THE REPUBLIC OF UGANDA

MAKERERE UNIVERSITY

ANNUAL FORUM FOR RESEARCH AND POLICY DIALOGUE

25th-26th April,2024

Directorate of Research and Graduate Training

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Message from the Director

I am delighted to present to you the book of policy briefs and abstracts highlighting the achievements and impactful research outputs by Makerere doctoral researchers. Makerere University has evolved to a research-led University. To fully achieve this strategic direction, more graduate students must be trained. The University has since prioritised graduate training as a channel to boost its research output. In the last ten years, the number of doctoral students graduating from the University has doubled from 51 in 2014 to 131 in 2024. The University's doctoral supervision capacity has also significantly improved across disciplines, and all the departments can supervise a doctoral student.

At the Directorate of Research and Graduate Training (DRGT), we are committed to continuously build a conducive environment for the flourishment of research and post-graduate training at the University. We shall continue working with the Colleges, Schools and Departments to ensure an improved research and graduate training environment. We are focused on addressing some challenges to foster the development of a better research culture and graduate training at the University.

We are also addressing the need to enhance collaborations and partnerships in grant writing and research communication capabilities of the researchers and widening their professional networks. Besides, there is a need to improve the opportunities to conduct research and develop experience in writing manuscripts for publication; improve the research infrastructure within the departments; improve motivation for multidisciplinary research, and build a dependable graduate supervision and mentorship mechanism at the University. The Directorate has reviewed and redesigned crosscutting courses for researchers in research management, research bid/grant writing, research finance, innovation and intellectual property rights; in addition to the available doctoral students' crosscutting courses to bridge some of the noted gaps.

We are deeply grateful to the development partners who have continuously supported the DRGT and our doctoral students to complete their studies and the improvement of research infrastructure at Makerere University. This support has seen many university staff and other outstanding members of our community graduate with doctoral degrees. In the just concluded graduation of February 2024, it was evident that over 50% per cent of the doctoral graduates were supported by the development partners to complete their studies.

This book provides insight into how Makerere University doctoral students are engaging with research end-users, such as industry; and it show-cases the social, economic, environmental and cultural benefits arising from the University research. Through research and innovations, our researchers are making contributions and improvements in the health sector, technology, agriculture, transport, and education among others.

The launch of the Annual Forum for Graduate Research and Policy Dialogue comes at a time when Makerere University is repositioning herself to be a research-led University. This provides an opportune moment for networking among doctoral students for academic sharing and research opportunities. This Annual Research Forum should be fully exploited to find common goals and develop teams that will work to transform our societies. In addition, the launch of the Research Information Management System (RIMS) will improve our online and digitisation services for research management, graduate training recruitment, teaching and supervision services.

Finally, I would like to thank the University Senior Management Team, in particular the Vice-Chancellor whose tremendous support has been truly remarkable. I also thank the doctoral students and their supervisors/mentors who have conducted research and provided materials presented in this booklet.

Prof. Edward Bbaale
Director, Directorate of Research and Graduate Training

Message from the Chair of the Organizing Committee

It has been a great privilege to chair the committee that organized this inaugural Annual Forum for Research and Policy Dialogue at Makerere University

The event theme: Regional Integration and Development was conceived to provide space to scholars, decision-makers, and other stakeholders to reflect on the importance of evidence-based policy making and will highlight emerging issues relating to research as a public good. It was intended to create a forum for researchers and leaders to learn, discuss and share ideas on how to shape the present and future social, economic, political challenges in the region and beyond.

As the Directorate of Research and Graduate Training (DRGT), we are grateful and honoured to see that you responded to our call and invitation to participate in this two-day forum. We are cognizant of a renewed need for Higher Education Institutions to play a role in engaging the policy space and contribute to making a policy environment receptive to evidence-based solutions.

The forum derives from the activities of the Directorate and student-led PhD Forum symposium aimed at galvanizing efforts to build skills of graduates/doctoral scholars in policy engagement and communications.
We received 83 abstracts and 33 policy brief proposals, each of which went through a review process.

We are grateful to all the participants for the enthusiasm and response.
This annual forum will act as a conversational zone to interrogate innovative ways through which academia has refocused beyond publication impact to interfacing research with policy processes to offer evidence-based policy solutions. Our hope and prayer is that during these two days of deliberations, we aggregate a collective response to challenges of the time.

On behalf of the organizing committee, I would like to thank our keynote speakers: Mr. Odrek Rwabogo, a Presidential Advisor. We are also grateful to all the policy actors from government, the professional and business world who will engage in the discussions to share experiences and insights that may enrich the scholarship and dynamic response to contemporary ways of life.

My appreciation also goes to my colleagues on the organizing committee for their commitment, tremendous effort and time they put in the organization of this event. In the same breath, my appreciation goes to the leadership of the DRGT for the guidance and support. In a special way,

I am grateful the Central Management of the University led by our Vice Chancellor for the financial support.
Lastly, allow me thank once again all the participants for your contributions towards making this forum a success.

WE BUILD FOR THE FUTURE

Message of the PhD Fellows President

Esteemed members of the PhD community, welcome! It is an honour to address you today as your PhD Fellows President.

I want to express my sincere gratitude to everyone involved in organizing this annual forum, especially our director, who serves as a dedicated patron for all Makerere University PhD fellows. To the university leadership, staff, supervisors, and our esteemed Vice Chancellor thank you for fostering a supportive learning environment that fuels our academic journey.

As scholars and researchers, our path is paved with dedication, perseverance, and an unwavering commitment to expanding the frontiers of knowledge. We embarked on this quest driven by a passion for discovery and a deeper understanding of the world.

Our pursuit of higher education inevitably presents challenges, setbacks, and moments of doubt. However, through these trials, we refine ourselves intellectually and personally. We learn to navigate the complexities of our fields, push past the boundaries of established knowledge, and innovate to contribute meaningfully to advancing human understanding.

As future leaders in our respective fields, we have a shared responsibility – to excel in our research endeavors while fostering a supportive and inclusive environment for our fellow scholars. Collaboration, mentorship, and a strong sense of community are the cornerstones of our collective success. Let us cultivate an environment brimming with respect, inclusivity, and collaboration where every voice is heard and valued.

I am excited to share the university's vision for a future where Makerere University stands as a premier research institution. The strategic plan crafted by our leadership outlines a bold and ambitious vision. Its realization will propel us onto the global stage, empowering us to make even more significant contributions to the advancement of knowledge.

As we navigate the challenges ahead, let us remember the importance of resilience, perseverance, and adaptability. Armed with determination and grit, we can surmount any obstacle that arises, emerging stronger and more resilient than before.

On behalf of the PhD Fellows at Makerere University, I extend my deepest gratitude to the university's top management for their continued support through the Makerere Innovation Fund, generously backed by the Ugandan government. Last year's allocation of over 30 billion shillings has significantly benefited 100 students, a testament to the government's commitment to research addressing critical contemporary issues. We ardently hope to see this number doubled in the coming years, ensuring that every PhD student can benefit from this valuable program. Once again, I thank the Government of Uganda and the university administration for these impactful initiatives.

Together, let us strive for excellence, push the boundaries of knowledge, and inspire the next generation of scholars. The future of academia rests in our hands. I am confident that together, we can create a brighter and more enlightened world for generations to come. As we build for the future.

Clare Cheromoi, PhD Fellows President

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POLICY BRIEFS

Digital Innovation as an Answer to Increased Bank Digital Utilization in Uganda

Introduction

The provision of digital banking services facilitates access to a diverse range of financial products and services, such as account creation, deposit and withdrawal functions, bill payments, money transfers, as well as access to loans and other financial instruments. In order to be competitive, banks in Uganda have adopted digitization of their systems and introduced online platforms. However, these platforms are still underutilized. The influencing constructs affecting bank digital utilisation include; infrastructure, access to electricity, Internet connectivity, mobile phone penetration, possession of national IDs, legal payment system, status of data privacy and protection, legal framework, among other factors.

According to the January 2022 Uganda Personal Digital Survey, financial digital utilisation stands at 33% for men, 26.4% for women, 25.2% for rural areas, 42% for urban areas and a total average of 29.7% for the whole of Uganda.

Findings from this mixed methods study employing an online survey to over 50% of current Bank IT Managers, coupled with observation and literature review, indicate that access to financial services, especially through digital financial services, has the potential to increase income-generating capacity, manage risks, lower the cost of money transfers and

improve savings behaviour. However, commercial banks have not been able to innovate new bank products for this purpose.

Out of the 13 million bank accounts opened by commercial banks, only two million accounts have been signed to access bank digital online platforms.

Background

The provision of digital banking services facilitates access to a diverse range of financial products and services, such as account creation, deposit and withdrawal functions, bill payments, money transfers, as well as access to loans and other financial instruments. Digital transformation has two main drivers of supporting banking organizations to offer new service channels through innovative electronic platforms (e-banking, virtual banking) and service points (e-branch stores, POS) and reducing their operational costs by restricting the number of physical branches and staff that they employ. While most personal financial transactions are shifting from cash currency to digital transactions, stakeholders must ensure that marginalized members of society are not unbanked and excluded from financial opportunities. Digital financial inclusion acts as a major catalyst for socio-economic, sustainable and inclusive prosperity. However, various challenges concerning digital financial inclusion, including but not limited to; lack of financial literacy, inefficient utilization of technology by the population, lack of trust and data privacy concerns, still remain. This forms the motivation why banks need to adapt their business models to adjust how they interact with customers, manage their middle and back-office operations, be competitive and be ready for the future. Most significantly, to ensure that the created digital platforms are optimally utilised.

However, the bank digitisation is still underutilised thus posting further financial exclusion and access barriers to financial services; reduced credit infrastructure for growth;

redundant digital infrastructure for efficiency; low formal savings, investment and insurance use; and poor protection and empowerment of individuals with less financial capability.

Findings show that instead of innovating new digital bank products, banks have the same digital products disguised in different names. All bank products are either business online, cards or mobile banking. It is important to have digital products that address the issues of digital divide, gender divide, as well as disabilities concerns and fills up the customer knowledge gap. The current bank digital applications and technologies do not address these major concerns, which are key in addressing the key gap curtailing bank digital utilization.

Methods

An online survey was done with 15 IT Managers of banks in Uganda as well as interviews with 1500 customers and staff of banks in Uganda forming a representative sample of 10% of the customer base of the three case study banks. The online survey was administered to the ten banks, which gave permission to carry out research representing 57.63% of the total bank market share of the commercial banks in Uganda. The case of three banks including; Centenary Bank, Post Bank and NCBA Bank, were selected also basing on willingness to provide information for the study, the spread of the branch network and rural representation of the bank, Ugandan owned banks and specimen of foreign bank to benchmark from. Using the market share method of published audited books of accounts for the financial year ended 31st December 2022. The case study sample banks chosen represent 14.28% of all the commercial banks in the country, but with a total market share of 22.52% of overall commercial banking in Uganda.

The branches were written on a paper, put in a basket and selected randomly. For Centenary Bank, 16 of the sample branches were from the central region, 10 branches from the west, 8 branches from the north and 6 branches from the East. While for Post Bank, the branches were divided into their respective regions and one branch chosen per region for this study. All the fou branches of NCBA Bank came from Kampala because they only have branches in Kampala. The choice of NCBA Bank helped reinforce the benchmarking between rural and urban branches. Another reason for the choice of the case study banks was based on local against foreign banks where authority to do the study had to come from foreign bases. This could have delayed and complicated the study. The choice of customers for the interview was based on customers who visited the branches to carry out business and they were approached.

Results

The study established that 76.7% of the respondents do not have much experience with digital platforms**.** 17% of the respondents are above 50years. 34.5% of the respondent rarely or don't use the bank digital platforms. 92.7% of the respondents use smart phones. 78.9% of the respondents lack knowledge about bank digital platforms. 75.7% of the respondents said ease of use was the major factor for use of the digital platforms. 91% of the users responded that knowledge was number one factor they still needed. As such, knowledge of bank digital platforms was key for more adoption of the bank digital products. There was no bank digital product that addressed the needs of the physically challenged and old people**.**

Policy and Advocacy Recommendations

To ensure more adoption to bank digital products and technologies, strong policies and regulations are essential. Decision-makers must take the following actions:

- Each bank should form a development team of digital banking products and technologies. The team should not only be composed of technical people but have a staff from; customer service, operations, IT department, dedicated manager for IT product development and monitoring.
- A legal framework should be drafted, tabled and passed to regulate the development, deployment, use and retirement of digital products. This legal framework should make clear the relationship of the digital product developers and owners.
- Digital products should be tailored to serve the disabled (physically challenged) and the old. From the study, it was found out that 6.7% of the customers are disabled. There should be Relationship Managers specifically for this group of people to help them navigate the digital age in banking.
- Use Machine Learning, Artificial Intelligence, and Big Data to know more about customer traits in order to target suitable digital products to those customers. This would also help to tailor communication with the customer easier for the product to communicate to the customer in a language she or he understands better. The bank digital products should use more images and sound than words.
- Bank of Uganda being the regulator should form an arbitration committee to quickly resolve misunderstandings between banks and customers especially if an aggrieved customer feels their money was fraudulently withdrawn from their account during the process of use of the bank digital product. This will help cases of customers resorting to the use of social media which spoils the reputation of banking. The committee could decide whether the act was out of negligence or deliberate. The turnaround time for the committee should be 48 hours.
- Bank of Uganda should ensure that banking HUBs are maintained per region where banks will have closed branches and resorted to digital channels. These will offer traditional banking especially the disabled and old people who cannot cope with the digital age banking. Uswitch channels to cater for all banks will be held by the regional HUBs.
- Engage the young generation to learn about digital banking because from the research, young people teach their grandparents and parents to use digital platforms.
- Sometimes when the bank network is off, bank agents can tell the customer to leave the money and the messages will come later. But a customer can look at an agent where he or she is leaving his or her money and gets discouraged. So bank agents should only hold customers' money when the bank network is on.
- Bank of Uganda should also advocate for more women managers. This is mostly in executive jobs so that there is gender balance in those jobs.
- Banks should enforce rules to ensure that all their bank staff use digital banking. This must be the easiest customer base for digital banking.
- Enhance training and knowledge of the bank digital products to customers and product users. The training should be at multi levels including; non users to adopt, users to optimize product use and security, about advances in the system among others.
- Waive taxes on point of sales machines and other bank digital product infrastructure.
- Cheque leaves should also be made digital with readable barcodes to make transaction for current or cheque accounts possible and easier.
- Sharing of banking and network infrastructure by all banks should be streamlined so that the infrastructure is not used by only one bank but all. This step will help reduce on network outages and improve efficiency of digital banking. It will also reduce the cost of digital banking as well as banking as a whole.
- Security of customers' accounts should be made a priority. Banks must make use of Biometrics and images. A second layer of security authentication should be made using information obtained from KYC (Know Your Customer).
- A customer to lose a PIN and go through the whole process as if he or she is applying for a new

bank card should be addressed. Old cards that have not expired should not be retired.

- Network providers should also collaborate with one another where they supply Internet to banks so that where there is network outage, their collaborator can supply reliable Internet for the bank so that bank network will not go off unnecessarily.

Conclusion

Digital utilization, can make a big difference in the banking sector to help in financial inclusion in Uganda. However, it can only do so with political commitment, supportive policies, and adequate funding in place. Decision-makers, Ministry of Finance and Economic Development, Bank of Uganda, Parliament, Banks, donors, implementing organizations, phone companies and the private sector must work together to ensure the success of digital banking.

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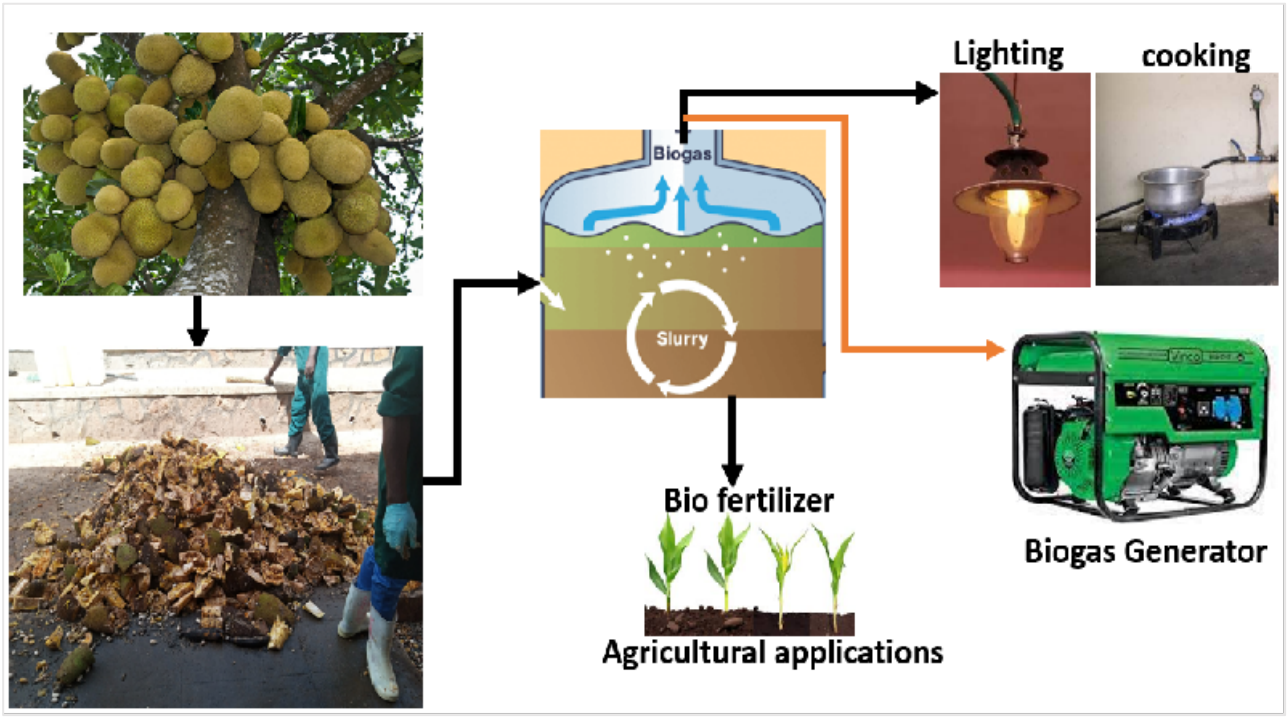
Sustainable Management of Agricultural Waste in Uganda Using the Concept of Circular Economy



Highlights

- The policy brief acknowledges the global challenges of environmental sustainability.
- Jackfruit waste, which is 65-75% of the total fruit, is an example of agricultural wastes that are overlooked with considerable potential.
- This waste can be used for biogas production, which can be converted into electricity.
- The electricity can be used to meet part of electrical energy requirement in homes and processing facilities.
- The waste can also be used for production of nutrient-enriched biochar (fertilizer) to improve different soil properties.

Introduction

As the global community grapples with the challenges of environmental sustainability, agricultural waste stands out as a pivotal frontier in the journey towards a greener future.

This policy brief explores how jackfruit waste, an example of agricultural wastes that are largely overlooked, is an abundant resource with immense potential for sustainable utilization.

By exploring the strategies for the efficient production and management of this waste, we aim to speed up the transition from a linear economy towards circular economies that prioritize waste reduction, reuse and recycling.

A circular economy strives to minimize waste and optimize resource usage by keeping products, components, and materials at their highest value through strategies like lifespan extension, reuse, recycling, and repurposing.

This stands in contrast to the linear economy model, where products are made, used, and then discarded as waste.

Through this approach, we endeavoured to pave the way for a more harmonious relationship between agriculture, industry, and the environment; thus charting a course towards a more sustainable and resilient future.

Methodology

The jackfruit waste was size-reduced, crushed and pressed to produce the liquid and solid jackfruit waste.

The jackfruit liquid waste was co-digested with chicken droppings for production of biogas and chicken-based digestate using a fixed-dome anaerobic digester.

The solid jackfruit was used for production of raw biochar via pyrolysis.

The raw biochar was enriched through adsorption with nutrients from chicken-based digestate obtained from anaerobic digester.

Subsequently, the study evaluated the impact of different biochar treatments on Nakati (*Solanum aethiopicum*) yields in greenhouse conditions.

Research Results

The sugar and starch contents of jackfruit waste were 68.87% and 31.76% respectively.

The lignin, cellulose, hemicellulose contents of jackfruit waste were 4.03%, 17.71% and 7.32% respectively.

The maximum weight degradation rate for the jackfruit waste occurred in the temperature range of 450–550 °C, which is the slow pyrolysis.

The Nakati yield production for nutrient-enriched biochar was 39.24 g/plant compared to 23.27 g/plant for raw biochar.

Considering maize nutrient requirements of 50 kg N ha-1, 1.089 t of digestate is required per hectare, corresponding to 43.2 m^3 of biogas corresponding to 864 MJ of energy requiring 26.78 t of firewood to produce the same energy.

Conclusions

Jackfruit waste is a potential feedstock for anaerobic digestion for biogas and

digestate production, owing to its high sugar and starch content.

However, its lignocellulosic nature necessitates pre-treatment before utilization as a feedstock.

Additionally, given the temperature range at which the maximum weight degradation rate occurred; jackfruit is suitable for biochar production through pyrolysis.

Application of nutrient-enriched biochar significantly enhances crop growth and yields compared to raw biochar.

Policy recommendations

- Urban authorities (City, Municipality or Town) should develop a comprehensive circular economy framework specifically tailored to the agricultural sector in Uganda and outline principles, strategies, and targets for minimizing agricultural waste and maximizing resource recovery.
- Encourage and incentivize the adoption of waste-to-resource initiatives such as composting, bioenergy production, and biogas generation.
- Invest in the necessary infrastructure for collection, sorting, and processing of agricultural waste. This includes composting facilities, biogas plants, and recycling centers.
- Integrate circular economy principles into existing agricultural and waste management policies and regulations as well as ensure coherence and alignment between different policy frameworks.
- Continue to allocate funding for research and development of innovative technologies and practices for the sustainable management of agricultural waste. Support collaborations between research institutions, universities, and private sector partners.

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FruVaSe

Do Libraries Contribute National Development in Uganda?

