BMC Public Health

RESEARCH

Open Access

One health strategic planning: multi-criteria decision analysis to prioritize rabies interventions in Burkina Faso

Madi Savadogo[1,2,5,6*], Peegdsom Simplice Assomption Yameogo[1,3], Thomas-Julian Omoijade Irabor[1,3], Rianatou Bada-Alambédji[4] and Nicolas Antoine-Moussiaux[1,3]

Abstract

Background Rabies is recognized among the top five priority zoonotic diseases in Burkina Faso. As in other endemic countries around the world, implementing the One Health approach is a best way towards rabies control. In 2022, Burkina Faso adopted a national strategic plan (NSP) with the aim of advancing collaborative efforts towards the elimination of domestic dog-mediated human rabies by 2030. The first two years following the adoption of this strategic plan were characterized by a low level of commitment from involved stakeholders and unsuccessful implementation due to a wide range of constraints that those stakeholders are facing.

Methods To review the ongoing strategy with these stakeholders, a multi-criteria decision analysis (MCDA) approach has been proposed to establish a prioritization of interventions. Participatory workshops joined relevant 45 institutional and community stakeholders (22 participants for human health group, 23 participants in animal health group, 45 participants for the plenary session) involved in animal and human rabies control, as well as actors from other sectors or civil society. The method was applied in parallel in two groups centred around sectoral participants from human and animal health, then combined through discussions in plenary sessions.

Results Overall, 41 interventions were selected, related to data collection and analysis, prevention and control, laboratory diagnosis, dog population management, advocacy and public awareness, and cross-cutting issues. Seven analysis criteria were defined by the stakeholders, related to rabies elimination, strategic and operational aspects, One Health capacity development, and social impact. The results revealed distinct prioritization between the sectoral groups. However, a relative agreement could be highlighted on the importance ascribed to a set of cross-sectoral interventions, including harmonization of procedures for surveillance, data sharing as well as prevention and control. Accordingly, interventions perceived as sector-specific were attributed with the lowest scores.

Conclusion The results of the study inform decision-makers regarding the interventions that are best supported by implementing stakeholders, hence showing the potential for increased their ownership, commitment, and eventually efficacy.

*Correspondence:
Madi Savadogo
savadogo.madi@yahoo.fr

Full list of author information is available at the end of the article

Keywords Zoonoses, Rabies, Strategic planning, Multi-criteria decision analysis, Integrated approaches, Rabies elimination, Public health, One health, Tropical medicine, Global health, Burkina faso

Introduction

Animal-mediated human rabies remains a global public health threat as it is responsible for a number of human deaths, with available estimates ranging from 13,743 [1, 2] to 59,000 annually [3]. This major zoonotic disease affects domestic animals, wildlife and human. Moreover, previous investigations have highlighted the importance of the dog in the epidemiological cycle of the disease, as this animal is responsible for over 90% of human rabies cases [2, 4, 5]. To support the achievement of the third Sustainable Development Goal (SDG3) - *Ensure healthy lives and promote well-being for all at all ages* - a global strategic plan was launched in 2015 with the ambition of eliminating human rabies transmitted by domestic carnivores by 2030. The global strategy has triggered the operationalization and the strengthening of intersectoral collaboration, and joint assessment tools have been developed, such as the Performance of Veterinary Services (PVS) evaluation of WOAH, the International Health Regulations (IHR, 2005) tools of WHO, and the Quadripartite One Health Joint Plan of Action, to provide guidance to countries towards rabies elimination.

Despite the efforts undertaken over the years, the threat has not been significantly reduced. Like many African countries, Burkina Faso has been struggling with this animal and human health problem for decades [6–9]. To control the disease, the national authorities introduced various initiatives including rabies vaccination of domestic carnivores and post-exposure prophylaxis for bitten persons. However, the incidence of rabies cases in animals remains considerable with regularly recorded animal bites and human rabies cases by medical and veterinary services [10, 11]. According to previous studies, an average of 11,500 bite cases and 40 human deaths are reported annually, while post-exposure prophylaxis completion among bitten people remains challenging [4, 5, 11]. Indeed, only two centers (located in the two main cities of the country, Ouagadougou and Bobo Dioulasso) are able to provide post-exposure prophylaxis. In addition, the national rabies surveillance system lacks sensitivity and responsiveness in both animal and human health. The two surveillance systems remain unconnected, thus not enabling the integrated management of rabies. Therefore, although rabies has been a notifiable disease in Burkina Faso for decades, it remains highly under-reported [5, 8]. The only laboratory with rabies diagnostic capacities belongs to the animal health sector and is located in Ouagadougou. In addition, significant rabies control measures such as dog vaccination, human pre- and post-exposure prophylaxis, public awareness raising, responsible dog ownership are still not or incompletely implemented. For example, dog vaccination remains very low (ranging from 8% in rural areas to 36% in urban area), while post-exposure prophylaxis delivery is characterized by a frequent shortage of inputs and lack of knowledge among health workers [5, 11].

Over the past decade, the fight against animal and human rabies in the country has been characterized by substantial progress. Many studies conducted on animal and human rabies have gradually improved the availability of epidemiological evidence across the country [4–6, 11, 12]. Subsequently, the One Health zoonotic diseases prioritization conducted in 2017, in the scope of the multisectoral engagement of animal, human and environment health, resulted in rabies being selected as the second disease of most concern, in a list including anthrax, brucellosis, highly pathogenic avian influenza and dengue [13]. These national efforts culminated in the creation of a formal national One Health coordination platform in 2019 [14], comprising specialized bodies, such as the thematic committee in charge of zoonotic diseases. This thematic committee, whose mandate is to formulate recommendations to improve the control of rabies and other zoonotic diseases of interest, includes stakeholders that represent domestic animal health, human health, environment and wildlife health, territorial administration, education and research entities, civil society organizations as well as international institutions. All these advances have contributed to the adoption in November 2022 of a national integrated strategic plan (NSP) aimed at ending domestic dog-mediated human rabies in the country by 2030. The NSP is aligned with the global strategic plan to end human deaths from dog-mediated rabies by 2030 [15]. It was developed by a consultant on basis of the results from the in-country stepwise approach towards rabies elimination (SARE) process, and of a template proposed by the United Against Rabies initiative, including World Organization for Animal Health, United Nations Food and Agriculture Organization, World Health Organization, and Global Alliance for Rabies Control [16]– [17]. However, almost two years after the NSP was adopted, the fight against the disease has not generated a satisfactory commitment from the various sectors and stakeholders, highlighting the challenge of such cross-sectoral initiatives in general but also issues tied the social, economic and political context of Burkina Faso.

