Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Evaluation of integrated community-based surveillance within the 4S network in Senegal: implications for early detection of epidemic and zoonotic events

Mame Yacine

MameYacine.MBODJ@pasteur.sn

Institut Pasteur de Dakar

Anankpo Gildas YAHOUEDO

World Health Organization

Rokhaya DIOP[1]

Institut Pasteur de Dakar

Hamidou THIAM[1]

Institut Pasteur de Dakar

Mam Coumba

Institut Pasteur de Dakar

Rabiétou LY[1]

Institut Pasteur de Dakar

Abdoulaye SAM[3]

Ministère de la Santé Publique et Action Sociale

Alioune SYLLA[3]

Ministère de la Santé Publique et Action Sociale

Boly DIOP[3]

Ministère de la Santé Publique et Action Sociale

Christine M HALLEUX[2]

World Health Organization

Michael MIHUT[2]

World Health Organization

Corinne Simone Collette

World Health Organization

Abdourahmane SOW[1]

Institut Pasteur de Dakar

Research Article

Keywords: Community-based surveillance, One Health, epidemic preparedness, Senegal

Posted Date: November 19th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11551776/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Evaluation of integrated community-based surveillance within the 4S network in Senegal: implications for early detection of epidemic and zoonotic events

Mame Yacine MBODJ[1]*, Anankpo Gildas YAHOUEDO [2], Rokhaya DIOP[1], Hamidou THIAM[1], Mam Coumba DIOUF[1], Rabiétou LY[1], Abdoulaye SAM[3], Alioune SYLLA[3], Boly DIOP[3], Christine M HALLEUX[2], Michael MIHUT[2], Corinne Simone Collette MERLE [2], Abdourahmane SOW[1]

[1]Institut Pasteur, 36 Avenue Pasteur I BP 220 Dakar, Senegal

[2]UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR), World Health Organisation, Geneva, Switzerland

[3] Ministry of Health and Public Hygiene, Fann Résidence, Rue Aimé Césaire, Dakar, Senegal

***Corresponding author**

Email: MameYacine.MBODJ@pasteur.sn (MYM)

Abstract

Background: Community-based surveillance integrated into the 4S network (Syndromic Surveillance System in Senegal) is an innovative approach designed to strengthen the early detection and reporting of diseases with epidemic potential, zoonoses, and unusual events through the active involvement of community stakeholders. Piloted in Senegal across three sites, Darou Salam (Pikine), Agnam Civol (Matam), and Dalaba (Kédougou), this strategy has proven its effectiveness in mobilizing community actors, complementing existing health systems, and detecting human and animal health events.

Method: The evaluation combined quantitative surveys of 83 community stakeholders and healthcare professionals with qualitative research comprising 44 semi-structured interviews and 9 focus groups. A descriptive analysis was conducted on the collected quantitative data and the database of alerts issued by community stakeholders. A thematic analysis was conducted on the qualitative data to contextualize the quantitative results.

Results: The results show strong community engagement, a revitalisation of the Integrated Community Surveillance and Alert Committees (CVAC.i), and improved detection of health indicators, including maternal deaths, suspected measles, rabies, and haemorrhagic fevers. The system facilitated the reporting of 179 alerts during the evaluation period, of which 88.3% were verified by healthcare professionals. However, logistical, human, digital, and financial constraints persist, raising questions about the model's large-scale feasibility and longer-term sustainability.

Conclusion: The Community-based surveillance in Senegal illustrates the importance of a participatory, cross-sectoral approach to strengthening health system resilience. Its long-term sustainability will depend on innovative funding mechanisms, the formalization of the CVACs' role, and sustainable cross-sectoral collaboration.

