



ONE HEALTH CASES

October 2024

Impacts of One Health on Education, Research, and Development: A Case of Uganda

A One Health (OH) baseline assessment was used to assess gaps and capacities in Uganda. We observed that the National OH Platform conduct activities are in line with the third National Development Plan, National Action Plan for Health Security, and the National OH Strategic Plan.

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Abstract

Certain public health challenges are made more complex to manage due to the intricate interactions between humans, animals, and the environment, necessitating a sustainable holistic approach known as One Health (OH). OH is a multidisciplinary framework that operates at local, national, and global levels to promote optimal health across human, animal, and environmental domains. In Uganda, the governance of OH is hampered by weak linkages primarily confined to key ministries – Agriculture, Animal Industry and Fisheries (MAAIF), Health (MOH), Education and Sports (MOES), and Water and Environment (MWE). This limited scope contributes to OH being perceived as relevant only to these ministries, while other governmental bodies, agencies, and departments undervalue it. Additionally, the existing gaps among professionals in human health, animal health, and environmental health sectors further hinder OH implementation. Despite ongoing efforts by institutions to advance OH education and research within their specific areas, there is a notable lack of collaborative initiatives. Through the Capacitating One Health in Eastern and Southern Africa (COHESA) project, this study presents baseline findings on OH in Uganda, focusing on research and development, governance, education, and implementation.

What is the Incremental Value That Makes this a One Health Case?

Prior to launching the One Health (OH) approach in Uganda in 2016, disease outbreak investigation was predominantly addressed through established task forces (TFs) selected to lead the investigation on an “ad hoc” basis for a limited period corresponding to the disease in question. These TFs were ineffective when the outbreak peak periods were over as they were no longer functional. In 2018, Uganda changed its approach to better manage OH issues through National Task Forces (NTFs). These NTFs share situation reports, mobilize, and share resources, to deploy joint rapid response teams (RRTs) to infectious diseases of One Health importance. They also oversee community mobilization, sensitization, training, and advocacy. However, other than just diseases, the National One Health Platform (NOHP) established the technical working groups (TWGs) that have always worked on other OH issues of importance, including

those linked to the environment, antimicrobial resistance (AMR), and other non-infectious diseases like cancers and strokes. The Capacitating One Health in Eastern and Southern Africa (COHESA) project has played a pivotal role in advancing our understanding of One Health dynamics in Uganda through its support for a comprehensive baseline assessment. This assessment has not only highlighted the intricate and multidisciplinary nature of One Health but also revealed the diverse and complex landscape in which it operates within Uganda.

Learning Outcomes

1. Describe the One Health Landscape in Uganda.
2. Describe the different One Health activities that have taken place in Uganda.
3. Identify limitations to the achievements of One Health in Uganda and recommendations how to overcome these.

Background and Context

The development of Uganda's National One Health Platform (NOHP) has been a deliberate and evolving process. The global spread of the highly pathogenic Influenza-A H5N1 virus in 2005 and the Rift Valley fever (RVF) outbreak in 2006 underscored the urgent need for a sustainable One Health framework. Initially, Uganda considered modeling its platform after Kenya's Zoonotic Disease Unit. However, the decision was made to establish a more comprehensive approach, incorporating key sectors such as Health, Agriculture, Wildlife, and Environment at the secretariat level. Additionally, other relevant partners and stakeholders – limited to no more than 16 – were included to ensure a robust and inclusive framework.

In August 2015, a pivotal stakeholder workshop, supported by the United States Agency for International Development (USAID) under the Emerging Pandemic Threats 2 (EPT2) and Preparedness and Response (P&R) programs, was convened. The workshop aimed to assess the operations of the One Health approach across key sectors in Uganda and to identify suitable institutional and regulatory frameworks (United Nations, 2015). The following key sectors took part: the Prime Minister's Office, the Ministry of Health (MOH), the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the Uganda Wildlife Authority (UWA), and the Ministry of Water and Environment (MWE).