As with all zoonotic diseases, animal-mediated human rabies epidemiology is associated with complex social and ecological systems, and its control continues to be challenged by constant changes, because multiple

entities and stakeholders are concerned [18, 19]. Due to the socio-epidemiological features of the disease, the adoption and the implementation of control measures require effective participation of different sectors, disciplines and administrations. This is highly encouraged under the aegis of the One Health approach and provides the basis for the global strategy to eliminate human dog-mediated rabies by 2030 [15, 19]. Indeed, rabies epidemiology is tied to the multiple interactions between domestic animals, wild animals, humans and their shared environment. Therefore, beyond biological knowledge and tools (including effective vaccine known since 1885), rabies control requires integrative approaches, considering the social-cultural, institutional, environmental and ecological determinants that can influence the dynamics of the virus transmission and propagation. This complexity entails the need for continuous improvement of the way transdisciplinary and multi-sectoral approaches are defined and implemented with the full participation of stakeholders, adapting interventions to local realities and spurring the needed ownership of these otherwise exogenous national strategies. Moreover, given the scarcity of resources, decision-makers are increasingly pushed to optimize public health investments, focusing on high-impact interventions. To this end, embracing the vision and expectations of different categories of stakeholders is a key ingredient to the success of any strategy [20, 21]. Therefore, participatory decision-making tools become essential, considering the multi-sectoral and multi-actor environment of rabies management.

Multi-criteria decision analysis (MCDA) provides a systematic and rigorous method to guide decision-making involving a multiplicity of actors, objectives and values. MCDA was developed at the mid of the 20th century in the field of industry and business management, to overcome the limitations of analysis that inadequately reduced complex decision-making to the consideration of a limited set of stakes, most often linked to financial perspectives [22, 23]. Over the years, their use has spread to several socio-economic areas, including agriculture [24], environment [25], and public health [26]. Indeed, MCDA has been used in previous studies for risk assessment and communication [27, 28], emerging diseases prioritization [29, 30], analysis of public acceptance in antimicrobial resistance control [31] and designing zoonotic diseases surveillance and control strategies [32]. These reports highlight the usefulness of the method in addressing the cross-cutting and complex challenges that characterize health issues. Therefore, extending the use of MCDA to support the evaluation of One Health strategies, comparing potential alternatives, may improve both implementation and effectiveness.

This study applies MCDA to prioritize interventions proposed in the national integrated strategic plan to end human deaths from domestic dog-mediated rabies by 2030 in Burkina Faso. It aims at identifying high-impact interventions in local contexts, improving the ownership and adequacy of decision-making in the implementation of national strategies.

Materials and methods

Study period and area

The study was conducted from May to June 2024 through two participatory workshops that brought together relevant national rabies stakeholders and experts. For logistical and security reasons, the workshops could enrol participants from six out of the thirteen administrative regions of the country (Tannounyan, Kadiogo, Nakambé, Nazinon, Guiriko, and Djoro). All administrative regions of the country have technical services responsible for planning and implementing animal health, human health, and environment-related interventions. Since 2019, as part of the implementation of the One Health approach across the country, several activities (including sensitization, joint investigations of rabies outbreaks) have been conducted to inform and train national and regional stakeholders on the challenges and issues related to global health security and the One Health approach [11].

Recruitment of stakeholders

In participatory approaches, the selection of stakeholders is a very critical step, as their visions and those of the entities to which they are affiliated can significantly influence the ability of the process to produce actionable solutions. This study considered as a stakeholder a person representing an entity or a group with direct responsibilities or with specific interests in animal-transmitted human rabies. A first list of stakeholders was obtained from previous study [19], and workshops conducted along the process for the development of national integrated strategic plan (*unpublished national data*). Subsequently, this list was reviewed by the facilitating team (i.e. the principal researcher, assisted by one human health expert and one animal health expert), discussing the relevance of each stakeholder until consensus was obtained. A final list of 45 stakeholders was established. Invitation letters were issued by the Ministry of Agriculture, Animal and Halieutic Resources and sent to stakeholders three weeks prior to the workshop start date, asking them to confirm their participation at least one week before start date. In the event of withdrawal, another stakeholder was proposed by the facilitators to receive an invitation. Finally, the workshops were attended by civil servant from the Ministry of Health (MoH, $n = 8$), the Ministry of Livestock (MoL, $n = 9$), the Ministry of Environment and Wildlife (MoE, $n = 5$), the Ministry of Territorial Administration (MoT, $n = 3$) and Ministry of National Defence (MoD, $n = 2$). Additional participants were invited from

research and education entities (n = 2), civil society organizations (n = 2), international institutions (n = 2), private animal health services, and local communities (n = 10). All participants are presented in Table 1.

Workshops for participatory prioritization

Two consecutive workshops were organized with the same participants (a two-day workshop organized in May 2024 in Manga, located in the administrative region of Nazinon, and a three-day workshop organized in June 2024 in Gaoua, located in the administrative region of Djoro). The first workshop aimed at harmonizing stakeholders' understanding of the issue. It consisted in presentations covering several rabies topics and expertise (including overview of priority zoonotic diseases in Burkina Faso, update on animal rabies control, update on human rabies control, rabies control and One Health operationalization, inter-sectoral strategy for dog-mediated human rabies elimination). Each day ended by exchanges and experience-sharing sessions between the stakeholders. The second workshop started with the presentation of the study and methodology. To ensure adequate interactive contributions and to allow at first for intra-sectoral agreements, participants were invited to form two sectoral working groups, one centred around human health and one centred around animal health. The stakeholders belonging to other sectors (i.e. environment, security and defence, territorial administration, community members) were randomly assigned to the two groups (as detailed in Table 1). Considering the diversity of the stakeholders' backgrounds and the need to ensure their effective participation along the process, workshop was facilitated by three co-facilitators (i.e. the principal researcher, assisted by one human health expert and one animal health expert). The overall process included subsequent steps described as follows:

Table 1 List of stakeholders involved in two groups and one plenary group discussions during the workshops

Groups	Stakeholders' disciplines or sectors	Types of organization	Number
Group 1 (human health group)	Human health	Civil society organization	1
		National public office	3
		Local public office	5
		Research institution	1
		International organization	1
	Security and defence	Army medical centre	1
	Environment	National public office	1
		Local public office	2
	Territorial administration	Administrative authorities	2
	Community	Religious leaders	3
		Community members	2
Total Group 1			***22***
Group 2 (animal health group)	Animal health	Civil society organization	1
		National public office	4
		Laboratory	2
		Local public office	3
		Private	2
		Livestock High school	1
		International organization	1
	Security and defence	Army veterinary service	1
	Environment	National public office	1
		Local public office	1
	Territorial administration	Administrative authorities	1
	Community	Religious leaders	2
		Community members	3
Total Group 2			***23***
Total of participants in the plenary group			**45**

Step 1: Identification of meaningful interventions

Using the stepwise approach towards rabies elimination (SARE) tool [33] and the current national integrated strategic plan, six rabies control action packages were defined: data collection and analysis (DCA), prevention and control (P&C), laboratory diagnosis (LAB), dog population management (DPM), advocacy and public awareness (APA), as well as cross-cutting aspects, including legislation (CCI). In each group, participating stakeholders were invited to discuss and agree on at least five meaningful interventions within each of these six action packages. The interventions proposed by the 2 groups were summarized, discussed and validated during a plenary group session, with the objective of generating a consensual list of at least 30 alternatives considered relevant (Annexe 1 in Supplementary Material).

Step 2: Definition of prioritization criteria

At this point, participating stakeholders discussed the developments in animal and human rabies control in the country, the key gaps and challenges, with the aim of establishing a comprehensive and shared understanding of the context [34]. Subsequently, in each group, consensual points were formulated in the form of criteria that can be used to rank identified interventions. To this end, on the basis of their understanding of the major issues regarding national efforts against animal-transmitted human rabies in the country, the facilitators proposed a list of three criteria, including proposed description and measurement scales. The aim of this support was to initiate and encourage discussions, as such an approach is often required to initiate and stimulate an active participation of stakeholders [32, 35]. This list was presented, discussed and amended in each group. Subsequently, the two lists of criteria validated in the two groups were presented, discussed, amended and adopted during a

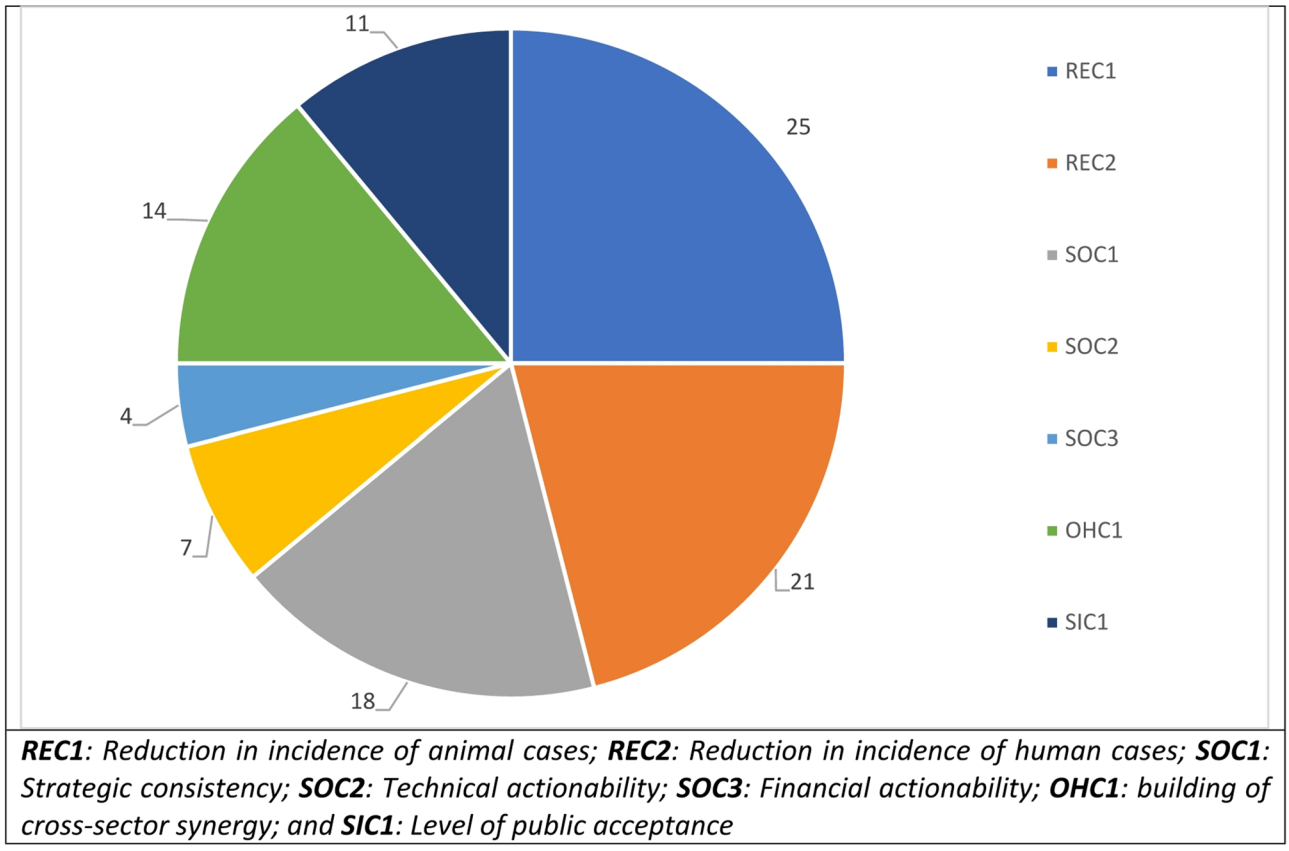

Fig. 1 Weights allocated to the 7 criteria by participating stakeholders

plenary session. The validated list of criteria with their categories, definitions and measurement scales is presented in Annexe 2 in Supplementary Material.