Keywords: Community-based surveillance, One Health, epidemic preparedness, Senegal

Introduction

In an era marked by persistent epidemic diseases, significant challenges in maternal and perinatal mortality, and the escalating threat of emerging zoonotic pathogens, health systems worldwide are compelled to reinvent themselves [1]. This reinvention necessitates a shift towards more responsive, resilient, and community-focused models of care and surveillance [2]. The rise of zoonotic diseases in flood-prone regions and other emerging infectious diseases at the human-animal interface, underscores the urgency of this transformation [3,4]. Similarly, persistent high rates of maternal and perinatal mortality in many settings demand community-level interventions and surveillance to ensure timely care and response [5].

Community-based surveillance (CBS) has emerged as a critical component of this paradigm shift, repositioning communities from passive recipients of healthcare to active participants in epidemiological surveillance [6]. This approach leverages local knowledge and social networks to detect and report health events early, thereby enhancing the timeliness and effectiveness of public health responses [7]. In Senegal, this strategy is embodied by the Integrated Community Surveillance and Alert Committees (CVAC.i), which involve community volunteers, health workers, and veterinary services within a cross-sectoral and participatory framework.

Since 2012, Senegal has been piloting the CVAC strategy, initially designed to monitor the health of pregnant women, mothers, and newborns. Over time, its scope has expanded to include the surveillance of diseases with epidemic potential. This evolution reflects a growing recognition of the value of community health workers in strengthening primary healthcare systems [8]. However, previous evaluations conducted by the Prevention Directorate (DP) of the Ministry of Health and Public Hygiene (MHPH) and the Pasteur Institute of Dakar (PID) identified important limitations. These included organizational weaknesses, motivational challenges among volunteers, operational inefficiencies, regional disparities in implementation, and poor cross-sectoral coordination. Such challenges are not unique to Senegal and have been documented in other community-based health programs in Africa [9,10].

To address these shortcomings, a new model of CBS integrated into Senegal's Syndromic Sentinel Surveillance Network (4S) was designed. This enhanced model aims to strengthen the early detection of priority diseases, zoonoses, and unusual events, while fully integrating maternal and neonatal health within a comprehensive 'One Health' framework. A key innovation of this model is the digitalization of data collection and reporting through the RedCap platform, intended to improve data flow and timeliness [11]. The new CBS model was piloted at three sites: Darou Salam, an urban area in Dakar; Agnam, a rural community in Matam; and Dalaba, a remote area in Kédougou.

This manuscript presents the results of the evaluation conducted after the first three months of implementation of the new CBS model. This evaluation assesses the model's relevance, effectiveness, and early impact, while also identifying key challenges to its sustainability and scalability.

Methodology

The evaluation was structured around the Organisation for Economic Co-operation and Development (OECD) criteria for evaluating development assistance: relevance, effectiveness, efficiency, and sustainability. A convergent parallel mixed-methods approach was adopted to provide a comprehensive understanding of the CBS model's implementation, combining quantitative and qualitative data collection and analysis.

Quantitative methodology

Scope of field data collection

The quantitative component targeted a comprehensive sample of stakeholders involved in the CBS pilot project. The sample included all active community stakeholders (n=56); all primary healthcare providers at the pilot sites, including 3 midwives, 3 Head Nurses (HN), 3Heads of Veterinary Posts (HVP) and 1 head of environment post (n=10); key actors at the regional and departmental levels, such as 3 Chief Medical Officers (CMO) , 3 Regional Health Directors (RHD) , 6 Primary Health Care (PHC) focal points of district and rgion, 6 surveillance focal points of district and region, and 3 regional directors of livestock and 3 environment (n=24); and strategic-level stakeholders from national institutions like the DP, Primary Health Care Unit (PHCU) , the Directorate of Mother and Child Health (DMCH) , and IPD (n=4).

Data collection and analysis tools

A structured questionnaire was developed and administered to all participants. The questionnaire was tailored to each stakeholder group, with specific questions designed to assess perceptions of the project's relevance, effectiveness, efficiency, and sustainability.

