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Response to zoonotic disease outbreaks along wild meat value chains in Sub-Saharan Africa (SSA): A systematic literature review

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ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 August 2025 and was last updated on 20 August 2025.

INTRODUCTION

Review question / Objective (i) What are the documented infectious disease outbreak events along the wild meat value chains in the SSA?
(ii) what response measures have been put in place by actors and their communities to mitigate disease outbreaks along the value chain;
(iii) What response measures have been implemented at the national and international levels towards mitigating the outbreaks?

Rationale Aggregated data and a framework for response to wild meat-borne infectious outbreak events is still lacking in the African continent, yet it is a region where wild meat consumption and trade is widely practiced. There is growing evidence of risks of emergence and reemergence of infectious outbreaks. However, lack of a summarized data on response to outbreaks along the wild meat value chain could hinder efforts towards responding to the outbreaks. Due to the rise in cases of the emerging and remerging infectious disease outbreaks attributable to wild animals, there is an urgent need to consolidate data and develop a guideline for outbreaks along wild meat supply chains , the context in which they occur, to guide response measures implemented against them, especially in the SSA region. The aggregated data would provide evidence-based background information for for to outbreak surveillance, timely detection, response and recovery. Whenever possible, response strategies could be simulated, modified or integrated to fit any operational contexts of wild meat value chains in different countries.

Condition being studied We aimed to understand outbreak response measures that have been implemented against infectious disease outbreaks attributable to wild meat. We targeted response at various levels: personal, national and international levels. At the personal and community level, responses are mostly behavioral as the affected persons may (or may not) adjust their lives in the wake of an outbreak. For instance, with regards to wild meat, communities could stop eating wild meat, opting for other protein sources, avoiding the taxa assumed to be the source of spillover, or not alter their behavior at all. At regional and national levels, response strategies are commonly aimed at breaking the cycle of disease spread through retrospective surveillance, contract tracing, and preventative efforts. International responses are coordinated by the World Health Organization and other stakeholders such as the Global Outbreak Alert and Response Network (GOARN). In developing nations such as in countries in the SSA region, international response involves the mobilization of partners towards pooling resources to mitigate outbreaks from infectious pathogen spillover events.

METHODS

Search strategy We conducted SLR as per the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). We conducted the search in March 2025 using four databases: Google Scholar, PubMed, and Web of Science and the WHO-DONs. We used the search syntax -"Pathogen spillover*" OR "Zoonotic spillover*" OR "Zoonotic transfer*" OR "Host jump" OR "Disease crossover*" OR "Infectious disease*" OR "Interspecies infection*" OR "Zoonotic disease*" OR "Zoonotic pathogen*" OR "Disease outbreak*" OR " zoonotic infection*" OR "Infectious zoonotic disease*" AND "Wild meat" OR "Bushmeat" OR "Game meat" OR "Bush meat" AND “Bushmeat trade” OR “Wild meat trade” OR "Game meat trade" OR "poach*" OR hunt* OR vend* OR “roadside sale” OR "Roadside market" OR "butcher*" OR "handler*" OR “chop bars” OR "Chopbars" OR "eat*" OR "hotel*" OR “wet market*” OR “Bushmeat market*” OR "Wild meat market*" OR "Game meat market*" OR “Bush meat market*” OR “Wild meat market*” OR “wildlife market*” OR “wildlife harvest*” AND Africa OR “East Africa” OR “West Africa” OR “Southern Africa” OR “Central Africa” OR Angola OR “Republic of Angola” OR Burundi OR Benin OR “Burkina Faso” OR Botswana OR “Central African Republic” OR “CAR” OR “Côte d'Ivoire” OR “Ivory Coast” OR Cameroon OR “Democratic Republic of the Congo” OR “DR Congo” OR “D.R. Congo” OR “Congo-Kinshasa” OR “Republic of the Congo” OR “Congo-Brazzaville” OR Comoros OR “Union of the Comoros” OR “Cape Verde” OR “Cabo Verde” OR Seychelles OR Djibouti OR Eritrea OR Ethiopia OR Gabon OR Ghana OR Guinea OR “Guinea-Conakry” OR Gambia OR “The Gambia” OR “Guinea-Bissau” OR “Equatorial Guinea” OR Kenya OR Liberia OR Lesotho OR “Kingdom of Lesotho” OR Madagascar OR Mali OR Mozambique OR Mauritania OR Malawi OR Namibia OR Niger OR Nigeria OR Rwanda OR “South Sudan” OR Senegal OR “Sierra Leone” OR Somaliland OR Somalia OR “São Tomé and Príncipe” OR Eswatini OR Swaziland OR Chad OR Togo OR Tanzania OR “United Republic of Tanzania” OR Uganda OR “South Africa” OR “Republic of South Africa” OR Zambia OR Zimbabwe- for Google school, and thereafter customized it as per the requirements of PubMed, and Web of Science for additional search.
For all the pathogens we identified as being related to outbreaks in the peer-reviewed literature from Google Scholar, Pubmed and Web of Science, we searched the WHO disease outbreak news website (WHO-DONs) for all the reported outbreaks and the associated response strategies . We restricted our search on WHO-DONs to the period 2004-2024, and to the African Region. We aggregated all the DONs issued for any specific outbreak, per country, by targeting all reports from the declaration of its outbreak to its end. We thereafter summarized all the response measures reported in all the DONs against each outbreak.

