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Strengthening intersectoral cooperation for control and integrated surveillance of rabies in Uganda: A multistakeholder engagement workshop

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ABSTRACT

Rabies is a prioritized zoonotic disease and significant public health threat in Uganda. Despite Uganda's commitment to the global "Zero-by-30" goal and a validated National Rabies Elimination Strategy (NRES), implementation has been hindered by fragmented surveillance, limited intersectoral coordination, and lack of operationalization of control plans. To address these challenges, a participatory multisectoral workshop was conducted by the Schnell Einsetzbare Expertengruppe Gesundheit and eRabies project team, in collaboration with Makerere University, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), and the Ministry of Health (MOH). The workshop brought together 49 participants from national, subnational, and international institutions to strengthen intersectoral cooperation, assess NRES implementation, and define next immediate steps for rabies control. The primary output was a structured SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of NRES implementation, across four thematic areas: Governance, Coordination, and Risk Communication; Rabies Prevention and Control; Field and Laboratory Surveillance and Data Management, and Training and Operational Research. Insights from the SWOT analysis informed a one-year log frame outlining 10 prioritized objectives and 26 targeted activities, each linked to success indicators and timelines. Early follow-up actions included piloting a digital application for integrated bite case management in four selected districts, specialized rabies diagnostic training, a national rabies research scoping review, and targeted mass dog vaccination campaigns. Despite these advancements, broader implementation of the plan remains inconsistent. Over a year later, activities such as vaccination coverage assessment, post-exposure prophylaxis procurement and

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distribution, and sustained community engagement have not progressed beyond planning or lack documentation. Sustained political commitment, dedicated financing, and strengthened coordination at both national and sub-national levels are critical to overcome existing challenges and ensure initial momentum translates into lasting impact. The workshop outputs offer a practical, stakeholder-driven framework to guide national priorities, aligned with the NRES and goal of rabies elimination in Uganda.

1. Background and context

Rabies is a viral zoonotic disease, causing almost 100 % fatality after clinical symptoms appear, resulting in approximately 59,000 deaths worldwide each year, yet it is 100 % vaccine preventable [1,2]. Despite its considerable public health burden, rabies control remains severely under-resourced with limited funding, insufficiency in trained personnel, and fragmented surveillance systems, hindering effective implementation of control programs. Insufficient data reporting makes it difficult to justify the prioritization of interventions and subsequent allocation of sufficient resources, perpetuating a cycle of neglect [3,4]. Breaking this cycle requires sound, data-driven planning, assessment of vaccine needs, targeted mass dog vaccination campaigns, – community education, and improved surveillance. Successful examples from Malawi, Tanzania and South Africa show that with coordinated annual dog vaccination efforts, bite-case monitoring, and school-based education, rabies control is achievable, even in resource-limited settings [5–7].

Rabies is a major endemic zoonotic disease in Uganda, with over 90 % of the population at a high exposure risk [8]. Uganda reports an estimated 25 dog bites per 100,000 population annually, yet actual rabies-related deaths are likely under-reported due to surveillance and diagnostic gaps [9,10]. Uganda has committed to the "Zero-by-30" goal – a global strategy jointly set by the World Health Organisation (WHO), Food and Agriculture Organisation of the United Nations (FAO), World Organisation for Animal Health (WOAH), and Global Alliance for Rabies Control (GARC) to eliminate dog-mediated human rabies-related deaths by 2030 [1].

Achieving this target relies on a One Health approach, defined by the One Health High-Level Expert Panel (OHHLEP) as a collaborative strategy to sustainably optimize the health of people, animals, and ecosystems, through coordinated efforts across sectors [11]. Uganda, adopting this approach, established the National One Health Platform (NOHP) in November 2016, bringing together key stakeholders from the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), the Ministry of Health (MoH), the Ministry of Water and Environment (MWE), and the Uganda Wildlife Authority (UWA) [12]. Under this platform, Uganda conducted a National Bridging Workshop in 2017, to step-up multisectoral collaboration, paving way for the launch of its first National One Health Strategic Plan in 2018. The plan emphasises inclusive stakeholder participation, integrated planning, strong government commitment, and shared responsibility for implementation [12]. Building on this foundation, Uganda developed its National Rabies Elimination Strategy (NRES) in 2022, with technical support from WOAH, which was endorsed by both the MoH and MAAIF [13].

Several targeted interventions have been introduced to improve rabies control in Uganda., including annual procurement and distribution of approximately 2000 dog rabies vaccines doses per district, and implementation of mass dog vaccination campaigns in high-risk areas [10,14]. However, progress is hindered by limited availability and accessibility of post-exposure prophylaxis (PEP), challenges in conducting sustained mass dog vaccination campaigns, and low coverage of free-roaming dog populations [15]. In addition, the presence of sylvatic rabies cycle, where wild animals such as jackals or mongooses act as reservoirs, further complicates control by sustaining wildlife-domestic animal-human transmission [16]. Though prioritized in the NRES, surveillance systems remain fragmented with inconsistent data collection across sectors. There is limited coordination between relevant stakeholders, lack of standardized tool for surveillance, and insufficient community engagement [12]. These gaps continue to hinder the implementation of NRES, as also highlighted in a previous multisectoral aimed to promote integrated rabies surveillance systems using a One Health approach [17].