In addition to the survey data, we conducted a descriptive analysis of routinely collected surveillance data. This included data from the epidemiological surveillance log, the maternal and perinatal death notification forms, and the weekly reports submitted by the HN. Data were extracted for the evaluation period and analyzed using R software. The analysis focused on key performance indicators defined in the project's monitoring and evaluation plan, such as the number of alerts generated, verification rates, and reporting timeliness. Data collected in the field were also examined.

Qualitative methodology

Data collection targets

The qualitative component aimed to explore stakeholders' experiences and perceptions across different levels to assess the added value of the CBS model, its limitations, and its long-term sustainability needs.

A total of 44 semi-structured interviews and 9 focus group discussions (with approximately 8 participants per group) were conducted. Participants included community stakeholders, nurses, midwives, and members of the general public across the three pilot sites (Agnam, Dalaba, and Pikine). Purposive sampling was used to ensure a diversity of perspectives. It is

important to note that not all targeted stakeholders could be interviewed due to their unavailability during the data collection period.

Data collection and analysis tools

The interviews were facilitated using interview guides adapted to each participant category to ensure the relevance and consistency of the discussions. All interviews and focus groups were audio-recorded with the respondents' prior informed consent. The recordings were transcribed verbatim and subsequently analyzed using a thematic approach. This method enabled the systematic identification of recurring themes, which helped highlight the main perceptions, constraints, and opportunities associated with the implementation of CBS.

Results

The evaluation covered the period from 23 December 2024 to 12 April 2025 in Agnam, from 10 January to 24 April 2025 in Dalaba, and from 11 February to 30 April 2025 in Darou Salam.

Sociodemographic characteristics of participants

The study included 83 participants who completed the quantitative survey. The distribution of participants was as follows: 13.3% from the central (strategic) level, 28.9% from the Agnam site, 26.5% from the Dalaba site, and 31.3% from the Darou-salam site.

For the qualitative component, a total of 44 individual interviews were conducted, including 15 in Agnam, 13 in Dalaba, and 16 in Darou-Salam. Interviews involved community members, community actors, and stakeholders at the central level. In addition, 3 focus group discussions were conducted at each site, for a total of 9 focus groups: 2 with community actors and one with community members at each site.

Overall, women comprised the majority of participants (66.3%), a trend particularly pronounced at the community sites, where they are the primary actors. In contrast, men were in the majority at the central level, reflecting the gender distribution in senior management positions within the health system. The average age of participants was 42 years, indicating a cohort of experienced, middle-aged adults. The vast majority of participants were married (81.9%).

The ethnic composition of the participants varied significantly by site, reflecting the local demographics. The Pular ethnic group was predominant in the rural sites of Agnam and Dalaba, while the Serer group was the majority in the urban Darou-salam site, with a moderate diversity of other ethnic groups. Educational attainment also showed marked differences. The central-level participants were predominantly university-educated, whereas at the community sites, educational levels ranged from no formal education (illiteracy) to secondary education. These sociodemographic data highlight site-level differences in gender, educational attainment, and ethnicity, as well as a high proportion of female participants.

Analysis of routinely collected surveillance data

A total of 179 alerts were generated by community stakeholders and transmitted via the RedCap system during the evaluation period.

The distribution of alerts over the evaluation period indicates that at least one alert was issued each week, with slight increases observed in the weeks of 26 January and 5 February 2025 (Figure 1).