Step 3: Weighting of prioritization criteria

Taking account of the representation of the stakeholders' value systems is essential in participatory decision process, which translates into the possibility to assign each criterion a weight that reflects its stakeholders' priorities or relative preferences [32, 36]. In each group, participants were asked to divide 100 points among the seven identified criteria, allocating a higher number of points to criteria they believed to be more pivotal for advancing rabies control. Then, individual weights were summarized and discussed in each group to reach a consensus. Finally, results obtained from the 2 groups were summarized, amended and validated during a plenary session (Fig. 1).

Step 4: Intervention ranking for performance evaluation

The performance of an intervention is considered as the value of each criterion for the aforementioned intervention [37]. In the absence of quantitative evidence to support the criteria and measurement scales, the study relied on group discussions. Therefore, in each group, stakeholders discussed and assign a consensual score to each intervention on each criterion. Results by groups were summarized and discussed within the plenary session. On that basis, a plenary discussion was conducted to re-attribute consensual score to each intervention on each criterion, providing an integrative perspective to be compared to the sectoral ones.

Intervention score calculation

All data validated from the discussion sessions were entered into Excel spreadsheets by the team of facilitators. Subsequently, all computations were performed in Excel. For each selected intervention, a total score was obtained according to the following formula:

$$\text{Individual intervention score} = (\mathbf{W_1} \times \mathbf{S_1}) + (\mathbf{W_2} + \mathbf{S_2}) + (\mathbf{W_i} \times \mathbf{S_i})$$

where W corresponds to weights of respective criteria, and S the values of scales defined into each criterion.

Thus, the interventions were ranked, representing an ordered ranking of most preferred to least preferred, taking all weighting schemes and intervention performance scores into account. Results presented in this study include the prioritization as conducted within the 2 groups as well as by the plenary group, which combines data from groups.

Results

Selected rabies interventions

Combining the two groups' choices, stakeholder discussions concluded on 41 interventions (Annexe 1 in Supplementary Material), which were classified into 5 action packages: data collection and analysis (DCA, 8 interventions), prevention and control (P&C, 10 interventions), laboratory diagnosis capacity (LAB, 6 interventions), dog population management (DPM, 7 interventions), advocacy and public awareness (APA, 5 interventions) and cross-cutting issues (CCI, 5 interventions).

Criteria for prioritization

From the discussions between stakeholders, seven criteria were defined for the assessment of the adequateness of interventions planned as part of the rabies national integrated strategic plan (Annexe 2 in Supplementary Material). These criteria were classified into four categories: rabies elimination criteria (REC), strategic and operational criteria (SOC), One Health criteria (OHC) and social impact criteria (SIC). For each criterion, four qualitative measurement scales were described, ranked from 0 to 3. Figure 1 shows the weighting of criteria. Rabies elimination criteria (REC1 and REC2) were attributed the highest weighting. Participants affected the lowest weights to two strategic and operational criteria, namely technical actionability (SOC2) and financial actionability (SOC3).

Decision analysis of selected interventions in groups

For the human health group, total scores attributed to the interventions ranged from 1.90 to 5.11 (Annexe 3 in Supplementary Material). The six preferred interventions were CCI4 (training decision-makers in One Health leadership), APA2 (development and implementation of an information-education-communication action plan on rabies), APA5 (development and implementation of an advocacy plan for stakeholder engagement and resources mobilization), CCI1 (development and dissemination of rabies case definitions), DPM7 (raising public awareness of responsible management of waste and domestic carnivores) and P&C (administration of PEP to all people exposed to animal bites).

For the animal health group, total scores ranged from 2.33 to 5.11 (Annexe 4 in Supplementary Material), with the following six preferred interventions: DCA3 (development and dissemination of SOP for integrated rabies surveillance), DCA4 (development and dissemination of SOP for sharing epidemiological data on rabies), DPM7 (raising public awareness of responsible management of waste and domestic carnivores), CCI1 (development and dissemination of rabies case definitions), DCA5 (development and dissemination of SOP for the joint investigation of bite cases) and CCI2 (development and implementation of integrated bite case management).

CCI1 and DPM7 were thus top-ranked by the two groups. No intervention from the laboratory diagnosis package was present in the top six lists, the first intervention of that category ranking 17th in the human health group and 10th in the animal health group. DCA1 (study on the structure of domestic carnivore population) was listed among the six least preferred interventions for both groups.

Decision analysis of selected interventions in the plenary group

The plenary group decision analysis is presented in Annexe 5 in Supplementary Material. Intervention scores varied from 1.64 to 5.36. The most preferred interventions were related to action packages such as data collection and analysis, prevention and control, dog population management, and cross-cutting and legislation issues. The combined top six preferred interventions were DCA3 (development and dissemination of SOP for integrated rabies surveillance), P&C6 (development and dissemination of SOP for biting dog observation), CCI1 (development and dissemination of rabies case definitions), DCA5 (development and dissemination of SOP for the joint investigation of bite cases), DPM2 (promotion of good waste management practices among communities), and DCA4 (development and dissemination of SOP for sharing epidemiological data on rabies). Least preferred interventions included DPM4 (control of reproduction in domestic carnivores using surgical techniques), P&C2 (training human health professionals in the administration of human PEP), LAB3 (introduction of rapid diagnostic tests for the detection of all animal rabies cases across the country), DCA2 (Study of the socio-economic impact of rabies in the country) and P&C7 (establishment of facilities for the observation of biting dogs).

Discussion

The study relied on the current national integrated strategic plan to ending domestic dog-mediated human rabies in Burkina Faso, having in mind that effective strategy planning should be a continuous processus [38]. While having a national strategy is essential for effective disease control, both the approach used to develop the strategy and the content of the resulting plan merit critical reflection, particularly in light of evolving local contexts and the diverse rationales of involved stakeholders. In the current vision to control priority zoonotic diseases, the national decision-makers strongly emphasized the development of transdisciplinary and cross-sectoral capacities. Successfully implementing such a vision requires practical tools that promote stakeholder participation and commitment. The study demonstrated the application of participatory decision analysis tool to improve coordinated initiatives planning for rabies elimination. The study reports the

first use of MCDA in the country to engage stakeholders in a perspective to continuously improving rabies strategic planning. Even more basically, this was also the first time in Burkina Faso that the stakeholders involved in the control of rabies are invited to participate directly and actively in identifying and assessing interventions, leading to a re-evaluation of priorities, such as the removal of the legislation-focused action package originally included in the global strategic plan [39].