The workshop concluded with a resolution that resulted in the founding of the Zoonotic Disease Coordination Office (ZDCO) (GoU, 2018b). The OH Technical Working Group (OHTWG) sits under the ZDCO, which includes 36 technical experts and policy makers from the four key sector ministries: MAAIF, MOH, MWE, and UWA. The OHTWG is also supported by other government institutions Office of the Prime Minister (OPM), Ministry of Education and Sports (MES), and other stakeholders (e.g., World Health Organization (WHO), Food and Agriculture Organization (FAO), Centre for Disease Control (CDC), USAID, training institutions). The four key ministries oversee the OH Secretariat (Fig. 1). A Memorandum of Understanding (MoU) was used to combine non-key sectors such as higher learning institutions, e.g., Makerere University, and professional groups including the Uganda Medical Association and Uganda Veterinary Association/Board.

NTFs periodically assemble for emergency response to zoonotic disease outbreaks especially emerging and re-emerging ones, such as: bovine spongiform encephalopathy (BSE /Mad cow disease), highly pathogenic avian influenza (HPAI), influenza A H1N1, anthrax, viral hemorrhagic fevers (VHF) such as Ebola virus disease (EVD), Marburg hemorrhagic fever (MHF), Crimean Congo hemorrhagic fever (CCHF), and RVF (GoU, 2018a). During the strategic meetings aimed at enhancing One Health (OH) governance in Uganda, several key goals were outlined to strengthen the country's response to health challenges. These goals include the sharing of situation reports, the mobilization and distribution of resources, the deployment of joint Rapid Reaction Teams (RRTs), and the execution of community mobilization, sensitization, and advocacy initiatives. Additionally, identifying and addressing training requirements was emphasized to ensure an effective and coordinated response to specific outbreaks. These objectives are in alignment with the 2021 evaluation of Uganda's National One Health Platform (NOHP), which utilized the adapted Network for the Evaluation of One Health (NEOH) tool to assess and guide the platform's progress (Rüegg *et al.*, 2018) which found the areas of planning and sharing needed improvement as they pertain to aspects of 'One Healthiness' (Fasina *et al.*, 2022).

