

PhD topic

**Co-designing an integrated community-based syndromic health monitoring system for wildlife, livestock and humans in a rural SES of Zimbabwe**

**Context:** Humans share multi-host pathogens that can cross the species, social and ecological boundaries of the socio-ecological system that they share (SES<sup>1</sup>). Tropical and sub-tropical SES are hotspots of pathogen spillover at these interfaces<sup>2</sup>. Changes in land-use, animal populations and climate drive the emergence of zoonotic diseases<sup>3</sup>. Southern Africa is home to a large and diverse mammalian fauna, and human and non-human wild and domestic species interact within numerous so-called wild-domestic interfaces<sup>4</sup>. These interfaces occur mainly where protected areas and communal areas are adjacent, as subsistence agriculture in semi-arid areas is often associated with extensive livestock farming. They are also located in remote marginal areas, covered by weak government services<sup>5</sup>. From a public health perspective, there is an urgent need to improve surveillance systems for both animals and humans in these hotspots areas<sup>6</sup>. The exposome of human communities living at these biodiversity-rich interfaces needs to be better understood in order to design health systems adapted to the infectious disease burden and to the local environmental and socio-cultural contexts<sup>7</sup>. This knowledge should serve as a foundation for community-based animal and human health systems that will support directly (e.g., early detection) and indirectly (e.g., improved well-being) local livelihoods.

The concept of SESH and the associated operational approach<sup>1,8</sup> allow for a transdisciplinary definition with local stakeholders of the main components of One Health (Human Health, Animal Health, Ecosystem Health, linked to Phd#1), and how they interact and contribute to the Health of the SES. In epidemiological surveillance, the One Health approach has been widely promoted because it holds out the promise of improved epidemiological and economic performance of surveillance. However, surveillance systems are still often operating in silos, with very few sectoral systems connected to each other.

**Objectives:** The objective of this thesis will be to develop a pilot to co-design a methodology for building a local-level syndromic health monitoring system at the wildlife/domestic/human interface that are centred on the needs of local stakeholders in the SES and that are based on an intersectoral collaborative approach in Zimbabwe. This pilot will require the implementation of integrated OH concept to achieve "the optimal health and well-being of all animals, people, plants and their shared environment, while recognising their inextricable interconnections"<sup>9</sup>.

The lack of operationalisation of OH is partly due to the lack of consideration of the implementation context, and in particular the expectations of stakeholders for a more integrated approach to monitoring. In this context, and within the framework of SWM project, this thesis will take place in an action-research context to support the creation of a syndromic health monitoring system at the wildlife/domestic/human interface. It will explore the participatory mechanisms, the conditions of commitment and the monitoring and evaluation of the implementation of this surveillance system.

**Methodology**

Before a better knowledge of the local context, we propose a structure in 3 axes:

1. An analysis of the context and the actors involved to understand the implementation framework as well as the posture (perceptions, expectations, motivations) and the capacities/knowledge (technical and social) of the actors with regard to an integrated surveillance system (proposed tools: PARDI method)
2. Co-construction of the health monitoring system at the interface based on a shared vision and an established and negotiated role of the actors involved (proposed tools: theory of change, anticipation - e.g., Futures Wheel)

3. The co-design of a monitoring of the system based on indicators co-constructed by local stakeholders integrated in an adaptive management process (proposed tools: serious games/maps, adapted from other contexts).

The hypotheses/research questions envisaged are:

- **Hypothesis 1:** The participation of the local stakeholders in the co-design and implementation of an integrated health monitoring system at the interface depends on the socio-economic, ecological and epidemiological conditions in their territory (conflicts, economic benefits, wildlife diversity, livestock diseases...)?
- **Hypothesis 2:** The use of anticipatory and participatory tools ensures the co-construction of a functional and sustainable health monitoring system by the stakeholders?
- **Hypothesis 3:** The co-design of a syndromic health monitoring system at the interface will mitigate some of the costs/conflicts associated with coexisting with wildlife conservation and promote healthier SES.