Executive summary

- Despite the advancement in ICTs threatening the relevance of libraries, the physical library is still envisioned as a knowledge house that contributes to developing reading practices and lifelong learning.
- They are simultaneously viewed as personal productive, social, and knowledge hubs. These lenses portray the library as physical entities and intellectual notions.
- This policy brief recommends the need to revitalize the role of libraries at primary, post-primary, and university levels to shape reading habits and lifelong learning; thus promoting information-based decision-making leading to enhancing national development.

Introduction

The emergence of ICTs and increased digital access to information and pedagogical changes may explain the diverse students' information-seeking habits, which have led to declining circulation statistics trends. With these reduced usage statistics, physical spaces become a point of contention between the financing bodies and librarians in justifying their relevance in the digital era and thus threatening their existence. Given the growing uncertainties about physical library spaces, libraries need a solid understanding of how the

a solid understanding of how the existing spaces are utilized and perceived and their meaning to users for strategic planning purposes. Thus, researching physical space utilization becomes increasingly significant in demonstrating its significance in the digital era. These insights may enrich the understanding of how library buildings function in an environment of scarce resources and demonstrate the value of physical library spaces in academic institutions.

Methods

Data was collected from four (4) University libraries; Makerere, Uganda Christian, Ndejje, and Kampala International - two public and two private all located in central Uganda. The study was largely ethnographic between 2019 and 2022. Twenty-one (21) interviews and six (6) focus group discussions were conducted with library users including students with disabilities.

Results: The study revealed that;

- Amidst the invention of ICTs and digital resources, physical libraries are still valuable for their access and use advantage - incorporating physical and digital resources. For many predominantly undergraduate users, the presence of the material resources had meaning, thus fronting the value of physical university libraries as knowledge hubs in the digital age.
- The physical libraries are still constructed as academic metaphors that have opportunities for promoting sustainable information and reading practices through accessibility and inclusivity.
- Despite the internal and external access barriers, most users' level of dependency on the physical library spaces were not affected. These findings echoed the relevance of physical library spaces toward supporting learning and research despite the unprecedented challenges which, if eradicated, can enhance physical space utilization and user experience in the digital environment.
- The availability, size, and architecture of previous (High school) library influenced students' use of a university library.

19:29 *I think a library must be more appealing than this. It should be designed to attract someone to come and see what is inside. My former school had one; Busoga College Mwiri had a more beautiful library than Ndejje. The structure, the way even the Makerere library. A university should have such facilities and shouldn't be so extensive. The way you design it should be able to attract people to come and read… the design should attract and compel you to read.*

Policy recommendations

- University management in collaboration with librarians should modify libraries to incorporate smart technologies in libraries to promote robust access and use.
- Ministry of Education and Sports should harness the potential of libraries by revitalizing their presence at primary, post primary, and institutions of higher learning.
- Ministry of Gender, Labour, and Social Development should revamp national libraries to enhance their effectiveness towards access and use of information resources.
- Librarians should position the library in the life of the users by offering unique services that address the global concerns.

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Violence against Nurses in Hospitals: A Policy Brief

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Executive summary

This policy brief indicates that nurses comprise majority of healthcare workers in hospitals and face a high risk workplace violence. Due to the hierarchical workplace culture in hospitals, nurses are assigned low ranks that make them inferior to doctors. In addition, nursing is portrayed as a female-oriented profession with nurses being perceived negatively, devalued and disrespected. Specifically, low ranks and gender inequality play a major role in facilitating violence against nurses, which results into poor patients' care.

Introduction

Nurses form the backbone of healthcare delivery in Uganda and constitute 72% to 80% of the entire public healthcare workforce[1]. Despite their significance, they are undervalued, unrecognized and their professional status is low. In addition, they are highly devalued and encounter workplace violence as an occupational hazard that has resulted into poor patients' care[2]. The devaluation and mistreatment they face is attributed to the hierarchical structure and nursing being categorized as a female profession. Traditionally, hospitals have been recognized for their hierarchical structures that endorse unequal power relationships, respect and value between nurses and doctors. Because hierarchy exists throughout hospitals, it is used to dominate nurses and facilitates their victimization.

Additionally, nurses are framed as subordinate or inferior to male-led medicine and encounter patterns of dominance and submissiveness. Similarly, they are accorded lower status and are expected to act subordinately to doctors[3]. Specifically, the hierarchical culture removes power from nurses and entirely makes them submissive to doctors[4]. Similarly, because nursing has been associated with the female gender role, it is portrayed as a female-oriented profession and is characterized by a negative image. Hence, there is a lack of recognition of their roles and disrespect for their skills and expertise. Because hierarchy shapes the delivery of health services, nurses as frontline staff at the bottom end are highly prone to victimization. Consequently, due to their subordinate position in the hierarchy and the gendered nature of the nursing profession, nurses are highly prone to workplace violence (WPV).

Methodology

A qualitative phenomenological research design comprised of sixteen nurse participants and purposively selected was used. Phenomenology seeks to describe the meaning of a phenomenon (experience) by exploring and focusing on the descriptions of those who have experienced it. Specifically, it describes the lived experiences of individuals about a phenomenon as

described by the participants[5]. Data was collected through semi-structured interviews and was analysed using interpretative phenomenological analysis (IPA) approach.

Findings

The research revealed strong evidence that low hierarchical status of nurses characterized by lack of power and subordination, facilitates their victimization. In particular, low hierarchal position characterized by a low status and lack of power, makes nurses particularly females to be relegated, disrespected and victimized. The findings also highlighted that the negative image related to nursing as a female-oriented profession, put nurses at a high risk of experiencing workplace violence. Hence, the connection of low hierarchical status of nurses with the female gender in nursing, play a significant role in fuelling and perpetuating their victimization. Therefore, the findings of the study suggest that low hierarchical position of nurses characterized by subordination to the male-led medicine and linked to gender imbalances, facilitate WPV.

Conclusion

It is plausible to argue that the hierarchical divide existing within hospitals, which assigns nurses low status, negative image and subordinates them to medicine has predisposed nurses to victimization. Within a hierarchical framework, nurses are generally relegated and disrespected which places them at a high risk of victimization. It should be recognized that due to hierarchical workplace culture reinforced by gender inequality, nurses especially females experience victimization. Therefore, violence against nurses is linked to nurses' low hierarchical status and gender inequality prevalent in hospitals. Specifically, gender-neutral policies in nursing and educational programs should be implemented to reduce gender-based occupational segregation to improve the hierarchical status and foster the image of nurses in hospitals.

Policy recommendations

On the basis of the research findings, policy recommendations are put forward aiming to improve the hierarchical status and image of nurses. These include;

- Nursing should be reorganized as an autonomous profession that collaborates with medicine. This will boost the hierarchical status and power of nurses. It will also change the perceptions which undermines nurses as being inferior to doctors.
- A deliberate policy should be introduced to increase the presence of nurses in top hierarchical jobs in hospitals. This will improve nurses' hierarchical status and disqualify the traditional view that nurses, and particularly females, only occupy low status jobs and ranks.
- Nursing should be promoted as a gender-neutral profession, a career for both men and women. Gender equality policies should be implemented to increase the number of males in nursing traditionally tilted to the female gender. This will reduce gender-based occupational segregation witnessed in nursing.
- A proactive attitude change through open discussion should be

rolled out with the public to address the negative image of nursing labelled as a female-oriented profession. A correct image of nursing will be portrayed to the public. It will also boost the image of nursing as a science-oriented profession in which the skills and not the gender of the professional is emphasized.

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Involving Young Fishers to Actively Participate in Reduction of Illegal Fishing

Figure 1: Photo taken during lifelong learning activities with young fishers against illegal fishing

Executive Summary

The practice of illegal fishing of immature fish using un-recommended fishing gears and methods still persists, which threatens sustainable fishing. This leads to losing of over 716 billion shillings annually. Uganda under the Directorate of Fisheries Resources in the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) introduced a co-management system that failed. It involved fishers in the management of the fishery resource. A presidential directive in 2016 introduced the army referred to as the Fisheries Protection Unit (FPU), which has also failed.

This policy brief recommends the lifelong learning approach where fishers are involved in group learning opportunities to rediscover their talents and potentials for improved livelihoods towards sustainable fishing.

Introduction

Illegal fishing of immature fish has been fought world over, In Uganda, it has been handled through a co-management system and the use of a Fisheries Protection Unit. However, the problem has persisted. Following the implementation of the Fisheries Protection Unit by a presidential directive, fishers have been brutally handled in an attempt to stop them from using illegal fishing

methods. Young fishers (15-35 years) find themselves largely excluded from the fishing industry. Yet, the high cost of strict top-down enforcements of FPU and the societal cost of lost lives, jobs, and livelihoods may not be justified in relations to fish biomass/ stocks in Lake Victoria.

Besides, the third National Development Plan 2020/21-2024/25 is keen at degradation of natural resources, which is caused by poor law enforcement capacity, limited environmental education and awareness, limited alternative sources of livelihood and limited research and innovation (National Planning Authority, 2020). Therefore, lifelong learning is needed by everyone including Fishers, to upgrade their skills throughout their adult lives. Such initiatives are also highlighted under the Uganda Vision 2040 in terms of basic education. Further, the Third National Development Plan 2020/21-2024/25 only highlights interventions for other sectors under chapter 9 with fisheries natural resources not provided for. Besides, the Fisheries and Aquaculture Act 2022 continues to highlight co-management with no clear educational approach, rather than the punitive approach for failing to comply with the fishing regulations.

Methodology

A participatory action research promoting lifelong learning was conducted between 2018-2023 with 30 young fishers (15-35 years) and 18 stakeholders at Kigungu fishing ground in a phased manner. Fishers acted as co-researchers as well as lifelong learners in this study.

Findings

It is evident by the study findings that;

- The Beach Management Unit system of the co-management approach failed due to lack of clear and distinct proactive non-formal group lifelong learning opportunities for fishers to willingly direct themselves towards sustainable fishing.
- Initiating fishers to direct their own learning interventions towards sustainable fishing using group lifelong learning interventions was successful. This was due to the bottom-up approach that permitted sharing brutal experiences subjected to fishers by FPU, reducing the high sense of hopelessness amongst fishers.
- The local leaders' experiences were crucial in enabling fishers implement their own lifelong learning activities towards sustainable fishing.
- However, fishers' hopelessness has greatly affected their willingness to participate in reduction of illegal fishing. Instead, fishers are doing it in hiding for survival since legal fishing gears and methods are very expensive.

Policy recommendations

- Young fishers' outcry should be taken seriously by acknowledging their livelihood to reduce on hopelessness. There is urgent need to proactively engage fishers in group

learning interventions as suggested by local leaders and fishers themselves which is lacking amidst enforcements. This would enable fishers identify their needs and livelihood opportunities. Hence, educational programmes should be beyond extension/ sensitization of fishers about legal fishing gears. They can be in form of fostering participation towards co-management and conscious raising to empower fishers to act and challenge the manipulative employment terms and brutal enforcements. Others can be in form of economic incentives training programs for sustainable livelihoods like vocational skilling, promotion of ecotourism and training fishers on literacy skills to increase participation. Further, there should be engagement of fishers' managers and all stake holders in co-creation of knowledge for successful educational programs.

- The lifelong learning interventions among fishers is crucial in reduction of illegal fishing. Lifelong learning (LLL) is about acquiring skills that enable us to survive. It should encourage the life-wide dimension which entails that learning takes place in a variety of different environments and situations, not confined to formal education systems, but also considering non-formal and informal learning settings, making use of a range of learning avenues. Further, lifelong learning interventions for fishers should attempt to use fishers and local leaders' experiences in learning through group learning to trigger fishers' thinking capacities. However, there is need for sensitivity to the rampant corruption among some leaders. Fishers need to be taken slowly in learning as an attempt to reflect and overcome prior brutal experiences to be supported on how to proceed in an empowering manner towards sustainable fishing. Division of roles at the beginning of lifelong learning engagements with fishers is key. Facilitators ought to utilize their professional knowledge on group and power dynamics.
- An integral approach is needed to ensure active participation of fishers such as shown in Figure 2 below. The figure indicates change of all stakeholders' attitude, knowledge and practices towards sustainable fishing as an outcome from the study. In this case, the Ministry of Gender Labour and Social Development should directly come up and collectively support the Directorate of Fisheries at MAAIF to help uncover fishers' potentials towards seeking alternatives and improving their literacy levels. There is also need to coordinate stakeholders. The Department of Adult and Community Education at Makerere University can work hand in hand to mediate the processes of lifelong learning.
- Finally, accompany any action by research. Participatory Action Research should be promoted among vulnerable groups like fishers towards sustainable fishing to achieve fishers' maximum participation. Participatory

Rural Appraisal tools such as visioning and stakeholders' analysis tools, conversations and meetings chaired by local leaders should be adopted. The trainers should be sensitive to un-equal power relations between fishers and other stakeholders as well as fishers' literacy levels.

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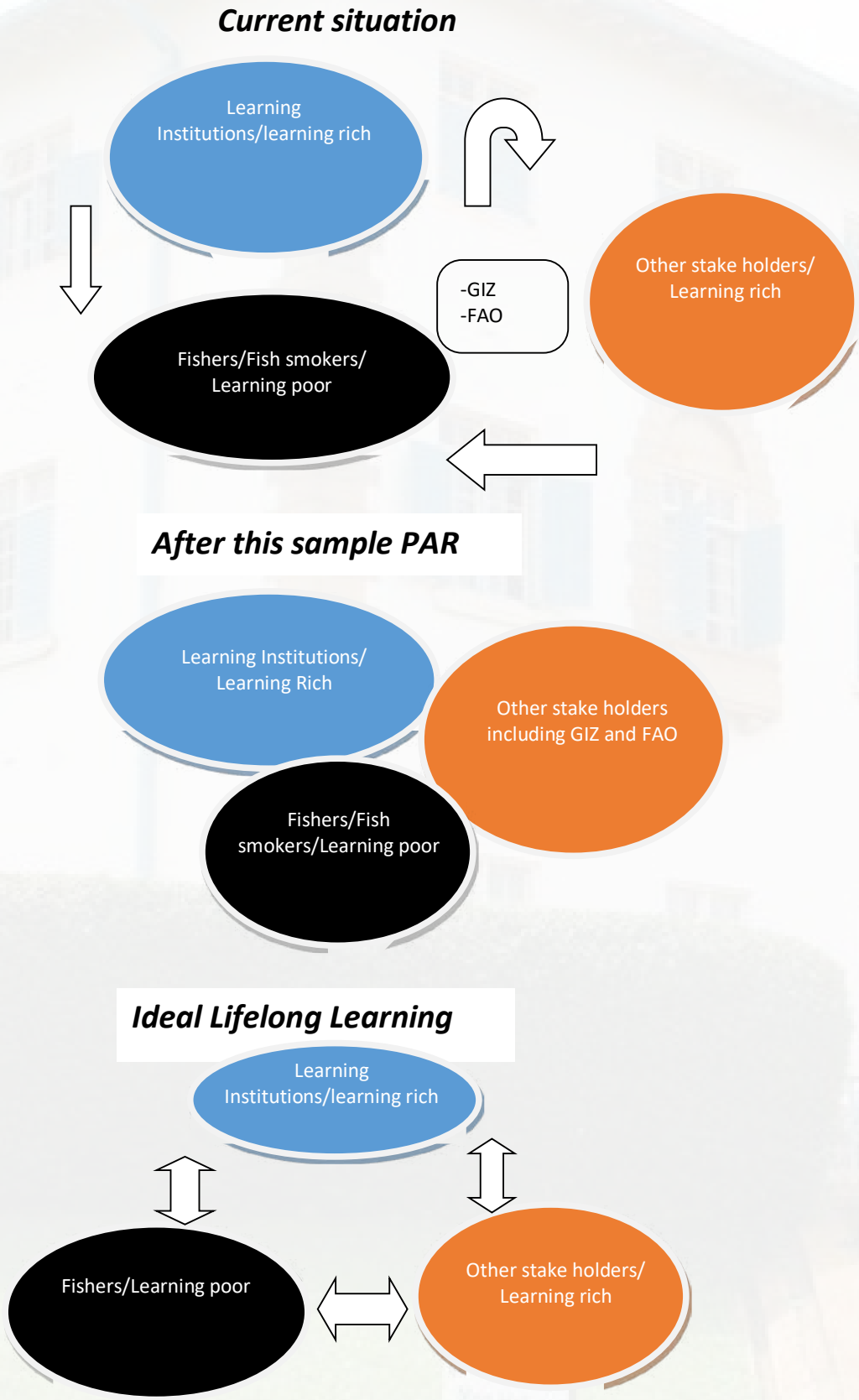
Figure 1: Social Constructivist Learning Model in the Fisheries Sector



When Spiders Unite, they can Tie Down a Lion: Stakeholders' Collaboration in Empowering Women Farmers in Ethiopia

Helina Befekadu Bekele

Source: Care Ethiopia documentation

Executive summary

Women farmers in East Hararghe, Ethiopia face challenges accessing agricultural resources due to gender-insensitive programs and extension services. These issues stem from budget constraints, lack of experience, and expertise. To bridge these gaps, the Agriculture Office and Care Ethiopia partnered on the GROW project. However, their differing priorities led to fragmentation in service provision, hindering the project's effectiveness in addressing women's social, economic, psychological, and political barriers in agriculture.

Introduction

In Ethiopia, 85% of the population live in rural areas and make a living from farming (Harun, 2014). They typically have small farms and use traditional methods. The government has tried different strategies to improve farming, but it hasn't worked well. One big reason is that these strategies didn't consider the specific needs of both men and women who work on the farms in households.

In this policy brief, the empirical findings on the opportunities and challenges of Agriculture Office and Care Ethiopia's collaboration to create access to agricultural resources to women farmers are presented. Collaboration, as Giroux & Suter (2009) and Toikka (2010) explain, means different groups teaming up and pooling their resources (like public, government, NGOs, and businesses) to meet specific needs. The key is for these groups to agree on a common goal. This contract should detail each organization's responsibilities, reward criteria if there is any, the duration of the collaboration, the acceptability by each organization and so on. Following this process helps them reach their shared goal of helping women access agricultural resources.

Methodology

This policy brief draws upon primary data sourced from the Ifajallela and Hawibilisuma farmer associations in the Meta district of Ethiopia, where the GROW project was executed between 2016 and 2020. The data was gathered from a total of 35 research participants, including 10 key informants (5 from each association's office) and 25 female farmers, with a ratio of 10:15 from the Ifajallela and Hawibilisuma associations, respectively. Their perspectives were elicited through in-depth interviews, focus group discussions, and key informant interviews conducted from October to January 2021.

Findings

This policy brief presents two sets of findings that came after a study on how social and institutional factors affect women's ability to get agricultural resources. The first part is about the role of the Agriculture Office and Care Ethiopia collaboration in addressing the barriers women face in access to agricultural resources. The two offices provided women with resources such as farming tools, training, and knowledge so they could grow vegetables, raise goats, and produce fruits. The Agriculture Office was handling these activities, while Care Ethiopia worked on raising community's awareness on social norms that affect women's access to agricultural resources. The women explained the benefit of the project as follows:

> *We didn't have any experience of planting fruits and vegetables before. The GROW project gave us the seedlings and taught us how to plant and take care of both. (October 15, 2021; Ifa Jallela farmer association)*

However, the collaboration faced challenges because each of the office wasn't fully committed to empowering women. Instead, some focused on their own interests, which messed up the project's impact. Taskforces weren't motivated enough, so they just went through routines without exerting much effort to achieve the project objective. Even some project officers skipped important meetings meant for keeping track of the project. The act of mis-allocation of the resource to personal network was another challenge that denied women access to resources. One of the key informant testimonies on the challenge is as follows:

> *Most of the time the Meta district agriculture office's heads were on regular cabinet meetings. It was very hard to meet them even in pre-planned meetings. As a result, they cannot help beyond fixing urgent issues. Most of the practitioners were also not willing to be creative. (December 1/2021; Dire Dawa Health Bureau)*

The above-mentioned challenges posed drawbacks to the project activities and as a consequence women's access to resources, knowledge and skills were constrained. To address these challenges at policy level, collaboration must be implemented as follows:

- An interdependent model of collaboration that can be harmonized across the region.
- As a rule of thumb, the guideline also includes task force prior training on the self-autonomy and creating attitude about their new role besides the technical knowledge of a given task.

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How Transformative Responses Increase Agro-pastoral Resilience to Drought in Uganda's Cattle Corridor

Executive summary

As drought is becoming extreme and cyclic, agro-pastoralists build resilience by adopting new or improved transformative responses. Mainly: planting dual purpose crop varieties, fodder/hay making, and water harvesting techniques that increase food, feed and water resilience. Such agroforestry practices and food banking techniques reduce farmers' resilience to drought.

This policy brief recommends the need to tailor the transformative responses to local agro-pastoral knowledge using local-based response framework.

Background

In Uganda's cattle corridor, 70% of the agro-pastoralists have been susceptible to more cyclic and extreme droughts since the 1990s (USAID, 2015; Mulinde et al., 2016). To address this gap, Uganda's Vision 2040 through the National Development Plan III, the Climate Change Policy (2015) and the National Adaptation Plan for Agriculture (2018) prioritizes increased resilience to climate change through adaptation and mitigation strategies.

However, building resilience to extreme drought at local scale is dependent on the mastery of adaptation responses. Studies conducted between 2016 and 2022 revealed that transformative responses could be good in building resilience to drought in Uganda's cattle corridor.

Methods

- Data was collected form six agro-apstoral districts (Nakasongola, Nakaseke,
- Sembabule, Rakai, Napak and Nakapiripirit). The mixed methods approach involving the use of a cross-sectional household survey and interviews among 426 households and historical archived rainfall data were utilized from March 2022 to June 2023.
- Participants in this study were mainly farmers growing crops and rearing livestock as well as agricultural extension officers. Drought-hot spot maps were generated from Climate Hazards Group InfraRed Precipitation (CHIRPS) using ArcGIS 10.5. Level of utility of transformative responses was measured using a Multinomial Logistic model; while for their contribution to household resilience the instrumental variable regression (IVR) model was used.