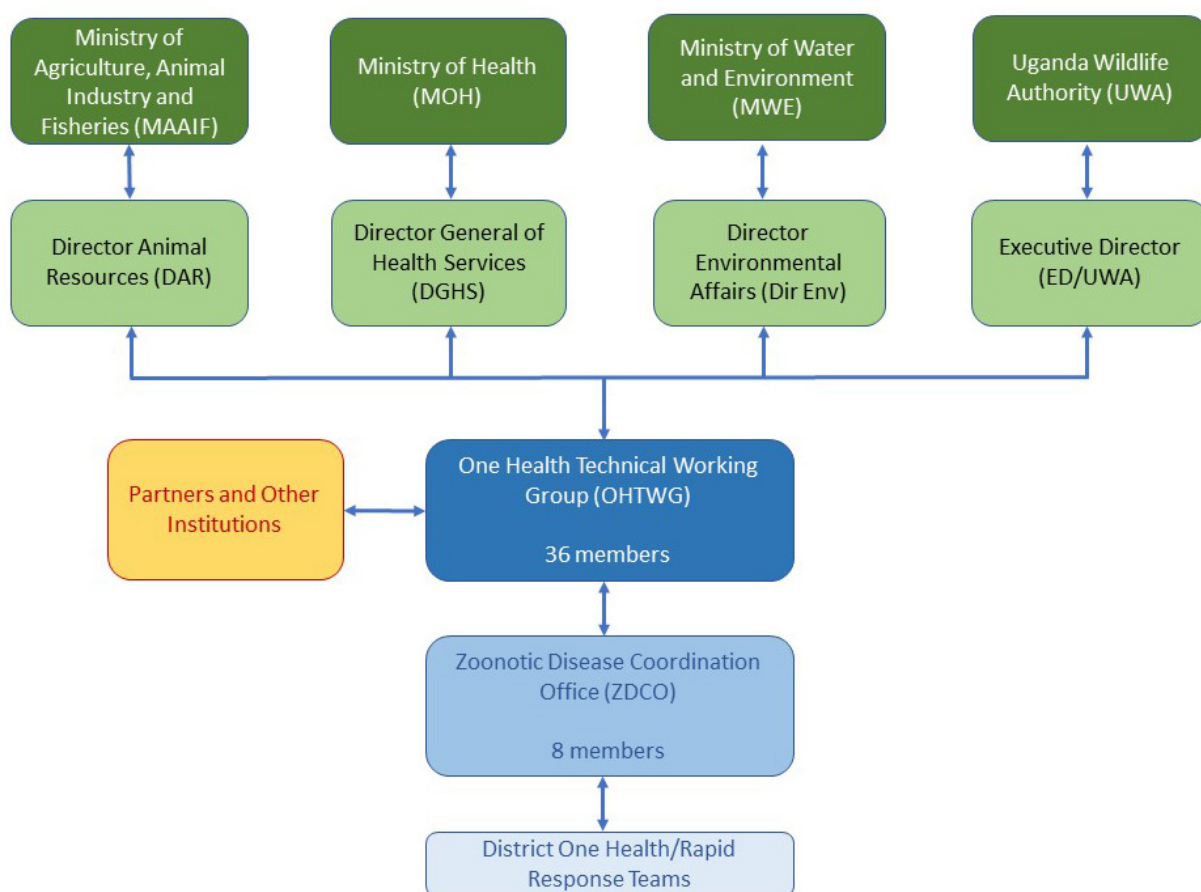


Fig. 1. Approved One Health Governance Structure within Uganda – from Uganda One Health Strategic Plan 2018–2022.

The COHESA project played a pivotal role in executing a comprehensive One Health (OH) baseline assessment in Uganda. This assessment employed a multi-faceted approach, including a desktop review of OH literature, key informant interviews (KIIs), and focus group discussions (FGDs) with OH experts from across the country. For the desktop review, the COHESA project’s country leader in Uganda, supported by trained enumerators, conducted an extensive search for online information related to OH governance, education, innovation, and the identification of gaps and challenges. The relevant documents were carefully identified, downloaded, and thoroughly reviewed. These findings were then systematically summarized and organized into the sections presented below.

For the key informant interviews (KIIs) and focus group discussion (FGD), a well-coordinated team of two trained enumerators conducted on-site visits to the workplaces of carefully selected key informants. The interviews were conducted in locations deemed appropriate and convenient by the key informants, following a standardized guide. During each interview, one enumerator read the consent form and posed the interview questions, while the second enumerator meticulously documented the responses using pen and paper. Subsequently, all key informants were invited to participate in the FGD. The interview sessions were audio-recorded using a SONY IC Recorder, model IC-PX470. These recordings were later transferred to a computer, where they were transcribed into Microsoft Word documents for analysis. Additionally, relevant documents – such as books, policy documents, strategic plans, and organizational structures – were photographed using a SAMSUNG tablet, model SM-X205. The handwritten notes, visual documentation, and transcribed audio recordings were integral to compiling this report and developing the subsequent case analysis.

Transdisciplinary Process

Of the 14 KIIs, 11 were male and 3 were female. The mean age of the informants was 44.5 years. All the informants had attained a tertiary level of formal education; 57.1% of the informants held senior positions

in their respective institutions whereas those who held employee, CEO and junior positions formed 14.2% in each case. Half (50%) of the informants were from the government institutions whereas those from academia formed 28.5% of the participants. The mean time the informants had spent with the different institutions was 10.5 years. The respondents had varying expertise ranging including, but not limited to, policy, ecology, environmental science, natural sciences, veterinary medicine, human medicine, data analysis, public health, laboratory, epidemiology, and OH.

