THE FIRST ANNUAL CONFERENCE ON EMERGING & RE-EMERGING INFECTIOUS DISEASES IN AFRICA

Date: 13th -14th September 2023

Blended Venue:

Physical

&

Online: zoom call

Prepared By

IDEA FELLOWSHIP PROGRAM

MBALE, EASTERN UGANDA

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Executive Summary

This report presents an account of the "First Annual Conference on Emerging and Re-Emerging Infectious Diseases in Africa (ACERIA Conference)" convened from 13-14 September 2023 at the Mbale Clinical Research Institute (MCRI) in Eastern Uganda. This activity was funded by EDCTP-2, (**Grant No: CSA2020E-3126**) for a training program in Infectious Disease Field Epidemiology and Biostatistics in Africa (IDEA Fellowship). The vision of the IDEA fellowship is to develop a critical mass of field epidemiologists in Africa equipped with the necessary knowledge, skills, and competencies in early recognition, surveillance, control, and prevention of emerging and re-emerging infectious diseases in Africa. The first ACERIA Conference aimed to bring together experts, researchers, and stakeholders from various fields, including industry and academia, to equip participants with the knowledge and skills to effectively identify, study, communicate, manage, and prevent emerging and resurging infectious diseases in the region.

The first ACERIA Conference held in September 2023 at the Mbale Clinical Research Institute [(MCRI); www.mcri.ac.ug] in Eastern Uganda, was a significant gathering of professionals dedicated to addressing pressing health challenges. The attendees represented a diverse spectrum of expertise and backgrounds, emphasizing the multifaceted nature of the challenges at hand. The **experts** who made presentations provided insights into the current challenges, solutions, and future directions in the realm of infectious disease control. **Researchers** were another prominent category of attendees. Their role was pivotal as they presented their research findings, shared new knowledge, and collaborated with peers in infectious diseases. Their contributions underscored the importance of evidence-based approaches in addressing health challenges continent on infectious diseases. The conference also saw participation from **stakeholders** like governmental bodies, NGOs, and their organizations. From stakeholders came a broader perspective emphasizing the societal, economic, and political dimensions of the infectious disease challenge. Their presence highlighted the interdisciplinary nature of the challenge and the need for a cohesive and collaborative approach.

The conference was organized around the central theme of "Enhancing Stakeholder Engagement and Public Awareness in Emergency Outbreaks." This theme underscored the importance of collective action, public awareness, and collaboration in addressing the challenges posed by infectious diseases. The conference was structured around several subthemes, including:

    I.   **Emerging and Re-emerging infections**
    II.   **Detection of outbreaks**
    III.   **Risk communication**

These subthemes provided a structured approach, allowing participants to explore each area in depth, share insights, and collaborate on potential solutions. Various presentations and sessions were organized, covering a range of topics from infectious disease trends to capacity-building initiatives. Notable entities and initiatives, such as the IDEA Fellowship Programme, were highlighted, emphasizing collaborative and structured approaches to capacity building and knowledge sharing.

The conference also acknowledged and appreciated the contributions of various institutions and stakeholders, including Busitema University, Mbale Clinical Research Institute, Infectious Disease

Institute, the Open University-UK, Uganda National Institute of Public Health (UNIPH) and others. Their support and collaboration were instrumental in the success of the conference.

This was a two-day conference with a total of 150 participants from academia, policy makers and other agencies.

During the conference, there was unanimous agreement on; Firstly, the importance of a multi-disciplinary approach to confront the challenges of emerging infectious diseases. Collaboration among government, academia, healthcare, and civil society is essential for resource sharing and expertise exchange. Secondly, underscoring the role of public awareness with specific strategies such as community outreach programs and the strategic use of digital media being extolled as instrumental for public education and engagement on infectious diseases. Data's crucial role in outbreak management highlighted and emphasis on real-time data, predictive modeling, and Bayesian methods for timely and effective responses was key to note.

Geospatial analysis was highlighted too. It was viewed as an emerging tool for the mapping of disease patterns and the identification of risk factors thereby offering a data-centric avenue for targeted intervention strategies. Resource allocation was another major point of discussions with a call for focused investment in research and development, particularly in the areas of diagnostics and therapeutics for infectious diseases. Lastly, ethical considerations were brought to the fore, especially regarding data privacy and the responsible use of health data.

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Background

Emerging and Re-Emerging Infectious Diseases (EREIDs) are a new health challenge worldwide. Over the course of the 20th century, significant reductions in the prevalence of infectious diseases were observed due to improved global sanitation, housing, personal hygiene, antiseptics, vaccination, and antibiotics. However, the evolution of Infectious agents and environmental changes drive new and resurgent diseases. This conference was aptly timed and aimed at bringing together a wide array of experts from academia, industry, and research institutions to discuss and deliberate on this pivotal subject.

The inaugural IDEA Conference provided a multi-and-inter disciplinary platform for scholars, healthcare professionals, and stakeholders to discuss, strategize, and formulate action plans to improve public awareness and emergency responses.

Objectives
1. **Insight into EREIDs**

   To deepen the understanding of Emerging and Re-Emerging infections, their detection, nature of outbreaks and their control.

2. **Stakeholder Engagement**

   To enhance the collaboration between diverse stakeholders ranging from Epidemiology fellows to international experts aiming for a more coordinated response to EREIDs.

3. **Networking and Collaboration**

   Offer a platform for participants to network, collaborate, and explore potential partnerships with frontline organizations responding to EREIDs.

4. **Effective Communication**

   To discuss and propagate effective strategies for communicating risks, primarily leveraging the potential of social media.

The two-day conference featured a series of presentations, keynote addresses, and discussion sessions meticulously planned and executed to achieve the conference objectives.

Day 1. September 13th 2023: Summary and Insights

TIME (24 HOURS)	SESSION	RESPONSIBLE
14:00 - 14:03	Welcome Address by IDEA Patron	Professor Peter Olupot-Olupot

14:04 - 14:10		Official Opening of the Scientific Conference	Professor Paul Waako
14:11 - 14:15		Keynote Address	Dr. Alex Ario
14:16 - 14:40		Presentation on Capacity Building	Professor Peter Olupot-Olupot
14:41 - 14:55		Ebola	Professor Sam K. Hunter
14:56 - 15:10		Ebola	Dr. Jonathan Izudi
15:11 - 15:25		Ebola	IDEA Secretariate
15:26 - 15:30		Coffee Break	-
15:31 - 15:45		Marburg	Dr. Luke Nyakarahuka
15:46 - 06:00		Cholera pathogenesis and vaccine development including recent trial results	Professor Matthew K. Waldor
16:01 - 16:15		Epidemiology and public health responses	Professor Louis H. MD
16:16 - 16:30		Malaria	Dr. Natuminda Rogers
16:31 - 16:45		Polio	Dr. Tumwebaze Mathias
16:46 - 17:25		Q & A, Discussion, and the way forward	IDEA fellows