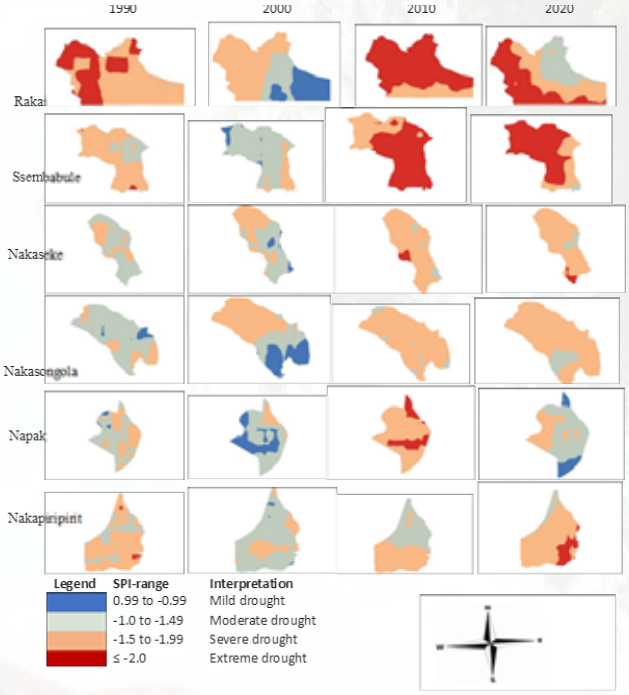
Results:

a) Drought:

- Drought durations have increased from 3.4 months to 6.2 months due to deforestation.
- Spatial-temporal changes from severe to extreme drought across the cattle corridor.

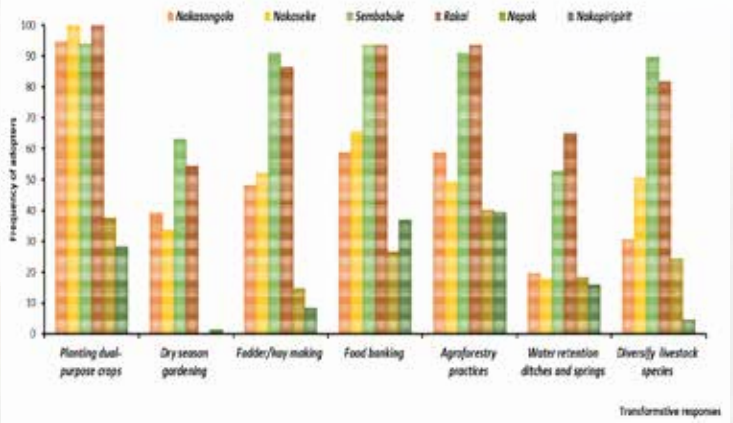
Transformative responses

- Planting dual purpose crop varieties,



fodder/hay making, and water harvesting techniques increased household food/feed and water resilience.

- Farmers who adopted agroforestry practices and food banking, resilience to



drought reduced by 55 and 25% respectively.

However, farmers were concerned with:

- The costly nature of adopting transformative responses especially; fodder making, maintaining dry-season gardening, acquisition of dual-purpose crops and diversification of livestock.
- Limited knowledge on the other benefits of fodder production.
- Limited impact of social-networks within the cattle corridor.

Policy recommendations

- Ministry of Agriculture Animal Industry and Fisheries (MAAIF) in collaboration with the private sector should support farmers to improve the nutritive qualities of specific dual-purpose grain crops to facilitate balanced regional food security in the cattle corridor.
- Local government in collaboration with farmers should diversify fodder production benefits.
- Local governments in collaboration with farmers should strengthen dry-season gardening by gazetting of natural water sources.
- Local governments in collaboration with the farmers should do resource stock taking to ease adaptability.

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Tackling the Menace of Gum Diseases to Improve Treatment Outcomes in Patients with Diabetes Mellitus

Executive summary

Poor response to treatment is a major challenge in the management of patients with diabetes mellitus (DM) in Uganda.

This policy brief highlights the management of gum diseases as an adjuvant to the conventional treatment of patients with diabetes mellitus through screening for gum diseases. The brief also seeks for ways to involve the dental fraternity in the management of patients with diabetes mellitus and treatment of gum diseases to improve the treatment outcomes.

Background

Item 13.4 of the World Health Assembly highlights reducing the burden of non-communicable diseases through strengthening and control of diabetes mellitus.

Currently, Uganda ranks number one in E.A among the countries with the highest prevalence of DM.

Despite the different Government interventions, a greater percentage of these patients have poor treatment outcomes which further predisposes them to development of complications.

Gum diseases have been identified as a possible risk for poor treatment outcomes in patients with DM.

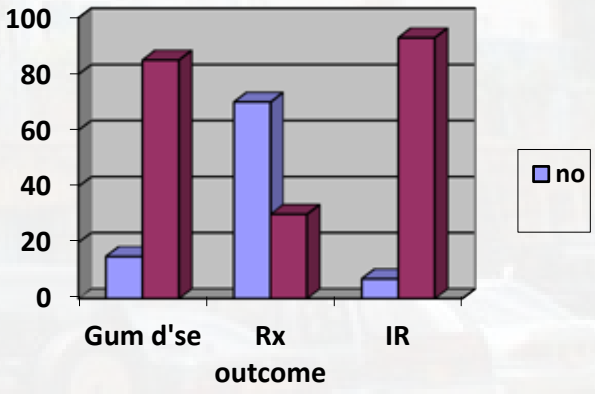
Unfortunately, the burden of gum diseases in patients with DM in Uganda has not been explored.

Methods

This was a multi-phase study conducted in Kiruddu involving adults with diabetes mellitus.

- Phase one involved 264 participants who were screened for presence of gum diseases and risk factors for these diseases.
- Phase two involved 59 patients with gum diseases who were subjected to treatment and followed up for three months.
- Phase three involved 233 patients who were assessed for relationship between gum diseases and insulin resistance...

Results



There is a high burden of gum diseases in patients with DM with 62% of patients having severe forms of disease.

- The high burden of gum diseases was associated with a lower level of education.
- Severe forms of gum diseases were associated with insulin resistance.
- Treatment of gum diseases was not associated with an improvement in treatment outcomes in patients with DM.

Policy Recommendations

- All patients with DM should be screened and managed for gum diseases
- Oral health education should be packaged in a simpler language for easy comprehension by the consumers.
- The dental fraternity should be brought on board in the management of patients with diabetes mellitus in Uganda.
- Though treatment of gum diseases was not associated with an improved outcome, the association of gum diseases with insulin resistance and poor diabetic outcomes makes it imperative to include treatment of gum diseases as part of the management package of patients with diabetes mellitus.

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Unregulated Health Advice in Uganda's Digital Healthcare Spaces: The Power of a Social Media Doctor

Executive Summary

In Uganda, as in much of the world, the digital revolution has transformed how health information is accessed and shared. Online and social media platforms have become hotbeds for **"social media doctors"** who, despite their **lack of verifiable credentials** and **absence of online medical practice licenses,** reach millions with health advice and marketed medical products. This unchecked flow of health information poses significant risks due to the dissemination of potentially harmful misinformation and disinformation. With AI systems still unable to reliably distinguish between authentic and fraudulent health content, the situation creates an urgent need for comprehensive regulatory mechanisms to safeguard public health in the digital age.

Introduction

In the emerging era of Society 5.0, where digital and artificial intelligence (AI) technologies are becoming deeply integrated into all aspects of our lives, the potential of AI to revolutionize healthcare is immense. This is particularly true in fields such as women's health, maternal and neonatal care,

and skincare, where AI has the power to deliver personalized, accessible, and timely medical advice. As the primary consumers of online health information, women, teenagers and young people in Uganda often turn to social media platforms for guidance on these critical health issues.

However, the widespread dissemination of unregulated health information poses significant risks. It is imperative that we deploy AI responsibly, ensuring that the data driving these technologies is accurate, secure, and used ethically to prevent misinformation. For policymakers, healthcare providers, and the public, this calls for a critical understanding and implementation of stringent data practices and AI regulations.

Our commitment to responsible AI in Uganda must involve clear guidelines and robust enforcement to safeguard the integrity of health information. As we navigate this digital transformation, our focus must remain on protecting and empowering all citizens, particularly vulnerable groups, with reliable, scientifically sound healthcare guidance.

This is not just a technological imperative but a moral one, ensuring that the digital advances in healthcare serve the well-being of every Ugandan.

Methodology and Results

Avoid Shallow Philosophies Underpinning Responsible Data and AI Practices.

In this work, we systematically examined the philosophical foundations of responsible data and Artificial Intelligence (AI) practices governing data and AI modelling for intelligent systems based on 80 peer reviewed articles, book chapters, technical reports, and studies published between 1973 and 2022. These studies were restricted to the philosophy of AI and Society 5.0 to inform the derivation of over 29 forms of AI philosophies with their fundamental relationships with Society 5.0. This unveiled intrinsic manifestations of algorithmic unfairness arising from inequitable AI and Machine Learning (ML) training datasets besides irresponsible data and AI modelling practices.

How are The Responsible AI Datasets Created?

We further traced this algorithmic unfairness to the unguided and unregulated AI industry practices propagated by selection of inappropriate research paradigms to inform the creation of specific AI and ML training datasets for building intelligent healthcare systems. Such systems included online platforms and chatbots designed to provide authentic timely responses to inform healthcare decision making among vulnerable online information seekers like teenagers and young women across various social groups. This pointed us to the need for responsible and Inclusive Intersectional AI practices and research approaches to creating ML and AI training datasets for equitable intelligent healthcare systems.

How to Implement Responsible Data Practices.

We intersectionally crowdsourced maternal healthcare advice from over 500 verified practicing healthcare professionals form Lira University teaching hospital, BRAC University and BRAC Uganda's heath program Verses their online social acquaintances with in their social networks to create a dataset based on responsible data practices.

How to Implement Responsible AI Practices.

We further implemented trustworthy medical sentiment analysis and local interpretable model agonistic explanations as responsible AI principles to distinguish between authentic and non-authentic maternal healthcare advice.

Limitations of AI in Digital Health.

We obtained a train set accuracy of 93% and a validation set accuracy of 56%, generalization log loss of 0.259, generalization balance accuracy of 83% and generalization Area Under the Curve of 90% meaning our model performed perfectly well at everything except for accurately distinguishing between authentic and non-authentic medical advice.

This simply means that AI models cannot certainly distinguish between authentic and non-authentic medical advice hence a need for better online tools for conversationally disseminating authentic medical advice. Therefore, we embarked on creating conversational AI techniques for leveraging conversational AI tools like ChatGPT by the information seekers through prompt engineering.

Reference Point for Regulating use of Digital and Social Media Platforms Medical Practice Doctors in Uganda

International guidelines, such as those from the UK's General Medical Council and the American Medical Association, underline the complexities of doctors' online conduct. These standards emphasize maintaining patient confidentiality, ensuring information accuracy, and upholding respect among colleagues. Notable challenges include balancing personal and professional online identities and mitigating potential harms from social media misuse.

Uganda can benefit from adopting similar comprehensive guidelines that are contextually adapted, focusing on

professional self-regulation, risk management, and the promotion of online professionalism to safeguard patient interests and enhance the medical profession's integrity globally.

ATTENTION!! WARNINGS ARISING FROM DIGITAL HEALTH REGULATIONS

Privacy Risks: Overlooked or inadequate data protection measures could expose patient confidential information, violating privacy rights.

Free Speech Limitations: Regulations must balance the enforcement of professionalism without infringing on individuals' rights to free speech.

Overregulation: Excessive controls could stifle the beneficial uses of digital health platforms and social media in healthcare, such as patient support groups and professional development.

One-size-fits-all Approach: Regulations that do not consider the diversity of medical disciplines and digital platforms may be ineffective or unnecessarily restrictive.

Compliance Complexity: Overly complex regulations might be difficult for practitioners to understand and follow, potentially leading to unintended non-compliance.

Technological Lag: Regulations might quickly become outdated due to the rapid evolution of digital technologies, requiring constant updates.

Enforcement Challenges: The global nature of the internet makes enforcement of local or national regulations challenging.

Resource Allocation: Enforcing social media guidelines could require significant resources that might be diverted from other healthcare priorities.

Potential for Misinterpretation: Vague guidelines can lead to varied interpretations, resulting in inconsistent application and effectiveness.

Impact on Innovation: Strict regulations might inhibit technological and methodological innovations in healthcare delivery that could benefit patients.

Key Findings:

Pervasive Misinformation:

A significant proportion of health-related advice and product endorsements on social media by unlicensed practitioners are found to be either misleading or outright false.

Lack of Oversight: There are no adequate regulatory frameworks in place to verify and authenticate the qualifications of individuals providing health advice online, leading to a "wild west" scenario.

AI Limitations: Current AI technologies employed by social media platforms are not yet capable of effectively identifying and flagging unreliable health information, resulting in widespread dissemination of harmful content.

Recommendations:

1. **Establishment of a Digital Health Regulatory Body:** Create a dedicated agency under the Ministry of Health to monitor and regulate online health content, ensuring that all medical advice and product marketing adhere to approved standards.

2. **Licensing System for Online Health Practitioners:** Implement a mandatory licensing system for anyone wishing to offer health advice or market health products online. This system should be linked to existing medical accreditation bodies.
3. **AI Enhancement and Partnership:** Collaborate with tech companies to enhance AI's ability to detect and filter out health misinformation and disinformation. Invest in developing AI models that understand local languages and contexts.
4. **Public Awareness Campaigns:** Launch comprehensive education campaigns aimed at helping the public identify and report unverified health information online.
5. **Strict Penalties for Misinformation:** Enforce stringent penalties for individuals and organizations found spreading health misinformation, to deter such practices.

Conclusion

This policy brief has underscored critical challenges and limitations inherent in utilizing AI to discern authentic from non-authentic healthcare information on online platforms. As digital platforms proliferate, so too has the number of healthcare practitioners utilizing social media and other digital mediums to deliver services. This continuous rise highlights the urgent need for robust digital healthcare regulatory frameworks in Uganda, where currently no dedicated body exists to oversee and mitigate the risks associated with these practices.

The absence of such regulation not only exposes the public to potential health misinformation but also compromises the integrity of professional medical practice online. It is crucial that stakeholders including policymakers, implementers, AI engineers, and the general public come together to establish a regulatory body equipped to handle these modern challenges. This body should enforce standards that ensure the responsible use of AI and uphold the accuracy and privacy of healthcare information, ultimately safeguarding patient care and maintaining public trust in the digital age.

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Acknowledgements

Do Levels of Formal Education, Farm Sizes and Gender Impact on Tomato Farmers in Central Region in Uganda?

Introduction

Uganda is endowed with vast amounts of soil resources suitable for agriculture depending on the climatic conditions, soil types and various crops being grown. Some of these systems practiced include; crop rotation, fallowing, intercropping and pesticides applications to increase crop yields and productivity. Different agricultural systems are being used by many farmers in Ugandan crop production. One of the common vegetables grown in central region is tomato. There are serious challenges associated with tomato production in the region. Some of these pertinent problems revolve around formal education, farm sizes and gender. Understanding these challenges is critical in the efficient planning and implementation of tomato farmer's development activities with subsequent improvement in the livelihoods of tomato farmers in Uganda.

Materials and methods

This study was conducted in 2018 in five districts of Mityana, Mubende, Masaka, Lwengo and Sembabule in central Uganda. These districts were purposively selected because they have similar ecological characteristics and are the largest producers of tomato in the central region (Mukiibi and Mwaule, 2000; Ndukwu, B., Idigbor, C.M., Onwundike, S.U., and Chukwuma, M.C. 2010).

Data collection method

Data was collected from selected farmers using open-ended questionnaires. It was coded, analysed, interpreted and results presented in table form.

Results

Table 1: Levels of formal education of tomato farmers in the five districts in central region of Uganda

Levels of education	Number of farmers	Percentage
Below primary seven (7)	39	16.2
Primary seven (7)	58	24.1
Ordinary level (S.4)	87	36.1
Advanced level (S.6)	33	13.7
Diploma and above	24	10.0
Total	**241**	**100.0**

A total of 241 tomato farmers were interviewed in the five districts in central region of Uganda. The choice of the districts was based on the fact that these districts have the largest acreage for intensive tomato production in the central region of Uganda. Results in Table 1 show that 87 (36.1 %) of farmers interviewed had completed senior four, 58 (24.1 %) completed primary seven, 39 (16.2 %) did not complete primary seven, 33 (13.7 %) stopped in senior six and 24 (10.0 %) had diploma certificates and above.

Table 2: Size of farms in acres of tomato farmers in central region of Uganda

Size of farms in acres	Number of farmers interviewed	Percentage
Less than two acres	100	41.5
2 and less than three acres	35	14.5
3 and less than four acres	25	10.4
4 and less than five acres	16	6.6
More than 5 acres	65	27.0
Total	**241**	100.0

In Table 2, 100 (41.5 %) of farmers interviewed had less than two acres of land for tomato production. 35 (14.5 %) had two and less than three acres, 25 (10.4 %) had three and less than four, 16 (6.6 %) had four and less than five and 65 (27.0 %) had more than five acres.

Table 3: Distribution of tomato farmers by gender in central region of Uganda

Gender	Frequency	Percentage
Male	153	63.5
Female	88	36.5
Total	**241**	**100.0**

Table 3 shows that males constitute 153 (63.5 %) of total tomato farmers and females were 88 (36.5 %) in the five districts who were involved in tomato production.

Discussion

In Uganda, tomato is the most important vegetable crop grown for both home consumption, domestic markets and export to neighbouring countries such as Sudan, Kenya, Rwanda and Democratic Republic of Congo. The production of tomato has increased employment opportunities and improved the livelihoods of Ugandans (Kennedy, 2008). The research evaluated levels of formal education, farm sizes and gender of tomato farmers in the central region of Uganda.

The largest number of tomato farmers were those who completed senior four level (36.1 %). These were young men who are looking for livelihoods and cash for social life. They understand the importance of agriculture especially tomato production. The next big cohort of tomato farmers were those who stopped in primary seven. This group do not have opportunities for formal employment hence were involved in farming.

From Table 1, level of formal education attainment tends to influence participation of people in agriculture. The higher the level of formal education, the less the number of people involved in agriculture. Table 2 shows that 41.5 % of farmers had less than two acres of land for tomato production. This implies that intensive agriculture could be used by this group of farmers, but agricultural inputs are expensive for them due to lack of cash, inability to borrow from banks and high bank loan rates.

Table 3 shows 153 (63.5 %) of tomato farmers were males involved in tomato production. This could be attributed to the fact that males

are usually family heads who should provide for the livelihoods of their families. Land ownership through heirship has been the domain of males. The above explains the 88 (36.5 %) of females owning land. Some females however, own land through heirship, others purchase their own land.

Conclusion

Education should be used for positive attitude change towards agriculture. Since most farmers have less than two acres for tomato production, intensive agriculture is needed. Male dominance in tomato production is good for family livelihood.

Recommendations

- More agricultural extension services to be extended to tomato farmers to improve upon tomato production.
- Females to be encouraged to participate more in horticultural agriculture.

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Gender Transformation in Politics: Analysing Local Community's Willingness to Support Women who choose to Contest on Open Seats

Executive Summary

Despite the operationalization of 30% reserve seats for women in the last 27 years, gender inequality in politics persisted. The open seat pathway has remained saliently closed for women to bridge the 20% gap. This policy brief seeks to present the society's perception towards voting a women who chooses to contest with a man on an open seat. Quantitative and qualitative data were collected from 400 respondents in four regions of Uganda.

Results revealed that society's perception towards willingness to vote a woman who chooses to contest with a man on an open seat was generally positive. However, this positive perception was not being translated into actual voting. For the last 27 years, the proportion of women winning the open seat has never exceeded 10% both at parliamentary and local government levels.

This policy brief recommends Parliament of Uganda to review affirmative action provisions; Articles 79 and 189 from one district women representative in Parliament and 30% women's reserved seats in the Local Councils respectively to 50% gender representation as a clear way of achieving gender equality.

Background

Equal participation of women and men is regarded as a fundamental feature for effective democracy and good governance; and the perspective at which policy affects them would be lost without their proportional representation. Besides, Article 33 (1, 2 and 3) guarantees women's rights equal to men including political representation. Considering that women constitute over 50% of Uganda's total population, it would only be just for the policy to mirror this numerical structure. However, women have historically suffered from disproportional representation in decision making than anywhere else, yet policy decisions made affect them most. From 1962 to 1985, Uganda had only two women representatives in the Legislative Council (Tripp, 2020).

Uganda, took a bold decision to provide for 30% reserved seats for women in the 1995 Constitution under articles 78 and 189 in addition to maintaining an open seat policy in effort to fast track gender equality in politics. The aim of 30% reserved seats was to generate a critical mass platform for women to gain skills and show case their capacity that would influence the local communities acceptability to be valued with same competency in leadership as men. It was anticipated that gender equality in politics would be achieved by the year 2000.

Although, the reserve seats have increased the number of women in politics from 18% in

1995 to 34% in 2021, the success has been limited to 30% critical mass description than in influencing creation of a levelled ground for women to compete favourably with men on open seats as shown in the Table 1.

Table 1: Trend in Numbers of Women in Politics in Uganda's National Parliament

Year	No. of districts	Reserved seats	Open seats	Others	Total women	Total MPs
1989	39	39	2 (0.7%)	9	50 (18%)	280
1994	39	39	8 (2.8%)	3	50(17.4%	286
1996	39	39	8 (2.9%)	4	51(19%)	276
2001	56	56	13(4.3%)	6	75 (24.4%)	304
2006	79	79	14 (4.4%)	1	100 (31%)	319
2011	112	112	11 (2.9%)	8	131 (35%)	375
2016	112	112	18 (4.2%)	9	139 (33%)	428
2021	146	146	16 (2.9%)	27	189 (34%)	552

Source: Nakaweesi-Kimbugwe et al., (2018) and Parliamentary Commission (2023)

It is near impossible for women to cross from reserve seats to open seats indicating that Uganda's political terrain remains highly male-dominated despite the government's efforts to address the gender inequality in politics. It is even worse in the district local councils where women constitute 1.4 %. Therefore, this study sought to examine the society's perception on their willingness to vote a women who chooses to contest on an open seat with a man and the members of parliament's willingness to support a policy that advocates for equal gender representation.