In addition, by establishing criteria for comparing interventions, participating stakeholders expressed points that constitute their significant individual or collective interests, one of the core values of the national public health policy [40]. It is worth noting that out of the seven criteria defined, two (i.e., building of cross-sector synergy and public acceptability) were already mentioned in the national health development plan document [40, 41], suggesting that the results are at least partially supportive of current plans. For all the above reasons, MCDA proved useful as a participatory approach for improved evaluation of rabies strategies and formulation of the best investment plan for diseases control [42–44].

The various interventions on which the participating stakeholders agreed covered key action packages recommended by the public health leading global institutions [15, 17, 33]. This observation highlights that the use of MCDA is not intended to compromise the technical content of ongoing strategy, but rather to better inform decision-makers about the areas for investment that are best supported by local implementers, so as to increase effectiveness of rabies control initiatives. From another perspective, despite the local context characterized by limited human and financial resources allocated for rabies control [8, 19, 45], the stakeholders placed little importance on criteria of technical and financial actionability. This attitude may be interpreted as an awareness of the difficulty of overcoming the scarcity of resources, then leading to focus on criteria with high-impact towards rabies elimination. Furthermore, the consistency of interventions with a rabies elimination strategy was also considered as of critical interest for stakeholders. The findings are consistent with those obtained by Del Rio Vilas et al. [42] in the Pan American Health Organization member states and Aenishaenslin et al. [32] in Canada, who reported that criteria considered to be of high-impact on animal health and human health were highly weighted by stakeholders.

When it comes to the prioritization of interventions, it was noted that cross-sectoral and collaborative initiatives were highly valued by the stakeholders. Indeed, interventions that promote standardization of procedures as well as coordinated initiatives across the sectors, mainly in the fields of epidemiological surveillance, prevention and control of animal and human rabies, were largely recognized as fundamental (more detailed description of prioritized interventions is provided in Annexe 6 in Supplementary Material). In addition to the fact that the consistency of surveillance and prevention with rabies elimination objectives was previously demonstrated [15, 46–49], the observation suggests that efforts deployed as part of the National One Health Coordination Platform's activities have probably increased awareness among stakeholders of the potential of capacity building for structuring the rabies multi-sectoral system. Nevertheless, the distinct prioritization by the human health and the animal health groups highlights the relevance of promoting One Health practice to harmonize viewpoints and tools, conduct joint and coordinated interventions to effectively control rabies and other cross-sectoral and transboundary public health threats. Compared to human health group, the interventions prioritized by animal health group were more cross-sectoral oriented. The top six preferences that emerged from the plenary group then proved more aligned with the animal health group prioritization, which may reflect a shift and convergence of perspectives towards actionable and shared solutions. This shift may have resulted from the discussions conducted by all the stakeholders at the end of each group session [50], allowing for gradual alignment which goes beyond the sole adhesion to the pre-existing viewpoint from the one or the other party. The significance of these discussions can be illustrated by the fact that DPM7 (raising public awareness of responsible management of waste and domestic carnivores), which was selected among the top six for both groups, was downgraded to 33rd position in the plenary group.

The plenary group prioritization also indicates a strong preference for procedure-related interventions. In a context where the practice of One Health is still being learned, as is the case in Burkina Faso, this preference may reflect a desire among stakeholders to first agree on common practices, embodied by common tools and standardized operating procedures. This may help operationalize One Health, providing a practical meaning to the approach, and clarify each party's roles and responsibilities, hence preventing potential conflicts. Yet the whole context in which the process was conducted, and particularly the fact that the workshop was organized by the animal health sector, may suggest a different interpretation of this adhesion of the human health actors to the animal health sectoral views. Indeed, Burkina Faso is in the early stages of the One Health implementation and its actors express a clear need for collaborative capacity building. Therefore, a tendency to adhere to the organizers' views may be also interpreted as a gesture of goodwill from the invited actors in the early steps of a new partnership. This uncertainty was previously described by van de Kerkhof [51], exploring the constraints of consensus in cross-group dialogues.

The significant contribution of MCDA approaches in improving decision towards coordinated management of zoonotic diseases was previously reported by several authors [32, 42, 52]– [53]. An additional point of interest at the end of the process was related to low prioritization of technically complex interventions, including decentralization of laboratory diagnosis capacities, control of reproduction in domestic carnivores and mass vaccination of domestic carnivores against rabies. This attitude of the stakeholders can be explained by the fact that, in the Burkina Faso context, these types of interventions are perceived as belonging solely to the animal health sector. Here, we need to build a communication and advocacy strategy that demonstrates the irreplaceable role of effective animal rabies management in the elimination of human rabies [54–57].

This study supports the usefulness of intersectorally negotiated MCDA in guiding important decision-making in the face of increasingly complex public health issues. Nevertheless, its scaling would require taking into account a number of limitations encountered during the study. First, due to time constraints, it was not possible to conduct an individual performance evaluation of the interventions by each of the participating stakeholder, which would be needed to better account for perspective diversity and avoid the group purely engulfing the value of minority perspectives. Moreover, whether intrasectoral agreements were sought along the process, the sectoral grouping randomly involved non-human health and non-animal health stakeholders. This may provoke among these non-sectoral stakeholders a tendency to let the viewpoints of the group's sectoral members dominate the discussions. The richest way to benefit from the distinct views from non-health actors remains therefore an open question. Considering the findings, the following recommendations were proposed:

- Improve the gains generated through the collaboration between sectors, by supporting the implementation of top-ranked interventions, in particular those strengthening institutional capacities, harmonization of procedures and practices, transdisciplinary collaboration;
- Institutionalize mechanisms for dialogue within the National One Health Coordination Platform to sustain exchanges, discussions and awareness-raising regarding actions recognized as instrumental in rabies elimination strategies, but poorly classified by stakeholders, with a view to improving their consideration and feasibility;
- Adopt the MCDA methods and regularly update the prioritization as national strategy is implemented for continuous improvement.