17:26 - 17:30		Closing Remarks	Professor Peter Olupot-Olupot

1. Vice Chancellor's Opening Remarks Summary

On September 13, 2023, the Vice Chancellor of Busitema University expressed gratitude for the personal touch that the gathering brought to the IDEA Conference. Held in collaboration with the Mbale Clinical Research Institute (MCRI), the conference aimed to discuss and address infectious diseases, their impact, and solutions for Uganda and beyond. The Vice Chancellor mentioned the significant contributions of the Ministry of Health, WHO, CDC, and other critical stakeholders towards this cause. The Vice Chancellor emphasized the importance of the event, noting it as a crucial platform for sharing knowledge on infectious diseases. Recognizing the presence and contributions of esteemed professionals, he lauded the IDEA Fellowship Program, led by MCRI for being an essential framework that promotes shared knowledge on emerging and re-emerging infectious diseases in Africa. The program's primary goal is to create a network of African experts who can contribute to the well-being of communities. Furthermore, he highlighted the significance of partnerships, emphasizing collaborations with renowned institutions such as IDI, CDC, Busitema University and the Open University This partnership, he believes, offers unique insights and opportunities to researchers and health workers in Uganda. In addition, the Vice Chancellor stressed the importance of understanding global trends related to infectious diseases. By doing so, the academic and research community can offer more effective strategies and solutions. He advocated for a data-driven approach to address challenges and praised the efforts of local and global professionals who provide continuous advancements in research and application. Lastly, he recognized the dedication of IDEA fellows, who consistently push for advancements in infectious diseases research and innovation. Their collaborative efforts significantly impact the health of the Ugandan community. As he concluded, the Vice Chancellor expressed hope for a successful conference and looked forward to the insights and discussions it would foster.

2. Keynote Address by Dr. Alex Ario

On September 13, 2023, Dr. Alex R. Ario from the Uganda National Institute of Public Health delivered a keynote address on emerging and re-emerging infectious diseases. The address emphasized the decline in infectious diseases observed in the 20th century, largely due to improved sanitation, housing, personal hygiene, antiseptics, vaccination, and the introduction of antibiotics. Despite these advancements, infectious diseases remain a significant cause of death worldwide, particularly in developing nations. Over the past fifty years, 30 new diseases have emerged, with a notable number (11 viruses and bacteria) being first discovered in Uganda. Alex highlighted the emergence of new infectious diseases, the re-emergence of former ones, and the persistent challenge posed by intractable diseases. The presentation also defined Emerging Infectious Diseases (EIDs) as newly identified or previously unknown agents causing public health issues, and Re-Emerging Infectious Diseases (Re-EIDs) as diseases that once posed significant health problems but declined, only to show current upward trends in incidence or prevalence. Notably, the talk showcased various infectious diseases discovered in Uganda and global examples. The presentation included statistics on major infectious disease outbreaks between 2002 and 2020 and discussed the occurrence of over 100 public health events annually in Africa. The global trends of EIDs were also elaborated, providing insight into the evolving landscape of infectious diseases.

3. Presentation on Capacity Building by Professor Peter Olupot-Olupot

He highlighted that the IDEA (Infectious Disease Epidemiology: The IDEA Fellowship Programme) initiative is a concerted effort aimed at capacity building in the realm of infectious disease epidemiology and biostatistics. Led by Professor Peter Olupot-Olupot, this program is a collaborative venture with a host of institutions, including the Uganda National Public Health Institute, Uganda National Health Laboratory & Diagnostic Services, Uganda Virus Research Institute, Mbale Clinical Research Institute, Infectious Diseases Institute, Ministry of Science, Technology & Innovation, and The Open University. A prominent concern that this program addresses is the evident capacity gap in Sub-Saharan Africa (SSA). Key challenges include the lack of an adequate evidence-base for responses to EREIDs, the current non-degree/non-career FETP, fragmented initiatives, and challenges in adhering to the WHO International Health Regulations Standards. The overarching vision of the IDEA Fellowship Programme is to fortify capacity building in infectious disease field epidemiology through pragmatic fellowship training. This mission aligns seamlessly with the mandates of the consortium institutions, encompassing various domains like research, public health surveillance, and diagnostics. The program emphasizes several core elements: promoting innovations, propagating research training, steering field training, orchestrating research, and ensuring efficient capital investment and research funding management. Furthermore, infrastructure, inclusive of equipment and staff, plays a pivotal role, with collaborative institutions providing the necessary support. The prime objective of the IDEA initiative within the program is to train specialists in Infectious Disease Field Epidemiology and Biostatistics, focusing on both knowledge enhancement and competence development. Additionally, the program aims to spearhead leadership in infectious disease surveillance, outbreak investigations, and leveraging emerging data for outbreak responses. Justifying the inception of this program, the MSc. IDE is shaped by the capacity gaps in responding to infectious diseases. There is a tangible dearth of specialists in the arena of disease outbreaks of public health importance and epidemic potential in Uganda and SSA. This program, therefore, not only fills this void but also introduces a well-defined career path in infectious disease field epidemiology for the country and SSA as a region. The structure of the program is also worth noting. Spanning two years (2 semesters equating to 17 weeks), it culminates in a mid-level career fellow earning a Masters. With a total of 15 students admitted, the progress has been satisfactory. The program entails diverse training modules, encompassing theoretical knowledge and real-world projects on diseases like COVID-19, Ebola Virus Disease, and Malaria, among others. The IDEA Fellowship Programme embodies a strategic and comprehensive approach to bridging the capacity gaps in infectious disease epidemiology in SSA. With a collaborative spirit, strategic partnerships, and a well-defined curriculum, it stands as a beacon of hope for strengthening public health responses in the region.

4. Sessions on Ebola by Professor Sam Okware

The presentation, titled "Emergency Preparedness: Experiences in managing Ebola 2000-2022", was delivered by Prof. Sam Okware, affiliated with the Uganda National Health Research Organization. The focus was on community engagement strategies in controlling Ebola outbreaks in Uganda from 2000 to 2022. The presentation provided an outline of the Sudbury virus (SUDV), discussing its transmission, clinical features, community-based strategies, challenges faced, best practices, and concluding remarks. Updated statistics about the Ebola outbreak were presented, followed by a deep dive into the transmission of SUDV, featuring illustrations detailing the presumed life cycle of Ebola. The presentation also highlighted various viral haemorrhagic fevers, with a specific emphasis on Ebola cases in Uganda between 2000 and 2022, which were

presented in tables and mapped visuals. Data on the distribution of symptoms and the sex distribution of Ebola cases in Gulu district in 2000 were graphically represented. The latter part of the presentation emphasized the national response to the Ebola outbreak, detailing community engagement strategies, community health system structures, and administrative coordination at both the political and community levels. The session culminated with an overview of the surveillance flow chart, illuminating the process of Ebola monitoring and response.

5. Sessions on Ebola: Professor Paul R. Hunter

Ebola, as elucidated by Professor Pauline from the Norwich Medical School, has garnered attention as a disease that has both emerged and re-emerged over time. Classified alongside Marburg and COVID-19, Ebola is a filamentous, negative-sense RNA virus. Patients infected with Ebola undergo an incubation period of 2-21 days, after which they may present with a range of symptoms from fever and fatigue to chest pain and sore throat. Alarmingly, the mortality rate associated with this disease fluctuates between 25% to 90%. Geospatial analyses have pinpointed Sub-Saharan Africa as a hotspot for outbreaks, with the transmission cycle involving fruit bats as the primary reservoir, and primates acting as intermediary hosts. In the battle against this potent disease, significant strides have been made, as showcased by the development of vaccines detailed in PLOS PATHOGENS. The urgency of the situation was evident when trial candidate vaccines made a record arrival in Uganda shortly after an outbreak. This swift response was a result of increased research efforts, particularly in the West African epidemic, driven by concerns for affected communities. However, managing the disease's spread isn't without challenges. For instance, while the World Health Organization recommends isolating areas used by Ebola patients for a minimum of 4 weeks, guidelines about managing pit latrines, a common sanitation solution, remain intricate. Diagnostics have also evolved, with the Polymerase Chain Reaction (PCR) method being employed to detect the virus, but it's worth noting that not all PCR detections guarantee the presence of an infectious agent. Further, as researchers continue to dive deep into understanding the disease, computational regression models have been developed to predict virus interactions, especially in bat populations. This knowledge is imperative as the scientific community aims to better understand risk factors and transmission avenues. He concluded that, while Ebola remains a persistent threat with the potential for future outbreaks, advancements in research, diagnostics, and prevention, such as vaccine development, are paving the way for better outbreak management and containment.