Methodology

Methodologically, this study employed a cross-sectional research design using both qualitative and quantitative approaches. Quantitatively, the study utilized a sample of 400 respondents that were drawn from four districts of Kasese, Mukono Jinja, and Arua; each representing a region in Uganda using random sampling techniques. While, qualitatively, 16 gender-segmented FGDs were conducted in the four study districts, as well as 38 key informant interviews including Members of Parliament (MPs).

Study findings

Table 2 shows the perception of the local community on willingness to vote a women on an open seat. The study revealed that generally, there was a high (90.7%) positive perception towards voting a woman contesting on an open seat. This was higher (46.7%) among the women than men (44.1%) though the difference was minimal. The finding indicates that the local community is willing to vote a women who chooses to contest on an open seat. This has been attributed to massive awareness campaigns on the general voting rights by the Electoral Commission.

Table2: Local community's perception towards women's participation on an open seat

District	Yes		Yes Total
	Female	Male	
Arua	47.5%	47.5%	94.9%
Kasese	48.5%	45.5%	94.1%
Jinja	50.0%	42.0%	92.0%
Mukono	43.0%	44.0%	87.0%
Grand Total	**46.7%**	**44.1%**	**90.7%**

Source: Field data (2023) n=307

Reasons for the positive perception

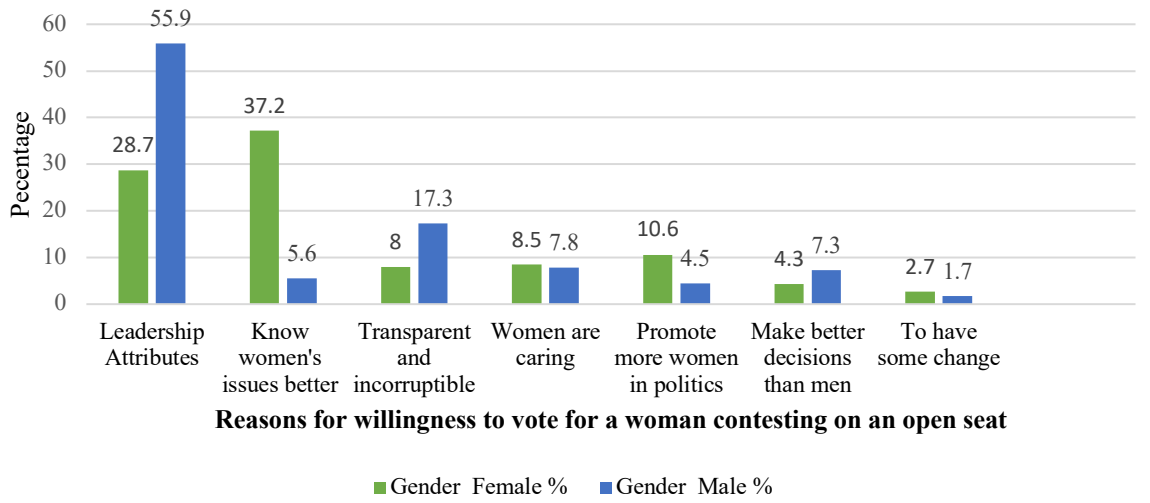
Respondents that expressed positive perception towards voting a women who chooses to contest on an open seat were asked to provide reasons for their positive perception. Their responses were analysed in Graph1 below.

The study revealed political/leadership attributes of the woman contesting may influence voters to vote her. This was majorly reported by men (55.9%) as compared to women. Indicating that men vote women based on leadership traits. Some of the attributes reported were ability to convince participants, education level, and respect in society, financial capacity, an attractive manifesto, and being knowledgeable about issues affecting society. FGD findings were also in agreement.

...according to me, leadership should never be based on a man or woman, leaders should be elected depending on quality. (Urban Men FGD, Arua District, 7/8/2022)

The second outstanding reason was that women understand women's issues better than men. This finding was mainly reported by women (37.2%). This indicates that women vote fellow women to address their issues.

Graph1: Reasons for willingness to vote for a woman contesting on an open seat.



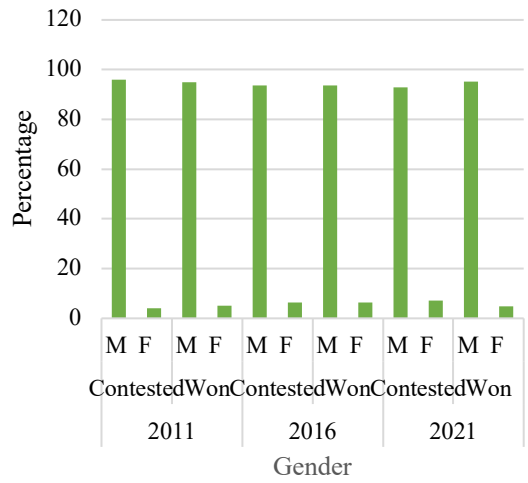
Source: Field data (2023)

For instance, in one of the FGDs with rural women in Jinja district and one of the KI from Kasese noted that:

Men have disturbed us too much over land, and they have also discriminated against us over the same issue of land in that when your husband dies, the clan people come and want to take all your land but when you run to your fellow woman, she helps and fights so hard and you eventually get all your property. (Rural Women FGD, Jinja District, 15/8/2022)

The study went further to establish the trend of women elected on open seats to understand whether the willingness from the local community translated into actual voting of women, and Table2 shows the results.

Table2: Trends of men and women that contested and won on open seat 2011 to 2021 at parliamentry seat



Source: Electoral Commission (2023)

Findings showed that from 2011 to 2021, the majority of the MP candidates were men with over 90% across all the electoral periods. Whereas the proportion of women contesting on an open seat has been increasing from 4% in 2011 to 7.2% in 2021, the progress has been very slow. The trend was similar at the local government level. These findings based on data from the Electoral Commission contravene the positive perception of the local community towards voting for a woman who chooses to contest on an open seat. The findings indicated that although women have tried to contest, winning this seat is nearly impossible.

Conclusion

Overall, the study concludes that whereas societal perception has changed to accept women in politics as reflected in the willingness to vote for a woman on the open seat, it has not translated into actual voting.

Recommendations

The study recommends the Parliament of Uganda to review Articles 79 and 189 of the Constitution which provides for reserve seats for women to cater for 50% gender representation in Parliament and local government as a way of dismantling the patriarchal culture.

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GRADUATE RESEARCH DIALOGUE – STUDY ABSTRACTS

SUB-THEME ONE: COMPETENCE BASED LEARNING

Refugees' Opportunities and Participation in Higher Education in Uganda

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Quality information on the rate of refugees' opportunities and participation in higher education in Uganda is generally non-existent. Attention is given toward primary and secondary school levels. Higher education is a strategic issue for refugees in Uganda, both as individuals and for long-term processes of post-conflict recovery and peace building. It has the potential to support sustainable socio-economic development within the refugee community, but the impacts will depend on which strategies are adopted and which types of capacity are prioritized for these refugees to achieve higher education. This study will focus on exploring refugee's opportunities and participation in higher education using Bourdieu's Theory of Capital, looking at the factors of social, cultural and economic capital.

The overall objective is to explore the determinants of refugees' opportunities and participation in higher education in Uganda.

The study will use a cross sectional survey and apply mixed methods. It will involve 381 refugee households in different settlements selected, 10 Key Informants Interviews (KIIs) and four Focus Group Discussions (FGD) involving host district officials. Further, it will also involve the Office of the Prime Minister (OPM), implementing partners in refugee education work, United Nations High Commissioner for Refugees, settlement heads and beneficiaries (refugee communities).

At analysis, means with corresponding standard deviation for normally distributed data (or median and interquartile ranges for skewed data) and graphs will be used in the descriptive analysis. Comparisons between variables will be made using Pearson chi squared test. All this will be done using STATA14. To establish associations, logistic regression will be run at bivariate (with level of significance set at 0.2) and multivariate levels. At multivariate, we shall report odds ratio as measure of association with corresponding 95% CI and a set level of significance at 0.05. Qualitative data will focus on investigating the determinants of refugees' participation in higher education in Uganda. This data will be collected through KIIs and FGDs. Thematic analysis technique will be used to analyse the data using ATLAS.ti software Version 22. Themes/emerging themes will be presented in form of tables and result interpreted.

The study will benefit refugees because it could result in their increased participation in higher education, inform the government of Uganda efforts to support refugees especially in the area of interventions, give insights for higher educational managers, Ministry Of Labour And Gender, Disaster Preparedness and Office of the Prime Minister to ensure that refugees are catered for in regard to participation in higher education.

Keywords: refugees, opportunities, participation, higher education

Socio-Cultural Factors that Influence Adherence to MDA among School Children in Schistosomiasis Hotspots along Lake Albert, Hoima District

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Background: Central to the uptake of praziquantel in controlling and eliminating schistosomiasis as a public health problem is an understanding of the socio-cultural factors influencing adherence to MDA among school children.

Methods: To examine socio-cultural factors that influence adherence to MDA among school children of Kaiso and Buhirigi primary schools in schistosomiasis hotspots along Lake Albert, Hoima district, I conducted an ethnographic study between November 2022 and August 2023. I conducted 19 IDIs with school children, 19 IDIs with their parents, 18 KIIs, 12 FGDs with school children and participant observations. Data was analysed using reflexive thematic analysis, according to Braun and Clarke. I used inductive coding using ATLAS. ti (Version 7) to generate code reports, including the coding summary by code report and the code summary report.

Results: The presence and nearness of sanitation facilities, family influence, availability of pre-snack treatment, increased knowledge of the effectiveness of praziquantel and why someone may or may not experience side effects facilitated praziquantel uptake irrespective of the raised concerns about the fear of side effects associated with praziquantel, existence of cultural beliefs and practices, empty promises, and bitter taste, size, smell of praziquantel.

Conclusions: Despite the barriers mentioned, knowledge of why someone may or may not experience side effects in addition to pre-snack treatment increased the uptake of praziquantel among school children. Therefore, there is a need for timely treatment and pre-snack treatment, especially during government MDA, if we are to eradicate bilharzia as a public health problem among school children in Uganda. Continuous sensitisation, education, lessons after treatment, and integration of schistosomiasis in the school curriculum in the hotspots could help school children's continued uptake of praziquantel.

Keywords: Hoima; socio-cultural, school children; MDA; praziquantel; schistosomiasis; facilitating; inhibiting; motivating; uptake; Uganda

Competence Based Learning in Education: Nurturing Communication and Collaboration Skills

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Competence based learning prioritizes development of practical skills and knowledge over rote memorization. Conventional education methods emphasize content delivery over skill development and nurturing, leading to a disconnect between theoretical knowledge and real world application. This approach may not adequately equip students with the necessary communication and collaboration skills demanded by contemporary workplace.

This study seeks to investigate the role of competence based learning in enhancing communication and collaboration skills among students and its impact on their academic performance and preparedness for work environment. It will be guided by the following objectives; 1.To establish the type of techniques that enhance effective communication within competency based teaching/learning framework, 2. To evaluate the influence of collaborative activities on mastery of curriculum based competencies among learners, 3. To investigate the perception of teachers, learners and parents regarding the importance of communication and collaboration skills in CBL, 4. To assess the integration of technology tools and digital platforms in facilitating collaboration and communication in CBC.

Understanding the effectiveness of competence based learning in fostering communication and collaboration skills is crucial for educational institutions, policymakers, and employers to design curriculum and training programs that align with the needs of the 21st century workforce.

Methods of data collection include, surveys, observation of classroom activities and interactions, conducting interviews with educators, students, and employers, questionnaires, and analysis of student's work portfolios. The target population comprises students enrolled in selected educational institutions. A stratified sampling method will be used to ensure representation across demographic and academic levels. Data will be analysed using qualitative and quantitative methods.

Anticipated outcomes include improved communication and collaboration skills among students, increased participation and motivation in learning activities, improved academic performance and enhanced preparedness for professional environments.

Keywords; competence-based learning; education; communication; collaboration

Interpersonal Communication Skills Nurtured in Preservice English Language Teachers: A Case of School of Education, Makerere University

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Teaching language is teaching people to participate in life. It is helping learners get immersed in the world of others. It is not just knowledge of the subject matter, grammar and comprehension (Kim, 2020). This research focused on interpersonal communication skills (ICS) that English Language Teacher Trainers (ELTT) nurtured in pre-service English language teachers (PELT) of School of Education, Makerere University. Barnlund's Transactional model of communication (1970) and Brunner's scaffolding theory (1966) formed the foundation upon which this study hinged.

The objectives were: 1). To explore the aspects of politeness and polite expressions ELTT nurture in PELT in order to promote interpersonal relations. 11). To ascertain how ELTT cultivate confidence PELT in order to promote their self-concept. 3). To examine the skills of emotional regulation ELTT cherish among PELT so as to harness constructive dialogue, and 4). To analyse how ELTT engage the conscious use of the nonverbal cues in PELT in order to encourage intercultural alliance.

Interviews, focus group discussions and document analysis were the methods used to collect data. The results established that ELTT nurture ICS in the PELT, although the ELT curriculum does not provide for these skills to be taught. The ELTT do so by modelling, counselling and mentorship, which are ideal methods that nonetheless only favour learners that are interested in and committed to their studies benefit.

The study concludes that the quality of PELT produced is low due to lecturer-student ratio, learner absenteeism and grade driven attitude among PELT. The study recommends that ELT curriculum should be revised to include ICS, awarding of marks should be revised to include lecture attendance and either more staff is recruited in the section or enrolment should be reduced to enable lecturers conduct quality trainings.

Key Words: interpersonal communication skills; politeness; confidence; emotional regulation; nonverbal cues.

The Role of Geography Teacher Competence in Facilitating Lessons in Selected Secondary Schools of Luweero District

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This study examined the competence of geography teachers and its role in facilitating lessons within the framework of Uganda's recently implemented competence-based curriculum. It focused on selected secondary schools in Luweero District. The research drew upon Shulman's (1987) theory of teacher competence to explore how geography educators navigated the demands of the new curriculum. It also integrated Mezirow's (1991) transformation theory to gain insights into teachers' transformative learning experiences.

The study investigated how geography teachers understood the components of the geography syllabus. It examined the pedagogical strategies they applied during lessons and evaluated their utilization of teaching materials. This assessment focused on the effectiveness and appropriateness of resources like textbooks, technology, and local materials in enhancing the learning experience.

Key variables included geography teacher competence, defined by content mastery, pedagogical proficiency, and effective utilization of teaching materials. Additionally, the facilitation of geography lessons was characterized by student interaction, diverse instructional methodologies, and real-world applications. The research aimed to identify areas for improvement in teacher competence, contributing to the enhancement of geography education in Ugandan schools and aligning with national development goals outlined in Uganda Vision 2040 and the Sustainable Development Goals.

Utilizing a qualitative approach involving interviews, observations, and document analysis, the research collected data on how geography teachers interpreted the syllabus, applied pedagogical strategies, and utilized teaching materials. The findings revealed varying levels of teacher understanding and diverse pedagogical approaches, with limited use of innovative and student-centred methods (Wamala & SSeruwagi, 2013). Consistent with these findings, inconsistencies persisted in the utilization of local resources and technology to enhance learning opportunities.

Through thematic analysis, the collected data was transformed into a tapestry of themes and patterns. This analysis identified recurring themes related to geography teacher competence, their understanding of the curriculum, the employed pedagogical strategies, and utilization of teaching materials. By comparing and contrasting findings from different data sources, the research ensured internal consistency and validity of the emerging themes.

Ultimately, the interpreted themes were presented within the context of the research questions, Shulman's theory of teacher competence, and Mezirow's transformation theory. The final report illuminated the current state of geography teacher competence and provided actionable recommendations for improvement. This knowledge aimed to pave the way for developing more effective geography education in Ugandan schools, empowering students to become knowledgeable and responsible citizens of the world.

Keywords Competence-based curriculum; Geography education; teacher competence; thematic analysis

THEME TWO: ENERGY AND CLIMATE CHANGE

Household Energy Transition to Clean Cooking Fuels: A Methodological Review

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Consumption of solid fuels (such as biomass, dung, and coal) in poorly ventilated kitchens causes household air pollution, which reportedly is responsible for over 3.5 million premature deaths worldwide. Therefore, over the last couple of years, national governments, and non-governmental organizations as well as international ones are promoting energy transition from solid fuels to clean and modern fuels in households. This paper aims to provide comprehensive review of the methodologies adopted to study household energy transition to clean fuels. Methodological reviews provide an in-depth assessment of the methodological aspects within the methodology chosen in the study. By focusing on research methods rather than research outcome, methodological review provides avenues for researchers to critically evaluate the validity and reliability of the research findings in a given field.

After critically reviewing the papers, specifically the methods, majority of the authors (48.8) reflected a positivistic philosophical world view. About 36.5% of the authors portrayed an interpretivist world view, while those with a pragmatist philosophical world view were the least (8 articles). In terms of research approaches and research methods, findings indicate that the majority of the scholars used the quantitative approach (28 articles) to conduct their studies, followed by the qualitative approach (14 articles). Only about six authors used the mixed methods approach to conduct household energy transition investigations.

We note that household energy transition involves changes in the way households source/access energy, and use it and this can be influence by a range of social, economic, environmental, cultural and technological factors. Therefore, taking on a single preposition, whether objective or subjective (positivist vs constructive); qualitative or quantitative may limit the researcher from understanding comprehensively issues surrounding household energy transition. In this study we propose the use of mixed research paradigm (pragmatic philosophy) adopting mixed research approaches to help understand the “why” and “how” of household energy transition.

Keywords: Solid fuels; methodological review; mixed methods; qualitative designs; qualitative designs

The Impact of Green Energy Consumption on Green Energy Transition in the East African Community

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The need for reducing the Greenhouse Gas (GHG) emissions has gained great attention by scholars and policy makers across the globe, seen as an effective response to climate change.

This paper investigates the impact of Green Energy Consumption (GEC) on Green Energy Transition (GET) measured by GHG emissions in the East African Community (EAC). Green energy in this study refers to renewable energy sources except the use of solid or traditional biomass. The authors controlled for the effects of economic growth, population growth, government effectiveness and regulatory quality.

This study utilized panel data of the five EAC countries of Uganda, Kenya, Tanzania, Rwanda and Burundi for the period of 2000 to 2022. The analysis adopted the use of the Autoregressive Distributed Lg (ARDL) model. The data were sourced from the International Energy Agency (IEA) and the World Bank Development Indicators (WDI).

The study found that GEC positively and significantly affects GET through the reduction of GHG emissions. Conversely, the study found that economic growth, population growth, government effectiveness and regulatory quality are positive but insignificant.

The concepts of GET and GEC, although studied in other perspectives especially general renewables and in other regions, there is no study about how GEC affects GET measured by GHG emissions in EAC.

Keywords: green energy transition; green energy consumption; ARDL; EAC

Tax Relationship Management and Performance of Petroleum Excise Duty: The Mediating Role of Digital Tax Adoption

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This paper examines the mediating effect of digital tax adoption in the link between tax relationship management and the performance of petroleum excise duty using evidence from petroleum importing companies, a neglected area in the literature. Data were collected through a questionnaire survey and 50 usable instruments were received from the managers of petroleum importing companies (PICs) in Uganda. The study's research design was cross-sectional and correlational. Data were analysed using SPSS v 23 and Medigraph program (Excel version). The analysis shows that digital tax adoption fully mediates the association between tax relationship management and the performance of petroleum excise duty. Results further reveal that tax relationship management is significantly associated with digital tax adoption and the performance of petroleum excise duty. This study provides empirical evidence on the mediating role of digital tax adoption on the link between tax relationship management and the performance of petroleum excise duty.

Keywords: petroleum excise duty; tax relationship management; digital tax adoption; Petroleum importing companies; Uganda.

Cassava Yield Response under Past, Present and Future Climate Regimes in Eastern DR Congo

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Climate variability and change is projected to significantly impact agricultural production across Africa. Whereas several studies assessed these effects in semi-arid southern Africa, only a limited number took interest on cassava and climatically varying DR Congo or in the Central Africa region. This study assessed the effects of climate variability and change on cassava yield in two territories of South-Kivu province Eastern DR Congo.

The assessment relies on the Decision Support System for Agrotechnology Transfer "DSSAT" crop model simulation of cassava under current and future climate (29 Global Climate Models "GCM" and 2 Representative Concentration Pathways "RCP"). The period 1980–2010 was used to represent the baseline climate, while future climate projection covers three periods including near future (2021–2039), mid-century (2040–2069) and end-century (2070-2099). Climate, soil and crop yield and field management data were collected for the study sites representing the cassava growing areas in the Province.

Results show that cassava yields will increase from 23.8% up to 97.1 among all the three study area sites under RCP 4.5 and RCP 8.5 following different climate regimes. However, these results simulated using DSSAT did not consider the effect of pest and disease. Rainfall increase and temperature changes are determining factors explaining yield increase in Baraka and Kabare where the projected rainfall increase as well as temperature explain simulated yield increase. The Government, farmers and other stakeholders should consider this opportunity where the yield is projected to increase and invest more in cassava growing as the way to produce more food and sustain the food availability even when other crops are affected by the varying and changing climate.

Keywords: Cassava; climate change; DSSAT; yield; DR Congo

Environmental Influences on Electricity Reliability in Uganda's Grid System

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Introduction: Electricity is a vital resource in modern society and its reliability is essential for economic development, public safety and general well-being. In Uganda, the grid system is the primary source of electricity for most of the population. However, the grid system is often hampered by environmental factors which may cause power disruptions and outages.

Purpose: This study investigates the environmental factors that influence the reliability of grid electricity in all the subsystems of the Ugandan power grid network.

Methods: The study used the systems reliability theory and the Auto Regressive Distributed Lag (ARDL) model to analyse the effect of hydrology levels of Lake Victoria, rainfall and tree characteristics on the grid electricity reliability in Uganda. This study used secondary power outage time-series data recorded by the four main hydropower plants that generate grid electricity, Uganda Electricity Transmission company (UETCL) which transports this generated electricity and Umeme Limited the biggest distributor of grid electricity.