To support Uganda's efforts towards eliminating rabies and specifically address the current gaps, a workshop was held to strengthen intersectoral collaboration and define further steps for rabies control. Structured tools such as the Stepwise Approach towards Rabies Elimination (SARE) have been used to assess rabies control capacity, identify system gaps, and improve One Health collaboration [18]. While Uganda conducted a SARE assessment in 2017, a limited follow-up and a lack of operationalisation have hindered action for rabies control [19]. Further tools such as the National Bridging Workshop for Rabies (NBW-R), to improve intersectoral collaboration for rabies have been developed and piloted in recent years [20], however Uganda was not among the pilot countries.

To optimally adapt to Uganda's context and the goals of the eRabies project, the workshop facilitated by the Schnell Einsetzbare Expertengruppe Gesundheit or German Epidemic Preparedness Team (SEEG),[1] in collaboration with the eRabies project[2] team, offered a flexible approach to focus on intersectoral dialogue and identifying practical barriers. The primary objective of the workshop was to enhance intersectoral collaboration among key stakeholders to co-create a detailed workplan to strengthen rabies control and integrated surveillance in Uganda. The process involved assessment of existing NRES implementation through a Strength, Weakness, Opportunities, and Threats (SWOT) analysis.

The following sections provide the key highlights of discussions and findings from the three-day workshop held from 13th to 15th March 2024 in Entebbe, Uganda.

2. Methods

2.1. Pre-workshop preparation

In preparation for the workshop, the organising and facilitating team, including members from the SEEG, eRabies, and relevant government partners, including MAAIF, MoH, Infectious Disease Institute (IDI) and NOHP, held a series of regular meetings to ensure smooth coordination and effective planning. These meetings focused on defining key objectives and anticipated outcomes, identifying participants, and developing tailored presentations and group activities. The workshop's design and content were developed jointly with partners to ensure alignment with their specific requirements and expectations. The detailed workshop agenda is available as Annex 1.

[1] SEEG is a German government initiative that supports partner countries worldwide in the prevention and control of infectious diseases and is implemented by the Deutsche Gesellschaft für Internationale Zusasamenarbeit (GIZ) in cooperation with the Robert Koch Institute (RKI), Friedrich-Loeffler-Institut (FLI), Bernhard Nocht Institute for Tropical Medicine (BNITM), and Chatité Berlin. This workshop was initiated by the SEEG's intersectoral collaboration working group, eRabies and Makerere University.

[2] eRabies project, funded by the Swiss National Science Foundation, is a collaborative project between the University of Zurich, the University of Bern, and Makerere University, aiming to contribute to eliminating rabies in Uganda.

2.2. Selection of participants

Stakeholders were collaboratively identified and selected by MAAIF, SEEG, and eRabies, for their potential to contribute to the strengthening of rabies surveillance systems and its control in Uganda. A multisectoral approach ensured broad representation from animal health, human health, and environment, at national and local government levels, as well as academia, and NGOs, and international partners (Table 1). Forty-nine participants attended, including representatives from all three ministries under the NOHP, international experts from Cambodia and Kenya, and who shared valuable insights based on their national experiences, and representatives from organizations such as the WOAH and the NGO Mission Rabies.

2.3. Workshop structure and design

The workshop employed a participatory approach, with multi-sectoral stakeholders co-leading discussions to co-create final outputs.

A Strength, Weakness, Opportunities, and Threats (SWOT) analysis, served as the central framework guiding the workshop design. SWOT analysis is an established strategic planning tool widely used to identify internal strengths and weaknesses, and external opportunities and threats, influencing an initiative or a system [21]. The outcome of this process ultimately informed the development of a targeted workplan with specific objectives and activities for rabies control.

2.4. Core participatory activities

2.4.1. SWOT analysis

To assess the implementation of the NRES, participants were divided into four multisectoral groups of 7 to 10 individuals, based on their expertise and sector affiliation. Each group was assigned one of the four strategic pillars (thematic areas) of the NRES:

1. Governance, Coordination, and Risk Communication,
2. Rabies Prevention and Control,
3. Field and Laboratory Surveillance and Data Management, and
4. Training and Operational Research.

Table 1
Workshop participants by stakeholder type, institution, and sectors.

Stakeholder Type	Institution	Sectoral representation (participants)	Total
Government Central	MAAIF, MoH, NPA, MWE	Animal Health (9), Human Health (9), Planning and coordination (1), Environment (1)	20
Government Local	District Health and Veterinary offices (Soroti, Busia, Kyegegwa, Katakui, Bukwo, Arua)	Human Health (6), Animal Health (6)	12
Academia	Makerere University (COVAB, IDI), Mbarara University of Science and Technology, AFROHUN	Multiple sectors	9
NGOs and international organizations	USPCA, VSF Germany, Mission Rabies, WOAH, CSO	Animal Health (5), Societal (1)	6
Professional Associations	USAPA, UVA	Animal Health (2)	2

NPA: National Planning Authority; COVAB: College of Veterinary Medicine, Animal Resources and Biosecurity, IDI: Infectious Disease Institute, AFROHUN: Africa One Health University Network, VSF Germany: Vétérinaires Sans Frontières, CSO: Civil Society Organizations; USAPA: Uganda Small Animal Practitioners Association, UVA: Uganda Veterinary Association.

Groups received guiding questions tailored to each SWOT component (Annex 2). Using these guiding questions, each group identified strengths, weaknesses, opportunities, and threats relevant to the respective thematic area.

2.4.2. Logical framework development

As a part of the participatory planning process and building on the SWOT analysis of the NRES, the same groups formulated a practical one-year workplan structured as a logical framework with SMART (Specific, Measurable, Achievable, Relevant, Time-bound) objectives tailored to the identified gaps and opportunities. For each objective, the groups proposed prioritized activities and outlined responsible stakeholders, necessary resources, success indicators, and timelines to measure progress.