6. Sessions on Ebola: Dr. Jonathan Izudi

The presentation provides a comprehensive overview of the Ebola incidence and mortality in Uganda before and during a lockdown in 2022. Highlighting the background, EBOD, characterized as a filamentous negative-sense RNA virus, showcases an alarming lethality with an annual average of 31 cases and 21 resultant deaths. To understand this scenario better, data was sourced from EBOD situation reports. These reports relied on on-site sampling and diagnosis techniques, specifically using PCR diagnostic tests. As a countermeasure to the spread, Uganda implemented a stringent lockdown, characterized by travel restrictions, mass gathering bans, and enhanced surveillance. However, these measures, though essential, brought forth various challenges. The data, both cumulative and segmented over the last three weeks, depicts the disease's progression in Uganda and specific areas like Kasese. An important observation is that despite the lockdown's introduction, EBOD incidence didn't show a decline in the initial 3 weeks, pointing towards inherent challenges like the difficulty in ensuring effective social distancing. In terms of actionable insights, the study underscores the significance of continuous public space interventions. Such interventions primarily involve regular cleaning initiatives and focused

distribution of hygiene products like soap. Moreover, considering the broader public health landscape, there's a need to bolster health communication strategies and foster deeper research to understand and counter EBOD more effectively in the Ugandan context.

7. Sessions on Marburg: Dr Luke Nyarakahuka

The presenter gave, a comprehensive review on the Marburg virus disease outbreak, its investigations, and research primarily in Uganda was presented. The presentation delved deep into various facets of the Marburg virus, including its biological attributes and impact. The virus, which causes Marburg Hemorrhagic Fever, was elaborately detailed, showcasing its morphology and genetic makeup. The presentation delineated the spatial distribution of the outbreaks in Uganda by years, offering a geospatial analysis of the affected regions. This was backed by a thorough breakdown of clinical symptoms associated with the Marburg virus, which ranged from mild symptoms like fatigue to more severe ones, such as hemorrhaging. A significant portion of the session was dedicated to phylogenetic analysis, which traced the evolutionary history of the Marburg virus. Next-gene sequencing of known Marburg virus strains was also discussed, highlighting the genomic differences and similarities amongst them. The presenter shed light on the ecological findings related to the virus, with specific emphasis on the role of bats as a natural reservoir. This was accompanied by images of bats and the habitats they frequent, underscoring their epidemiological significance in the spread of the virus. Outbreak investigation highlights were enumerated, revealing the challenges faced and the methodologies employed during these investigations. These included risk factor assessments and contact tracing. The presenter shared some intriguing findings on the ecology of the Marburg virus, suggesting a close relationship between its spread and certain ecological factors. Furthermore, the presentation moved into more specific case studies, like the one in Kween, where the efficacy of different interventions was assessed. Data pertaining to bat studies was also shared, underscoring their significance in the spread of the virus. In one of the slides, a visualization of disease patterns was seen, possibly leveraging a combination of clustering and geospatial analysis. The discourse concluded with acknowledgments, expressing gratitude to various contributors and collaborators. This comprehensive overview not only enhanced the audience's understanding of the Marburg virus but also showcased the multi-disciplinary approach needed to tackle such outbreaks. It was evident that the presenter's data-driven methodologies, combined with a rigorous scientific approach, played a pivotal role in the insights shared.

8. Session on Cholera Pathogenesis and Vaccine Development by Professor Matthew K. Waldor

He highlighted that "PanChol," is a novel live-attenuated cholera vaccine being developed in collaboration with the Brigham and Women's Hospital and Harvard Medical School. The primary objective behind PanChol is to address the limitations observed in current oral cholera vaccines (OCVs). Present OCVs like Shanchol and Euvichol offer protection through immunization but have several constraints like limited efficacy in young children, requirements for multiple doses, and a short duration of protection. Vibrio cholerae, the causative agent of cholera, is a Gram-negative bacterium with two serogroups of concern. The OCVs have primarily targeted these serogroups. The PanChol vaccine has been derived from a virulent parent strain, with specific genetic alterations to make it a thermostable strain. This feature is crucial as it offers advantages like a reduced cold chain dependence, which can be logistically challenging in certain endemic regions. Epidemiologically, cholera is a major concern in regions with high transmission, and several outbreaks have been reported. It's essential to note that the infection leads to long-lived immunity. A significant feature of PanChol is its ability to colonize the intestine without causing

disease, making it a potential solution for rapid protection against cholera. This "dual-acting" OCV offers both rapid protection from colonization and disease and long-term immune protection. Pre-clinical data indicates that PanChol provides unparalleled rapid "point-like" protection against cholera. It is poised to mediate proactive vaccination campaigns, especially in high-risk zones. The vaccine's development has reached a stage where it's undergoing the Wellcome Trust funded Phase I trial. This trial aims to assess the safety and immunogenicity of PanChol across multiple doses. The results, up to the provided data point, show no reactogenicity with 100% seroconversion across all doses. Looking forward, there's a laid-out development plan for PanChol. The immediate steps include finalizing the manufacturing protocol, possibly leading to a lyophilized or better product, and initiating small phase tests to ascertain the safety of the final drug product. Another critical aspect is developing PanChol for heterologous vaccine antigens to enhance the immune response. The broader goal is to position PanChol not just as a solution for cholera but as a platform for delivering other antigens to the intestine, further cementing its potential in the realm of vaccine development. He concluded that PanChol promises a revolutionary approach to cholera vaccination. Its unique features, coupled with rigorous development plans, place it as a potential frontrunner in the fight against cholera and possibly other diseases. The research underscores the significance of continuous innovation in biomedical research, especially when addressing global health challenges.

9. Session on Epidemiology and Public Health Responses by Professor Louis Ivers.

She highlighted the following key points Cholera remains a major public health concern globally, with specific areas, especially in Africa and Asia, being profoundly affected. The transmission of cholera involves a complex interplay of environmental and human factors, making its control a multifaceted challenge. Since 2021, there has been a noticeable upsurge in cholera cases, with countries like the Democratic Republic of Congo and Haiti bearing a significant burden. Geographical analysis from the slides indicates that cholera's presence in South East Africa and the cumulative cases from Haiti between 2010 to 2023 have been particularly concerning. One of the emerging considerations is the role of climate change, which increases cholera exposure and vulnerability. The slides present data linking climate patterns to the spread and severity of cholera outbreaks. Additionally, socioeconomic factors play a crucial role in cholera vulnerability. There's a noticeable connection between poverty levels and susceptibility to cholera, as shown in the scatter plot. A similar link exists between food insecurity, especially in regions like Haiti, and cholera risk. The challenges posed by water insecurity further complicate the issue. To address cholera's challenge, a roadmap has been proposed. This involves systematic steps to control and prevent the spread of this disease. The effectiveness of available cholera vaccines is also highlighted, providing a glimmer of hope in the fight against cholera. One of the noteworthy initiatives in this battle is the Zanmi Lasante project, targeting cholera-affected areas. Lastly, the fight against cholera is not isolated. It is intrinsically tied to broader sustainable development goals, indicating that controlling cholera requires a holistic approach that includes addressing poverty, food security, water accessibility, and climate change. For those looking for deeper insights, the slides provide resources that can furnish further information on this pressing health challenge.