Results and conclusions: The findings revealed that hydrology levels of Lake Victoria and rainfall significantly affected grid electricity reliability in the generation subsystem of the Ugandan power grid network. Rainfall as well as tree characteristics did not significantly influence grid electricity reliability in the transmission and distribution subsystems in Uganda. The study concludes by highlighting the implications of environmental factors on grid reliability in Uganda and recommends that the government should invest in climate related actions that can mitigate the environmental factors that lead to power disruptions on the power grid. Investing in robust power generating infrastructure is also an alternative way of adapting to the changing environmental conditions as well as considering having alternative energy sources such as solar and wind onto the grid to diversify the energy mix and reduce dependence on grid hydropower.

Keywords: Grid electricity reliability; power outage frequency; power outage duration; ARDL.

Beyond Fossil Fuels: Pioneering Biochar Slurry as Alternative Fuel in Diesel Generators for Cleaner Energy Production

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The transition from fossil fuels to sustainable energy sources is imperative for environmental conservation. Diesel generators, widely used for power generation, significantly contribute to carbon emissions. This research explored biochar slurry, derived from biomass waste, as a renewable alternative to diesel fuel, addressing both emission reduction and energy sustainability. The study aimed at assessing the feasibility of biochar slurry as a substitute for diesel in generators. It focused on mapping the biomass waste hotspot and the quantity, characterizing biochar properties, and evaluating the combustion efficiency and emission profiles of biochar slurry compared to conventional diesel.

The methodology encompassed a multi-faceted approach. Initially, a comprehensive analysis of biomass waste availability was conducted. Subsequent characterization of biochar involved analysing physical and chemical properties vital for combustion. Numerical simulations of char particle combustion provided insights into efficiency and emissions. Response Surface Models were employed for optimizing particle processing techniques. Practical validation was achieved through experimental trials of biochar slurry in diesel engines, focusing on operational efficiency and emission reduction.

Preliminary results indicated that biochar slurry can significantly lower emissions, notably nitrogen oxides and particulate matter, compared to standard diesel. The simulations and experimental trials demonstrated the potential of biochar slurry in maintaining operational efficiency while reducing environmental impact. The study also highlighted the scalability and sustainability of using biomass waste for energy production.

In conclusion, biochar slurry emerged as a promising alternative to diesel fuel, offering substantial environmental benefits by reducing emissions and repurposing biomass waste. This research not only contributed to the field of sustainable energy but also encourages the adoption of cleaner fuel alternatives in power generation. The findings paved the way for future investigations into the broader application of biochar slurry in various energy systems, marking a significant step towards a greener and more sustainable future.

Keywords: Alternative fuel; Biochar Slurry; emission reduction; sustainable energy

Climate Imperatives and Judicial Oversights in Uganda: Comparing Nyakaana v NEMA (2015) and Water & Environment Network (U) Ltd v NEMA (2021) with South Africa's Earthlife Johannesburg v Minister of Energy (2017).

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Globally, the UNFCCC, SDG 13, the Paris Agreement, and related instruments establish climate imperatives encompassing measures that countries ought to undertake to address climate change in all its forms. Uganda incorporates these imperatives into its legal and policy framework.

Employing a doctrinal legal research methodology, a case study approach, a comparative review analysis, and a rights-based lens, this paper investigates the extent to which Ugandan judicial interventions, like *'Nyakaana v NEMA (2015)'* and *'Water & Environment Network (U) Ltd v NEMA (2021)'*, compare with a leading South African precedent, *'Earthlife Johannesburg v Minister of Energy (2017)'*, regarding their treatment of climate imperatives in cases related to environmental degradation. Despite the inherent alignment with and recognition by the country's legal and policy framework, as well as judicial notice of the prevailing global climate crisis, Ugandan courts tend to overlook climate imperatives in suits addressing environmental degradation.

Consequently, the courts have demonstrated inconsistency in upholding the right to a clean and healthy environment, leaving environmental rights vulnerable to sanctioned violations- an affront to the country's tripartite obligation to respect, protect, and fulfil human rights. Such oversights generate a significant pathway through which anthropogenic factors thrive and aggravate the country's climate change crisis. To avert this threat, this paper proposes the establishment of a distinct High Court division staffed by expert judges specifically trained and exclusively dedicated to handling cases related to climate change and environmental protection, aligning with SDG 13, UNFCCC stipulations, and the Paris Agreement framework.

Keywords: climate change; climate imperatives; environmental degradation; SDG13; judicial interventions.

SUB-THEME THREE: GENDER

Examining the Challenges Faced By Deaf Women in Addressing Gender-Based Violence in Kampala District

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The UN Declaration on Elimination of Violence against Women (1993) defines violence against women as "any act of gender-based violence (GBV) which results in or is likely to result in physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or are arbitrarily deprivation of liberty, whether occurring in public or private life." Social discriminations such as those based on gender and disability increase the vulnerability to GBV for both men and women with disabilities (Platt, 2015).

The purpose of this study was to understand the challenges faced by deaf women in addressing gender-based-violence in Kampala district.

Methods: The study was guided by a case study design. Thus, a qualitative data collection approach was adopted. I further used in-depth interviews, focus group discussions and documents. Findings revealed a communication barrier at police stations, lack of sign language interpreters, and low levels of knowledge on GBV, perhaps due to limited information.

Based on the findings, the government should enhance dissemination of GBV information and awareness among deaf women in form of pictures/videos. Since communication barrier is the major challenge, there is need to employ sign language interpreters at police stations in a bid to arrive at effective communication.

In summary: The Uganda needs to work towards the promotion, protection and implementation of the convention on the rights of people with disabilities. Emphasis should be on Article 16, which states that parties shall take all appropriate legislative, administrative, social, educational and other measures to protect persons with disabilities, within and outside the home, from all forms of exploitation, violence and abuse, including their gender-based aspects.

Key words: Deaf women, challenges, Gender-Based Violence, Ugandan sign language (UGSL), Kampala district, Uganda.

[Re]Imagining Family Roles through Child Art: A Shared Responsibility for Gender Equity and Social Inclusion in Uganda

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This qualitative study explores the subjective child art and perceptions of primary school-going children (6 to 11 years) in Uganda.

It explores family roles as shared responsibilities for gender equity and social inclusion. Using Child art (through drawing and painting), the research sought to understand the socio-cultural factors influencing family roles within the context of Uganda, and how children through artistic narratives [re]imagine family roles in their family context(s).

Three objectives guided the study; to explore how children perceive and depict family roles as a shared gender responsibility within their family contexts, as reflected in their child art; to investigate the socio-cultural factors, which influence family roles; and finally, to examine the extent to which children's depiction of fathers' involvement in domestic tasks contributes to [re]imagining family roles as a shared responsibility for gender equity and social inclusion.

While the study is anchored on the interpretivism theory, it is also supported by the socio-semiotic theory, which focuses on the role of social and cultural contexts in shaping processes through the use of signs and symbols. A purposive sample of 24 children from Wakiso and Jinja areas was selected. Data collection methods included child art (drawings and paintings), interviews, and non-participant observation. Reflexive thematic analysis was used to unpack data patterns, themes, and meanings from children's narratives and artistic expressions.

Findings revealed a multifaceted understanding of family roles among the participating children, highlighting issues such as the symbolism of family as a unit of togetherness, the concept of shared gender responsibilities, and the active involvement of fathers in traditionally maternal tasks such as homework assistance and cooking. These artistic representations offered a glimpse into children's aspirations for more inclusive and equitable familial structures.

Conclusively, the study underscores the importance of recognising children as active participants in shaping family dynamics and highlights the potential of children's artistic narratives (Child art) as a powerful tool for understanding and promoting gender sensitisation. By amplifying their voices and perspectives through art, this research contributes to on-going efforts to foster more equitable and supportive family environments in Uganda and beyond.

Keywords: Family roles, child art, shared responsibilities, gender equity and social inclusion.

SUB-THEME FOUR: GOVERNANCE, ECONOMIC AND SOCIAL CHANGE

Gwantamu: On Food Pottery Metaphors and Their Role in Kampala's Public Debate

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In this study, we examine how metaphorical expressions, particularly the Luganda proverb *Musango gwa ntamu: gubuulirwa n'omugenyi* (a broken cooking pot's issue is so important that even guests should be aware) influence public discourse and societal understanding. It is framed on the contention that Metaphor offers not only the chance to better explain how citizens view the political world and why they hold the preferences they do, but its criteria and processes hold wider relevance for political psychology and public opinion research. Focusing on the Non-Aligned Movement (*NAM)* Conference held in Kampala, in January 2024, we analyse the concept of *Gwantamu*, derived from the proverb alluded to, to reveal how food pottery metaphors capture the experiences and ethical principles of Kampala's people.

We contend that an understanding of local political dynamics is incomplete without considering the deeply embedded food culture metaphors. Such metaphors not only depict civic hospitality but also demand transparency from leadership about the city's adversities.

Our research method entails a critical analysis of metaphorical expressions used during the conference, evaluating their relevance to public dialogue. We uncover a dissonance between government-led narratives for the conference and community voices hitherto described as **'silent voices'** of the populace, highlighting the necessity for more openness. The study demonstrates that metaphors are crucial in elucidating social and ethical issues, which concern the residents of a city; Kampala, in particular, and Ugandans in general.

Keywords: Food, culture, food pottery-metaphors, social-politics.

Acceptability of an Online Peer Support Group as a Strategy to Improve Antiretroviral Therapy Adherence among Young People in Kampala District, Uganda: Qualitative Findings

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Introduction: Peer support groups are central to antiretroviral therapy (ART) adherence among young people living with HIV (YPLHIV). However, peer support activities, which occur face-to-face in Uganda and elsewhere in Sub-Saharan Africa, have structural limitations and may not be readily available when young people need them. Online peer support has the potential to help YPLHIV access regular psychosocial support without significant effort or cost. Acceptability is key to the successful design, implementation and evaluation of virtual peer support. We assessed the acceptability of a WhatsApp-based peer support group as a strategy to improve ART adherence among Ugandan YPLHIV.

Methods: We conducted a formative qualitative study in three health facilities in Kampala, , between July and August 2022. We held four focus group discussions with 27 YPLHIV seeking services at the study facilities. We also conducted six key informant interviews with health providers attached to adolescent HIV care clinics. The data was analysed using thematic methods to understand socio-cultural beliefs and perceptions towards utilizing WhatsApp-based peer support groups for HIV care.

Results: Overall, the peer support group on WhatsApp was acceptable for use among YPLHIV. The young people regarded it as convenient because it saves time and is more cost-effective, compared to the transport costs of in-person meetings. Health providers revealed that the WhatsApp peer support group could reduce the stigma associated with community follow-up for non-adhering young people and empower YPLHIV to overcome stigma. Both the young people and health providers suggested that online peer support could provide accessible emotional support, which could improve YPLHIV's psychosocial well-being and enhance adherence to ART. However, participants raised concerns about privacy, the cost of data, and smartphones, especially for younger adolescents.

Conclusion: Online peer support groups are acceptable to Ugandan YPLHIV and hold promise in enhancing psychosocial support and improving treatment adherence in this sub-population. Research is needed to evaluate the feasibility and effectiveness of this peer support model. In implementing online support groups, due consideration should be given to open-source software tools with high privacy standards.

Keywords: online peer support group; antiretroviral therapy among young people; WhatsApp

Relevance of Local Government Elections on Ex-Combatant Reintegration in Post Uganda National Rescue Front II in Yumbe District.

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Post-war reintegration of combatants can be challenging due to several factors. Yet, the non-integration of combatants into a community can create insecurity and curtail local economic activities. To achieve peace and security, former combatants must be integrated into their respective communities. One avenue is political inclusion.

This study used the social constructivism theory to explain how ex-combatant participation in the local government elections in Yumbe District enhanced security and peace in the district. The study's primary objective was to examine the impact of local government elections on the successful reintegration of ex-combatants into the community of the Uganda National Rescue Front II (UNRF II). The research identified factors that facilitated or hindered ex-combatant integration and suggested policy recommendations to ensure effective reintegration into society.

It qualitatively and descriptively examined the local government election impacts and factors on ex-combatants' experience and community responses. Snowballing sampling was used to select participants. The key study findings showed that ex-combatants participated in all-level local government elections except that none of them stood for or got elected as a member parliament. Some were elected to local leadership positions. However this has created tension in the villages due to unbalanced power relations. Political, economic and social micro factors play a role in motivating ex-combatants to participate in local government elections. In conclusion, UNRF II ex-combatants' participation has to some level created security and peace. There is also a high degree of ex-combatant integration, enabling government penetration of remote areas.

Keywords: Local-government elections, post-war, ex-combatant-integration, peace and security.

E-Governance, Quality of Work Life Experiences, Subjective Wellbeing and Coping Strategies in the Uganda Police Force

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The Uganda Police Force (UPF) has made great effort to utilize e-Governance in a bid to enhance service delivery. Digital governance tools such as the UPF Mobi App, police payment systems and other online crime reporting platforms have been implemented to promote efficiency and effectiveness in the Police Force. However, given rapid advancements in technology, the impact of digital transformation on the Quality of work life (QWL) and Subjective Wellbeing (SWB) of police officers is often overlooked.

And yet, this is important because it may have positive and negative effects on the wellbeing of police officers; and subsequently affect their overall service delivery. In terms of theory, the Job Demands-Resources (JD-R) model offers an appropriate framework for gaining insights into the changes in job demands and resources caused by the digital transformation. By applying this model, the paper presents how technology facilitated job demands and how resources interact with individual characteristics and organizational factors to shape the QWL experiences of police officers. The model further explains how the SWB and coping strategies are influenced in response to the issues presented by this technologically advanced work environment on the officers. The aim of this paper, therefore, is to examine the impact of e-Governance on the officers' QWL experiences and their SWB. It further discusses the coping strategies adopted by the officers to deal with challenges arising out of the digital transformation.

The specific objectives of the paper include the following:

1. To assess the association between e-Governance, QWL experiences and SWB in the UPF.
2. To determine whether coping strategies moderate the association between e-Governance and SWB in the UPF.
3. To examine the experiences of police officers regarding their QWL and assess their perceptions regarding the e-Governance practices adopted in the UPF.
4. To identify the most prevalent coping strategies adopted among police officers in the UPF.

Keywords: e-Governance, quality of work life, subjective wellbeing, coping strategies

Colonial Foundations of Post-Independence Corruption in Uganda: A Complexity Systems Perspective

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This study delves into the intricate relationship between Uganda's pre-independence history and the enduring challenge of corruption in the post-independence era from a complexity system perspective. This study employs a complexity systems perspective to dissect the intricate web of historical and contemporary factors contributing to corruption in Uganda; shedding light on the enduring impact of pre-independence history on post-independence challenges.

Drawing on a multitude of empirical evidence, it is established that Uganda's historical struggle with corruption finds its roots in the colonial legacy left by the British. The influence of colonialism on contemporary corruption is illuminated in the study, contending that colonial experiences significantly shape(d) present-day corruption in developing nations.

The study identifies several avenues through which colonialism sowed the seeds of corruption in post-independence African states. Upon gaining self-rule, African states, including Uganda, witnessed the ascendancy of elites who perpetuated colonial ideals. This paper asserts that corruption, deeply entrenched in the historical context of colonisation, can be viewed as a by-product of fraudulent behaviour inherited from colonial rulers.

Furthermore, the study highlights the vital role of political and economic history in comprehending corruption in Uganda. The British protectorate status and subsequent independence in 1962 laid the groundwork for Uganda's administrative vulnerabilities, especially in Buganda, where colonial authorities favoured strategic cooperation. Addressing contemporary corruption in Uganda necessitates a comprehensive approach that delves beyond immediate causes. This perspective has often been overlooked in prior endeavours in Uganda and many other African nations.

Keywords: corruption, historical, complexity systems

The Contribution of Community Visual Art Initiatives in Imparting Social Change in Uganda: A Case Study of Wakiso District

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This study is about the efficacy of Community Visual Art Initiatives and how they are central in social development spaces, especially in regard to social change. It analyses key aspects of social change embedded in the practices of selected community visual art initiatives in Uganda, focusing on Wakiso District. Wakiso is characterised by various social and economic challenges brought about by the rapid progress of urbanisation.

Koizumi (2018) explains that art projects serve as a place connecting the artists with people within and outside the community. Therefore, this study is guided by the following objectives: to establish the contextual background of selected community visual art initiatives (CVAIs) in Uganda; to examine the social, economic and political role of CVAIs on the local communities; to analyse the impact of Visual Art Initiatives on local communities in imparting social change, and its implication on policy making.

This research project uses the Qualitative Research Design and purposely selects 26 CVAIs from interviews, as well as focus group discussions. It also used Narrative and Thematic data analysis techniques.

This study reveals that urban culture has negatively impacted relationships among residents as they strive to survive in a complex and fast-changing setting. The study therefore illuminates how community visual art initiatives have contributed to social change as they offer philanthropic Visual Art services to the community.

Keywords: visual art initiatives; social change; urbanisation

Governance and Modern Renewable Energy Consumption in the East African Community (EAC): A Dynamic Panel CS-ARDL Approach

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Purpose: In this research, we look at the effect of governance on the consumption of modern renewable energy in the East African Community (EAC); economic growth, trade openness and foreign direct investment.

Design/methodology: The study relied on secondary data sourced from the World Development Indicators, World Governance Indicators and the International Energy Agency (IEA) for the EAC from 1996 to 2019. The Panel Cross-Sectional Augmented Distributed Lag (CS-ARDL) model and the second-generation panel data models were employed in the analysis.

Findings: The findings indicate that poor governance and inadequate foreign direct investment are significantly responsible for the low level of modern renewable energy consumption (MREC) in the EAC. On the other hand, trade openness significantly enhances MREC, and therefore, GDP per capita has no significant effect on MREC.

Originality: The consumption of modern renewable energy sources (renewable energy excluding the traditional use of biomass) and its determinants, as majority of the studies focus on renewable energy consumption as a whole. The study also employed the Panel Cross-Sectional Augmented Distributed Lag (CS-ARDL) model and second-generation panel data models.

Keywords: East African Community; renewable energy consumption, governance, CS-ARDL, second-generation panel data techniques.

SUB-THEME FIVE: HEALTH SYSTEMS

Evaluation of Antifungal Activity of Commonly Used Medicinal Plants for Treatment of Candidiasis in Pader District, Northern Uganda

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Background: The emergence of resistant *candida* species to antifungal drugs has led to resurgence in herbal usage globally. This calls for an urgent need to verify the antifungal effectiveness of medicinal plants so as to boost the local health care system, and to provide baseline information for future research on them, in order to develop new antifungal drugs. Medicinal plants of *Momordica foetida* Schumach., *Sansevieria dawei* Stapf, *Khaya anthotheca* (Welw.) C. D C., Merremia sp. and *Hallea rubrostipulata* (K. Schum.) are widely used by communities of Pader district, Northern Uganda for treatment of candidiasis, although the anti-candida activities of these plants from this area have not been verified.

Objectives: This study assessed antifungal activities of commonly used antifungal plants of *Momordica foetida*, *Sansevieria dawei*, *Khaya anthotheca*, Merremia sp. and *Hallea rubrostipulata* against eight selected susceptible and resistant strains of *candida albicans* and non albicans species

Methods: Powdered plant materials of *Sansevieria dawei, Momordica foetida,* Merremia sp., *Khaya anthotheca* and *Hallea rubrostipulata* were sequentially extracted using petroleum ether and methanol respectively, and total water extraction done using maceration, decoction and hot water infusion. Single plant extracts and their combinations, positive controls (amphotericin B, Fluconazole pharmaceutical and analytical grades) and negative control (80% DMSO) were screened for their antifungal activity on eight fungal species comprising of *Candida albicans* (ATCC 90028, ATCC 10231, 0796 and 0770a), and *candid*a non *albicans* (*C. glabrata* ATCC 2950 and VVc 004; and *C. tropicalis* ATCC 750 and 0210). Method of Agar well diffusion was used. Strengths of antifungal activities were determined by measuring Zones of fungal growth Inhibition (ZOI) Data analysis was done using SPSS version 20. Mean values for ZOI were expressed as Mean ± SEM.

Mean comparisons of ZOI of plant extracts, standard antifungal drugs (positive controls) and DMSO (negative control) were performed by one-way ANOVA followed by Tukey's HSD post hoc multiple comparison test.

Results: Plant species of *Hallea rubrostipulata* demonstrated significantly the highest zones of inhibition *(*ZOI: 18.00±1.00 - 38.33±0.17) followed by Amphotericin B (ZOI: 11.98±0.11-22.32±0.32), combination of *Merremia* sp. + *K. anthotheca* (ZOI: 7.89±0.26- 19.67±0.37), and lastly *K. anthotheca* (ZOI: 10.11±0.31 -15.11±0.65) respectively in decreasing antifungal strengths.

Conclusion: Plant species of *Hallea rubrostipulata*, *Khaya anthotheca*, and a combination of *Merremia* sp. and *Khaya anthotheca exhibited* broad spectrum antifungal activities against candida species tested, therefore are noble therapeutic plants for new antifungal drug development.

Keywords: Antifungal activities, candidiasis, resistant *candida* species, therapeutic plant.

Optimal Waist Circumference Cut-Off Points for Predicting Metabolic Syndrome among Females of Reproductive Age in Wakiso District, Central Uganda

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Background: Metabolic Syndrome (MetS) poses a significant challenge to global public health, given its strong link to the escalating burden of type 2 diabetes and cardiovascular disease. Cardiovascular diseases constitute the leading causes of morbidity and mortality worldwide. The prevalence of MetS is increasing in Africa with approximately 32.4% having the condition. Waist circumference (WC) is a convenient metric for diagnosing MetS. However, the current WC cut-off points for diagnosing MetS are based on European population data that may not be universally applicable. There is thus a need to establish appropriate WC cut-off points appropriate for the Ugandan setting.