2.5. Preparatory activities: Laying the groundwork for SWOT analysis and logical framework

2.5.1. Situation analysis of One Health structures and strategic frameworks for rabies

This focused session reviewed existing structures, resources, and policies for rabies control and surveillance in Uganda through a One Health lens. The NOHP Coordinator presented the operational structure of NOHP, budgeting mechanisms and ongoing One Health activities. The national rabies focal person in MAAIF outlined the rabies burden and trends, training initiatives, vaccination efforts, diagnostic testing capacity, sample transportation systems, and relevant legal and policy frameworks.

2.5.2. Current barriers to One Health collaboration

Despite established One Health systems like the NOHP, numerous challenges hinder effective intersectoral collaboration. Using WHO survey tool based on incentives to One Health action, participants in six groups identified barriers across 11 focus areas, including policy, funding, professional awareness, professional competence, evidence, collaboration, communication, coordination, capacity, monitoring, and evaluation of Uganda's One Health activities. Barrier cards were ranked for perceived relevance, with critical barriers highlighted during the group rotations. Participants also reflected on the current intersectoral communication tools and were invited to contribute to the WHO survey online.

2.5.3. Rabies control experiences from other endemic countries: Cambodia and Kenya

As a part of preparatory activities, participants were presented with case studies from Cambodia and Kenya to simulate discussion and identify adaptable strategies for rabies control in resource-limited settings. Cambodia's experience, though outside Africa, was relevant due to similar resource and funding constraints, and included approaches such as intersectoral collaboration for surveillance using Integrated Bite Case Management (IBCM), rabies educational materials in national school curriculum, provision of PEP in public hospitals, mass dog vaccination, and improved rabies diagnostics. Kenya shared progress in rabies surveillance and national strategy implementation through a One Health approach. These examples informed discussions on practical solutions applicable to Ugandan context.

2.5.4. Integrated digital rabies surveillance

This session focused on IBCM as a key component of rabies surveillance within a One Health framework. Participants learned the theoretical basis and its practical implementation for enhancing case detection, risk assessment for dog bites, and intersectoral coordination, presented from a perspective of a Rabies NGO's perspective. A comparative analysis was presented on the existing rabies surveillance tools used in Uganda: Event Mobile Application (EMAi) system by MAAIF, Integrated Disease Surveillance and Response (IDSR by the

MoH, the IDI bite capture form, and the Rabies Exposure Assessment and Contact Tracing (REACT) app developed by Mission Rabies. A previous multistakeholder assessment has identified the essential IBCM data needs such as bite reports, victim and biting animal details, and follow up data, as well as gaps in interoperability, data flow, and response coordination.

2.5.5. Group exercises on resources and synergies

Participants worked in five multisectoral groups using two hypothetical case studies (Annex 3). They explored current mechanisms for rabies control at district, regional and national levels, identifying collaboration and resource sharing across sectors. Each group selected three priority technical areas from a pre-defined list of nine options: funding-budget, training, community engagement: awareness and response, logistics, coordination at the governance level, coordination at

Table 2
Strengths, Weakness, Opportunities, and Threats (SWOT) analysis of implementation of the National Rabies Elimination Strategy (NRES) by participants under four thematic areas. Participants were grouped according to their expertise in the thematic areas.

Thematic area	Strengths	Weakness	Opportunities	Threats
Governance, coordination, and risk communication	• Existing NRES and legal framework (Rabies Act, Cap 44, Animal disease Act, Cap 38, *Animal (straying) Act Cap 40, Public Health Act Cap 28, Animals (Prevention of Cruelty) Act, Cap 39, Veterinary Surgeons Act*) • Existing NOHP and subnational One Health teams in 36 districts; Rapid response teams in others • Established focal points for rabies and zoonoses at national level • Existing animal and human health disease management structure from national to subcounty level	• Outdated Rabies act 1932 • Weak enforcement of existing rabies regulations • National Rabies task force not functional; OH policy not operationalized • Incomplete, poorly managed animal health data • Limited government funding and political will to advocate for rabies control (surveillance, diagnostics, vaccination)	• Existing HMIS and IDSR systems that could link human and animal health • Partner's interest in intersectoral collaboration • Existence of East African Community (EAC) strategy on OH • Political support	• Changing health priorities, with reduced focus on rabies • Shifting priorities and available resources to other emerging and re-emerging diseases – shifting of available resources
Rabies prevention and control	• Human resources (Animal Health Officers, Veterinarians, Assistant Veterinary Officers, VHTs, medical doctors, public health officers, health workers, health educators etc) • Availability of human and animal rabies vaccines (700,000 doses every two years for animals) • Functional administrative structures to support mobilization, lobbying, and advocacy • Available rabies IEC materials for rabies control and prevention • Annual rabies awareness campaigns with partner support	• Inadequate PrEP/PEP supply and poor distribution in district government facilities • Limited cold chain facilities and vaccine management capacity • Insufficient vaccines and logistics for mass dog vaccination campaigns (human resource, transport, incentives for community mobilization) • Limited dissemination and use of rabies IEC materials • Limited rabies knowledge among VHTs and community health workers	• Willing partner support (SEEG, GIZ, VSF-GERMANY, Mission Rabies) • Strong media engagement e.g. TV, social media, IEC materials and nationwide access to radio stations • Government's regular media airtime for community awareness	• Untrained/unauthorized practitioners spreading misinformation • Community misconceptions and superstitions • Lack of transborder coordination • Multiple rabies reservoirs (mongoose, foxes, caveat cats) • Counterfeit products and vaccines
Field and Lab surveillance and data management	• Existing surveillance structures and data tools from subnational to national levels • For human health (IDSR, Event Based Surveillance (EBS), Community Base Surveillance (CBS), DHIS2, etc) and Animal Health e.g. EMA-I, standard surveillance form) • Existence of national transportation guidelines for animal and human samples	• Under- and delayed reporting of rabies cases in humans and animals • No joint surveillance response teams (IBCM) • Lack of a data-sharing mechanism across sectors • Limited district/regional diagnostic capacity (human resources, equipment, reagents, PPE) • Transportation guidelines not implemented • Only one accredited national lab for rabies testing • Inadequate field transport and fuel	• National (government) and international partner support • Integration of mobile reporting technologies such as GARC, Mission Rabies apps)	• Limited motivation and training of surveillance teams (reporting, sample collection, transportation) • Cultural beliefs limiting reporting • Data security and privacy concern (system hacking) • Unreliable health hub systems • High dependency on partner funding
Training and Operational Research	• Existing research institutions e.g. COVAB, IDI, and OH structures, e.g., NOHP • Established research laboratories, e.g., NADDEC, UVRI, regional labs • Established national research regulatory bodies e.g. UNCST and established institutional research ethics committees • Available online rabies training curriculum for in-service professionals	• No national rabies repository for rabies samples • Lack of rabies research agenda • Insufficient advocacy on rabies research funding • Centralized research institutions • Limited network of established research laboratories and private sector • Outdated rabies training curriculum not aligned with current technologies	• Collaboration with international research institutions and universities and partner funding like SNSF (eRabies project) • Target of "Zero-by-30"	• Donor-driven research priorities • Political interference in rabies control • High cost of research and training

