hospital/KAFU) — *Headache and the Eye: Ophthalmic Misattribution*

15:00 - 15:20: Muita Peter Muriuki (MMU) — *Isolated Attosecond Pulse Generation via Laser Fields*

OLD LIBRARY: Climate Change & NRM 4

Chair: Dr. Constance Ikhoha | Rapporteur: Allan Kiptoo

14:00 - 14:20: Meryem Bououd (Mohammed V Univ. Morocco) — *Environmental Regulations & Firms' Performance*

14:20 - 14:40: Wilberforce W. Wasike (UTAMU) — *AI-Enabled Climate Intelligence for Adaptive Governance*

14:40 - 15:00: Johanna A. Wanjala (DeKUT) — *Groundwater–Streamflow Interaction Under Hydroclimatic Variability*

15:00 - 15:20: James Maingi Muasya (KAFU) — *First-Principles Investigation of Barium Titanate for Photovoltaics*

ODEL: Governance & Socio-Economic Dev. 4

Chair: Dr. John Ayisi | Rapporteur: Ramadhan Ali

14:00 - 14:20: Collins Reuben Gaunya (Egerton Univ.) — *Bridging Implementation Gap in Probation Supervision*

14:20 - 14:40: Ahmed Wangara (KAFU) — *Understanding Juvenile Delinquency Through Family Lens*

14:40 - 15:00: Robert Liyala (Kisii Univ.) — *Community-Based Coping Strategies for Recurrent Floods in Nyando*

15:00 - 15:20: Tonny T. Nyandwaro (KEMRI) — *Prevalence & Economic Impact of Cystic Echinococcosis in Narok*

GOVERNOR'S HALL: Digital Transformation & AI 1

Chair: Prof. Kelvin Omieno | Rapporteur: Rodney Anami

14:00 - 14:20: Yohanna Obiye (KAFU) — *Hybrid AI Framework for Proactive Detection of Flood-Based Cyber Attacks*

14:20 - 14:40: Jean Claude Zigama (Kabarak Univ.) — *Harnessing AI to Transform Pedagogy & Educational Outcomes*

14:40 - 15:00: Judy Wamuya (Chuka Univ.) — *Climate Diplomacy on X: Global North vs Global South at COP28*

15:00 - 15:20: Lillian Isiaho (KAFU) — *Impact of Artificial Intelligence (ChatGPT) in Nursing Education*

15:20 – 15:40 Discussion / Q&A | END OF DAY TWO

Day 3: Parallel Session V (08:30 – 10:30)

Friday, 23rd October

LAB 1: Health Sciences & Biotech 5

Chair: Dr. Anne Asiko | Rapporteur: Ruth Kadenyeka

08:30 - 08:50: Phenard O. Odero (KAFU) — *Etiological Profile of Low Vision in Kakamega Eye Camps*

08:50 - 09:10: Sarai N. Delilah (KAFU) — *Determinants of Access & Use of Myopia-Control Interventions*

09:10 - 09:30: Seth Muga (KAFU) — *Symptom Burden & Contact Lens After-Care in Western Kenya*

09:30 - 09:50: Stella Imade Papa (KAFU) — *Ligamentum Flavum Thickness & Low Back Pain MRI Study*

09:50 - 10:10: Clevin W. Aswani (Karatina Univ.) — *Fingerprint Patterns in Type II Diabetes Patients*

OLD LIBRARY: STI Track 1

Chair: Prof. George Manyali | Rapporteur: Mr. Wawire

08:30 - 08:50: Dorothy Wafula (KAFU) — *Diatomaceous Earth as Activator for Pumice Geopolymer Concrete*

08:50 - 09:10: Alvin Joseph Mugo (MMU) — *High-Order Harmonic Generation in Chirped Strong Laser Fields*

09:10 - 09:30: Loice Naswa Wechuli (Univ. of Eldoret) — *In Silico Multi-Target Phytochemicals Against MRSA*

09:30 - 09:50: Kelvin K. Omieno (KAFU) — *Modelling Innovation Units for Research Commercialization*

ODEL: Sustainable Agriculture 1

Chair: Dr. Annette Busula | Rapporteur: Clara Kilaha

08:30 - 08:50: Emmanuel O. Mokoro (Borangi Inst.) — *Climate Resilience & Digital Agri-Extension in East Africa*

08:50 - 09:10: Danstan O. Nyangaresi (Kisii Univ.) — *Greenhouse Farming & Food Security in Gucha Sub-County*

09:10 - 09:30: Bernard Mukoye (Phytosanitary Directorate) — *Pest Threats to Food Security in Kenya*

09:30 - 09:50: Omondi Argwings (Sigalagala Poly.) — *Fish Feed Status & Feeding Technologies for Aquaculture*

SPECIAL STUDENT SESSION (LAB 2): RUBY AFRICA TRAINING WORKSHOP

Day 3: Parallel Session VI & Grand Closing Ceremony

Friday, 23rd October

Parallel Session VI (10:30 – 12:00)

LAB 1: Interdisciplinary Research

- *Peter G. Oino (Kisii Univ.):* Climate-Place-Body Nexus in Medical Anthropology
- *Solomon Mwalati (MMUST):* Operational Efficiency & Bank Performance
- *Opiyo James (MMUST):* Social Sustainability Reporting on NSE Listed Firms

OLD LIBRARY: STI Track 2

- *Muchelule Yusuf (Umma Univ.):* LLMs as Socio-Economic Agents in Low-Resource Economies
- *Solomon O. Aunga (KAFU):* Conceptual Metaphor Analysis of Student Discourse
- *Amos O. Wanjara (KAFU):* Quasi-Copulas in Mathematical Fuzzy Logic

ODEL: Sustainable Agriculture 2

- *Hans L. Libamila (KMTC):* Aflatoxin Contamination in Food Crops in Kenya
- *Joseph L. Mbati (KAFU):* Smart Student Kitchen Garden Model for Agripreneurship
- *Rapando K. Constantine (Kisumu Poly.):* Intra-Household Food Distribution in Busia

CLOSING & AWARD GIVING CEREMONY (13:00 – 15:30)

Emcees: Dr. Shikuku / Dr. Nyambane

Official Speeches & Remarks:

- DVC (Academic, Student Affairs & Research) — Prof. Fred Amimo
- Vice-Chancellor — Prof. Peter Mwita
- Keynote Speaker Remarks

Awards & Session Conclusions:

- Presentation of Best Innovation & Paper Awards
- Vote of Thanks — Prof. George Manyali
- Closing Prayer — Dr. Rodger Wekesi (Chaplain)







OUR PARTNERS

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Directorate of Research innovation and Outreach (DRIO)

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