Objectives: This study determined the optimal waist circumference cut-off points that predict Metabolic Syndrome in women of reproductive age residing in Wakiso district, central Uganda.
Methods: The data collected was from a cross-section study conducted in Wakiso, involving 697 randomly selected females aged 15 to 49 between June 9th and August 17th, 2021. Data included Metabolic Syndrome components: waist circumference, High-Density Lipoprotein Cholesterol, triglycerides, blood pressure, and fasting blood sugar. Metabolic Syndrome status was identified based on two or more MetS components excluding waist circumference. Receiver operating characteristic analysis was conducted to determine optimal waist circumference and age-specific WC cut-off points. The diagnostic accuracy of WC cut-off points was assessed using sensitivity, specificity, the Youden index, and the Positive likelihood ratio.

Results: Approximately 49.9% of the 697 participants had two or more MetS risk factors. For females aged 15-49 years, the average optimal waist circumference (WC) cut-off was 80.3 cm. Variations in optimal WC thresholds were observed across different age groups: 97.4 cm (15-24 years), 79.9 cm (25-34 years), 85.6 cm (35-44 years), and 91.1 cm (45-54 years). The area under the ROC curve for these age groups ranged from 0.78 to 0.86, indicating good discriminatory capability. The sensitivity ranged from 85% to 97%, specificity from 58% to 88%, and the Youden Index from 0.557 to 0.729.

Conclusions: This study identified the optimal waist circumference cut-off point for diagnosing MetS among females aged 15-49 years as 80.3 cm. This closely aligns with the International Diabetes Federation's recommendation for MetS diagnosis. Additionally, it revealed that Ugandan females in this age group exhibit waist circumference cut-offs ranging from 79.4 cm to 91.1 cm based on age. These findings strongly support the precision and relevance of current waist circumference guidelines in both clinical and public health settings.

Keywords: Cut-off points, females, optimal, reproductive age, waist circumference

A Systematic Review Reveals That African Children of 15-17 Years Demonstrate Low Hepatitis B Vaccine Seroprotection Rates

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Background: Childhood HBV immunization remains globally fundamental to the elimination of hepatitis B virus (HBV). However, monitoring proportions of HBV vaccine seroprotection and their determinants among African paediatric recipients is crucial.

Objectives: This study sought to verify the extent of immune protection accorded by the HBV vaccine in African children of up to 17 years of age.

Methods: This study pooled the prevalence of HBV vaccine seroprotection reported by primary studies conducted in the Northern, Western and Southern African regions. We included 19 eligible articles out of the 197 initially downloaded and published from 1999 to 2021 from African Journals Online (AJOL), EMBASE, Scopus, and PubMed. The study protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO), University of York Centre for Reviews and Dissemination, under registration number CRD42022361277. Seroprotection rate and its associated factors, and heterogeneity analyses among primary studies were done at 95% CI, and a p value less than 0.05 was considered significant. All statistical calculations were done using the Medcalc software version 19.1.3.

Results: Significantly higher ($p < 0.0001$) proportion of HBV vaccine seroprotection (69.07%) was found among children under 15 than children aged 15-17 (32.368%), 95 % CI [34.2454% to 39.0847%].

Conclusion: Whereas successful integration of the commendably efficacious HBV vaccine on the extended programmes on immunisation (EPI) has been a major achievement in the eradication of HBV infection in Africa; with commendable seroprotection noted among children under 15, markedly reduced HBV vaccine seroprotection is demonstrated among adolescent children 15-17. Future studies are required to assess the need for booster dose vaccination in most at risk populations and age groups.

Key words: Children, hepatitis B, seroprotection, Africa

Antimicrobial, Antioxidant, and Sun Protection Potential of the Isolated Compounds from *Spermacoce Princeae* (K. Schum)

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Background: *Spermacoce princeae* (K. Schum) has been used in the treatment of bacterial skin infections in Uganda. Pharmacological studies revealed that extracts of *S. princeae* exhibited antibacterial, antioxidant, and sun protection potential. This study aimed at isolating and identifying pure compounds of the extracts based on comprehensive analytical characterisation by multiple analytical techniques.

Methods: The plant sample was collected, and compounds extracted by sequential maceration using *n*-hexane, ethyl acetate, methanol, and distilled water. The compounds were isolated using a combination of chromatographic techniques and their structures were elucidated by multiple spectroscopic techniques. The antibacterial and antifungal activity determination of the isolated compounds was carried out using an agar well diffusion and potato dextrose assay against *Pseudomonas aeruginosa*, *Staphylococcus aureus, Escherichia coli, Klebsiella pneumonie, Candida albicans, and Aspergillus flavu* while the antioxidant activity was screened with the 2,2-diphenyl-2-picryl-hydrazyl (DPPH) radical scavenging assay. The sun protection factor was determined using a Shimadzu Ultra Violet-visible (UV-VIS) double beam spectrophotometer between 290 to 320 nm. Microsoft Excel. The results were generally expressed as mean ± standard deviation (SD).

Results: Eleven compounds; quercetin (**1**), kaempferol-3-*O*-rutinoside (**2**), rutin (**3, 12**), *myo*-inositol (**4**), asperulosidic acid (**5**), hexadecanoic acid (**6**), β-sitosterol (**7**)**,** stigmasterol (**8**), campesterol (**9**), ursolic acid (**10**), and β-sitosterol glucoside (**11**) were identified in the *S. princeae* extracts. Compound **2** had good antifungal activity against *C. albicans* (zone of inhibition, 23.0 ± 0.1 mm). Compound **9** showed antibacterial and antifungal activity against *S. aureus, P. aeruginosa, C. albicans, and A. flavu*. Compound **2** had a good percentage radical scavenging effect (IC_{50} = 64.81µg/ml) and a good sun protection factor (SPF = 26.83).

Conclusion: This study reports the first-time isolation and identification of compounds **1** to **11** from *S. princeae,* which contribute to its antimicrobial, antioxidant, and sun protection potential. The water extract should be considered in drug formulations. The compounds and organic extracts be further evaluated for their cytotoxicity, establish their mode of action, sensitivity, and selectivity. In future work, we will address further in-depth analysis of the 432 compounds contained in the n-hexane and aqueous extracts of *Spermacoce princeae*

Keywords: Skin infections, *Spermacoce princeae*, antioxidant activity, antimicrobial activity, sun protection potential

Responsible Conversational AI for Equitable Maternal Healthcare

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Maternal healthcare is a sensitive urgent public health issue that requires timely trustworthy and authentic medical responses. Unfortunately, curative healthcare systems of Low Middle-Income Countries (LMICs) are insufficiently responsive to such healthcare needs. Such needs vary among social groups, often founded on social inequalities like income, gender and education. Therefore, health information seekers turn to unregulated online healthcare platforms, social media and Large Language Modes (LLMs) which un-regulated provide unverified healthcare information.

In this work, we systematically examined the philosophical foundations of responsible data and Artificial Intelligence (AI) practices governing data and AI modelling for intelligent systems based on peer reviewed articles, book chapters, technical reports, and studies published between 1973 and 2022. These studies were restricted to the philosophy of AI and Society 5.0 to inform the derivation of over 29 forms of AI philosophies with their fundamental relationships with Society 5.0. This unveiled intrinsic manifestations of algorithmic unfairness arising from inequitable AI and Machine Learning (ML) training datasets besides irresponsible data and AI modelling practices.

We further traced this algorithmic unfairness to the unguided and unregulated AI industry practices propagated by selection of inappropriate research paradigms to inform the creation of specific AI and ML training datasets for building intelligent healthcare systems. Such systems included online platforms and chatbots designed to provide authentic timely responses to inform healthcare decision making among vulnerable online information seekers like teenagers and young women across various social groups. This pointed us to the need for responsible and Inclusive Intersectional AI practices and research approaches to creating ML and AI training datasets for equitable intelligent healthcare systems. Therefore, we inter-sectionally crowd-sourced maternal healthcare advice from over 500 verified practicing healthcare professionals form Lira University teaching hospital, Brac University and Brac Uganda's heath programme Verses their online social acquaintances with in their social networks to create a dataset based on responsible data practices.

We further implemented trustworthy medical sentiment analysis and local interpretable model agonistic explanations as responsible AI principles to distinguish between authentic and non-authentic maternal healthcare advice.

Surprisingly, we obtained a train set accuracy of 93% and a validation set accuracy of 56%, generalisation log loss of 0.259, generalisation balance accuracy of 83% and generalisation Area Under the Curve of 90%. This meant that our model performed perfectly well at everything, except for accurately distinguishing between authentic and non-authentic medical advice. This simply means that AI models cannot certainly distinguish between authentic and non-authentic medical advice. Therefore, there is a need for better online tools for conversationally disseminating authentic medical advice. We embarked on creating conversational AI techniques for leveraging conversational AI tools like ChatGPT by the information seekers through prompt engineering. These have been published and made openly available for the general public. However there is an urgent need for policy, guidelines and regulation of online healthcare practice.

Keywords: Artificial Intelligence (AI), Conversational AI, responsible AI, Large Language Models (LLMs), Maternal Health, Health Equity.

Timing of Surgery and Preoperative Predictors of Surgical Site Infections for Patients with Depressed Skull Fractures in a sub-Saharan Tertiary Hospital: A Prospective Cohort Study

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Background: Surgical site infections (SSI) remain a major cause of life-threatening morbidity following surgery for depressed skull fractures (DSF) among traumatic brain injury (TBI) patients. We aimed to compare the risk of SSI within 3-months between surgery done before versus after 48hours of injury, and with its predictors.

Methods: We conducted a prospective cohort-study in Mulago Hospital, Uganda. Mild-moderate TBI-patients with DSF were followed up peri-operatively from the operating timing up to 3-months. The outcome variables were the incidence-risk of SSI, types of SSI, microbial culture patterns of wound isolates, and hospitals length of stay.

Results: We enrolled 127 patients with DSF; median-age=24(IQR=17-31 years), 88.2%(112/127) male, and assault victims=53.5%. The frontal bone was involved in 59%, while 50.4% had a dural tear. The incidence of SSI was 18.9%, mainly superficial incisional infections, and higher among patients operated after 48 hours (57.3% versus 42.7%, p=0.006). Gram-negative microorganisms were the commonest isolates (64.7%). Sub-analysis for the surgery done <48 hours (<24 versus 24-48hours) showed no significant difference in SSI (p=0.657). In multivariate analysis between the group of SSI and no SSI, surgical timing >48 hours (95%CI,1.25-6.22), pneumocranium on CT scan (95%CI,1.50-5.36), and involvement of air sinus (95%CI, 1.55-5.47) were all associated with >2.5 fold increase in the rate of SSI. The SSI group had a longer median of hospital stay(p-value<0.001).

Conclusions: The SSI risk in DSF is high, following a surgical intervention>48 hours of injury, with predictors such as frontal location of DSF, pneumocranium on CT scan, and involvement of the air sinus.

Keywords: depressed skull fractures, pneumocranium, surgical site infection, surgical timing.

Metagenomic Sequencing of the Skin Microbiota of the Scalp Predicting the Risk of Surgical Site Infections Following Surgery of Traumatic Brain Injury in Sub-Saharan Africa

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Background: Surgical site infections (SSI) are a significant concern following traumatic brain injury (TBI) surgery and often stem from the skin's microbiota near the surgical site, allowing bacteria to penetrate deeper layers and potentially causing severe infections in the cranial cavity. This study investigated the relationship between scalp skin microbiota composition and the risk of SSI after TBI surgery in sub-Saharan Africa (SSA).

Methods: This was a prospective cohort study, enrolling patients scheduled for TBI surgery. Sterile skin swabs were taken from the surrounding normal skin of the head and stored for analysis in -80°Celcius. Patients were monitored postoperatively for up to three months to detect any occurrences of SSI. 16S rRNA sequencing was used to analyse the skin microbiota composition, identifying different taxonomic microorganisms at the genus level. The analysis compared two groups: those who developed SSI and those who did not.

Results: A total of 57 patients were included, mostly male (89.5%) with a mean age of 26.5 years, predominantly from urban areas in Uganda and victims of assault. Graphical visualisation and metagenomic metrics analysis revealed differences in composition, richness, and evenness of skin microbiota within samples (α) or within the community (β), and showed specific taxa (phylum and genera) associated with either the group of SSI or the non-SSI.

Conclusions: The metagenomic sequencing analysis uncovered several baseline findings and trends regarding the skin microbiome's relationship with SSI risk. There is an association between scalp microbiota composition (abundance and diversity) and SSI occurrence following TBI surgery in SSA. We hypothesise under reserve that the scalp microbiota dysbiosis could potentially be an independent predictor of the occurrence of SSI. Further research is needed to confirm these hypotheses.

Keywords: dysbiosis, metagenomic sequencing, skin microbiota, surgical site infections, traumatic brain injury.

Adaptive Network Architecture for Sensor Data Acquisition

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This study presents the design and implementation of an adaptive network architecture tailored to address the challenges of sensor data communication, particularly in geographical areas where insect monitors, specifically smart bee monitors, are deployed. The architecture is engineered to facilitate uninterrupted low-power harvesting while accommodating delay-tolerant data acquisition for certain sensors, as well as aggregating data and traffic sensitive to quality of service. It enables buffering, prioritisation, and reliable communication, all while operating on relatively low-performance and energy-constrained equipment.

Methodology: The methodology encompasses a comprehensive approach, including requirements analysis, literature review, and gap analysis for environmental monitoring IoT Deployment Network Architectures. The study further involves the development of an Adaptive Network Architecture Design, which includes the study of existing protocols for low-bandwidth setups, the development of machine learning algorithms for transitioning between operation modes and prioritization, and the formulation of requirements and test cases for network operation.

Expected Results: The study anticipates the simulation of a wireless sensor network and hybrid backhaul network (utilizing GSM, WiFi, and LoRa) for various deployment settings. It involves the implementation of communication modules and switching algorithms using existing sensor devices and microcontroller devices within deployed beehive units across different environmental settings (urban, forest, hilly or mountainous locations) during wet and dry seasons. The evaluation of network performance will be conducted using parameters such as throughput, latency, energy efficiency, packet loss, and data compression. Results will be captured and analysed to assess network longevity before shutdown, duty cycle analysis, and overall performance.
It is anticipated that the architecture, with its incorporated GSM, WiFi, and LoRa modules for sending text, image, video, and audio values, will produce positive results. These results include lower power consumption, longer-range communication capabilities, and the capacity to monitor beehives with little bandwidth usage—all while preserving data quality after compression. The IoT Deployment Network Architectures is poised to revolutionize the field of environmental monitoring by providing dependable and efficient sensor data collecting through optimization algorithms customized for diverse environmental conditions, encompassing both urban and rural landscapes.

Keywords: adaptive network architecture; sensor data communication; smart bee monitors; low-power harvesting

Prevalence of and Psycho-Social Factors Associated with Alcohol Use among Primary-School Going Children Aged 6 to 13 Years in Mbale District Uganda: A Cross-Sectional Study

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Background: Alcohol use among children in low-resource settings has received limited attention. This study investigated the prevalence of and biopsychosocial factors associated with alcohol use among children aged 6 to 13 years and enrolled in primary schools in Uganda.

Methods: This cross-sectional study conducted in primary schools within Mbale district, employed stratified random sampling to select 470 child-parent dyads. Screening for child alcohol consumption utilised the validated Ugandan *(Lumasaaba)* version of the Car, Relax, Alone, Forget, Family/Friends, Trouble (CRAFFT) tool. Alcohol Use Disorder (AUD) was diagnosed using the AUD module of the Mini International Neuropsychiatric Interview for children and adolescents (MINI KID). Logistic regression analysis explored associations between alcohol consumption (CRAFFT cut-off score: 1 or more) and biopsychosocial factors (age, sex, nutrition, family dynamics, socioeconomic indicators, and school environment). Data analysis utilized STATA-17 statistical software.

Results: The median age of the participants was 11 years, with an interquartile range (IQR) of 9 to 12 years and a male to female ratio of 1:1.3. The screening prevalence of alcohol consumption among the children in the past 12 months was 25.2% (95% CI: 21.4-29.4) and 7.2% (95% CI: 5.1-10.0) were diagnosed with AUD. The study found a comparable prevalence of alcohol use between boys (25.0%, 95% CI: 19.4-31.5) and girls (25.4%, 95% CI: 20.0-31.1). Age-specific variations indicated that early adolescents (10 to 13 years), were more likely to consume alcohol 28.1% (95% CI: 23.5-33.3) compared to pre-adolescent children (6 to 9 years) 17.6% (95% CI: 11.9-25.1) in the past 12 months.

Factors associated with alcohol use included single-parent households, lower caregiver education, low socioeconomic status, maternal drinking, food insecurity, under-weight, physical discipline by parents, peer influence, rural school attendance, and the school environment.

Conclusion: The prevalence of alcohol consumption among children in Mbale district, was high with one-in-four primary-school-children aged 6 to 13 years consuming alcohol in the past year. There was no significant gender difference. It highlights various interconnected factors associated with alcohol use among school-aged children. We recommend awareness campaigns at all levels, stricter implementation of alcohol policies, school prevention programmes, and family-focused and socio-economic interventions. Nationwide school surveys should target pre-adolescent alcohol use.

Keywords: primary school-age children, alcohol use, associated factors, cross-sectional study, Uganda

"I would like to be provided with a Service on Time and be cared for": Perceptions of Quality of Care in HIV Testing Services from the Perspective of Adolescent Girls and Young Women in Rural Uganda

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Objective: Adolescent girls and young women in Uganda are disproportionately affected by high rates of HIV infections. In response, the Ugandan government has placed significant emphasis on HIV testing services (HTS) as a core component of its HIV/AIDS strategic plan. The primary aim of this qualitative study was to investigate the experiences of adolescent girls and young women as they navigate HTS and to assess how these experiences shape their overall perceptions of the quality of HTS in rural Uganda.

Methods: A total of 24 in-depth interviews and 8 focus group discussions, involving adolescent girls and young women aged 15-24 who reside in the Greater Rakai region, were conducted. Data from the transcripts were analysed, using a thematic analysis approach, and conceptualised using the WHO Quality of Care Framework.

Findings: Six domains of quality of care were examined, including safety, patient-centeredness, effectiveness, efficiency, timeliness, and equity. While participant experiences and perspectives varied, the majority expressed satisfaction with three key aspects: 1) effective health education provided through community outreach initiatives, 2) comprehensive pre-and post-test counselling sessions, and 3) access to HIV treatment services. Conversely, most participants were dissatisfied with 1) provider-patient interactions, 2) wait times for HIV-related care, 3) resource availability, such as provider shortages and limited testing equipment, and 4) access to HTS services.

Conclusion: The study's findings offer valuable insights for policymakers, facilitating the development of effective strategies to increase HTS uptake and enhance healthcare delivery for this population. Recommendations include creating more youth friendly HTS and implementing guidelines to provide health workers with additional training for effective service provision to young people.

Keywords: Quality of care, adolescent girls and young women, HIV/AIDS, HIV testing service (HTS), Rakai region, Uganda

Plasmodium Falciparum Genetic Diversity and Multiplicity of Infection Based on MSP-1, MSP-2, Glurp and Microsatellite Genetic Markers in Sub-Saharan Africa: A Systematic Review and Meta-Analysis

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Background: In sub-Saharan Africa (SSA), *Plasmodium falciparum* causes most of the malaria cases. Despite its crucial roles in disease severity and drug resistance, comprehensive data on *Plasmodium falciparum* genetic diversity and multiplicity of infection (MOI), which refers to the number of parasite strains infecting a single individual are sparse in SSA. This study summarises available information on genetic diversity and MOI, focusing on key genetic markers (*msp-1, msp-2, glurp*, and microsatellites). The systematic review aimed to evaluate their influence on malaria transmission dynamics and offer insights for enhancing malaria control measures in SSA.

Methods: The review was conducted following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. Two reviewers conducted article screening, assessed the risk of bias (RoB), and performed data abstraction. The review included 52 articles: 39 cross-sectional studies and 13 Randomized Controlled Trial (RCT)/cohort studies, involving 11,640 genotyped parasite isolates from 23 SSA countries. Meta-analysis was performed using the random-effects model in STATA version 17.

Results: The study found considerable genetic diversity among *Plasmodium falciparum* parasites in SSA, with variations across different regions. The overall pooled mean expected heterozygosity across studies was 0.65 (95% CI: 0.51-0.78). Regionally, values varied: East (0.58), Central (0.84), Southern (0.74), and West Africa (0.69). Based on allele frequencies, the overall pooled allele frequencies of *msp-1* alleles: K1, MAD20, and RO33 were 61%, 44%, and 40%, respectively, while *msp-2*: I/C 3D7 and FC27 alleles were 61% and 55%. Regionally, Central Africa reported higher frequencies (K1: 74%, MAD20: 51%, RO33: 48%) than East Africa (K1: 46%, MAD20: 42%, RO33: 31%). For *msp-2*, East Africa had 60% and 55% for I/C 3D7 and FC27 alleles, while West Africa had 62% and 50%, respectively. The pooled allele frequency for *glurp* was 66%. The study also revealed quite high *Plasmodium falciparum* MOI in SSA, with regional differences. The overall pooled mean MOI was 2.09 (95% CI: 1.88-2.30), with regional variations: East (2.05), Central (2.37), Southern (2.16), and West Africa (1.96). The overall prevalence of polyclonal *Plasmodium falciparum* infections was 63% (95% CI: 56-70), with regional prevalence as follows: East (62%), West (61%), Central (65%), and South Africa (71%).

Conclusion: These findings highlight the importance of considering regional differences in parasite genetic diversity and MOI when developing malaria control strategies and surveillance programmes in Sub Saharan Africa.

Keywords *Plasmodium falciparum*, genetic diversity and multiplicity of infection, sub-Saharan Africa.

Trends in HIV Testing and Associated Factors among Adolescent Girls and Young Women in Rural Uganda: Cross-Sectional Analysis of Rakai Community Cohort Study Data, 2013 to 2020

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Introduction: HIV Testing Services (HTS) serve as a crucial gateway to HIV prevention, care and treatment, all of which are pivotal to achieving the UNAIDS 95-95-95 targets. Despite numerous strategies aimed at enhancing HTS in Uganda, testing rates persist below the global target, particularly among adolescents. Adolescent girls and young women (AGYW) are disproportionately affected. **Objective:** This study analysed the patterns and determinants of HTS uptake among AGYW in Greater Rakai, Central Uganda.