Thematic results from the desktop review, KIs, and FGD are presented within the OH areas of research and innovation, governance, education, and implementation.

Research and Innovation

The research and innovations in OH have been spear-headed by a system in which learners (undergraduate and postgraduate) are drawn from different disciplines such as health, humanities, engineering, and education among others. Students are trained in various theoretical and practical disciplines of risk assessment, risk communication, epidemiology, surveillance, and many others (Buregyeya *et al.*, 2020). Students coming from diverse academic backgrounds have often resulted in the multistakeholder response to a common community challenge hence exhibiting OH in action.

Much of the research and training related to OH in Uganda is on zoonotic diseases and AMR, with lesser work being done on environmental aspects such as aflatoxins, pesticide resistance, pollutants, biodiversity loss. Environment health is limited to drivers of infectious diseases, i.e., climate-sensitive topics such as vector-borne zoonotic diseases or wildlife-associated infectious diseases (GoU 2018a, b; Buregyeya *et al.*, 2020; Bakiika *et al.*, 2023). These theoretical trainings are followed by a field attachment within communities, during which the learners implement the practical skills obtained to address community-related health challenges. Innovations are required to address the narrow focus currently seen in OH curriculums in Uganda. Additionally, much of the research being done is still siloed in nature, with focus on a topic within a discipline as opposed to multidisciplinary work (Atusingwize *et al.*, 2020).

While community work tends to be implemented by a few disciplines, there is innovation in terms of their activities (Figs. 2 and 3). Community work has to some extent empowered communities with practical knowledge and skills to develop sustainable solutions or interventions for better and effective management of zoonotic diseases. For example, during the (on-site) field attachments students were often seen participating together with the market vendors in market cleaning as well as community One Health Talks (Bakiika *et al.*, 2023).

The increasing prevalence and geographic distribution of AMR threaten to undermine decades of progress in the effective prevention and control of infectious diseases (Murungi *et al.*, 2023). Through the National action plan on AMR, the government has proposed the following innovations:

1. Promoting innovations in the search for alternative treatments and drug discoveries.
2. Promoting innovations in drug technology.
3. Collaborating with international partners in basic intervention research.
4. Enhancing operation and health systems research at the local levels.
5. Establishment of the Short courses on pandemic preparedness with the OH approach.

It is imperative to note that the proposed research issues by the government are being executed by research institutions, universities, and other tertiary institutions; however, at this time there is no plan on how to actualize these proposed innovations in partnership with researchers.

One Health Governance

Uganda launched the NOHP on November 3, 2016, a multisectoral coordination mechanism to spearhead collaborative efforts among MAAIF, MOH, MWE, and UWA in disease prevention, detection, and response (Fig. 2). The chair of the NOHP rotates every year between the four ministries. There is a coordination center for the NOHP at the MoH headquarters; however, the chair of the platform calls for the meeting whenever there are critical issues to be resolved.

Uganda prioritized zoonotic diseases in March 2017 using an OH approach that focuses the limited resources available on the diseases with the greatest impact at the national level. Anthrax, zoonotic influenza



Fig. 2. Showing One Health innovation Club Members during rabies vaccination campaign areas of Kampala City in 2017 that won a global competition in One Health.

viruses, viral hemorrhagic fevers, brucellosis, trypanosomiasis (African sleeping sickness), plague, and rabies are among the prioritized zoonotic diseases (Nantima *et al.*, 2019). After these zoonotic diseases were prioritized, Uganda published a National OH Strategic Plan in January 2018; this emphasized the OH initiatives, capacity for early detection, reporting, and response to zoonotic diseases has increased at all levels (GoU, 2018a). A chronological illustration of events leading to the establishment and implementation of the OH approach in Uganda from 2006 to 2022 is shown in Fig. 4.