Conclusion

The participatory decision analysis method applied in this study made it possible to identify cross-sectoral and collaborative interventions highly valued by the stakeholders. However, the difference of rankings between animal health and human health groups, low ranking of certain very technical interventions, with a demonstrated strong impact on rabies reduction, but perceived as being very sector-based ones, remain major topics to be considered in the dialogue between stakeholders on the implications of the One Health approach for effective zoonoses control. Therefore, considering the ever-changing social and epidemiological context, future progress in the field of rabies control, as well as learnings and feedbacks from the multiple stakeholders, MCDA process should be considered as an iterative practice supporting a more general intersectoral process of organisational learning.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-025-25163-0.

Supplementary Material 1: Annexe 1: List of 41 interventions used in the process of prioritization. Annexe 2: Criteria and description of measurement scales used to prioritize interventions. Annexe 3: Human health group ranking of the interventions. Annexe 4: Animal health group ranking of the interventions. Annexe 5: Plenary group ranking of the interventions. Annexe 6: Summary description of the top six interventions prioritized by groups

Acknowledgements

The authors are grateful for all national experts and stakeholders for their cooperation during the study. They would also like to thank the Ministry of Agriculture, Animal and Halieutic Resources (MARAH) of Burkina Faso for the technical support provided during workshop organization. We are also greatful to Professor Claude Saegerman, Faculty of Veterinary Medicine, University of Liege, Belgium; Professor Bassirou Bonfoh, Centre Suisse de Recherches Scientifiques en Côte d'Ivoire; Doctor Bernadette Abela-Ridder, World Health Organization, Geneva, Switzerland; Professor Ayayi Justin Akakpo, Ecole Inter-Etats des Sciences et Médecine Vétérinaires de Dakar, Senegal; and Professor Jakob Zinsstag, Swiss Tropical and Public Health Institute, Basel, Switzerland for their scientific advice along the study.

Authors' contributions

Conceptualization: M.S., N.A-M., R.B-A.; Data curation: M.S.; Formal analysis: M.S.; Funding acquisition: M.S., N.A-M.; Investigation: M.S.; Methodology: M.S., N.A-M., R.B-A.; Project administration: M.S., N.A-M.; Supervision: N.A-M., R.B-A.; Writing of original draft: M.S., N.A-M.; Reviewing and editing: P.S.A.Y., T-J.O.I., R.B-A. All authors reviewed and approved the manuscript.

Funding

This research received funding from the Academy of Research and Higher Education (ARES) of Belgium.

Data availability

The data used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted aaccording to the terms of the interministerial ARRETE N° 2020-210-MS/MINEFID/MESRSI/MAAH/MRAH/MEEVCC, which

outlines the organization and responsibilities of technical services and stakeholders involved in zoonotic diseases control in Burkina Faso. In addition, ethical approval was obtained from the national research ethics committee (N°2024-02-33), which determined that written consent was not required to conduct investigation and publication, with the stipulation that all published data should be anonymized. Nevertheless, all the participants to the workshops were informed about the background and purpose of the study, highlighting that their participation was voluntary, and all published information would be kept anonymous. Overall, the study was conducted in compliance with the Declaration of Helsinki and all applicable ethical guidelines.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Fundamental and Applied Research for Animal and Health (FARAH), Faculty of Veterinary Medicine, University of Liège, Liège, Belgium
[2]Unité de recherche sur les Maladies à potentiel Epidémique, Maladies Emergentes et Zoonoses, Département Biomédical et Santé Publique, Institut de Recherche en Sciences de la Santé, Ouagadougou, Burkina Faso
[3]Department of Public Health, Faculty of Medicine, University of Liège, Liège, Belgium
[4]Service de Microbiologie-Immunologie et Pathologie Infectieuse, Département de Santé Publique et Environnement, Ecole Inter-Etats des Sciences et Médecine Vétérinaires, Dakar, Sénégal
[5]Direction de la Santé Animale, Direction Générale des Services Vétérinaires, Ministère de l'Agriculture, des Ressources Animales et Halieutiques, Ouagadougou, Burkina Faso
[6]Rabies Free Burkina Faso, Ouagadougou, Burkina Faso

Received: 31 May 2025 / Accepted: 3 October 2025
Published online: 07 November 2025