OH: One Health; VHT: Village Health Teams; IEC: Information, Education, and Communication; COVAB: College of Veterinary Medicine, Animal Resources and Biosecurity, IDI: Infectious Diseases Institute, NOHP: National One Health Platform, NADDEC: National Animal Disease Diagnostics and Epidemiology Centre; SNSF: Swiss National Science Foundation; UVRI: Uganda Virus Research Institute; UNCST: Uganda National Council for Science & Technology; HMIS: Health Management Information System; IDSR: Integrated Disease Surveillance and Response; PPE: Personal Protective Equipment.

the technical level, risk assessment and mitigation, field investigation and rapid response teams, and laboratory. Guided by prompt questions (Annex 4), discussions focused intersectoral collaboration, community involvement, and strengthening legal frameworks, diagnostics, and surveillance to improve rabies detection, response and prevention.

3. Results

3.1. SWOT analysis

One of the key outputs of the workshop was a SWOT analysis of Uganda's NRES implementation (Table 2). Each group under the thematic areas (Governance, Coordination, and Risk Communication; Rabies Prevention and Control; Field and Laboratory Surveillance and Data Management, and Training and Operational Research) provided specific assessments based on the SWOT framework.

In the area of "Governance, Coordination, and Communication," participants highlighted existing legislative and policy frameworks such as Rabies Act [22], Animal Disease Act [23], Animal (straying) Act [24], Public Health Act [25], Animals (Prevention of Cruelty) Act [26], Veterinary Surgeons Act [27], and One Health structures. Key weaknesses included outdated legislation, weak enforcement, poor communication, and a non-functional task force. While opportunities and interest for intersectoral collaboration exist, threats like low political prioritization may hinder progress.

In the area of Rabies Prevention and Control, a strong workforce and regular availability of animal vaccines, and availability of rabies information and education materials were identified as strengths. Weakness was noted for PEP availability and distribution, limited cold chain infrastructure, and insufficient dog population management strategies. Collaboration with partners and enhanced media use were identified to offer opportunities, but misinformation by unqualified practitioners, community superstitions and the presence of multiple wildlife reservoirs were considered significant threats.

For Field and Laboratory Surveillance and Data Management, established surveillance systems and sample transport guidelines were listed as strengths. Yet, underreporting of cases, lack of IBCM, and under-equipped regional labs, limited data sharing across sectors were identified as critical weaknesses. Digital tools and international support present opportunities, while low motivation among surveillance teams, cultural barriers and private concerns for reporting, and reliance on external funding threaten the sustainability of the system.

Finally, in Training and Operational Research, participants acknowledged strong institutional frameworks and research bodies. Key weaknesses included the lack of a rabies-specific research agenda, outdated training curriculum, and limited partnerships with the private sector. Still, international collaborations and online training resources offer potential. Political interference, high costs, and donor-driven priorities were identified as weaknesses.