The OH strategy was developed through a consultative process that included all sectors and partners, as well as with assistance from the P&R Project, which is part of USAID's EPT-2 Program. The OH framework, which preceded the strategy, was designed to address resource mobilization and response capacity during zoonotic disease outbreaks and other public health threats (GoU, 2018a). However, during zoonotic disease outbreak responses, such as the response to an RVF outbreak in Kabale District in March 2016, sectors continued to work independently. A respondent in the FGD indicated that a lack of guidelines was identified as one of the issues that contributed to a fragmented response during outbreaks. Since then, the OH strategic document better elucidates guidelines for responses.

The following gaps have continuously made the realization of the OH approach in Uganda challenging:

1. Partnerships between human and animal health exist at the national level but are very weak and rarely acknowledged at the local level, and bureaucratic obstacles across sectors are exacerbated by resource competition.
2. There is a lack of interoperability between human and animal health surveillance systems. Zoonotic disease surveillance systems must be strengthened, and the interchange and curation of zoonotic disease data between the MOH and MAAIF must be systematized.
3. Emergency preparedness and response teams continue to work in silos. In the absence of outbreaks, they remain in 'redundancy' mode. The greater problem is keeping personnel and motivation high in the face of restricted resources.
4. Environmental and other ministerial entities that can contribute to OH continue to have limited engagement or opportunities to contribute to OH in Uganda.



Fig. 3. Traditional tippy/tap (left), and an improved tippy/tap developed by undergraduate pre-service students (right) 2016.

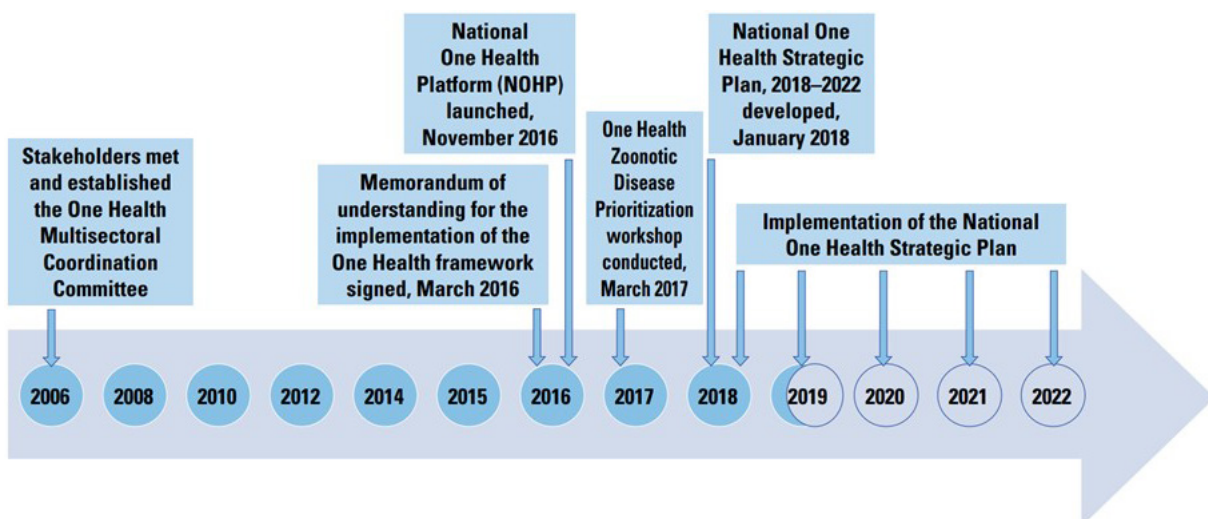


Fig. 4. Timeline of the One Health governance in Uganda from 2006 to date. (Source: Nantima *et al.*, 2019).

Therefore, there is a need for the institutional arrangement of OH to be effectively addressed in each sector to encourage common vision and joint planning. In addition to institutional buy-in across all relevant sectors, long-term sustainability is impacted by piecemeal financing from externally funded projects. National funding is needed for long-term sustainability of OH in Uganda.