Participant or population The review is targeting wild meat dependent communities in the Sub-Saharan Africa, and the stakeholder responsible in the mitigation of outbreak and outbreak impact.

Intervention NA. We were not implementing a trial in this study and therefore there was not intervention group.

Comparator NA. We were not implementing a trial in this study and therefore there was not comparator group.

Study designs to be included Because we could only get a few articles from the search, we included all articles regardless of the study design. These included case reports, longitudinal and cross-sectional studies. Some were qualitative and others quantitative studies.

Eligibility criteria We included articles that documented infectious disease outbreaks associated with wild meat in SSA between

2004-2024; a period that has been associated with increased reporting of infectious pathogens from wild meat. These included outbreaks that were suspected to have resulted from wild meat or were epidemiologically linked to wild meat as an occupational hazard, even where the exact moment of spillover and outbreaks was untraceable. We also included studies documenting knowledge, perception or attitude, and practices amongst wild meat value chains actors and wild meat-dependent communities towards a previous outbreak that may be attributed to wild meat value chains. We screened the reference lists from eligible papers to identify any additional articles not captured by our search syntax but were consistent with the outlined inclusion criteria. We excluded studies documenting outbreaks attributable to wild animals but not specific to either wild meat or wild meat value chains. Similarly, we excluded studies on the serological prevalence of zoonotic pathogens in humans and wild animals in shared habitats, even if it is attributed to occupational hazards from participating in the wild meat value chain. While serological studies could be pointers to a history of zoonotic spillovers in human-animal shared landscapes, they were mostly incidentally recorded and rarely included any response measures, especially if they did not cause an outbreak. In addition, articles reporting on outbreaks events from outside SSA were excluded, regardless of whether such events spread into SSA.

Information sources

Web of Science
Pubmed
Google Scholar
World Health Organization Disease Outbreak News
Reference lists from eligible studies.

Main outcome(s) We document four zoonotic viruses (Ebola, Marburg, Lassa and Mpox Fever) and one bacterial pathogen (Bacillus anthracis) that have caused disease outbreaks linked to the wild meat value chains in SSA from 2004-2024 and the response measures taken during the outbreaks. Over the 20 year period, there were 81 disease outbreak events from the listed pathogens in the SSA. At the personal (subnational) level, communities responded to outbreaks by modifying their behavior in response to the outbreaks or as per directives issued by the national health authorities. Communities stopped, or reduced their participation along the value chain as hunters, processors, sellers or consumers of wild meat. In some cases, meat from the animal taxa implicated in the outbreak were avoided while other animals were still sought for their meat. Others still continued harvesting, sale and consumption of wild meat due to disbelief in the attribution of such outbreaks to wild meat. Outbreak response at the national level mainly involved human surveillance via contact tracing, case management and mitigation of the disease spread. In SSA, success of these responses was dependent on international collaborations and foreign aid. In some instances, the affected communities perceived these directives as unfair, hence resisting or not complying with the measures.