**Thesis committee disciplines:** Anthropology; Companion modelling; Participatory epidemiology; epidemio-surveillance

#### Expected results

- Raise awareness among local stakeholders (in Binga district, Zimbabwe) of the need for collective actions focused on health and surveillance for the benefit of all (humans and non-human) animals.
- Multi-stakeholder capacity building for surveillance of diseases of shared interest.
- A methodology/model for the development of One Health surveillance at the interface that could be applied to other similar contexts.
- At least 3 scientific articles: a review of participatory epidemiology at the wildlife/livestock/human interface (in Africa); a research paper on the use of future visioning tools and approaches (e.g. Future Wheels) in participatory surveillance; a research paper on the use of serious games to develop community-based syndromic indicators.

**Feasibility:** Embedded in the SWM project study site of Binga district in Zimbabwe, in close collaboration with the project team, and probably other postgraduate students associated with the project, Phd#3 will have a working environment, with appropriate human, logistic and financial resources. She/he will interact with the other PhD candidates of this Nexus, especially with PhD#1 during the first year of the project and PhD#2 for participatory tools. The candidate will also benefit from a mirror thesis attached to the OLOH project (possibly supported by the PReZoDe/Preact initiative) that will provide a comparative approach on the setting-up of surveillance systems in savanna interface SESs.

#### References

1. Wilcox, B.A., et al., *Operationalizing One Health employing socio-ecological systems theory: lessons from the Greater Mekong Sub-region*. *Frontiers in Public Health*, 2019. **7**(85).
2. Jones, K.E., et al., *Global trends in emerging infectious diseases*. *Nature*, 2008. **451**(7181): p. 990.
3. McMahon, B.J., S. Morand, and J.S. Gray, *Ecosystem change and zoonoses in the Anthropocene*. *Zoonoses and Public Health*, 2018. **65**(7): p. 755-765.
4. de Garine-Wichatitsky, M., et al., *Consequences of animals crossing the edges of transfrontier parks, in Transfrontier Conservation Areas. People Living on the Edge*, J.A. Andersson, et al., Editors. 2013, Earthscan: New York and London. p. 137-162.
5. Andersson, J.A. and D.H.M. Cumming, *Boundary formation and TFCAs in Southern Africa, in Transfrontier conservation areas: People living on the edge*, J.A. Andersson, et al., Editors. 2013, Earthscan Publications: Londres. p. 25-61.
6. Meurens, F., et al., *Animal board invited review: Risks of zoonotic disease emergence at the interface of wildlife and livestock systems*. *Animal*, 2021. **15**(6): p. 100241.

7. de Garine-Wichatitsky, M., et al., *Coexisting with wildlife in transfrontier conservation areas in Zimbabwe: Cattle owners' awareness of disease risks and perceptions of the role played by wildlife*. *Comparative immunology, microbiology and infectious diseases*, 2013. **36**: p. 321– 332.
8. de Garine-Wichatitsky, M., Binot, A., Ward, J., Caron, A., Perrotton, A., Ross, H., . . . Echaubard, P. (2021). "Health in" and "Health of" Social-Ecological Systems: A Practical Framework for the Management of Healthy and Resilient Agricultural and Natural Ecosystems. *Front Public Health*, **8**, 616328.
9. One Health High-Level Expert Panel, et al., *One Health: A new definition for a sustainable and healthy future*. *PLoS Pathogens*, 2022. **18**(6): p. e1010537.

**Candidate profile:**

- Training: Master degree or equivalent in one of the following fields: ecology, animal science, veterinary public health, epidemiology, population biology
- Ability to work in an interdisciplinary environment
- Aptitude to conduct research in rural areas and engage with rural communities
- Willingness to live abroad over long periods abroad in a tropical environment
- Proficiency in data processing and statistical analysis software; notions in participatory modelling will be considered a plus
- Languages: very good command of spoken and written French, good command of spoken and written English
- Level B driver license is an advantage for conducting field work

**People to contact :**

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