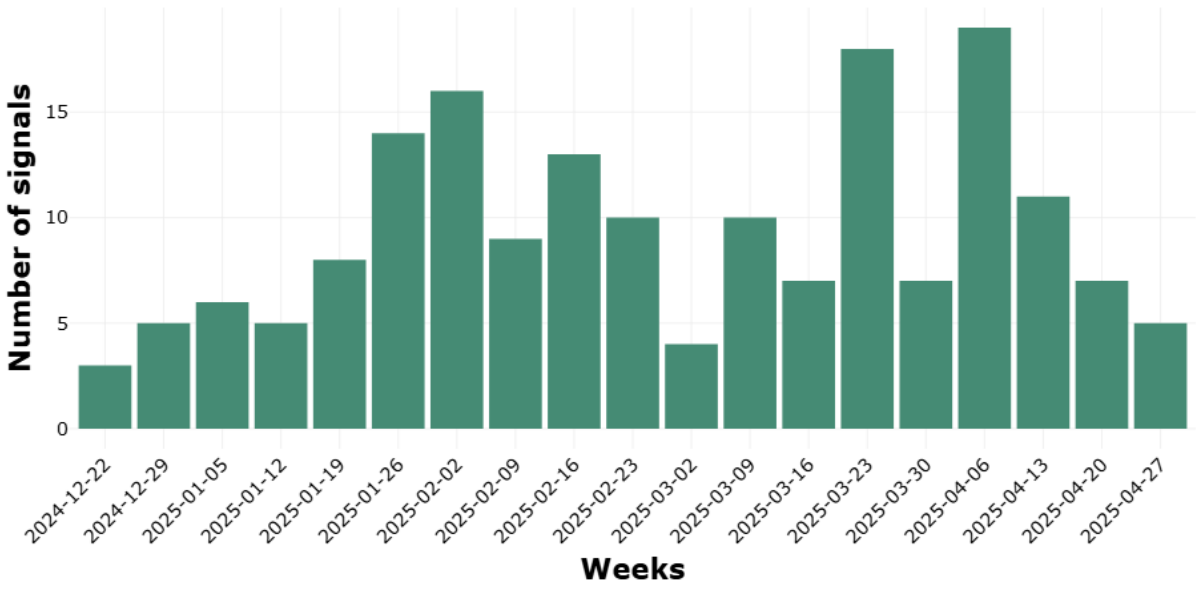


Figure 1: Weekly breakdown of alerts issued (23 December 2024 – 30 April 2025)

The graph illustrates the total number of alerts generated per week by community stakeholders across the three pilot sites. The distribution shows consistent reporting activity with minor peaks observed in late January and early February 2025, corresponding to heightened community awareness campaigns.

A summary of the key monitoring indicators for these alerts is presented in Table 1.

Table 1: Summary of key indicators for monitoring alerts

Monitoring indicators	Number	Percentage (%)
Total alerts issued	179	-
Alerts verified	158	88,27 %
Valid alerts	125	79,11 %
Confirmed alerts	62	49,60 %
Maternal deaths	0	0,00 %
Perinatal deaths	2	1,12 %
People enrolled in mutual insurance schemes	21	11,73 %
Cases managed in 4S	40	22,35 %

Samples taken	8	20,00 %
Blood samples	7	87,50 %
Stool samples	1	12,50 %

The table summarizes the flow and outcome of the 179 alerts generated by the Community-based surveillance system during the evaluation period. It highlights the high verification rate but also shows a drop-off at each subsequent stage of the surveillance cascade, from case definition compliance to laboratory confirmation.

Of the 179 alerts, 158 (88.3%) were successfully verified by the local Head Nurse. The 21 unverified alerts (11.7%) were attributed to several factors, including data entry errors by community volunteers, patients not reaching the health post after referral due to distance or lack of financial resources, and logistical challenges. Nearly 80% of the verified alerts met the syndromic case definitions provided during training. Of these, approximately half were subsequently confirmed by the ICP based on clinical assessment at the health facility. Among the confirmed cases, 22% were formally managed within the 4S network, and 8 samples were collected for laboratory analysis (including one stool sample), all of which tested negative. Additionally, two perinatal deaths were reported through the system, although they were not followed up with a verbal autopsy during this initial period.

Relevance and perception of the community-based surveillance model

There was strong consensus among all stakeholder groups on the relevance of the CBS model. Quantitative survey data showed that the majority of participants considered the model "very relevant" (82.1%) or "relevant" (17.9%) (Figure 2). Furthermore, 95.5% of respondents believed that the CBS's objectives were well-aligned with national public health priorities. While over half of the participants (63.2%) were aware of other similar community health initiatives, they perceived the CBS model as distinct due to its integrated One Health approach, structured framework, and digital integration.