One Health Education

For over a decade, the African One Health University Network (AFROHUN), formerly the One Health East and Central African (OHCEA), together with Makerere University have been implementing a pre-service capacity-building initiative with the aim of producing OH graduates with transformative knowledge that can contribute to preventing, detecting, and responding to infectious disease outbreaks (Rwego *et al.*, 2016; Amuguni *et al.*, 2019). Through the OH Institute hosted at Makerere University, AFROHUN has offered multidisciplinary training on the management of infectious diseases for undergraduate and graduate students. Such courses have included (i) Disease Outbreak Investigation and Emergency Response; (ii) Leadership in Infectious Disease Management; (iii) Gender and Risk Management; (iv) Health Policy Analysis; (v) Bio-risk Management; (vi) Community Engagement among others; (vii) risk communication; and (viii) pandemic preparedness in OH.

These trainings have concentrated more on undergraduate learners, and some few for MSc, PhD, and Postdoc level. Unfortunately, these training programs do not include the capacity to influence policy.

Different academic institutes within Uganda do offer some courses on OH education. A KI respondent indicated that within OH short course training programs, the proportion of trainees by gender tends to be equal; however, a great disparity of more males is always seen with the trainings at higher levels especially from postgraduate onwards.

Epidemiology of zoonotic diseases (anthrax, brucellosis, RVF) is taught at the National Livestock Resources Research Institute (NaLIRRI). In most instances, these are short courses offered to in-service veterinary practitioners through a series of classroom works and laboratory demonstrations. Furthermore, interested and competent persons are given the opportunity to conduct advanced epidemiological studies at postgraduate levels (*KI respondent*). While at the MOH the trainings offered include Introduction to OH, Leadership in OH and resource mobilization (*KI respondent*), in the environmental fields, Uganda National Meteorological Authority always supports their workers to further study at graduate levels and attain a Master's degree in Meteorological related fields (*KI respondent*). However, it is evident that these courses are more focused on sectoral competencies as opposed to strictly OH in nature.

The baseline assessment identified many key gaps facing OH education in Uganda and they include:

1. OH is still a fairly new concept and therefore it has not been taken as a priority with many would be implementing stakeholders still trying to better understand what it is.
2. OH-related training has been allocated limited financial resources. The low level of funding in OH has often resulted in slow realization of the OH initiative.
3. OH trainings have largely been implemented on a curriculum that offers more theoretical training than the required practical and field-based training.
4. Hardships in OH team-building and inappropriate OH team constitutions, have greatly been experienced and this ultimately limits the implementations of OH initiatives.
5. Poor systems thinking and advocacy skills.
6. Most trainings are on short terms and often the training schedule are very fast.
7. The ministry of Education has not yet embraced the OH Education as the learning curriculum at different levels does not completely holistically address the issues of OH.
8. Less visibility of OH concept at the grassroots.

Other gaps not necessarily specific to OH related to education in Uganda are over-enrolment of students in health training institutes due to high demand. This is exacerbated by insufficient tutors and qualified clinical instructors, as well as inadequate equipment, space, and laboratory skills training. Institutes in rural areas are more negatively impacted by these issues, further limiting the education of students in these institutes. Overall, there are concerns students across all sectors of OH are facing issues with limited technical and cross-cutting OH competencies in a consistent manner across disciplines.

Implementation

For decades, OH has been primarily concerned with zoonotic illnesses. However, considering the present public health challenges confronting Uganda and many other nations, such as pollution and hazardous waste, climate change and the emergence of the pathogen economy, it is very critical to develop and implement a multisectoral approach toward its management. Before the nationalization of the OH concept and principles, Uganda had exhibited successful multisectoral disease response initiatives. This included the human immunodeficiency/acquired virus syndrome (HIV/AIDs) epidemics in the 1980s, put under control through strong political leadership (spearheaded by the president of the Republic of Uganda) and multisectoral collaboration with the civil societies (Buregyeya *et al.*, 2020).