Annex

- *The Rabies Act, Cap 44; provides for the suppression of rabies. It gives power to seize, detain or destroy stray dogs* [22].
- *Animal disease Act, Cap 38, provides for the control of animal diseases, including the separation of diseased animals from the healthy ones and reporting/notifying of the disease to the Commissioner for Animal Health* [23]
- *Animal (straying) Act Cap 40; gives powers or authority to the veterinarians and police officers to seize and detain straying animals, including dogs and if necessary, their disposal* [24].
- *Public Health Act Cap 28; empowers any person who becomes aware of any unusual sickness or mortality in animals, including dogs and cats of epidemic nature, to immediately report to a local authority or to a medical officer of health* [25].
- *Animals (Prevention of Cruelty) Act, Cap 39; provides for penalties for injury, torture, ill treatment, beating and inflictions done to animals, hence promoting observance of animal welfare* [26].
- *Veterinary Surgeons Act: This Act provides for the registration and licensing of practitioners of veterinary surgery and for other matters connected with and incidental to the practice of veterinary surgery* [27].
- *Local Government Byelaws on animal movement control; The by-laws give powers to the local authorities to seize and impound loitering animals.*

3.1.1. Cross-cutting issues

Across the four thematic areas, several issues emerged repeatedly. Governance gaps, particularly outdated legislation and weak enforcement are linked to limitations in other thematic areas. Dependence on external partners were noted in both surveillance and research, while lack of logistics and human resources and community level barriers such as misconception and misinformation were mentioned across rabies prevention and surveillance areas. On the other hand, recurring opportunities identified such as strong partner support and existing One Health structures which offer shared entry points for NRES implementation.

3.2. Logical framework of workplan for targeted objectives and activities

The planning exercise, informed by the SWOT analysis, resulted in the development of a one-year workplan presented as a log frame. It outlines 10 targeted objectives and 26 activities across all four thematic areas, identifying responsible stakeholders, resource needs and success indicators (Table 3).

Under the thematic area "Governance, Coordination, and Risk Communication", objectives focused on developing national advocacy and communication strategies and operationalizing rabies task forces at the national and district levels with support from ministries and local governments. Regular training and coordination meetings were planned to promote sustained collaboration across sectors.

In the area of Rabies Prevention and Control, activities centred on scaling up mass dog vaccination campaigns covering at least 70 % dog population, increasing availability of PEP. Proposed actions included baseline population assessments, vaccine procurement, improving cold chain infrastructures, and implementation of mass dog vaccination campaigns with local participation. Additionally, activities were also proposed for post-vaccination monitoring, ensuring logistical support at the district level, and community awareness programs for the administration of PEP.

For Field and Lab Surveillance and Data Management, objectives aimed to strengthen integrated surveillance, intersectoral data sharing, and improve diagnostic capacities. Proposed actions included the implementation of IBCM, training of IBCM officers, and enhancing diagnostic capabilities at regional laboratories, in terms of laboratory infrastructure and human resource capacity for rabies testing.

Additionally, in Training and Operational Research, activities prioritized involved developing rabies-specific curricula, conducting joint training sessions in high-risk areas, and identifying research needs through national stakeholder mapping. These proposed activities were complemented by clearly defined needs such as logistical support, cold chain equipment (refrigerators, inverters), rabies vaccines, and human resources.

4. Discussion

This workshop is an example of a One Health activity as defined by the OHHLEP, emphasizing coordinated, collaborative, and multisectoral efforts across human, animal and environmental health to achieve optimal health outcomes [11]. It aimed to strengthen intersectoral collaboration and co-create a detailed log frame to guide rabies control and integrated surveillance in Uganda, demonstrated through

Table 3
Log frame with objectives and activities under each thematic area from strengths, weakness, opportunities and threats analysis.

Thematic area	Objectives	Activities	Responsible lead	Needs to be worked on	Success Indicators	Timeline
Governance, coordination and risk communication	To develop and disseminate a national communication and advocacy strategy for rabies elimination	Develop and disseminate a national advocacy strategy Develop and disseminate an intersectoral communication strategy	MOH working with MAAIF (with support of OPM, MAAIF, MoH, MOES, MWE, MOFEP, UWA, MoLG, MGLSD, Training institution, (Universities & Colleges) Others FAO, WHO, WOAH)	Definition of Communication Channels Identification of focal point group for document drafting Identification of Target Groups Communication Expert Community Engagement Expert	Communicated strategy and workplan Number of stakeholder Meetings	Q4 Q4
	To establish & operationalize the Rabies task force teams at National and Districts level	Stakeholder mapping and orientation of stakeholders on the One Health Concept	MAAIF, MOH	List of stakeholders and contacts Define focal points and personnel on different administrative levels	Districts selected Task force members identified and formally appointed	Q1
		Training of Rabies task force teams at all National and Sub National levels and quarterly meetings for this task force teams		Training material, training facility Trainers (Experts on rabies, communication and community engagement experts)	Task forces trained, Refresher training for existing district tasks forces	Q1 Q1-Q4
Rabies prevention and control	To increase rabies vaccination coverage to 70 % of dog population and reduce stray dog population	Conduct baseline assessment of dog population	MAAIF, private sectors, local government and local leaders	Trainings on dog population estimation, tools, humans and financial resources	Estimated baseline dog population	Q1
		Procurement of sufficient doses of rabies vaccines each year	MAAIF	Budget, communication with WOAH vaccine bank, administrative experts	Number of vaccines procured and distributed	Q2-Q3
		Develop vaccination schedules with local authorities and community participation and conduct mass dog vaccination campaigns accordingly	MAAIF, Local government, vet officers, Local leaders	-Supplies for vaccination (syringes, gloves, dog restraining equipment) -Logistical support to field staff (Transportation: vehicles, motorcycles, fuel; protective wears, anaesthetics)	Vaccination timeline for districts Number of dogs vaccinated	Q3
		Conduct post-vaccination survey, assess vaccine coverage and document lessons	MAAIF, local government			Q4
		Ensure cold chain integrity for rabies vaccines storage and delivery through power back up in districts	MAAIF, Local government	Logistics: Refrigerators Inverters, power-generators		
	To enhance the availability of PEP for rabies in hotspot districts	Training public health workers on rabies PEP and PrEP administration	MoH, local government, Implementing partners	Experts, vaccines, RIG, consumables, resources	Number of public health workers trained	Q4
		Procure sufficient doses of human rabies vaccine (PEP and PrEP)			Number of PEP and PreP procured and administered (according to dog bites)	Q4
	To strengthen human resource capacity	Train technical officers and veterinarians for cold chain management, vaccination campaign management, digital phone app usage	Training Institutions, MAAIF, local government, local leaders	Experts in cold chain management, digital applications	Number of personnel trained	Q1
		Train extension officers to report vaccination data accurately and promptly to relevant health authorities				Q2
		Mobilize communities to raise awareness on dog vaccination, human vaccination and proper waste management	Training Institutions, MAAIF, local government, local leaders, MWE	Community leaders, schools, extension officers		Q1-Q4
Field and lab surveillance and data management	To strengthen intersectoral data sharing mechanisms for rabies	Conduct stakeholder meetings to a. develop SOPs/guidelines for data sharing, b. Harmonize intersectoral data collection and reporting tools	MoH, MAAIF, (Rabies focal persons)	Identification of stakeholders, understanding available tools, Moderators (linking both sectors) to develop the guidelines and SOPs, technical support	Number of meetings in a year	Q1-Q4