Methods: This cross-sectional study drew data from the Rakai Community Cohort Study (RCCS), associated with the Rakai Health Sciences Programme. It aimed to determine the utilisation of HIV testing services (HTS) among sexually active adolescent girls and young women aged 15-24 years. The study covered a population surveyed from July 2013 to November 2020 across 34 rural and peri-urban communities. RCCS conducts surveys every 18 months, gathering comprehensive data on HIV risk factors. The analysis categorised AGYW into two groups based on pre and post targeted policy change rounds. It employed descriptive analyses, Cochran-Armitage trend tests, Chi-square tests, and generalized estimating equations to estimate odds ratios for HTS. Multicollinearity was examined, and potential confounders were incorporated into the multivariable model. STATA software (v15) facilitated all statistical analyses.

Results: A total of 10,356 adolescent girls and young women received HTS in the five rounds of the RCCS study between 2013 -2020 distributed as follows; 2144 participants for round 16, 2195 participants for round 17, 2089 participants for round 18 ,1837 for round 19 and 2091 for round 20 were analysed. After the policy was changed, HTS receipts went from 95.5% to 96.1%, respectively, before and after the policy. But there wasn't significant linear trend in the association between HTS uptake and targeted testing policy. ($Z=-1.3$, $P = 0.2$).

The targeted testing policy, while potentially having benefits, was associated with a substantial decrease in the odds of ever obtaining HIV testing services among younger adolescents (OR=0.19, p-value<0.001). Older adolescents are more likely to undergo HIV testing compared to younger counterparts (OR=2.31, p-value<0.001). Adolescents with up to secondary school education are more likely to receive HIV testing services than those with only primary education (OR=2.85, p-value=0.05). Occupational factors play a role, with those working in bars or restaurants more likely to test, while students are less likely compared to those engaged in housework or agriculture (OR=2.05, p-value=0.055). Adolescents in fishing communities have higher odds of HIV testing compared to those in non-fishing areas (OR=1.60, p-value=0.001).

Conclusions: HTS receipt was likely associated with older adolescents, fishing communities and ART initiation but also less likely with the targeted testing policy. Interventions are needed to promote retention in care among adolescents. These findings highlight the complex interplay of individual and contextual factors influencing HIV testing behaviour among AGYW in rural Uganda. While some groups exhibited positive trends, others faced barriers. Further research is needed to understand the reasons behind the policy's impact and explore targeted interventions that can increase testing rates among vulnerable groups like students and younger adolescents while maintaining the potential benefits of the policy.

Keywords: HIV testing, HIV/AIDS, adolescent girls and young women, trends, associated factors, Uganda, Rakai Community Cohort Study, Uganda.

The Utilization of Antenatal Care Services by Adolescent Urban Refugees in Kampala, Uganda

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Introduction: Uganda hosts over 1.5 million refugees and about 6% of these are urban refugees living mostly in Kampala district. Uganda is implementing the integrated healthcare system where the health services are utilised by both the refugees and host populations without discrimination. Specific data on the utilisation of antenatal care services by adolescent urban refugees in Uganda is not widely available.

Objective: To generate evidence on the utilisation of antenatal care services by adolescent urban refugees in Kampala, Uganda.

Methods: This was a cross sectional study and quantitative methods of data collection were used. The Study was carried out in Kampala district, Uganda. 637 interviews were conducted with urban refugees who were pregnant 10-19 years within a period of five years back from the time of the study. A semi structured questionnaire was administered using the ODK software. The data was exported to excel and analysis was done with STATA version 14. Univariate and bi-variate analysis using a Chi square test to determine associations was done and results reported using proportions and P-values in tables.

Results: 637 interviews were conducted and about 590 (92.6%) attended at least one antenatal care visit, 424 (71.8%) attended 4 and more tines and only 8 (11.5%) attended the recommended WHO 8 antenatal care visits. The average ANC attendance was 5 visits and only 245 (41%) attended antenatal care within the first 12 weeks of the pregnancy. The bi-variable analysis using the Chi Square test suggests a statistically significant association between the number of ANC visits and marital status (X^2, 33.7 (8) p- 0.000), family type (X^2, 13.9 (2) p-0.001), occupation (X^2, 28.7 (8) p-0.000) and nature of facility (X^2, 26.5 (4) p-0.000). There is no significant association with education level (X^2 13.8 (8) p-0.090, religion (X^2 13.8 (8) p-0.085) and distance to the facility ($X^2$26.5 (6) p-0.576).

Conclusions: Attendance of antenatal care by adolescent urban refugees is sub-optimal with a few attending the recommended 8 visits by WHO and few attend their first ANC visit within the first 12 weeks of the pregnancy. There is need for targeted social economic interventions to encourage the adolescent refugee mothers to utilise antenatal care services optimally.

Keywords: Maternal Health Services, Antenatal Care, Utilization, Adolescent Health, Refugees, Urban Health.

Immunological & Parasitological Impact of Co-Deployment of IRS & Bed Nets for Malaria Mosquito Vector Control in Uganda

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Introduction: Uganda has one of the highest global malaria burdens. There is a co-deployment of Indoor residual spraying (IRS) and treated bed nets for mosquito malaria vector control in selected districts in the country. This is proving to be costly & non sustainable. The Ministry of Health is in the final stages of rolling out R21 Malaria Matrix vaccine in the country. This study investigated the real additional parasitological & immunological benefits of co-deployment of IRS & LLINs in areas of high malaria transmission such as Uganda.

Methods: We used Luminex assay & Microscopy to determine antibody levels and presence of malaria parasites respectively in blood samples of children enrolled in a primary study that enrolled expectant mothers in a double blinded randomised clinical trial of two anti-malaria prophylaxes. We separated children into those from households with IRS + LLINs and those from IRS alone and followed them up for a year. Kaplan Meir survival curve, nested table, one sample t test & one sample Wilcoxon test & Regression were used in statistical analysis.

Results: There was no significant difference in the risk of malaria infection & antibody titers between children from households without bed nets versus those from households with bed nets. Children with severe malaria expressed lower level of protective antibodies against majority of signature antigens except for a few. Reduced levels of protective antibodies against Reticulocyte Binding Homologue 2 & 4 can be good predictors of severe malaria in young children.

Conclusion: The epidemiological benefits of co-deployment of IRS and bed nets seem to be short lived with no real additional immunological benefit in malaria endemic regions like Uganda. However, malaria specific antibodies in endemic areas seem to protect against severe disease. Immunological markers can be considered for malaria diagnostics purposes in the near future.

Keywords: LLINs, antibody, IRS, co-deployment

Decision-making Pathways for Contraceptive Use among Refugee and Host Populations in Adjumani District, Uganda: An Exploratory Study

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Background: Contraceptive use is known to have a positive impact on maternal and child health outcomes. However, its usage is still low in low-income countries, especially among people in humanitarian situations. The objective of this study explored decision-making processes towards the use of contraceptives by people in humanitarian situations to inform programme design and uptake.

Methods: A qualitative exploratory study was conducted among women of reproductive age (15-49 years) and men (15-60 years) living in three refugee settlements of Pagirinya, Nyumanzi, and Mirieyi and the surrounding host communities in Adjumani district, Uganda. Data was collected using 49 in-depth interviews (IDIs), 11 Key Informant Interviews (KIIs,) and 20 Focus Group Discussions (FGDs). Codes were generated using interactive processes and organised into sub-categories, categories, and broad themes Inductive thematic analysis was done with the aid of Atlas.ti. Version 14.

Results: We found that the decision-making processes entailed linear and nonlinear internalised cognitive and contextual processes involving four dynamic pathways. In the linear pathway, participants reported starting with 1) idea inception, 2) followed by cognitive processing, 3) consultation, and 4) decision-making for contraceptive use. The complex linear pathway happened when participants did not go through consultation but went straight to decision-making. However, participants who followed the non-linear pathway repeatedly went back to cognitive processing. Some women after consultation, or those already using and those not using contraceptives, decided to go back to cognitive processing to reconsider their current positions. This study found that some women who were not using contraceptives ended up using them, while some who were using contraception ended up dropping out.

Conclusions: This study showed dynamic decision-making processes involving both internal and external environments as triggers to decision-making for contraceptive use. Interventions to increase contraceptive use should target both users and significant others who influence decision to use particularly among refugees.

Keywords: Decision-making, pathways, family planning, refugees.

Investigation of Farmers KAP, their Impact on Farm Ecosystem Health and Human Genotoxicity in the Cattle Corridor: A Case Study of Kiruhura District

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Background: Pesticides are ubiquitous in the ecosystem and exposure to the public is unavoidable. In the cattle corridor, climate change and chemical pesticide resistance is an emerging problem. Therefore, pesticide use and exposure is on the rise. Research has demonstrated pesticide exposure to contribute to pathologic transformations that underwrite the onset of non-communicable disease processes. And exacerbate susceptibility to communicable disease likely due to their immunosuppressive and immune-interruptive abilities.

Problem: In Uganda, over 70% of the population is employed in agriculture. The sector accounts for about 49% of the gross domestic product (GDP). However, few studies have been done on the impact of pesticide use on ecosystem exposure and human health.

Aim: To investigate the influencing factors and impact of Uganda's growing pesticide use on ecosystem exposure and human health.

Objectives: We propose to describe the nature and extent of pesticide use by farmers, quantify pesticide exposure as pesticide residues in cow's blood and milk, human blood and open well water; demonstrate Oxidative stress, inflammatory and genotoxic alterations as predictors of disease susceptibility in exposed farmers.

Methods: a cross-sectional mixed methods study design considering humans, cattle and open water sources as the study populations. First, a descriptive survey on farmer KAP towards pesticide use and exposure. Quantitative laboratory-based investigations will then be applied sequentially involving GC/MS to detect and quantify pesticide exposure in humans, cattle and open well water. ELISA, qPCR and Colorimetry will be employed to quantify oxidative stress, inflammatory parameters and genetic damage in humans with a case control approach.

Major outputs: An understanding of farmer KAP on pesticide use, how these attributes may be affected by economy, how they affect pesticide exposure in the farm ecosystem and how this exposure affects human health.

Keywords: Pesticide exposure, farmer KAP, human genotoxicity, Ecosystem exposure,

Barriers to and Facilitators of Public Health Facilities' Responsiveness to Cervical Cancer Screening Literacy Needs of Rural Women with HIV in East Central Uganda

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Background: Rural women with HIV have low or no education attainment, misconceptions, beliefs, and health facility related challenges while engaging with cervical cancer screening services. These challenges affect their "cervical cancer screening literacy", ability to access, understand, appraise, and apply cervical screening information to seek and use cervical cancer screening services. Therefore, cervical cancer screening information and services should be provided in ways that mitigate challenges. This identified barriers and facilitators of public health facilities' responsiveness to cervical cancer screening literacy needs of rural women with HIV in East Central Uganda.

Methods: We conducted 15 Key Informant Interviews with health care providers who are involved in planning, communicating and providing cervical cancer screening services at four purposively selected public health facilities in East Central Uganda; Malongo HCIII and Wabulungu HC III in Mayuge district and Mutumba HCIII and Banda HCIII in Namayingo district. Data was collected using a Semi-Structured Interview guide developed based on the Organisational Health Literacy Responsiveness framework. The same framework was used to derive deductive categories during thematic analysis whereas barriers and facilitators were identified inductively from the interviews.

Results: Barriers to health facilities' responsiveness to cervical cancer screening literacy needs of rural women with HIV included few trained health workers, high workload among health workers, long waiting time, limited communication modalities, inadequate IEC materials, IEC materials not translated to local language and language barrier. Facilitators included free cervical cancer screening, integration of cervical cancer screening into HIV care, support to navigate cervical cancer screening services, using peers during education sessions, availability of IEC materials and using local language.

Conclusion: Strategies targeted at identified factors may help public health facilities in the study setting and potentially other rural public health facilities in Uganda to improve their responsiveness to cervical cancer screening needs of rural women with HIV.

Keywords: Cervical cancer screening, literacy, needs, barriers and facilitators, rural women, HIV.

Distribution and Antifungal Susceptibility Profile of Oropharyngeal Candida Species Isolated from People Living With HIV in the Era of Universal Test and Treat Policy in Uganda

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Introduction: Despite the increased frequency of oropharyngeal candidiasis among people living with human immunodeficiency virus, its management is no longer effective due to empirical treatment and emergence of antifungal resistance.

This study sought to investigate the prevalence of oropharyngeal candidiasis and assess the antifungal susceptibility profile of oropharyngeal *Candida* species isolated from people living with HIV. Additionally, we evaluated the correlation between oropharyngeal candidiasis and CD4 T cell as well as viral load counts.

Methods: A descriptive cross sectional study was carried out from April to October 2023 in which 384 people living with HIV underwent clinical examination for oral lesions. Oropharyngeal swabs were collected and cultured on Sabouraud Dextrose agar to isolate *Candida* species which were identified using the matrix assisted laser desorption ionisation time of flight mass spectrometry. Additionally, the antifungal susceptibility profile of *Candida* isolates to 6 antifungal drugs was determined using Vitek® compact system. Data on viral load were retrieved from records and CD4 T cell count test performed using BD FACS presto.

Results: Prevalence of oropharyngeal candidiasis was 7.6%. Oropharyngeal candidiasis was significantly associated with low CD4 T cell count and high viral load. A total of 35 isolates were obtained out of which *C. albicans* comprised of 20 (57.1%) while *C. tropicalis* and *C. glabrata* comprised 4(11.4%) each. *C. parapsilosis*, *C. dubliniensis* and *C. krusei* accounted for 2(5.7%) each. Additionally, 7(20%) isolates were resistant to fluconazole, 1(2.9%) to flucytocine and .2(5.7%) isolates were intermediate to caspofungin. However, specific specie isolates like *C. albicans* showed 20% (4/20), *C. glabrata* 50% (2/4) and *C. krusei* 50% (1/2) resistance to fluconazole. Additionally, *C. krusei* showed 50% resistance to flucytocine.

Conclusions: Prevalence of OPC among PLHIV was low and there was a significant association between OPC and CD4 T cell count as well as viral load. *C. albicans* was the most frequently isolated oropharyngeal *Candida* species. *C. glabrata* and *C. krusei* exhibited the highest antifungal resistance among the NAC species. Fluconazole demonstrated the highest resistance among antifungal drugs.

Keywords: Antifungal susceptibility, *Candida* species, PLHIV, oropharyngeal candidiasis, OPC

In Vitro Evaluation of Virulence Attributes of Oropharyngeal *Candida* Species Isolated from People Living with Human Immunodeficiency Virus

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Back ground: Oropharyngeal *Candida* species are able to exist as commensal micro flora in the oral cavity. However, due to their virulence attributes and in the setting of impaired immunity among people living with human immunodeficiency virus, the commensal *Candida* species can transition to the pathogenic cause of oropharyngeal candidiasis. Thus, we evaluated the ability of *Candida* species isolated from the oropharynx of people living with human immunodeficiency virus to produce phospholipase, proteinase, haemolysin, esterase, coagulase (extracellular hydrolytic enzyme activity) and form biofilm *in vitro*.

Methods: *In vitro* evaluation of virulence attributes of 35 oropharyngeal *Candida* species were evaluated using egg yolk agar method for phospholipase activity, bovine serum albumin agar (BSA) method for proteinase, blood agar plate method for hemolysin, Tween 80 opacity test medium method for esterase, classical tube method for coagulase activity and microtiter plate assay method for biofilm formation.

Results: Out of 35 total isolates, 20 were *C. albicans* and 15 were non-albicans *Candida* species. Phospholipase and proteinase activity was in 33(94.3%) and 31(88.6%) respectively, 21(60%) produced haemolysin and esterase activity was observed in 23(65.7%), coagulase activity was noted in 18(51.4%) and 25(71.4%) of total isolated demonstrated biofilm formation. Extracellular hydrolytic enzyme activity was noted in 60%-100% of *C. albicans* and 46.7%-86.7% non-albicans. Biofilm formation was observed in 12(80%) of non-albicans *Candida* and 13(65%) of *C. albicans*.

Conclusion: There was increased expression of virulence attributes in oropharyngeal *Candida* species**.** There was no significant difference in phenotypic expression of extracellular hydrolytic enzyme activity and biofilm formation between *C. albicans* and non-albicans *Candida* species.

Keywords: *Candida*, virulence, hydrolytic enzymes, biofilm.

SUB-THEME SIX: INNOVATION; SCIENCE AND TECHNOLOGICAL ADVANCEMENT

A Comparative Analysis of the Individual Multivariate Heuristic Algorithm's Detection Capabilities to Detect Zeroday Malware and Overcome Zeroday attacks Based on Static PE Features

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The rapid evolution of technology has ushered in an era of remarkable advancements, particularly in the realm of connectivity, which has further highlighted the need for security as a vital aspect in protecting computing devices and business applications from malicious software. This transformative journey has ushered in an era of technological innovation that is shaping the way we securely communicate, and conduct business. Malware is a major threat to computer systems, as it can compromise their security and functionality and it's classified into different types based on their static body features. However, malware authors use various obfuscation and evasion strategies to evade detection by traditional algorithms that include signature-based or heuristic algorithms. Therefore, there is a need for more robust and adaptive detection algorithm that can cope with the dynamic nature of zero-day malware and its attacks.

This paper presents a comparative analysis of the individual multivariate heuristic algorithm's detection capabilities to detect zero-day malware and overcome zero-day attacks based on static PE features. The multivariate heuristic algorithm is a combination of Logistic Regression and the Deep Neural Network algorithm of Multi-Layer Perceptron (MLP), which combination leverages the power and advantages of machine learning and deep learning techniques. The algorithm is able to analyse static features that are inherent in PE files to access whether they are malicious or not. The paper evaluates the performance of the multivariate heuristic algorithm's individual algorithms on a dataset of 1000 benign and malicious PE files, using various metrics such as accuracy, precision, recall, and F1-score. The results show that the Deep Neural Network algorithm outperforms the Logistic Regression algorithm in terms of detection accuracy in pre-emptively identifying zero-day malware, thereby minimizing the potential damage when it achieves an average accuracy of 97.8% and a detection rate of 95.6%.

The findings underscore the important role of advanced detection algorithms in fortifying cyber defences against emerging threats. By comprehensively analysing the static PE features, the vulnerabilities exploited by zero-day malware are combated, empowering organisations to pre-emptively mitigate potential risks. In conclusion, the Multivariate heuristic algorithms represent a significant advancement in computer security, providing proactive defence against the escalating zero-day malware crisis. By addressing the limitations of the traditional algorithms and embracing the power of the Multivariate heuristic algorithms, this solution equips organizations with the tools needed to safeguard critical assets to maintain operational continuity amidst today's dynamic cyber threat landscape.

Keywords: Malware zero-day, Multivariate, Logistic Regression, Deep Neural Network, Multi-Layer Perceptron (MLP)

Adoption or Adaptation? Dynamics of use of Prepaid Metering Technology in Water Utility Services in Uganda

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Utilisation of technological innovations impacts societal relationships and consequently influences social change and social interaction, including the way people communicate; do business and access services. The Uganda government, through the National Water and Sewerage Corporation (NWSC) operationalized the pro-poor strategy of 2006, by among others, introducing prepayment technology (PPMs) in urban poor settings of Kampala. Between 2008 and 2013, a total of 1,413 communal prepaid water dispensers fitted with prepaid metering technology were installed in selected informal settlements and over 32,000 tokens were issued out to users as accessories. Despite this, water consumption figures on the prepayment technology meters (PPMs) for the urban poor for the period between 2015 and 2019 report a monthly average consumption at the 1,413 PPMs as 66,493 m^3.

This translates into a paltry 13 litres per capita consumption per day and 3.007 m^3 per household per month). This water use is still below the Uganda national standard of per capita consumption of at least of 20 litres as stipulated in the Uganda National Water Policy of 1999. What is puzzling is whether users have adopted the prepayment technology or found means of circumnavigating the technology in what is seen as an adaptation mechanism.

This study, therefore, sought to examine the dynamics of utilisation of prepayment technology (PPM) in piped water services among the urban poor in Kampala. Dynamics to utilisation of technology in this study were measured at four levels; namely continuous usage, tinkering, abandonment and rejection. A mixed methods design consisting of probability and non-probability sampling procedures was adopted. The results showed that slightly half of the 375 respondents (59%) had ever used PPM technology to access piped water. The sample T-tests revealed a significant mean difference in the cost of a 20-litre Jerri can at PPM tap and other water sources ($p<0.01$).

The key challenge respondents noted was the long period of non-functionality of PPMs that is continually eroding all the significant gains made. Utilization of technological innovations such as the PPM is an outcome of complex processes involving interdependent factors such as technology characteristics and occurring at varying levels of time and space. For instance, users, as actors with agency, socially construct meanings out of technologies which then affect how they react.

Keywords: adaptation; adoption; dynamics; prepaid; technology; water

Usability Context and Adoption of Human Capital Management Systems in Ugandan Public Universities: Application of the Unified Theory of Acceptance and Use of Technology

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Background: As technology continues to emerge as an asset for enhancing Human Resource Management (HRM), many institutions are increasingly adopting Human Capital Management Systems (HCMS). In 2021, Uganda's Ministry of Public Service unveiled its robust HCMS deployed in all public institutions to enhance HRM processes. As of 2024, none of the public universities in Uganda have fully adopted the system's modules due to various challenges such as digital literacy limitations, insufficient infrastructure, and context mismatches. Furthermore, failure to take into account end users' characteristics and their contexts has hindered system adoption. These challenges are exacerbated by the absence of extensive research on the deployment of HCMS in the African educational context, with existing literature also only focusing on limited theoretical frameworks, overlooking the broad contextual factors that influence technology adoption. These knowledge gaps may impede stakeholders' comprehension of the multifaceted factors affecting HCMS adoption, ultimately resulting in inadequate utilisation of the HCMS and substantial monetary losses to institutions. To address these gaps, an all-encompassing approach like the Unified Theory of Acceptance and Use of Technology (UTAUT) is required to take into account both internal and external factors that impact the adoption of HCM systems.