Since the development of an OH strategic plan, the ZDCO's mandates are to serve as the operational secretariat of the OHTWG and to support the OHTWG in its roles in accordance with the One Health Framework (OHF) and MOUs between members. In consultations and jointly with the key members, ZDCO is expected to prepare and submit work plans, budgets, and project/research proposals for approval to the OHTWG and to ensure that OH and related activities are included in relevant sector development plans as deserving. However, it is imperative to note that to a considerable extent, most of these approaches operate in projectivized mode. The ZDCO which has now transitioned to the One Health Coordination Office (OCO) has been cardinal and active in developing the OH communication strategy. It has also been championing the OH calendar events like organizing the national Rabies Day and Antimicrobial resistance awareness.

Project Impact

COHESA has immensely facilitated the OH gap analysis with expert stakeholders. This has been through the baseline assessment inclusive of the desktop review, KIIs, and the FGD. Key findings in gaps from the baseline assessment have stemmed the following activities:

1. National OH stakeholders' workshop that brought together diverse stakeholders for the first time to discuss the baseline findings and topical issues in (i) Financing and resourcing of OH, (ii) Awareness and grounding of OH, and (iii) Coordination and administration of OH.
2. Netmapping (a process to understand the influence of stakeholders toward a common goal) was performed with the relevant OH stakeholders to determine who influences effective OH governance in Uganda. The netmap revealed that Uganda's OH governance has weak linkages concentrated mostly around and within the lined ministries of MAAIF, MOH, MOES, and MWE. This could be understood based on the knowledge that OH is still regarded as the issue concerning the four listed ministries and is very lowly prioritized in the other ministries, agencies, and departments in Uganda. Similarly, the lower the government structure, the less the linkages with the OH-related issues including effective governance. This finding directly could imply and mean that there is less prioritization of OH activity as well the actualization at the lower governing departments, ministries, and agencies in Uganda.

Project Outlook/Conclusions

The COHESA team will continue to support the institutionalization and implementation of OH and thereby generate opportunities for stakeholders in the OH landscape in Uganda to actualize the OH approach. It is important to continue efforts to communicate effectively to the stakeholders in the OH Spectrum to ensure inclusion and avoid duplication of efforts. The COHESA project will also endeavor to help form the next generation of the OH workforce in actualizing OH for education, research, and development. While implementing COHESA project activities we will be conducting specialized OH community outreaches to primary schools and orient pupils to the concepts of OH. COHESA also will encourage practitioners to explore further opportunities for OH in education, research, and development. This will be through presenting the strengths and challenges of OH in Uganda.

The complex health challenges we are facing cannot be solved by stakeholders with a sectoral-based and single-discipline approach. OH stakeholders provide critical skillsets to contribute and benefit from a tradition of collaboration, cooperation and participation in resolving the health challenges of the animals,

humans, and the entire environment. Therefore, the OH stakeholders are suited to add further skills and capacity around OH in the form of education, research, and development in the hopes to actualize implementation of the OH strategy in Uganda. Doing this will require reforms in OH education to be more broadly and cohesively implemented across all levels of education while supporting a multidisciplinary unified research strategy. These practitioners will help to staff the various governance and private sector approaches to OH, which will benefit from national-level funding of the OH strategic plan.

Group Discussion Questions

1. Consider Uganda's education system, particularly at the postgraduate level – What are your thoughts on an OH-based PhD-taught program for mentoring present and future OH Leaders in the OH Landscape?
2. What would be an appropriate OH research team to participate in the OH co-design process?
3. How will the views of OH practitioners be amplified in effective OH governance?

Acknowledgments

We extend our sincere appreciations to all the individuals who participated actively in the Key Informant interviews and the Focus Group Discussions where we captured part of the findings in this case. Capacitating One Health in Eastern and Southern Africa (COHESA)' is co-funded by the OACPS Research and Innovation Programme, a program implemented by the Organization of African, Caribbean and Pacific states (OACPS) with the financial support of the European Union.

Conflict of interest

The authors declare no conflict of interest.

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