(*continued on next page*)

Table 3 (*continued*)

Thematic area	Objectives	Activities	Responsible lead	Needs to be worked on	Success Indicators	Timeline
		Print and disseminate the guidelines and SOPs to stakeholders			Number of printed guidelines and SOPs	Q4
	To establish and operationalize IBCM at the national and sub-national levels	Conduct pilot of IBCM in selected districts	DVO, DHO, universities (COVAB, IDI) and partners)	DVO, DHO, animal and human health extension workers, phones	Data analysed and lessons learnt	Q1
		Develop guidelines for the operation of IBCM	MoH, MAAIF, (Rabies focal persons), Partners (Mission Rabies, eRabies)	Moderator (with link to human and animal health sector)	Guidelines available	Q1
		Training of rabies key stakeholders at all levels for IBCM and designation of IBCM officers		Trainers Responsible person for the designation at the ministries (MAAIF, MoH)	Number of trained participants, designated officers and districts with designated officers	Q1
	To strengthen regional laboratory capacity for rabies surveillance and diagnostics	Practical training sessions for regional veterinary lab personnels by national reference labs and partners	MoH, MAAIF, (Rabies focal persons)	Trainers, lab and lab equipment, surveillance tools to capture data, experts for surveillance tools	Number of training sessions and number of participants	Q2
		Developing a monitoring system to assure constant availability of reagents and equipment for rabies testing	MoH, MAAIF, (Rabies focal persons)	Designated personnel to oversee supplies, forecast and procure	No stock out	Q3-Q4
Training and Operational Research	To develop a national rabies research agenda	Conduct network mapping of rabies stakeholders in Uganda Conduct workshop with relevant stakeholders to identify rabies research needs	Lead MAAIF and MoH, educational and research institutions like Makerere University, and IDI	Linkage to the University councils, research agencies in Uganda	Mapping report, Research agenda in place	Q2
	To enhance capacity for rabies training and operational research in Uganda	Develop rabies training curriculum for technical and community level training	COVAB and IDI (Makerere university)	Curriculum development and review experts	Curriculum developed	Q4
		Joint training of lab staff, vet staff and human health workers in rabies high risk areas, raising awareness in the local community, training of teachers in schools	MoH, MAAIF, local governments National Curriculum Development Institute	Rabies training experts and trainees Training materials Communication and curriculum experts	Number of people trained Training material in place Number of teachers trained	Q4
		Specialized training for lab staff on rabies diagnostics and handling of samples (50 people in total)	MoH, MAAIF, local governments	Experts and trainees Lab equipment (functional labs) Reagents and consumables	Number of lab staff trained	Q1-Q2

MoFPED: Ministry of Finance, Planning and Economic Development; OPM: Office of the Prime Minister; MOES: Ministry of Education and Sports, MWE: Ministry of Water and Environment; UWA: Uganda Wildlife Authority; MoLG: Ministry of Local Government; MGLSD: Ministry of Gender Labour and Social Development; DVO: District Veterinary Office; DHO: District Health Office.
Timeline: Q1: April, May, June (2024); Q2: July, August, September (2024); Q3: October, November, December (2024); Q4: January, February, March (2025).

collaborative group work, discussions, joint planning and post-workshop follow-up. Participants represented diverse professional backgrounds and sectors-including national and local government, academia, regulatory bodies, and various organizations, working together to address critical challenges in rabies response.

Through structured group exercises and dynamic brainstorming sessions, supported by visual aids, guides, and interactive facilitation, significantly enhanced the communication, fostered open and constructive dialogue, and aided active engagement. This enabled evaluation of existing systems, and identification of real-world challenges, critical gaps and opportunities for rabies control across all levels of governance. Previous participatory workshops have shown that when outputs are driven by co-creation, the involvement of experienced experts and stakeholders is essential to ensure that results reflect shared visions and priorities [28,29].

A central output of the workshop was a structured Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis of the National Rabies Elimination Strategy (NRES) implementation, applied across the strategic pillars (Governance, Coordination, and Risk Communication; Rabies Prevention and Control; Field and Laboratory Surveillance and Data Management, and Training and Operational Research). This unique approach helped build a shared, cross-sectoral understanding of rabies control in Uganda. It moved beyond assessment towards structured implementation planning within the context of NRES, making it a valuable addition to Uganda's rabies control. To our knowledge, this is the first time Uganda has developed a rabies control action plan using the SWOT tool.

