



Local prioritization of zoonoses and livestock diseases in Cameroon

FINDINGS

- Categorical principal component analysis (CatPCA) is a multidimensional analysis that can be used to identify key disease impact criteria for prioritization purposes both for zoonoses and livestock diseases
- The methodology is scalable and can be used at local level for endemic zoonosis and livestock disease ranking
- The post hoc cluster analysis can be used to identify strategic clusters of priority diseases whatever the scale in order to design site specific operational plans for mitigation of zoonoses and livestock diseases in low- and middle-income countries such as in Cameroon

RATIONALE

Multi-criteria decision analysis (MCDA) methods are currently known as objective modeling tools for informed decision-making processes in animal and human health, since they rely on varying scales and perceptions of impacts using a structured, transparent approach, and aim to give consistent, reproducible results.¹ The method has been used for the prioritization of zoonoses² and emerging diseases in developed countries where livestock production is mainly intensive and animal surveillance systems well developed.³ Yet, in sub-Saharan Africa (SSA) livestock production systems vary from intensive to extensive⁴ and the epidemiological situation is characterized by the presence of various endemic diseases associated to the continuous threat of the emergence/reemergence of new/known diseases.⁵

Despite the recognized need, the use of such a tool have been rarely used at local or community level (6) in order to make sure that the interests of decision makers match with the ones of farming communities to guide operational disease surveillance, investigation and response for animal health in SSA (7). In this research we contextualized MCDA for the prioritization of both endemic zoonoses and livestock diseases to enable better operationalization of disease prioritization outcomes in the context of African countries or other low and middle income countries (LMICs).

Table 1: Features and outcomes of the parallel prioritization of zoonoses (ZD) and livestock diseases (LD)

	ZD prioritization	LD prioritization
N° of diseases listed	421	421
N° of diseases selected	36	40
N° of zoonotic diseases	36	17
N° of criteria experts	15	21
N° of disease experts	25	40
N° of selected criteria by CatPCA	17	19
N° of clusters	4	3
Main classification domain *	Public health	Control and prevention

*Domains: Epidemiology-infectiology; Control and prevention; Economy and trade; Public health; Society; Environment; Livestock production system (excluded for ZD prioritization by CatPCA)
N°: Number

STAKEHOLDER ENGAGEMENT

- Strong stakeholder engagement and participation took place at every level
- A list of potential zoonoses and livestock diseases was commonly agreed with all stakeholders
- Two groups of experts were established: One made up experts for the prioritization of zoonoses and livestock diseases; the other for the scoring of the diseases

METHODS AND FINDINGS

The **MCDA** previously used^{2,3} has been associated to a categorical principal component analysis (Cat-PCA) for the reduction of dimensions or criteria, and a two-step cluster analysis in lieu of a regression tree analysis for two parallel disease prioritization processes: One for zoonoses and the other for livestock diseases. Several steps were used:

- Disease lists and selection from decision trees with inclusion and exclusion criteria;
- Selection of experts based on required representativeness (balanced between human, animal, environmental health experts of ZD and amongst animal health experts for LD);
- Selection of classification criteria (from seven domains and 70 criteria) using **CatPCA** after data normalization and **aggregation** of criteria scores on relevance and importance;
- Disease scoring (four experts per disease);
- Data normalization and **aggregation** of disease scores on relevance and importance to obtain their overall mean score;
- **Ranking, two-step cluster analysis** and **sensitivity analysis** (on domains and experts).

Six and seven domains for 17 and 19 criteria were selected by CatPCA for the prioritization of zoonoses and livestock diseases respectively. The most influencing domains were “public health” for zoonoses and “control and prevention” for livestock diseases (Table 1).

36 zoonoses (15 bacterial, 14 parasitic, seven viral diseases) and **40 livestock diseases** (15 bacterial, ten parasitic, 15 viral diseases) have been ranked. **Four and three clusters** have been identified for the prioritization of zoonoses and livestock diseases respectively (Table 1). **Sensitivity analysis** resulted in high correlation between complete models and reduced models showing the robustness of the processes.

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NEXT STEPS: PRIORITIZATION OF ZOOSES AND LIVESTOCK DISEASES

- This method will be presented to international, national, local stakeholders who were involved in the process such as the national programme on prevention and control of emerging and re-emerging zoonoses, disease surveillance networks and their partners.
- The same process will be used in other agro-ecological zones of Cameroon and upscaled at country level.
- The tool will be adapted to other One Health issues such as antimicrobial resistance with respect to food from animal origin.
- Training of local undergraduate and postgraduate students interested in One Health will be carried out.

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