Objectives: This study aims to investigate the impact of usability context on the adoption of HCMS in Ugandan Public Universities by utilising variables from Venkatesh et al.'s (2003) UTAUT theory.

The study will focus on the following objectives:

1. To investigate the influence of performance expectancy on Ugandan public university staff behaviour intention to adopt HCMS.
2. To assess the influence of effort expectancy on Ugandan public university staff behaviour intention to adopt HCMS.
3. To find the influence of social influence on Ugandan public university staff behaviour intention to adopt HCMS.
4. To examine the influence of facilitating conditions on Ugandan public university staff's actual use of HCMS.
5. To investigate the influence of Ugandan public university staff behaviour intention on their actual use of HCMS.
6. To investigate the moderating effect of user background characteristics (gender, voluntariness of use, age, and experience) on the relationship between usability context constructs and the adoption of HCMS among Ugandan public university staff.

Methods: Targeting three Ugandan public universities, a pragmatic research paradigm and a mixed-methods sequential explanatory research design will be employed. First, quantitative data using the UTAUT Scale will be collected from 335 university staff and analysed using SPSS Version 26. To investigate the impact of usability context on the adoption of HCMS using the UTAUT variables, simple linear regression will be employed. PROCESS Macro Version 4.3 will be used to investigate the moderating effect of user background characteristics. Based on the quantitative results, a sample of 15 respondents obtained through purposive sampling will be interviewed and analysed using the MAXQDA software to further identify the obstacles and enabling factors of HCMS adoption needed to derive informed recommendations.

Conclusion: The research findings may have the potential to offer guidance for policy formulation and implementation of HCMS, propelling the adoption of ICT in HRM forward.

Keywords; Adoption of ICT, Human Capital Management System (HCMS), Usability Context, UTAUT theory

Leveraging Explainable Transformer Models for Informed Financial Decision Making among Women in Uganda

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Building financial security often begins with establishing the habit of saving. However, many Ugandans, particularly women, face the challenge of informed financial decision making which has caused fewer subscriptions to financial technology (fintech) application services by women compared to men. This disparity can be attributed to several factors, including limited financial literacy and the prevalence of English-only interfaces in many fintech applications in Uganda. Financial illiteracy hinders their ability to understand and evaluate financial products, making them less likely to adopt while language barrier, which is faced by women who primarily speak Luganda or other local languages, restricts their access to critical information and instructions within the apps.

Unfortunately, training and deploying machine translation models in a low-resource language setting like Uganda, as an approach to tackle the language barrier and consequently address financial illiteracy, presents computational constraints that need to be dealt with. Thus, this research seeks to address this critical issue by developing and training context-aware, resource-efficient, and explainable transformer machine translation models tailored to the intricacies of financial literacy content in Luganda, a low-resource African language, that can be leveraged by fintech service providers to develop more inclusive financial products and applications. To address the limited data gap, we will mine data from tweets and fintech-related content on TikTok, as well as extract and merge data from existing fintech datasets. The goal is to build a properly curated parallel English-Luganda corpus of 4000 sentences specifically focused on financial knowledge content.

Keywords: Machine Translation; Financial Literacy; Women in Fintech; Machine Intelligence

Determinants of the Commercialization 'Valley Of Death' among Ugandan Researchers, Innovators, and Techno-Business Firms

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Purpose: Firms typically invest a significant portion of their resources into basic research to produce new ideas and technologies. However, turning them into marketable products is challenging. Firms often struggle to bridge the gap between prototype development and successful product commercialisation. Scholarly literature provides little guidance on how this gap can be overcome and what role broader organizational factors play in this process. The main objective of this study was to assess the determinants of CVD among researchers, innovators, and techno-business firms in Uganda.

Design/methodology/approach: A qualitative research method was employed, using interview and observation approaches. This method involved gathering various types of evidence, including documents, observations, artefacts and interviews with selected individuals in the field. Systematic observation was conducted to understand interaction(s) and contextual factors associated with CVD. Interviews were conducted to gain insights and experiences on the determinants of CVD. The collected data was supplemented with information from government R&D databases.

Findings: The study findings indicated that market dynamics, strong R&D infrastructure, technological expertise, product awareness, and supportive government regulations are crucial determinants of CVD among researchers, innovators, and techno-business firms. To overcome CVD, the study proposes developing financial systems, encouraging partnerships/collaborations, facilitating globalization, and establishing R&D infrastructure.

Originality: This study makes theoretical and policy contributions by highlighting the determinants of CVD. _The study also proposes an intervention framework at the policy, firm, and market levels. Ultimately, this study presents a solution that can be implemented by firms to improve the benefits of innovative technology and product development for commercial gain and overall economic growth.

Implication: Bridging CVD hinges on sustainable financial systems, effective partnerships/collaborations, strong global linkages, and availability of R&D infrastructure. This will generate transformational development by increasing industrial output and strengthening linkages between researchers, innovators, and the private sector.

Keywords: commercialization valley of death, innovators, researchers, techno-business firms, Uganda.

SUB THEME SEVEN: NATURAL RESOURCES MANAGEMENT AND FOOD SECURITY

Incidence, Severity and Farmers' Knowledge in Management of *Alternaria* blight of Sweet potato in Uganda

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Uganda is the largest producer of sweet potato in Africa. The crop is affected by several biotic or abiotic constraints, among which *Alternaria blight* disease is included. A field survey to assess the disease was carried out in 16 major sweet potato growing districts of Uganda. Hierarchical sampling was used to establish the incidence and severity using a scale of 1-9 where 1 = no symptoms and 9 = very severe damage in all regions and districts.

A total of5 Samples from each farmer's field were collected and documented. Data was documented on three categories of sweet potato varieties,1) local, 2) released 3) to determine the mean incidence and severity in the different districts. A total of 450 Alternaria isolates were collected from leaves and vines with known symptoms of the disease, and were cultured and characterised at the Pathology Laboratory at the National Crop Resources Research Institute (NaCRRI).

The highest mean disease incidence index of the disease was observed in Mpigi district (58.3 %) followed by Hoima (48.6%). Moderate disease incidences were recorded in Wakiso (46.7 %), Kabarole (42.4%), and Mubende (40.6%), and the lowest disease incidence was recorded in Kumi (0 %), Soroti (0.7%), and Bushenyi (0.7%).

The high severity score in the central and eastern regions ranging from 3-7 was attributed to the peak cropping season while Kumi, Soroti, and Bushenyi had low incidence. It was discovered that some districts widely grew released varieties in comparison to the local varieties, and also unknown varieties were being grown in the different regions surveyed. The difference in disease incidence between districts was partly attributed to the cropping pattern, crop growth stages, differences in weather patterns, and lack of good agronomic practices (GAP) on the crop that promote the development and virulence of the pathogen. Variations in prevalence, incidence, and severity of the Alternaria blight disease in the sweet potato growing areas of Uganda suggest that the disease is a major threat to production. This supports the need to develop varieties that withstand the disease to complement the use of clean planting materials.

Keywords: Sweet potato, Incidence, Severity, Alternaria blight, varieties.

Effects of Acute Gamma Irradiations on Cassava Tissue Types of Selected Ugandan Cassava Genotypes

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Induced mutagenesis (IM), using acute gamma irradiations (AGI), has facilitated generation of new varieties that can withstand abiotic and biotic stresses. The exposure of in vitro totipotent/embryogenic tissues such as in vitro nodal cuttings (ivNC), shoot apical meristems (SAMs) and friable embryogenic callus (FEC) of cassava to different doses of acute gamma irradiations, has resulted in generation of non-chimeric mutant plants. However this has not been demonstrated for Ugandan cassava genotypes. The study focused on understanding the effects of the AGI doses on the ability of the different tissues to regenerate into plants.

The ivNCs of nine genotypes (Alado, NASE 13, NASE 19, NAROCASS1, CV-193, CV-98/0505, CV-60444, BAO and control Ubi Putih) were exposed to acute gamma irradiations of six different doses (0, 5, 10, 15, 20, 25, 35) Gy. The SAMs of two genotypes (Alado and NASE 13) were subjected to the same (0, 5, 10, 15, 20, 25, 35) Gy. FEC of two genotypes (NASE 13 and NAROCASS 1) were exposed to (0, 10, 20) Gy. Ten explants were established per genotype per irradiation dose for ivNC and SAMs, while 10 clusters of FEC were set up for each genotype and irradiation dose.

The results indicate that different tissue types respond differently to similar doses. The SAMs and ivNC that were exposed to AGI ranging from 5 to 15 Gy were able to regenerate as noted by the number of roots, shoots, leaves and the shoot length while exposure to ranges of 20 to 35 Gy did not permit growth in SAMs and ivNC. For ivNC, NASE 19 and NAROCASS 1 performed better than the 7 genotypes while for SAMs, Alado outperformed NASE 13. For FEC, 20 Gy of NAROCASS 1 performed better than 10 Gy, while NASE 13 did not respond. The findings imply that the regenerated tissues have the potential of giving rise to new varieties.

Keywords: cassava genotypes, tissue types, acute gamma irradiations, regeneration

Identification of Genomic Regions for Traits Associated with Flowering in Cassava (*Manihot esculenta* Crantz)

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Flowering in cassava (*Manihot esculenta* Crantz) is crucial for the generation of botanical seed for conventional breeding. However, genotypes preferred by most farmers are erect and poor at flowering or never flower. To elucidate the genetic basis of such a flowering behaviour, 293 diverse cassava accessions were evaluated for traits associated with flowering at two locations and seasons in Uganda. Genotyping using the Diversity Array Technology Pty Ltd. (DArTseq) platform identified 24,040 single-nucleotide polymorphisms (SNPs) markers distributed on the 18 cassava chromosomes.

Analysis of genetic relatedness among study accessions using principal components (PCs) showed three population subdivisions. Linkage disequilibrium (LD) estimation revealed close association between causal genes and the traits associated with flowering. Polymorphism information content (PIC) and minor allele frequency (MAF) were 0.25 and 0.23, respectively, indicating good quality of SNPs.

A genome-wide association study (GWAS) analysis uncovered 53 significant marker–trait associations (MTAs) with flowering-associated traits involving 27 allelic positions. Two SNPs (S5_29309724 and S15_11747301), were associated with all the traits. Using five of the 27 SNPs with a Phenotype_Variance_Explained (PVE) ≥ 5%, 44 candidate genes were identified in the peak SNP sites located within 50kb upstream or downstream, mostly associated with branching traits. Eight of the genes, orthologous to *Arabidopsis* and other plant species, had known functional annotations related to flowering, e.g., *eukaryotic translation initiation factor* and *myb* family transcription factor. This study identified genomic regions associated with flowering-associated traits in cassava, and the identified SNPs can be useful in marker-assisted selection to overcome hybridization challenges, like unsynchronized flowering, and candidate gene validation.

Keywords: flowering traits; first branching; branching levels; flowering behaviour

Farmers' Management Practices on GHG Emissions from Paddy Rice Field in Eastern Uganda

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Global warming is the biggest threat to crop and livestock production across the planet Crop and livestock farming are the major causes of higher concentration of greenhouse gases in the atmosphere, which turn into global warming. Agriculture plays a vital role in the economy of Uganda, with paddy rice and livestock farming being significant contributors. However, the environmental impact of these agricultural activities, particularly their greenhouse gas (GHG) emissions, has gained increasing attention in the context of climate change mitigation and sustainable development.

This study aims at identifying management practices and how they are associated with greenhouse gases emission from agriculture taking into account paddy rice farming. To achieve this; a comprehensive approach will be employed, combining exploratory surveys and farm visits. Data will be collected from representative farmers in the Eastern Uganda region, covering a range of management practices and climate conditions. Specific attention will be given to practices such as rice cultivation methods, alternate wetting and drying (AWD), livestock feeding strategies, manure management, dietary modifications for livestock to reduce enteric fermentation emissions.

Data will be analysed using R Statistical Software. Using the analysis of variance (ANOVA), the comparison of means for the respective treatments, factorial analysis, the least significant difference (LSD) will be used at p= 0.05 significant level. The results of this study will be shared by policy makers and other stakeholders including; farmers, extension agents and scientists to help in tackling the issue of increasing greenhouse gases emissions from agriculture.

Keywords: agriculture, greenhouse gas emissions, paddy rice, management practices, Eastern Uganda, sustainability

Increased Thermoregulatory Sensitivity to Chlorpyrifos in Bank Voles, *Myodes Glareolus*, Selected for High Metabolic Rate

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Chlorpyrifos (CPF), a commonly used insecticide, alters thermoregulation in rodents. Though wildlife species greatly vary in metabolic rates, how such a variation modifies severity of CPF effects is not clearly understood. High metabolic rates can either lead to faster bio activation of CPF, increasing severity or accelerate detoxification and elimination, decreasing severity.

The above predictions were tested in bank voles artificially selected for high swim-induced aerobic metabolism (A) and randomly bred Control lines (C) which had about 50 and 20% variation in maximum and basal metabolic rates respectively. Voles were surgically implanted with miniature temperature data loggers in the peritoneum. In experiment I (n=64, generation 14), voles in the CPF0 group were administered rapeseed oil. The CPFT group voles received 11mgCPF/kg for 4 consecutive days and 22mgCPF/kg on the fifth day. Body temperature was logged for 5 days at 5 minute intervals and body mass taken daily. In experiment II (n=88, generation 18), a single exposure to 22 mgCPF/kg (CPFT) or oil (CPF0) was made and body temperature was logged for 4 days at 2 minute intervals. Three-hourly average body temperature (T_b°C), minimum body temperature (T_{bmin} °C) and time (*t* minutes) to reach T_{bmin} were analysed.

Repeated 4-day CPF exposure at 11mg/kg lowered T_b only at 15-18 hours after exposure (CPFT: 37.98 ± 0.08 °C, CPF0; 38.21 ± 0.08 °C, $F_{(1,50)}$ = 5.3, $p=0.025$). The Treatment by Linetype interaction was not significant ($p=0.394$). Age significantly predicted body mass ($F_{(1,79)}$ = 8.0, $p=0.006$) but age-independent body mass did not vary with repeated treatments (CPFT: 22.6 ± 0.5 g, CPF0: 23.5 ± 0.5 g, $F_{(1,4)}$ = 3.0, $p=0.157$). On the fifth day, a dose of 22 mgCPF/kg lowered T_b (CPFT: 37.65 ± 0.09 °C, CPF0: 38.02 ± 0.09 °C, $F_{(1,26)}$ = 13.6, $p=0.001$) for 15 hours. The Treatment by Linetype interaction was significant; the reduction was higher in selected than control voles but in the CPFT group ($p=0.026$). CPF exposure also led to reduced T_{bmin} ($p<0.05$) for 12 hours. At peak reduction, T_{bmin} of voles in the CPFT group was 0.77°C lower than that in the CPF0 group (CPFT: 36.86 ± 0.12 °C, CPF0: 37.63 ± 0.13 °C, $F_{(1,37)}$ = 22.0, $p<0.0001$). The Treatment by Linetype interaction was not significant. No effect of Treatment on *t* was observed. Body mass at first treatments significantly predicted final body mass ($F_{(1,170)}$ = 462.2, $p<0.0001$) but age did not ($F_{(1,32)}$ = 0.78, $p<0.385$). Final body mass independent of body mass at first treatments was low in the CPFT group (CPFT: 22.5 ± 0.2 g, CPF0: 23.2 ± 0.2 g, $F_{(1,3)}$ = 13.0, $p=0.042$). No significant interactions were observed. Without repeated exposure, a single dose of 22 mgCPF/kg had no effect on T_b.

Overall, repeated exposure to chlorpyrifos lowers body temperature and body mass. The magnitude of lowered body temperature increases in individuals who inherit high metabolism. Though effects are non-lethal, occupation of colder habitats and genetic fitness especially during wet and cold season may be reduced, negatively impacting wildlife biodiversity.

Keywords: Metabolic rate, Chlorpyrifos, thermoregulation, Bank voles.

Effect of Natural Ventilation on Air Quality of Residential Buildings in Kampala City, Uganda

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This study underscores the importance of addressing indoor air quality in low-income settlements to safeguard the health and wellbeing of occupants. Indoor environmental quality is critical for new and existing buildings as it greatly influences occupants' health, comfort, and productivity. It comprises four main environmental categories: thermal comfort, indoor air quality (IAQ), lighting, and acoustics. Poor indoor air quality, often resulting from the build-up of airborne contaminants, poses health risks to occupants, leading to Building-Related Illnesses (BRI) or Sick Building Syndrome (SBS).

Ventilation is crucial in improving IAQ by introducing fresh outdoor air and diluting indoor pollutants. In low-income settings of Kampala City, indoor air quality is compromised by high rates of outdoor air pollution, overcrowding and inadequate building ventilation since most residences rely on passive systems like air vents and windows. The limited vegetation cover, high vehicular population, and unpaved roads further worsen indoor and outdoor air quality challenges in Kampala's settlements.

The increasing use of louvers and overcrowding in most urban households prompted this study. The study will use standardised questionnaires to gather demographic and subjective air quality data, including perceptions of air freshness, overall satisfaction with the air quality, and occupant opinions about household air quality conditions. Meanwhile, air quality data loggers will be used to measure air quality parameters such as $PM_{2.5}$, PM_{10}, and CO_2. The research will highlight the inadequacies in Uganda's urban development, characterised by unplanned settlements and inadequate infrastructure. Addressing these challenges aligns with the national development agenda (NDP III) and the Vision 2040 goals of attaining inclusive, productive, and liveable urban and rural areas and improving access to decent housing for socio-economic development, as well as SDGs 3, 9, and 11 of ensuring healthy lives and wellbeing through building resilient infrastructure for safe and sustainable human settlements.

Key words: Natural ventilation, Air quality, Residential buildings, Uganda

Effect of Ultra sonication Treatment on Anti-Nutrients in Common Beans

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Common bean is a nutritious crop, rich in proteins, carbohydrates, vitamins and minerals; and is of great importance in Uganda. However, common beans contain anti-nutrients which affect absorption of minerals or impair digestion of proteins. Ultra-sonication is a processing procedure with prospects of reducing anti-nutrients in edible legumes. It has been found to preserve the sensory and functional properties of food.

In this study we aim to evaluate the effect of ultra-sonication processing technology on anti-nutrients in common beans. Sixty common bean genotypes will be divided into two portions. One will be assessed for concentration of anti-nutrients and the other will be sonicated. Accordingly, 100 g of common bean flakes will be mixed with 500 ml of tap water and the suspension will be sonicated for 15, 30, 60 and 120 sec at an amplitude of 84 µmpp using a Branson 2000 Series bench-scale ultrasonic unit (Branson Ultrasonics Corporation, Danbury, CT, USA). The sonicated common bean flakes will thereafter be assessed for concentration of anti-nutrients. Findings from this study will be key for processors who produce ready to eat products from common beans and will add to the general knowledge available on ultrasonication food processing technology.

Keywords: common bean, anti-nutrients, ultra-sonication, nutrition

Constraints and Impact of Adoption of Improved Robusta Coffee Varieties on Profitability and Welfare of Smallholder Farmers in Uganda.

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For over a decade, the Uganda government has been investing in development of improved Robusta coffee varieties, primarily to boost production. However, the rate of adoption of the improved varieties is about 5%. The majority of farmers continue producing traditional varieties that annually yield about 500 kg of clean coffee per hectare per year, compared to the improved varieties which yield close to 5,000 kg per hectare per year. The low productivity jeopardises coffee profitability, undermines household welfare; and threatens Uganda's aspiration to rapidly raise annual coffee exports to 20 million 60-kg bags by 2025.

Nonetheless, studies are still inconclusive on constraints to adoption; the effect of the sub-optimal adoption on coffee profitability; and the impact of improved Robusta coffee on the welfare of smallholder farmers. No evidence has been found to show that any empirical study has jointly focused on the link between adoption of improved Robusta coffee varieties with profitability and household welfare among smallholder farmers in Uganda using panel data.

Using computer software STATA version 15, Statistical and econometric methods will be applied to quantitatively analyse five waves of the Uganda National Panel Survey (UNPS) data. A Random Effects Tobit Regression Model will be used to determine constraints to adoption of improved Robusta coffee varieties. A translog production function will be applied to determine profitability of improved Robusta coffee varieties. Fixed effects and random effects regression models will be applied to analyse the impact of improved Robusta coffee varieties on household welfare. It is hoped that the research will generate policy recommendations that foster adoption; positively impact profitability of improved Robusta coffee varieties; promote household welfare and contribute knowledge towards Uganda's attainment of both the middle-income status and Sustainable Development Goals.

Key words: Adoption; Robusta coffee; smallholders; Uganda.

Towards a Framework for Assessing the Effectiveness of Epapers in the Ugandan Press

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Available research reveals that newspapers globally have succumbed to political economy shocks and digital media technologies, such as social media. Some scholars predict doom for the newspaper industry, especially the demise of print newspapers, due to threats posed by online platforms, news aggregators like Google, falling print-circulations, and alternative/online news sources. In countries like Uganda, newspaper circulations have fallen since 2010 and several newspapers have digitalized in form of online news versions and ePapers in order to reach wider audiences. However, we lack an appropriate framework for assessing the contribution of digitalisation, specifically ePapers, to print media industry.

To fill this gap, I develop a framework for assessing the effectiveness of ePapers drawing from Technology Determinism, the Social Shaping of Technology and Critical Political Economy theoretical resources. I propose three parameters for this assessment: (a) Sustaining Traditional Media Roles articulated in the Fourth-Estate perspective; (b) Readership; and (c) Revenue and Profit Generation. Under each parameter, I propose indicators. In sustaining traditional media Roles, the indicators are: Provision of access to information education to readers and facilitating Accountability demands. By readership parameter, I propose indicators as new ePapers subscribers, actual readership for ePaper non-subscriber audiences and Cross-references for ePapers. Under the Revenue Generation parameter, I propose Revenues collected from ePaper online advertising, ePaper online subscriptions or readerships and Changes in both subscriber and advertisement revenues over time as indicators. I further propose the framework's possible empirical testing in media studies using a mixed methodological approach.

Keywords: newspapers, epapers, digitisation, digital media, Uganda

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