While the workshop differs from established rabies-specific tools like SARE or NBW-R, it shared and complemented aspects of both tools. SARE provides an overall assessment and long-term planning framework, while NBW-R focuses on strengthening intersectoral collaboration [30,31]. Both tools guide the development of SMART objectives. The technical domains exploring the current mechanisms of surveillance, training, vaccination, and community engagement mirror NBW-R's structure, reflecting shared priorities. The workshop also differs from broader health and veterinary assessment tools such as WHO Joint External Evaluation (JEE), which assesses national capacities for public health emergencies [32], and the WOAH Performance of Veterinary Services (PVS) which evaluates the veterinary service performance and gaps [33]. The workshop was disease-specific, context-driven and action-oriented. It didn't score national capacities or benchmark against international standards. Instead, it used the SWOT framework to

identify practical opportunities, producing a short-term, implementable rabies workplan.

Building on the insights of SWOT analysis, participants developed a logical framework, to translate strategic insights into actionable short- and medium-term goals – leveraging strengths, addressing gaps, utilizing opportunities, and mitigating risks. While the NRES already includes a high-level log frame to guide long-term strategic planning, this exercise added value by complementing this framework rather than replacing it. It offered a practical tool rooted in the findings from SWOT analysis. By focusing on short-term priorities based on specific thematic areas, the approach emphasized accountability, supported intersectoral collaboration, and reinforced alignment with Uganda's One Health framework. These outputs were designed to contribute directly to measurable rabies control outcomes. Examples include targeted vaccination campaigns in high-risk districts to approach WHO recommended 70 % coverage, adoption of IBCM and enhanced diagnostic capacity to improve case detection and reporting and strengthened intersectoral coordination and community engagement to sustain surveillance and prevention. Table 3 links each priority activity to clear indicators and timelines, providing a framework for tracking progress towards national and global elimination targets.

This SWOT analysis revealed critical threats and weaknesses. Over-reliance on external donor funding, and inadequate political will and limited government commitment for rabies funding recognised as a threat to the long-term implementation and sustainability of rabies control efforts in Uganda across several thematic areas. To address this, rabies control should be included into the national and subnational budgeting, ensuring it becomes a routine and funded component of health and veterinary services. Strengthening institutional responsibility, particularly at local government level, will be a key to build long-term commitment and financial support within the country. Participants also noted fragmented surveillance systems and need of integration into a central digital platform. This would allow real-time data sharing, better communication and harmonization between sectors, and quicker response to rabies cases.

Following the successful workshop, there was strong high-level engagement. On March 16, 2024, the SEEG GIZ team met with the Minister of State for Agriculture, Animal Industry and Fisheries, alongside representatives from MAAIF and NOHP. The Minister expressed strong support, pledging government funding to sustain and expand follow-up activities. In parallel, the MoH also reiterated its commitment to the workshop outcomes and agreed to support the implementation of key recommendations.

The outputs of the SWOT analysis proved valuable in guiding the next steps for rabies control. Under the theme "Training and Operational Research", a key weakness identified was the lack of a focused rabies research agenda. A comprehensive scoping review was thus undertaken to map existing rabies-related research in the country, identifying key gaps and informing future research priorities [34]. In the area of surveillance and data management, eRabies team, in collaboration with Mission Rabies and MAAIF, piloted the use of the REACT application for Integrated Bite Case Management (IBCM) [35]. Participants from both national and district levels (Soroti, Kyegegwa, Masaka, and Arua) were trained to use the REACT app. Additionally, a specialized training on rabies sample collection and testing using Lateral Immunoflow Assay was conducted with ten selected participants, enhancing field diagnostic capacity and overall response preparedness. Some mass dog vaccination campaigns have been conducted by government and project teams in selected districts [36].

Despite these promising advancements, broader implementation of workshop outputs remains inconsistent. Over a year since the workshop, several planned activities are either uninitiated or partially executed. For example, vaccination coverage, one of the core objectives of the plan, has limited documentation, and it remains unclear whether districts can meet the targeted 70 % vaccination coverage. Other activities such as post-vaccination monitoring, procurement and distribution of post-exposure prophylaxis for humans, animal vaccine availability, cold chain logistics, national roll-out and update of curricula for health and veterinary health professionals remain undocumented. Sustained community engagement and intersectoral coordination mechanisms have not yet demonstrated measurable progress. Surveillance gaps remain, and routine intersectoral data sharing has not been fully institutionalized. The absence of a consistent monitoring framework across all thematic areas also limits the ability to evaluate progress.

Although no formal follow-up or evaluation mechanism was planned during the preparatory phase, the workshop was designed to produce actionable outputs to guide stakeholder-led initiatives aligned with national efforts in rabies control and One Health coordination. It produced several outputs and renewed stakeholder commitment, yet measurable impacts on rabies control and surveillance are not evident. Ongoing activities such as continued multisectoral meetings, surveillance efforts in selected districts, and ongoing discussions on evaluation suggest positive momentum, but these remain limited in scope. Formal evaluation will be required to assess whether these participatory efforts eventually result into sustained improvements in surveillance, vaccination coverage, and intersectoral data sharing. While responsibilities for each activity are outlined in the proposed workplan, assigning a single clear lead per activity, supported by relevant partners, would strengthen accountability. Overall coordination should be facilitated through the NOHP to ensure alignment, ownership and regular progress reviews.