10. Session on Malaria by Dr. Naturinda Rogers

The presentation, led by Dr. Naturinda Rogers from the National Malaria Control Division, highlighted malaria's significance as a re-emerging infectious disease. Historically, malaria has had profound impacts, with suggestions it may have claimed half of all human lives ever lost.

Notably, the 20th century witnessed a 90% decline in global malaria-induced mortality. However, recent data reveal concerning fluctuations in incidence rates, with evident patterns and intensities in disease spread, underscored by geospatial analyses. Several factors contribute to this re-emergence. Biological threats encompass diminished immunity in regions with low endemicity, augmented disease proliferation in particular locales, and the emergence of resistance against drugs among both the plasmodium parasite and its vectors. Socio-economic challenges include constrained health funding spanning individual to global scales, complications arising from population booms and unplanned urbanization, and hurdles in scaling malaria vaccine production and distribution. The disease's spread also seems intertwined with climatic variables, as depicted in charts from 2017 to 2020. Other exacerbating factors include prevailing political unrest, complex emergencies like natural calamities, and faltering health infrastructures. On the vector front, the presentation delves into species-specific dynamics and resistance patterns. The "WHO World Malaria Report 2021" is spotlighted, offering a panoramic view of the global malaria situation. Conclusively, the presentation underscores a multifaceted strategy for disease management. This encompasses bolstered malaria surveillance, behavioral modifications via communication, novel tool development for disease handling, health system fortification, a holistic One Health approach, and assured financing for anti-malaria initiatives.

11. Session on Polio by Dr. Tumwebaze Mathias

The presentation, delivered by Dr. Tumwebaze Mathews, provides an overview of polio, its global eradication progress, challenges faced, and the recommended strategies moving forward. Polio, a highly infectious disease caused by an enterovirus with three serotypes, primarily spreads through the fecal-oral route. Although vaccination offers immunity, protection against one virus type doesn't assure immunity against the others. A small fraction of infected individuals develop paralysis, and the presence of the virus is confirmed through stool samples. In terms of eradication efforts, a strategy outlined in 1988 aimed for global polio eradication by 2000. Key pillars of this strategy include ensuring high routine immunization coverage with the Oral Polio Vaccine (OPV), reducing poliovirus circulation through National Immunization Days, setting up active surveillance systems, and executing mop-up vaccination campaigns. By 2023, there's been significant progress in reducing polio transmission in endemic countries. However, challenges persist. Notably, Vaccine-derived polioviruses (VDPV) have emerged as a concern, particularly in regions with low vaccination coverage. This type of polio arises when the weakened vaccine virus reverts to a more virulent form. Several hindrances impede eradication, such as ineffective polio response campaigns, limited booster effects, and children not receiving adequate vaccine doses. Inefficient surveillance, weak health infrastructure, and societal barriers also play roles in slowing eradication. To address these challenges, the presentation recommends reintroducing the inactivated polio vaccine in all countries, intensifying the search for cases, enhancing collaborative surveillance, and strengthening overall health systems coordination. Ensuring every child receives adequate doses of the vaccine is also crucial.

a. Summary of Discussion Points

- **Emerging and Re-Emerging Infectious Diseases (ERIDs)**: A critical discussion on the necessity for multidisciplinary approaches in tackling ERIDs, emphasizing the role of data-driven methodologies and real-world applications.

- **Capacity Building**: Recognition of the significant capacity gap in infectious disease epidemiology, especially in Sub-Saharan Africa, and the role of programs like IDEA in bridging this gap.

- **Vaccination and Drug Resistance**: Concerns about the efficacy of current vaccines and the emergence of drug-resistant strains.

- **Role of Climate and Socioeconomic Factors**: Acknowledgment of climate change and socioeconomic conditions as significant risk factors for the spread of infectious diseases.

- **Technological Advancements**: Exploration of next-gen sequencing, machine learning algorithms, and PCR in improving diagnostics and surveillance.

b. Key Questions Raised

1. How can data analytics and machine learning be effectively utilized for predicting and managing outbreaks?

2. What are the actionable steps to combat the capacity gap in infectious disease epidemiology in Sub-Saharan Africa?

3. Are current vaccines sufficient, or is there a need for a new generation of vaccines?

4. How does climate change directly affect the prevalence and spread of ERIDs?

5. How do we address the challenges related to data reproducibility and validation in disease research?

6. What are the ethical considerations in data collection and surveillance?

c. Consensus and Action Points

1. **Data-Driven Approach**: Commitment to integrate data analytics and machine learning in epidemiological studies for predictive modelling.

2. **Collaboration**: Strengthening international partnerships for knowledge sharing and capacity building.

3. **Vaccine Development**: Concerted efforts to be made for research and development of more effective vaccines.

4. **Funding and Resources**: Allocation of more resources for research and infrastructure to adhere to WHO International Health Regulations Standards.

d. Closing Remarks: Professor Peter Olupot-Olupot

The inaugural IDEA conference has successfully served as a collaborative platform, bringing together experts, stakeholders, and frontline organizations to deliberate on the pressing issue of Emerging and Re-Emerging Infectious Diseases. The discussions and presentations were rooted in rigorous scientific methods and data-driven approaches, aligning well with the conference objectives. It's evident that tackling ERIDs requires a multidisciplinary approach, encompassing everything from advanced biostatistics to social science. While advancements in technology offer promising avenues for research and treatment, the challenges posed by factors like climate change, social conditions, and limited resources require immediate attention. In closing, this conference stands as a testament to what can be achieved through collective effort and shared expertise. Let us carry forward the insights and action points garnered here to make meaningful strides in the field of infectious diseases. The path ahead is fraught with challenges, but armed with data and collaborative spirit, we are better equipped to face them.

Thank you for your active participation and contributions. We look forward to seeing you in the tomorrow for day 2 of the IDEA conference, where we hope to discuss the progress made on the action points outlined today.