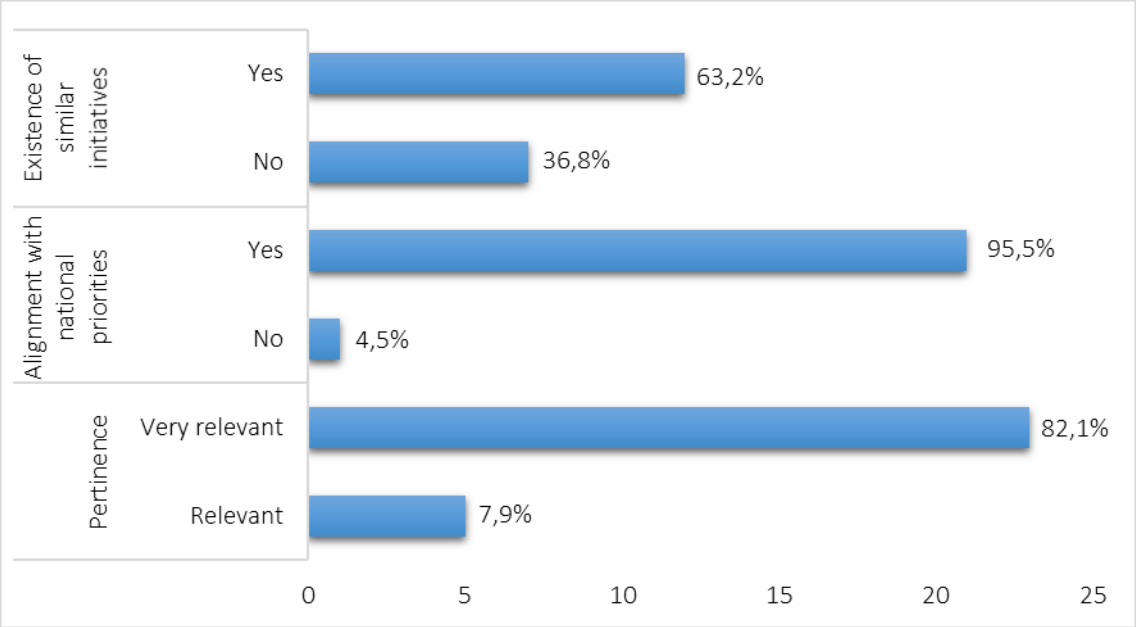


Figure 2: **Perception of the project's relevance by central and intermediate levels**

Qualitative findings strongly corroborated these positive perceptions. Interviews and focus groups revealed that stakeholders viewed the CBS as a major innovation that had revitalized the role of the CVAC.i. The scheme has strengthened participants' skills by providing training and tools (telephones, notebooks, and badges), thereby improving the detection of priority and zoonotic diseases and communication with the public.

The testimonials highlight a shift in practices, including greater consideration of animal health, the adoption of new procedures (e.g., managing poultry in the event of avian influenza or dealing with dog bites where rabies is suspected), more frequent home visits and community talks, and the promotion of early detection and increased use of healthcare services. The public increasingly recognizes CVAC.I, as a trusted stakeholder, strengthen social cohesion and health awareness.

The combination of quantitative and qualitative data confirms the relevance, acceptability, and transformative impact of CBS on public health and community dynamics.