References

1. Gan H, Hou X, Wang Y, et al. Global burden of rabies in 204 countries and territories, from 1990 to 2019: results from the global burden of disease study 2019. Int J Infect Dis. 2023;126:136–44. https://doi.org/10.1016/j.ijid.2022.10.046.
2. Qin X, Liu K, Fu T, et al. Global burden, trends, and predictions of rabies: an analysis from the global burden of disease study 1990–2019 and projections for 2030. J Public Health (Berl). 2025;33:69–78. https://doi.org/10.1007/s10389-023-01971-9.
3. Hampson K, Coudeville L, Lembo T, et al. Estimating the global burden of endemic canine rabies. PLoS Negl Trop Dis. 2015;9(4):e0003709. https://doi.org/10.1371/journal.pntd.0003786.
4. Sondo KA, Diallo I, Savadogo M et al. Enquête transversale Sur les Cas de Rage reçus de 2003 à 2014 Au service des maladies infectieuses du centre hospitalier universitaire Yalgado Ouédraogo (Burkina Faso). Sci De La Santé. 2018; *41*(1). https://www.revuesciences-techniquesburkina.org/index.php/sciences_de_la_sante/index
5. Savadogo M, Koné P, Dahourou LD, et al. Epidémiologie de La Rage et connaissance, attitudes et pratiques des communautés Au Burkina Faso. Rev Elev Med Vet Pays Trop. 2020. https://doi.org/10.19182/remvt.31863.
6. Sondo KA, Okenga YC, Diop SA, et al. Rabies in children: report of 24 cases at the Yalgado Ouedraogo university hospital center of Ouagadougou in Burkina Faso. J Trop Dis. 2015;3:168. https://doi.org/10.4172/2329-891X.100016.
7. Nitcheman S. Contribution à l'étude des zoonoses infectieuses majeures En république de Haute-Volta. Thèse Médecine Vétérinaire EISMV Dakar, 1983; 170p.
8. Dodet B, Africa Rabies Bureau (AfroREB). The fight against rabies in Africa: from recognition to action. Vaccine. 2009;27:5027–32. https://doi.org/10.1016/j.vaccine.2009.06.030.
9. Mbilo C, Coetzer A, Bonfoh B, et al. Dog rabies control in West and Central Africa: a review. Acta Trop. 2021;224:105459. https://doi.org/10.1016/j.actatropica.2020.105459.
10. Ouermi AS, Dravé A, Sawadogo N, et al. La Rage Chez l'enfant: Difficultés diagnostiques Chez Un adolescent Épileptique Au centre hospitalier universitaire Régional de Ouahigouya Burkina Faso. Health Sci Disease. 2018;19(2). https://doi.org/10.5281/hsd.v19i2.1036.
11. Savadogo M, Ilboudo GS, Dahourou LD, et al. Epidemiological investigation of a goat rabies outbreak and assessment of knowledge, attitudes, and practices of communities regarding rabies in the rural commune of Sabou, Burkina Faso. J Epidemiol Public Health. 2024;9(2):178–93. https://doi.org/10.26911/jepublichealth.2024.09.02.05.
12. Minoungou G, Dahourou LD, Savadogo M, et al. Surveillance of animal rabies in Burkina faso: a retrospective laboratory data from 2008 to 2012. Int J Veterinary Sci. 2021. https://doi.org/10.47278/journal.ijvs/2021.051.
13. Mpouam SE, Mingoas JPK, Mouiche MMM, et al. Critical systematic review of zoonoses and transboundary animal diseases' prioritization in Africa. Pathogens. 2021;10(8):976. https://doi.org/10.3390/pathogens10080976.
14. Ilboudo AK, Sow A, Dione MM et al. West African countries One Health platforms evaluation and launch: Workshop report. 2022. https://cgspace.cgiar.org/server/api/core/bitstreams/7b2f5e08-3104-42c8-a3a3-4a8ce128c33a/content
15. World Health Organization. World Organisation for Animal Health, Food and Agriculture Organization, Global Alliance for Rabies Control. Zero by 30: the Global Strategic Plan to end human deaths from dog-mediated rabies by 2030, 2018.
16. Tidman R, Thumbi SM, Wallace R, et al. United against rabies forum: the one health concept at work. Front Public Health. 2022;10:854419. https://doi.org/10.3389/fpubh.2022.854419.
17. Tidman R, Fahrion AS, Thumbi SM, et al. United against rabies forum: the first 2 years. Front Public Health. 2023;11:1010071. https://doi.org/10.3389/fpubh.2023.1010071.
18. Waltner-Toews D. Zoonoses. One health and complexity: wicked problems and constructive conflict. Philos Trans R Soc Lond B Biol Sci. 2017;372(1725):20160171. https://doi.org/10.1098/rstb.2016.0171.
19. Savadogo M, Renmans D, Alambedji RB, et al. Using causal loop analysis to explore pathways for zoonosis control in low-income setting: the case of dog rabies vaccination in Burkina Faso. Prev Vet Med. 2022;203:105623. https://doi.org/10.1016/j.prevetmed.2022.105623.
20. Crozier M, Friedberg E. L'acteur et le système, Les contraintes de l'action collective. *Editions du Seuil, editor*.1977; ISBN 978-2-7578-4115-0.
21. Fulton E, Jones T, Boschetti F, et al. Assessing the impact of stakeholder engagement in management strategy evaluation. IJEME. 2013;3(2):82–98.
22. Froger G. Les démarches d'aide multicritère à la décision en économie de l'environnement. In: Economie de l'environnement et des ressources naturelles. Institut de l'énergie et de l'environnement de la francophonie, n°66-67-1er et 2e trimestre 2005. https://ifdd.francophonie.org/media/docs/publications/197_LEF66-67.pdf#page=46
23. Behzadian M, Kazemadeh RB, Albadvi A, et al. PROMETHEE: A comprehensive literature review on methodologies and applications. Eur J Oper Res. 2010;200(1):198–215. https://doi.org/10.1016/j.ejor.2009.01.021.
24. Blanquart S. Role of multicriteria decision-aid (MCDA) to promote sustainable agriculture: heterogeneous data and different kinds of actors in a decision process. Int J Agricultural Resour Gov Ecol. 2009;8(2–4):258–81. https://doi.org/10.1080/12460125.1997.10511726.
25. Bennis K, Bahi L. Application de La logique Floue à l'aide à La décision participative pour l'évaluation de l'impact Sur l'environnement–cas de Tanger. J Decis Syst. 2016;25(1):56–78. https://doi.org/10.1080/12460125.2015.1108158.
26. Diaby V, Campbell K, Goeree R. Multi-criteria decision analysis (MCDA) in health care: a bibliometric analysis. Oper Res Health Care. 2013;2(1–2):20–4. https://doi.org/10.1016/j.orhc.2013.03.001.
27. Selamet J. Identifying criteria for designing risk communication system in Palu, Sulawesi, Indonesia. J Disaster Res. 2019;14(9):1346–52. https://doi.org/10.20965/jdr.2019.p1346.
28. Guillot C, Aenishaenslin C, Acheson ES, et al. Spatial multi-criteria decision analysis for the selection of Sentinel regions in tick-borne disease surveillance. BMC Public Health. 2024;24(1):294. https://doi.org/10.1186/s12889-024-17684-x.
29. Cox R, Sanchez J, Revie CW. Multi-criteria decision analysis tools for prioritising emerging or re-emerging infectious diseases associated with climate change in Canada. PLoS ONE. 2013;8(8):e68338. https://doi.org/10.1371/journal.pone.0068338.
30. Fedyaeva VK, Omelyanovsky VV, Rebrova O, et al. Mcda approach to ranking rare diseases in Russia: preliminary results. Value Health. 2014;17(7):A539. https://doi.org/10.1016/j.jval.2014.08.1729.