Day 2. September 14th, 2023: Summary and Insights

TIME (24 HOUR)	SESSION	RESPONSIBLE
14:00 - 14:03	Welcome Remarks	Professor Peter Olupot-Olupot
14:04 - 14:20	Detection of outbreaks	Mr. Mugiyi Tony
14:21 - 14:35	Covid-19	Dr. Mukunya David
14:36 - 14:40	Covid-19	Dr. Okello Francis
14:41 - 14:55	Covid-19	Dr. Mutoto Paul Bukhota
14:56 - 15:10	Cholera	Dr. Okiro William
15:11 - 15:25	Cholera	Ms. Aujo Deborah
15:26 - 15:40	Spatial clustering, hotspot analysis, and Temporal distribution of the 2022 Ebola Virus Disease outbreak in Uganda	Dr. Paasi George
15:41 - 15:50	Coffee Break	IDEA Secretariate
15:51 - 16:05	Detection of Isolated Cases of	Mr. Opolot Godfrey

		Crimean Congo Hemorrhagic Fever in Uganda	
16:06 - 16:20		Detection of multi-drug-resistant TB Antimicrobial resistance profiles of Escherichia coli in humans and cattle in different farming systems in Kamuli and Isingiro districts of Uganda	Mr. Bogere Mathias
16:21 - 16:35		Q & A, Discussion, and the way forward	Dr. Opoisha Joseph
16:36 - 17:10		Q & A, Discussion, and the way forward	IDEA Fellows
17:11 - 17:15		Closing Remarks	Professor Peter Olupot-Olupot

1. **Welcome Remarks**
   - By: Professor Peter Olupot-Olupot

2. Sessions on Covid-19: Assoc. Prof Mukunya David

The presentation titled "Emerging and Re-emerging Diseases: A Data-Centric Approach" commenced with an elucidation on the significance and global relevance of diseases that emerge or resurface over time. It particularly delves into neonatal tetanus, outlining its causes, global incidence, and prevention strategies. A subsequent section provided an overview of key data sources and statistics pertinent to the diseases in discussion. This foundation paves the way for an array of data visualizations that capture the prevalence, geographic distribution, and overarching trends of these diseases, ensuring a clear and comprehensive understanding. As the presentation progressed, attention is shifted to Cholera, detailing its transmission mechanisms and notable global outbreaks. An intensive exploration, possibly focusing on a recent outbreak or case study, is followed by graphical insights that likely display the incidence rate of Cholera over time, pinpointing affected regions and illuminating potential contributing factors. The narrative then transitions to the pressing issue of antibiotic resistance. This segment underscores the origins of antibiotic-resistant pathogens, elucidates the global challenges they present, and proposes strategies to mitigate their impact. Complementary to this, subsequent slides might present case studies, latest research revelations, and interventions crafted to counteract this resistance. Drawing towards its culmination, the presentation introduces the topic of inhalational botulism. It underscores its causative factors, symptomatology, and the cruciality of timely detection. Additionally, it spotlights recent research or insights specific to this ailment. In a timely pivot, the presentation also encompasses COVID-19, shedding light on its monumental global ramifications, modes of transmission, and the data-backed methodologies employed for its comprehension and containment. A series of slides delve deeper into the data dimensions of the discussed diseases, analyzing transmission rates, population-specific impacts, and the efficacy of intervention measures. Concluding on a poignant note, the presentation emphasizes the indispensable role of a data-centric approach in deciphering and addressing the challenges posed by emerging and re-emerging diseases. It advocates for relentless research, consistent monitoring, and the perpetual vigilance required in this ever-evolving domain.

3. Sessions on Covid-19: Mr Francis Okello

The presentation was about the comorbidity-related inequality in COVID-19 deaths in Eastern Uganda and its implications for vaccine prioritization. The presenter, France Okello, was affiliated with Busitema University and presented this at the IDEA Conference. The study began with the background of COVID-19 in Uganda. The virus was confirmed in the country in March 2020, and by 2021, 10,755 individuals had been infected with 10,400 recoveries and 3,632 deaths. The World Health Organization set a 70% global vaccination target by mid-2022, emphasizing healthcare workers, those over 60, and immunocompromised people. However, by that time, only 31.8% of the global population and a mere 1.87% of Ugandans had received at least one vaccine dose. The primary objectives of the study were twofold: to understand the level of inequality in COVID-19 deaths attributable to comorbidities and to provide recommendations for vaccine access prioritization. The study was conducted at Mbale and Soroti Hospitals, using cross-sectional design with retrospective data from April 2020 to March 2021. Ethical approvals were secured from the National Research Ethics Board and UNCST. One significant revelation from the data was the role of comorbidities. Over a quarter (34.6%) of the patients studied had at least one comorbidity, with the most common ones being hypertension (17.4%), diabetes mellitus (11.6%), malaria (4.6%), HIV (1.03%), and tuberculosis (0.27%). The mortality rates due to COVID-19 were significantly impacted by these comorbidities. Mortality stood at 16.2%, with increased deaths when patients had comorbidities. The detailed rates were 330 per 1000 for

those without any comorbidity, 1250 per 1000 for those with one, and 1750 per 1000 for patients with multiple comorbidities. Furthermore, the study examined the relationship between age, comorbidity, and mortality. It was observed that mortality was more concentrated in patients with comorbidities, as evidenced by the concentration curve. The vaccine's efficacy in reducing mortality risk was also highlighted, with the uptake of safe and efficacious vaccines standing at 21.5%. Vaccine uptake lowered the risk of mortality by 11%. In conclusion, the presenter emphasized that comorbidities and mortality were rarer in patients below 18 years. However, even with limited statistical precision, taking at least one dose of the COVID-19 vaccine reduced mortality risk by 11%. Okello suggested that during priority setting for pandemic vaccines, rapid data modeling can inform prioritization based on known and evolving disease burdens and characteristics. As a future strategy, differentiated vaccine administration modules for different groups should be considered to increase uptake.

4. Sessions on Covid-19 by Dr. Mutoto Paul Bukhota

Dr. Mutoto Paul Bukhota presented a comprehensive overview of the COVID-19 pandemic, emphasizing its causative agent, SARS-CoV-2. He elucidated the distinctions among the seven known human coronaviruses, underscoring the unique challenges posed by the three categorized as "novel". Dr. Bukhota provided a chronological account of the daily COVID-19 cases in China, offering attendees a clear perspective of the outbreak's initial trajectory. On a broader scale, he furnished a statistical breakdown of cases and fatalities, encompassing global, African, and particularly Ugandan demographics. The data was supplemented with a geographical analysis of the Mbale Region, presenting a granular view of the pandemic's regional implications. Graphical insights painted a vivid picture of epidemic trends, clearly demarcating periods of significant spikes in case numbers. Shifting the discussion towards operational measures, Dr. Bukhota detailed the critical activities of the Emergency Operations Center (EOC). Among these were high-risk communication endeavors and robust patient-monitoring frameworks. The presenter further accentuated the paradigm of home-based care for COVID-19 patients, meticulously outlining the selection criteria and requisite medical evaluations. This section was particularly insightful, as it underscored the feasibility and challenges of managing patients outside traditional healthcare settings. Delving deeper into the practical implications of home-based care, Dr. Bukhota shared poignant experiences. He recounted the journey of a family of 15 that underwent quarantine following the tragic death of one of their members to the virus. The narrative highlighted the spectrum of experiences encountered by families and healthcare providers. On one end, there were narratives of swift recoveries, and instances where families expressed profound gratitude for the support received, especially in covering essential costs like food and medicine. However, the challenges were equally stark. He illuminated the grim realities faced by many, such as prolonged isolations, inadequate support from health institutions, and logistical nightmares faced by health workers, particularly in transportation. Reflecting on the broader impact and lessons learned from the pandemic, Dr. Bukhota critically assessed the outcomes of various intervention strategies. Among the commendable achievements, he noted a perceptible shift in public attitudes and a commendable rise in the adoption of home-based care services. However, the journey wasn't devoid of hurdles. He drew attention to the increasing stigma associated with COVID-19 patients, emphasizing the societal challenges this posed. The presentation culminated with a thought-provoking quotation by Michael Levitt, which underscored the complexities of pandemic response. Dr. Bukhota's commitment to veracity was evident through his diligent citation of reputable sources, including the likes of WHO and the Centers for Disease Control and Prevention (CDC). Through his discourse, he not only provided a factual

account of the pandemic's progression but also invited attendees to introspect on the multifaceted challenges and lessons it unveiled.