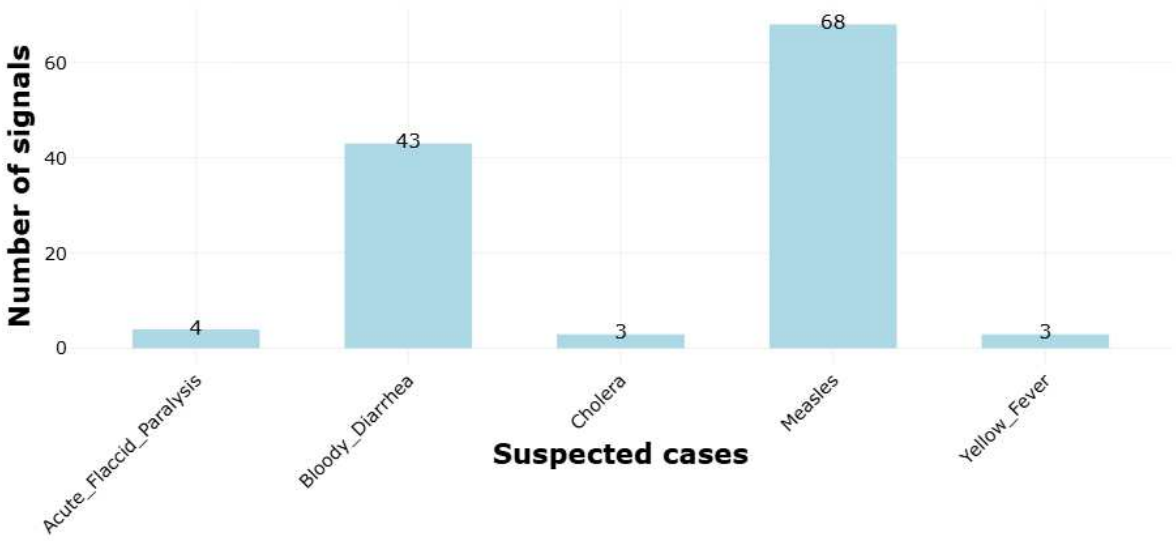
Effectiveness

The effectiveness of the CBS model was demonstrated through its ability to facilitate the early detection, reporting, and referral of suspected cases to health posts. Home visits were the primary method for identifying cases, often accompanied by awareness-raising sessions in which community members were encouraged to report symptoms. Once a case was identified, the CVAC.I often accompanied the patient to the health post, ensuring they were registered in the CBS system and integrated into the formal health system.

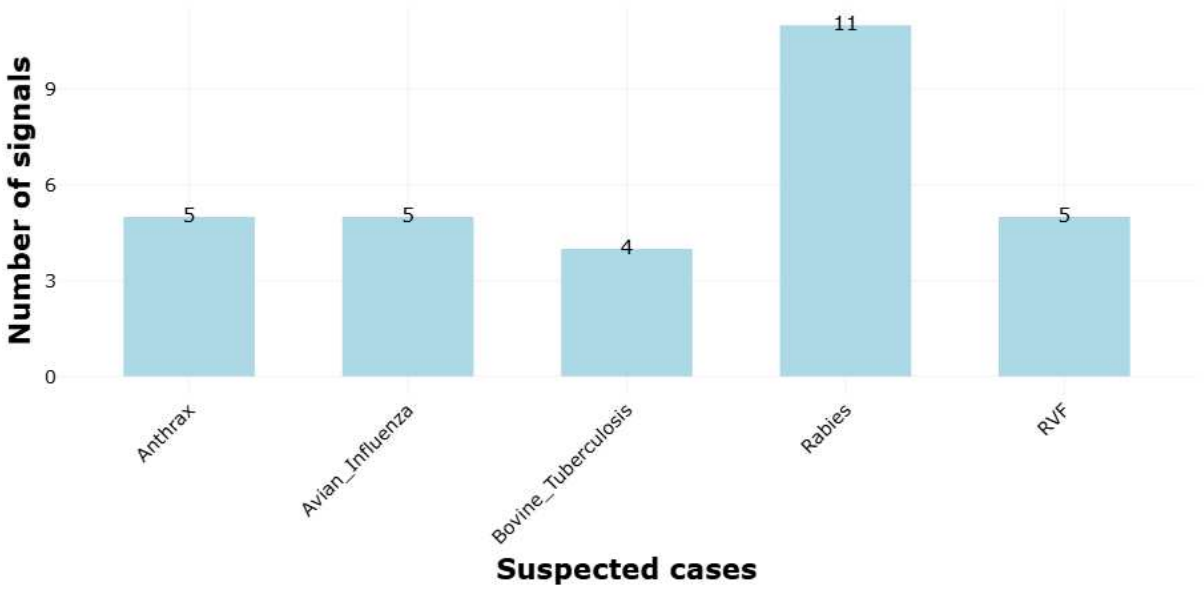
Analysis of alerts transmitted by CVAC.I via Redcap