31. Manriquez D, Costa M, Ferchiou A, et al. Multi-criteria decision analysis for assessing social acceptance of strategies to reduce antimicrobial use in the French dairy industry. Antibiotics. 2022;12(1):8. https://doi.org/10.3390/antibiotics12010008.
32. Aenishaenslin C, Hongoh V, Cissé HD, et al. Multi-criteria decision analysis as an innovative approach to managing zoonoses: results from a study on Lyme disease in Canada. BMC Public Health. 2013;13:897. https://doi.org/10.1186/1471-2458-13-897.
33. Chen Q, Ma X, Rainey JJ, et al. Findings from the initial stepwise approach to rabies elimination (SARE) assessment in China, 2019. PLoS Negl Trop Dis. 2021;15(3):e0009274. https://doi.org/10.1371/journal.pntd.0009274.
34. Guillot C, Bouchard C, Aenishaenslin C, et al. Criteria for selecting sentinel unit locations in a surveillance system for vector-borne disease: a decision tool. Front Public Health. 2022;10:1003949. https://doi.org/10.3389/fpubh.2022.1003949.
35. Nana SD, Duboz R, Diagbouga PS, et al. A participatory approach to move towards a one health surveillance system for anthrax in Burkina Faso. PLoS ONE. 2024;19(6):e0304872. https://doi.org/10.1371/journal.pone.0304872.
36. Korhonen PJ, Silvennoinen K, Wallenius J, et al. A careful look at the importance of criteria and weights. Ann Oper Res. 2013;211:565–78. https://doi.org/10.1007/s10479-012-1307-y.
37. Aenishaenslin C, Bélanger D, Fertel C et al. Guide pratique de mise en place d'un processus décisionnel multicritère et multi-acteurs: étapes et outils. Technical report, *Les Cahiers du GERAD G-2019-02, GERAD, HEC Montréal, Canada*. 2019. https://www.gerad.ca/fr/papers/G-2019-02
38. Martin RL. 2018. The big lie of strategic planning. Harvard Business Review. January 2018. file:///C:/Users/tcpbk/Downloads/hbr20180118_strategicplanning_v2.pdf.
39. Erkyihun GA, Deressa SG, Wakene WZ, et al. Efforts of rabies elimination with a one health approach and SARE tools in Ethiopia. Decoding Infection and Transmission. 2024;2:100028. https://doi.org/10.1016/j.dcit.2024.100028.
40. Burkina Faso. Plan national de développement sanitaire 2021–2030. 2021. https://extranet.who.int/countryplanningcycles/sites/default/files/public_file_rep/BFA_Burkina-Faso_PNDS_2021-2030.pdf
41. Burkina Faso. Politique nationale de santé. 2011. https://www.sante.gov.bf/fileadmin/user_upload/storages/fichiers/pns_version_adoptee_paraphee.pdf
42. Del Rio Vilas VJ, Burgeno A, Montibeller G, et al. Prioritization of capacities for the elimination of dog-mediated human rabies in the Americas: building the framework. Pathog Glob Health. 2013;107(7):340–5. https://doi.org/10.1179/2047773213Y.0000000122.
43. Frazão T, Camilo D, Cabral E, et al. Multicriteria decision analysis (MCDA) in health care: a systematic review of the main characteristics and methodological steps. BMC Med Inform Decis Mak. 2018;18:90. https://doi.org/10.1186/s12911-018-0663-1.
44. Gutema FD, Agga GE, Makita K, et al. Evaluation of the control options of bovine tuberculosis in Ethiopia using a multi-criteria decision analysis. Front Vet Sci. 2020;7:586056. https://doi.org/10.3389/fvets.2020.586056.
45. Fahrion AS, Taylor LH, Torres G, et al. The road to dog rabies control and elimination-what keeps us from moving faster? Front Public Health. 2017;5:103. https://doi.org/10.3389/fpubh.2017.00103.
46. Lembo T, Hampson K, Kaare MT, et al. The feasibility of canine rabies elimination in Africa: dispelling doubts with data. PLoS Negl Trop Dis. 2010;4(2):e626. https://doi.org/10.1371/journal.pntd.0000626.
47. Velasco-Villa A, Escobar LE, Sanchez A, et al. Successful strategies implemented towards the elimination of canine rabies in the Western hemisphere. Antivir Res. 2017;143:1–12. https://doi.org/10.1016/j.antiviral.2017.03.023.
48. Changalucha J, Hampson K, Jaswant G, et al. Human rabies: prospects for elimination. CABI Reviews. 2021. https://doi.org/10.1079/PAVSNNR202116039.
49. Amani A, Abela B, Biey J, et al. Accelerating rabies elimination in Africa by 2030. Lancet. 2024. https://doi.org/10.1016/S0140-6736(24)02141-X.
50. Sakamoto M, Yamaguchi E, Yamamoto T, et al. An intervention study on students' decision-making towards consensus building on socio-scientific issues. Int J Sci Educ. 2021;43(12):1965–83. https://doi.org/10.1080/09500693.2021.1947541.
51. van de Kerkhof M. Making a difference: on the constraints of consensus building and the relevance of deliberation in stakeholder dialogues. Policy Sci. 2006;39:279–99. https://doi.org/10.1007/s11077-006-9024-5.
52. European Food Safety Authority (EFSA), Berezowski J, de Balogh K, et al. Prioritisation of zoonotic diseases for coordinated surveillance systems under the one health approach for cross-border pathogens that threaten the union. EFSA J. 2023;21(3):e07853. https://doi.org/10.2903/j.efsa.2023.7853.
53. Yasobant S, Bhavsar P, Lekha KS, et al. One health risk and disease (OHRAD): a tool to prioritise the risks for epidemic-prone diseases from one health perspective. Glob Health Res Policy. 2024;9:20. https://doi.org/10.1186/s41256-024-00359-w.
54. González-Roldán JF, Undurraga EA, Meltzer MI. Cost-effectiveness of the national dog rabies prevention and control program in Mexico, 1990–2015. PLoS Negl Trop Dis. 2021;15(3):e0009130. https://doi.org/10.1371/journal.pntd.0009130.
55. Wallace RM, Undurraga EA, Blanton JD, et al. Elimination of dog-mediated human rabies deaths by 2030: needs assessment and alternatives for progress based on dog vaccination. Front Vet Sci. 2017;49. https://doi.org/10.3389/fvets.2017.00009.
56. Mindekem R, Lechenne MS, Naissengar KS, et al. Cost description and comparative cost efficiency of post-exposure prophylaxis and canine mass vaccination against rabies in N'djamena, Chad. Front Vet Sci. 2017;4:38. https://doi.org/10.3389/fvets.2017.00038.
57. Zinsstag J, Lechenne M, Laager M, et al. Vaccination of dogs in an African city interrupts rabies transmission and reduces human exposure. Sci Transl Med. 2017;9(421):eaaf6984. https://doi.org/10.1126/scitranslmed.aaf6984.

Publisher's note