5. Sessions on Cholera: Dr. Okiror William, IDEA FELLOW

The presenter opened with an overview of the assessment related to cholera outbreak. The central focus was on the cholera preparedness assessment in Busia. district. Delving into the background, the speaker highlighted on the 24th July 2023, MoH was notified of   a confirmed cholera outbreak in Namayingo District close to the Kenyan border. The presenter noted that as of   10th September 2023, there were 20 reported cases (6 confirmed and 14 suspected), no deaths. Busia district geographically neighbors   Namayingo district and as business hub as well as a border district there was increased   risk of spillover of cholera cases to Busia district and subsequent cross border spread of cholera to Kenya .Furthermore, Busia district has had previous cholera outbreaks in 2020 and 2018, that was imported from Namayingo after attending a burial where he got infected. About 16 cases were registered with one death of which they all belonged to the same family. This prompted MoH to conduct cholera vaccination in Busia.

Municipality in 2021. Since 2020, no cholera outbreak has been registered in Busia.The rationale for Busia's cholera preparedness investigation was expounded upon basing on this backgroud. The district faced challenges in terms of health facility inadequacies and general mistrust in health behaviors among its populace. The presentation then dissected cholera preparedness through various pillars. In the domain of leadership, coordination, planning, and monitoring, the district showcased strengths like its cholera outbreak action plan but faced limitations in weekend case management and lacked a dedicated cholera response plan. Risk communication and community engagement emerged as another significant pillar. The district had communication plans in place, but there was a noted absence of information, education, and communication materials for cholera. Surveillance and outbreak investigation strengths rested on community-based disease surveillance and immediate report channels. However, weaknesses arose from not having standardized the cholera-specific Disease Surveillance and Response (DSR) tools, limited isolation beds for cholera patients, and undertrained health workers. Water, sanitation, and hygiene (WASH) were presented as foundational in cholera management. The district received support from agencies like LGA/UNICEF but faced challenges with the availability of open defecation-free verified areas. Laboratory diagnostics and testing saw the standardization of sample collection systems and timely laboratory response. Still, challenges arose when labs did not operate over weekends and lacked cholera sample collection materials. Infection prevention and control was discussed, where handwashing was highlighted as a priority. However, the scarcity of personal protective equipment in some health facilities and the unavailability of regular water supply posed challenges. The session on case management emphasized the district's strength with cholera treatment centers. Nonetheless, the district lacked clear guidelines for patient management and had cases of mismanagement. Logistical support appeared to be a significant component of cholera management. The presenter shared images of the isolation tent at Busia HCIV and highlighted the operational support and logistics challenges. The district had begun putting an isolation structure in place for patient management, but the equipment and facilities for cholera care still required improvement. In conclusion, the presenter emphasized that whereas, the district had an existing DTF structure in place, there was need to address gaps identified in response pillars and the assessment provided a platform for adequate preparations to respond in case of any cholera outbreak in the district. Recommendations included reinforcing handwashing, ensuring adequate supplies, increasing community involvement, and intensifying surveillance and rapid response to cholera outbreaks.

6. Sessions on Cholera Ms. Aujo Deborah, IDEA FELLOW

Deborah Ajujo, an IDEA Fellow, presented an analytical study on a cholera outbreak that transpired in the Namayingo District of Uganda on 16th August 2023. Her presentation was meticulously segmented to offer a holistic understanding of the event, shedding light on the background of the disease, the specificities of the case, and the consequent measures taken. Starting with a backdrop, Ajujo enlightened her audience about the general characteristics of cholera and emphasized the need for profiling cholera cases. Additionally, she delineated the supporting surveillance measures and their potential implications for health system services and policies. The specific event leading to the study was highlighted in the third slide, indicating that on 16th July 2023, the Namayingo District Health Office had identified a suspected case of cholera in a 2-year-old female. This patient, hailing from Sechio Village, manifested symptoms including abdominal pain, profuse watery diarrhea, and vomiting. Subsequent to this case, two more suspected cholera cases were unearthed on the 10th of July from the same household, further escalating the gravity of the situation. Ajujo then transitioned to her research methodology, which was rigorously systematic. She used established tools and criteria such as community and standard case definitions, cholera line listing forms, and case investigation reports. The timeline of activities provided a chronological account of the case progression, from initial case confirmation to consequent interventions. Subsequently, Ajujo showcased epidemiological data from 14th July to 14th August 2023. Within this period, there were 26 suspected cases, of which 6 were confirmed, and fortunately, no deaths. A deeper demographic assessment divulged that the majority of these cases were found in individuals aged between 10 and 29. A significant insight from the data revealed that an overwhelming 89% of these cholera cases were among individuals who had not received the OCV (Oral Cholera Vaccine). A geographical representation underscored the areas most affected by the outbreak, with three villages, namely Sechio, Namawundu, and Bugongo, being highlighted. The case linkage further expounded on the connections between individual cases, illuminating patterns of transmission. Ajujo also highlighted other surveillance activities that were undertaken, emphasizing the importance of alert desks, case finding, case confirmation, and contact tracing. These activities showcased the concerted efforts to contain the spread and manage the outbreak. Concluding her presentation, Ajujo underscored that Namayingo District remains a critical zone for cholera prevalence. She stressed the importance of improving WASH (Water, Sanitation, and Hygiene) practices to curtail the recurrence of such outbreaks. A significant takeaway was the necessity for a more fortified and integrated surveillance system across borders, highlighting the interconnectedness and potential for disease spread across regions. Ajujo also advocated for more research on monitoring cholera vaccines' effectiveness, thereby ensuring a more proactive and preemptive approach to such outbreaks in the future.

7. Session on Spatial Clustering, Hotspot Analysis, and Temporal Distribution of the 2022 Ebola Virus Disease Outbreak in Uganda by Dr. Paasi George, IDEA FELLOW

In the presentation delivered, the presenter embarked on a comprehensive analysis of the spatial clustering, hotspot identification, and temporal distribution of the 2021 Ebola outbreak in Uganda. The country, positioned in east-central Africa and neighboring the DR Congo to its south, faced an abrupt surge in acute viral illnesses as early as July 2020. By August, several cases of Ebola were confirmed, intensifying concerns about its spread and containment. The presenter diligently highlighted the methodologies and materials employed in tracking the disease. The data, sourced

from local health offices and WHO alerts, was meticulously managed using advanced software tools like MS Excel, ArcGIS, and Stata. The result was a series of compelling visuals, from heat maps pinpointing areas of intense case concentrations to bar graphs illustrating the epidemic's progression across specific districts. One significant metric that was given due attention was the Serial Interval (SI) – the time lapse between successive cases in a chain of transmission. Additionally, the estimated reproduction number (R0), a pivotal measure indicative of the disease's potential spread, was meticulously charted for various districts. This district-wise breakdown of R0 underscored the variability in the epidemic's intensity across the region. Pivoting to insights, the presenter shed light on the marked disparities in the epidemic's manifestation across districts. While some areas saw sporadic cases, others grappled with a more pervasive spread. The epidemic's duration, too, varied, with certain districts experiencing prolonged bouts of the disease. The incorporation of an overlay of external events, interventions, and policies brought forth a nuanced understanding. Photographs of emergency response teams in action served as a stark reminder of the ground realities. The graphs delineating the epidemic dynamics in different districts, both pre and post-lockdown, painted a vivid picture of the lockdown's effect on disease transmission. Moreover, the interrupted time series analysis offered deep insights into Ebola-related mortality trends. Through this, the presenter alluded to potential explanations for the observed trends, hinting at logistical challenges, community engagement levels, and regional healthcare infrastructure. To top it all, the presentation culminated in an assessment of both global and local trends. The presenter harnessed geospatial analyses to track disease patterns, unearthing correlations and patterns pivotal to strategic response planning. Throughout the discourse, the presenter not only showcased a mastery over the subject matter but also the adeptness in employing advanced data analytics tools. The presentation was a testament to the confluence of rigorous data analysis and profound domain expertise, paving the way for data-driven interventions and strategies.