These challenges reflect broader systemic barriers in Uganda, rooted in slow bureaucratic processes and limited responsiveness. Persistent issues such as delayed or no-fund release, lack of coordination, and resources procurement bottlenecks challenge policy implementation [37]. Policy fragmentation across ministries often creates overlapping responsibilities, reinforce institutional silos, and limit cohesive planning [37]. Gaps in governance structures, particularly in coordination and sustained financing, further limit the follow through [38,39]. This pattern is not limited to this workshop. As seen in the NBW experiences, roadmaps often face challenges in post-workshop implementation due to limited follow-up, fragmented coordination, and clear accountability structures [40,41]. Addressing these challenges will need stronger accountability, local ownership, dedicated funding, and functional coordination structures. Equally important is consistent policy-level engagement to ensure that the workshop's outcome lead into lasting impact.

Some methodological limitations of the workshop should also be acknowledged. Despite efforts to ensure broad sectoral and institutional participation, representation from environmental and wildlife sectors, women, and local communities was limited. This gap reflects equity challenges and raises concerns about whether the priorities of all affected sectors and communities are adequately reflected in One Health planning. To fully realize effective and sustainable One Health systems in Uganda, future efforts and coordination mechanisms should prioritize gender balance and involve underrepresented groups including community-based actors, and marginalized populations. Their insights and experiences are critical for designing interventions that are locally relevant, inclusive and socially accepted. Additionally, the SWOT analysis and logical framework development were conducted with a limited timeframe, which may have hindered the in-depth analysis. The exercises also relied on self-assessment of participants, making the findings subjective to bias. During the SWOT analysis, no formal prioritization or ranking was conducted, which limits the ability to immediately identify the most critical areas for action. Instead, key issues considered important were incorporated into the log frame. Finally, as the workshop was context-specific to Uganda's rabies status, policy, and health system structures, the generalizability of outcomes to other settings may be limited.

Nevertheless, the workshop outputs reflect the value of participatory approaches in shaping national priorities, strengthening public health policies, and informing strategic planning. Similar applications of SWOT

analysis have proven valuable in other contexts, such as Nigeria for rabies strategy refinement [42], and Kenya, for national One Health strategic planning for zoonotic disease control [43]. Prior studies have also highlighted the role of participatory SWOT exercises in transforming stakeholders' concerns into actionable plans and improving organizational performance [44,45]. By complementing existing tools like SARE and NBW-R, this approach offers a pathway for operationalizing One Health strategies for rabies control. Accordingly, the findings can provide a foundation for the potential refinement and adaptation of the NRES to better respond to emerging challenges and priorities. However, the successful translation of these outcomes also depends on the sustained political commitment and dedicated resource allocation by the government for rabies control.

5. Conclusion

This workshop served as a valuable platform for fostering interdisciplinary and multisectoral collaboration, bringing stakeholders from human, animal and environmental health sectors to collectively explore strategies for rabies control and strengthening the integrated surveillance systems. A SWOT analysis was employed as a systematic tool to identify strengths, weaknesses, opportunities, and threats associated with the current National Rabies Elimination Strategy (NRES) in Uganda. The insights from this analysis informed the formulation of targeted objectives and actionable activities to enhance rabies control efforts. The workshop further reinforced the need of a One Health approach as a cornerstone for implementing coordinated strategies. The outcomes can serve as a guide to relevant authorities in prioritizing and operationalizing effective measures for rabies control in Uganda, while contributing to the national goal of rabies elimination.

CRediT authorship contribution statement

Rabina Ghimire: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Samuel George Okech:** Writing – review & editing, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Anna S. Fahrion:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Investigation, Funding acquisition, Conceptualization. **Terence Odoch:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Jan Matern:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Tina Bohnes:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Nathalie J. Vielle:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mathew Muturi:** Writing – review & editing, Validation, Supervision, Resources, Methodology, Investigation, Formal analysis, Data curation. **Johanna Pauline Wiethoff:** Writing – review & editing, Validation, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Maria Flavia Nakanjako:** Writing – review & editing, Validation, Resources, Methodology, Investigation, Conceptualization. **Frederic Lohr:** Writing – review & editing, Validation, Resources, Methodology, Investigation, Data curation. **Prahors Ung:** Writing – review & editing, Validation, Resources, Methodology, Data curation. **Chheng Tann:** Writing – review & editing, Validation, Resources, Data curation. **Simon Peter Alubbe:** Writing – review & editing, Validation, Resources, Methodology, Formal analysis, Data curation. **Anna Rose Ademun:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Conceptualization. **John Opolot:** Writing – review & editing, Validation, Resources, Methodology, Data curation. **Fred Monje:** Writing – review & editing, Validation, Resources, Methodology, Data curation. **Judith Nanyondo Semanda:** Writing – review & editing, Validation. **Dickson Akankwatsa:** Writing – review & editing, Validation, Resources, Data curation. **Lilian Wambua:** Writing – review & editing, Validation, Resources, Methodology, Investigation, Data curation. **Salome Dürr:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Funding acquisition, Data curation, Conceptualization. **Sonja Hartnack:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Ethical approval

All participants were informed about the purpose of the workshop, and verbal consent was obtained for participation and for the use of anonymized data in publications. Ethical clearance for qualitative stakeholder and community engagement activities within the eRabies project is obtained from the Research Ethics Committee of the School of Veterinary Medicine and Animal Resources, Makerere University (SVAR-IACUC/135/2023) and Uganda National Council for Science and Technology (Research registration number HS3463ES).

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.onehlt.2025.101206.

Data availability statement

All the data from the workshop are included in the manuscript and supplementary information.

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