Data management Citations retrieved from the search were exported to Rayyan to check for duplication, and conduct title, abstract and whole text screening. A mixed deductive and inductive thematic analysis was used to extract data from the included articles based on repetitive themes that were emerging. We selected the emerging themes in accordance to our research questions. The extracted data were collated in Excel Microsoft for descriptive analysis using R Studio (Version 4.4.2) with packages tidyr, dplyr, and ggplot2 to generate graphs and QGS (version 3.3.2) for illustrative maps. To develop an outbreak framework, we used guidelines from Hassell et al. 2025, Hopkins et al. 2022 and Hopkins et al. 2021 to develop a theoretical frame work for mutually positive outcomes for both communities and governments during outbreaks. Briefly, we classified outcomes from outbreak response measures according to the impact they had on personal, national, and international needs during outbreaks. Eventually, outcomes could either be win-win, win-lose, win-neutral, neutral-neutral, lose-neutral or lose-lose. Since an ongoing outbreak is already a mutually unhealthy baseline for personal, national and international needs during an outbreak, authors unanimously agreed that; responses that had a positive impact on both personal, national, and international needs as win-win; responses perceived to maintain the baseline status as neutral-win; responses that had a negative impact on both personal, national, and international needs were classified as lose-lose, lose-neutral, neutral-neutral or neutral-lose outcomes. We classified mixed outcomes (lose-win, neutral-win, win-neutral, win-lose) accordingly and as per the definitions in the previous sentence. Thereafter, we used selected, at times modified, interventions from our data and from Hassell et al (2025) to outline a theoretical framework for response to future infectious wild meat-borne disease outbreak events.

References

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Quality assessment / Risk of bias analysis Due to the low number of studies retrieved in this review and the heterogenous nature of the studies design, we did not conduct any quality assessment, nor risk of bias analysis. We therefore included all the papers, and the World Health Organization-Disease Outbreak News (WHO-DONs) retrieved and which were compatible with our inclusion criteria.

Strategy of data synthesis The following parameters were used for SLR data extraction: Publication reference data; animal species, the status of the animal (live or dead), wild meat (fresh or processed) and pathogen involved. We also included data on the wild meat value chain node and actor involved; the age and gender of the value chain actor involved; the outbreak responses at individual level, and responses by the local, national or regional authorities, and the international community. We included the year of spillover event, whenever reported where available, and the SSA country of origin. These variables were extracted and transferred into unto Microsoft Excel spreadsheet for data preparation and categorized accordingly for meta-analysis. We conducted preliminary data analysis such as descriptive statistics using Micrososft excel for descriptive statistics of the data from the SLR. We also used inductive thematic analysis to identify emerging themes with regards to zoonotic spillovers and outbreak response from the SLR data using standard procedures. Similarly, we read carefully scanned through the WHO-DONs reports, and inductively identified and defined emerging themes with regards to response to the outbreaks that we identified from the SLR, countries involved, and the year of reporting. We eventually included seven data codes under which we classified emerging themes . We used R Studio (Version 4.4.2) with packages tidyr, dplyr and ggplot2 for descriptive analysis and presentation of the data obtained from DONs.

Subgroup analysis NA.

Sensitivity analysis NA.

Language restriction No restriction imposed.

Country(ies) involved Kenya, Netherlands, Nigeria, USA, UK.

Keywords Bushmeat, game meat, zoonoses, spillovers, outbreaks, outbreak response, WHO.

Dissemination plans Output from this study will be disseminated to communities through local workshops and seminars; to scientific and research communities through a published article in a peer review journal; and to the national and international health authorities through published articles, special communications, where possible and through policy documents.

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