8. Session on Detection of Isolated Cases of Crimean Congo Hemorrhagic Fever in Uganda by Mr. Opolot Godfrey, IDEA FELLOW

In a comprehensive presentation prepared by a IDEA EPIFELLOW on September 9, 2023, the continuous detection of isolated cases of Crimean Congo Hemorrhagic Fever (CCHF) in Uganda was meticulously analyzed. The presenter delved into the competencies necessary for tackling the disease, emphasizing the importance of infectious disease outbreak surveillance, infectious disease rapid epidemiology, and infectious disease monitoring and response. The presentation began with a case study involving a 4-year-old boy from the Katooke zone in the Nabweru sub-county. This boy was referred to the Kawempe Regional Referral and had his blood sample analyzed at the UVRI. Tragically, the results were positive for CCHF. Notably, the Ministry of Health (MoH) and World Health Organization protocols were stringently adhered to during the assessment and treatment processes. As the outbreak loomed, a swift outbreak response and environmental sampling were initiated. A team of public health investigators was promptly deployed to the region, and the medical records of patients showing symptoms of fever and bleeding were critically reviewed. To facilitate this, a structured questionnaire was employed to gather necessary data. The presenter highlighted some significant statistics: 50% of the CCHF patients were children under the age of 5, and sadly, one confirmed case resulted in death, indicating a case fatality rate of 2.35%. The symptomatology among CCHF cases was also analyzed, revealing that the majority exhibited fever, joint pains, and bleeding. The affected regions were visually represented using geospatial analysis, focusing on the CCHF-affected area in Wakiso district during the February outbreak of 2023. Additionally, the epidemiological curve

showcased an intermittent source outbreak of CCHF in Nabweru Sub-country, pinpointing the cases confirmed in a given month. In the realm of diagnostic measures, the presenter detailed the use of animal surveillance to monitor and manage the disease's spread. Laboratory investigations for the Virus (VHF) were thoroughly conducted, adhering strictly to manufacturers' instructions. RNA from the eluted samples was then meticulously analyzed using an established RT-PCR assay. The presentation concluded with crucial insights into the Ugandan situation. The country, while having a robust national surveillance system and diagnostic capability for VHFs, is faced with challenges. The general populace remains less vigilant or aware, potentially due to a low suspicion index surrounding the disease. However, the findings underscored the endemic nature of CCHF in Uganda and the significant exposure risk from ticks. The presenter also stressed the significance of establishing a well-anchored national Viral Hemorrhagic Fever (VHF) surveillance system and diagnostic capability, considering the potential threat the disease poses.

9. Session on Detection of Multi-Drug-Resistant TB and Antimicrobial Resistance Profiles by Mr. Bogere Mathias, IDEA FELLOW

The presenter, during the EDCTP IDEA Fellowship conference, focused on the challenge of finding tuberculosis (TB) in mobile pastoral communities, drawing a case study from South-Western Uganda. The study was concentrated in the Kazo district, where Uganda, already being one of the 30 countries with a high burden of TB, exhibited a significant discrepancy in TB case findings. Between 2014 and 2015, national TB prevalence statistics revealed that 39% of people who exhibited cough symptoms for over two weeks did not seek treatment. In 2018, while 1500 people were reported with TB, only 34% were officially notified as drug-resistant TB. The presenter described the Kazo situation as particularly concerning. Case findings for TB were consistently low across quarters, and the stigma associated with TB deterred many symptomatic patients from utilizing TB services. An example was provided where, despite the detection of 36 TB cases in South-Western Uganda from April 2022 to March 2023, only 2 were diagnosed in Kazo district, a majority pastoral community. To address this, various methods were employed. Stakeholder engagement and microplanning meetings were organized, involving the District Teams and USAID's local partner health services Ankole/TASO. The district TB register was meticulously reviewed, and hotspots were mapped with the active participation of the community. Five villages each from Buremba, Kyamangaara, and Nkungu sub-counties were selected for the study. Each hotspot was attended to by a professional health worker and a Village Health Team (VHT) member who visited households and congregated settings. A one-day orientation of these health workers and VHTs was facilitated. Tools devised by the MOH (Ministry of Health) were employed, focusing on health education, TB screening, and sputum collection, over a three-day period. Samples collected were transported and tested at the district lab using the NAAT gene expert technique. Those found sensitive to the first-line medications, such as RHZE, were categorized as DS TB, while the samples resistant to rifampicin were considered DR TB. Results from the engagement revealed that of the 1526 people screened, 220 exhibited presumptive TB symptoms, translating to 14.4%. Further, 15 of these cases, equating to 6.8%, were confirmed bacteriologically. It was noteworthy that of these 15 patients, 13 were from Buremba, and a significant 53.8% among them had rifampicin-resistant TB. Stakeholder engagement played a pivotal role, with strategies ranging from community radio engagement in Kazo to physical community engagement in Buremba. The findings were significant enough for the MOH to declare a public health emergency in Kazo, prompting further investigations. In conclusion, the presenter emphasized the high yield achieved by pairing community health workers with professional health workers for TB screening in such communities. This approach, the presenter suggested, could

serve as a model for TB case finding in hard-to-reach communities. The study underscored the importance of stakeholder engagement in identifying TB cases in pastoral communities. The success of such initiatives, the presenter contended, was rooted in its data-driven, community-engaged approach.

10. **Session on Antimicrobial resistance profiles of *Escherichia coli* in humans and cattle in different farming systems in Kamuli and Isingiro districts, Uganda. by Mr. Oposhia Joseph, IDEA FELLOW**

The presenter unveiled findings from an epidemiological study focused on antimicrobial resistance (AMR) among E. coli isolates in the Kamuli and Isingiro districts of Uganda. This investigation was undertaken from 2018 to 2022, with the primary intent to discern the distribution, magnitude, and determinant factors associated with AMR in the region. The rationale behind the study was framed against the backdrop of the growing menace of AMR, which has become a significant threat to global health and economic development. The presenter emphasized that sub-Saharan African countries, particularly Uganda, grapple with the dual challenge of a persistent burden of infectious diseases and escalating AMR. Uganda's struggle is compounded by the absence of a comprehensive national surveillance system to monitor AMR, and rural areas are particularly underserved in terms of research in this area. The presenter identified an evident lacuna in literature pertaining to the magnitude and determinants of AMR in rural Ugandan settings. Over-the-counter sales of antibiotics without prescriptions, coupled with their irrational use, were pinpointed as concerns that exacerbate the situation. Such practices make data-driven, targeted strategies to manage AMR more imperative. The study's significance was underscored by its potential to bridge knowledge gaps on AMR in rural Uganda and influence AMR management and control strategies. The study was methodically structured, employing a cross-sectional design that spanned the districts of Kamuli and Isingiro funded by Makerere University RIF. The presenter detailed the methodologies involved, from participant selection to data collection and analysis. Maps depicting the geographical demarcation of the study areas further provided context to the findings. Explicit procedures were delineated regarding sample collection from both humans and livestock, transportation logistics, sample preparation, and laboratory analyses. The study also delved deep into antimicrobial sensitivity testing, revealing key insights into AMR patterns among E. coli isolates. Additionally, the presenter highlighted practices associated with antibiotic use, levels of knowledge among farmers, prescription practices, and acknowledged the limitations encountered during the study. Through this exhaustive investigation, the presenter not only shed light on the prevalent state of AMR in the chosen Ugandan districts but also underscored the pressing need for robust, data-driven strategies to counter the challenges therein.

a. Summary of Discussion Points

1. **Data Integrity and Reproducibility**: Concerns were raised about the reproducibility of data, especially in studies involving infectious diseases like COVID-19 and Ebola. The importance of data validation methods and the application of algorithms like clustering and deep learning for quality control were discussed.

2. **Interdisciplinary Collaboration**: The need for more interdisciplinary research, especially between data scientists and biomedical researchers, was acknowledged. The potential for

machine learning in predictive modelling for patient outcomes and epidemiological studies was noted.

3. **Public Health Policy**: The efficacy of data-driven strategies in public health policy, especially in vaccine distribution and managing antibiotic resistance, was discussed. The importance of rapid data modeling to inform policy decisions was emphasized.

4. **Emerging Technologies**: The potential of emerging technologies like geospatial analysis in tracking disease patterns and the use of Bayesian methods in statistical analysis was discussed.

b. Consensus and Action Points

1. Develop a set of guidelines focused on data reproducibility and validation, in alignment with industry and academia standards.

2. Standardize ethical protocols across various fields of biomedical research.

3. Promote interdisciplinary collaborations through joint grants and research programs.

4. Advocate for data-driven policy-making in public health organizations.

5. Establish a working group to explore the integration of emerging technologies like geospatial analysis and Bayesian methods in current research paradigms.

Closing Remarks
Presenter: Professor Peter Olupot-Olupot

Summary and Key Insights

Professor Olupot-Olupot concluded the conference by emphasizing the critical role that data science plays in advancing biomedical research and healthcare. He praised the depth and breadth of the presentations and discussions, highlighting the interdisciplinary nature of the challenges and solutions presented. He stressed the importance of integrating advanced data analytics, machine learning, and statistical methodologies to provide actionable insights for both clinical and policy-related decisions. The professor called for continuous collaboration, knowledge-sharing, and adaptation to new technologies and methodologies, urging everyone to maintain the "perpetual vigilance" required in this ever-evolving domain.

Summary of Conference Highlights

1. **Data-Centric Approaches**: The conference extensively covered the importance of a data-centric approach in understanding emerging and re-emerging diseases. Presentations touched upon statistical methods, machine learning, and advanced data analytics as critical tools for dissecting complex health-related challenges.

2. **Global Health Issues**: Topics like COVID-19, antibiotic resistance, and multi-drug-resistant tuberculosis were discussed in depth, providing a global perspective on urgent health issues.

3. **Epidemiological Studies**: The application of data science in tracking disease patterns and hotspots through geospatial analysis and predictive modeling was a recurring theme.

4. **Ethical and Reproducibility Concerns**: Ethical considerations in data collection and the importance of data reproducibility were stressed, aligning well with industry standards and guidelines.

5. **Interdisciplinary Collaboration**: The conference championed the cause of interdisciplinary research, advocating for greater collaboration between data scientists, biomedical researchers, and policy-makers.

6. **Public Health Policy**: Several presentations focused on how data science can inform public health policy, particularly in resource-constrained settings and in the prioritization of vaccine distribution.

7. **Technological Advancements**: The conference also explored emerging technologies such as advanced statistical methods, machine learning, and geospatial analysis, pointing to their future roles in biomedical data science.

Implications for Future Research and Policy

1. **Data Reproducibility**: The emphasis on data reproducibility suggests a future research focus on creating standardized methodologies that can be universally adopted.

2. **Machine Learning in Healthcare**: The recurring discussion on machine learning and predictive modeling points towards an increased adoption of these techniques in both research and clinical settings.

3. **Public Health Decisions**: The discussions on the role of data science in public health policy imply a shift towards more data-driven decision-making processes at governmental and organizational levels.

4. **Global Health Strategies**: The focus on global health issues like antibiotic resistance and COVID-19 suggests a need for international collaboration in both research and policy-making.

5. **Local Challenges**: The in-depth case studies from specific geographic locations like Uganda indicate that future research and policy must be sensitive to local conditions, challenges, and needs.

Recommendations

1. **Standardize Methodologies**: Develop and standardize reproducible methodologies for data collection and analysis.

2. **Interdisciplinary Grants**: Encourage funding for interdisciplinary research that bridges data science and biomedical research.

3. **Training Programs**: Implement training programs to upgrade the skills of professionals in the latest data analysis techniques and tools.

4. **Policy Framework**: Advocate for a data-centric policy framework that can guide public health decisions, especially in emergencies like pandemics.

5. **Open Data Repositories**: Develop repositories for open-access data to facilitate global research collaborations.

6. **Community Engagement**: Community-based approaches should be considered in both research design and policy implementation, especially for infectious diseases and vaccine distribution.

7. **International Collaboration**: Establish international task forces to tackle global health challenges using a data-centric approach.

The conference served as a catalyst for future innovations and collaborations, emphasizing the role of data science in advancing global healthcare and research. The discussions and presentations set the stage for upcoming advancements in the field, aligning well with broader objectives in biomedical data science.

Budget

Activity	Description/Justification	Estimated Cost (USD)
Venue Rental	Cost for 2-day venue rental in Mbale, Uganda	4,000
Catering & Refreshments	Cost for food and refreshments for 150 participants over 2 days	6,000
AV Equipment & Support	Cost for audio-visual setup and support	3,000
Speaker Fees & Travel	Fees and travel expenses for 10 key speakers	5,000
Marketing & Promotion	Cost for marketing and promotional activities	2,500

Printing & Materials	Cost for badges, handouts, etc.	1,000
Miscellaneous Expenses	Other miscellaneous conference-related expenses	2,000
Transportation & Logistics	Providing transportation for key speakers or shuttle services for attendees	2,500
Entertainment & Social Events	Dinners, cultural events, or performances for attendees	3,000
Equipment & Materials	Costs for renting or purchasing equipment, setting up booths, or other materials	1,500
Security	Ensuring the safety of attendees, especially for larger conferences	2,000
Insurance	Coverage for any unforeseen incidents during the conference	1,500
Staff & Volunteer Expenses	Remunerations, allowances, or perks for staff and volunteers involved in the conference	3,000
Total Expenses		**37,000**

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Acknowledgments

5. **Medical Professionals and Policy Makers**:

    - We are grateful for the participation of healthcare providers and policy makers, who bridge the gap between academic research and practical implementation.

6. **Logistical Support**:

    - Kudos to the logistics and technical teams for ensuring that the conference ran smoothly, both in-person and virtually.

7. **Administrative Staff**:

    - Thanks to the administrative staff for their impeccable planning and organization, from registration to session coordination.

8. **Media and Communication Teams**:

    - We acknowledge the role of the local media personnel in disseminating the findings and highlights of the conference to a broader audience.

We look forward to future collaborations that continue to push boundaries in biomedical research and healthcare, advancing our collective goal of improving global health outcomes. Thank you all for your dedication and contributions.