This section presents an analysis of the alerts issued during the assessment period, focusing on their daily distribution, key monitoring indicators, and the categories of diseases with epidemic potential (DEP), zoonoses, and unusual events reported by CVAC.i (Figure 3). The aim is to illustrate how the monitoring system functions, the level of compliance, the processes used for alert management, and the trends observed within the communities.

A: Suspected cases of diseases with epidemic potential among the 179 alerts received



B: Suspected zoonotic diseases among the 179 alerts received



C: Suspicion of unusual events among the 179 alerts received

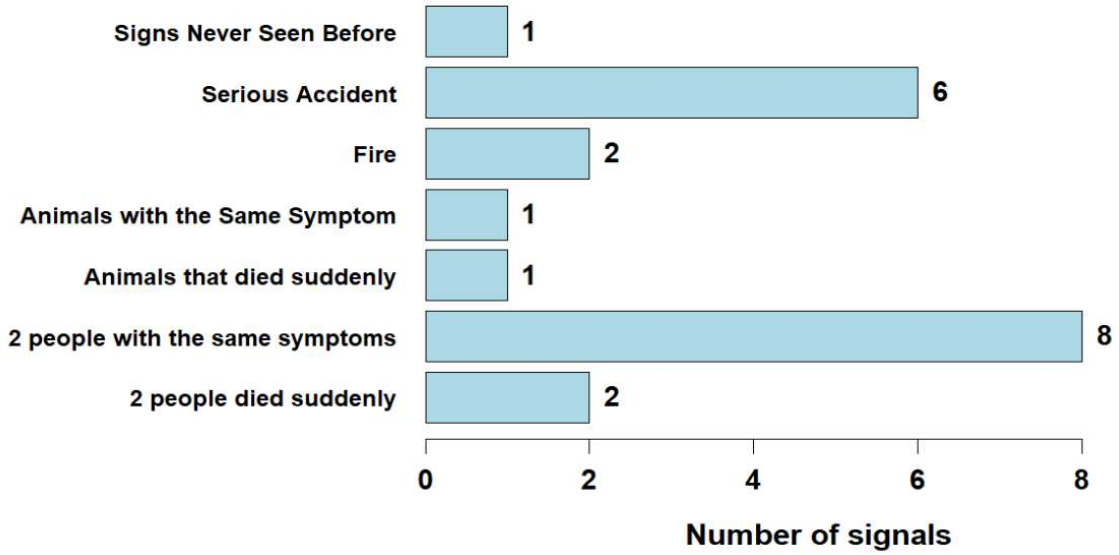


Figure 3: **Distribution of alerts by category**

The charts display the number of suspected cases reported by community stakeholders, categorized by type. (A) Diseases with Epidemic Potential, showing a high number of suspected measles and bloody diarrhea cases. (B) Zoonoses, showing a relatively balanced distribution with rabies being the most frequently reported. (C) Unusual Events, with clusters of illness being the most common report.

Among diseases with epidemic potential, suspected measles cases were the most frequently reported (68 cases), followed by bloody diarrhea (43 cases). This suggests a high level of community awareness for these conditions, which may warrant further investigation and public health action. The distribution of suspected zoonoses was more balanced, with rabies being the most common (11 cases), followed by anthrax, Rift Valley fever, and avian influenza (5 cases each), highlighting the need for a continuous multisectoral approach within a One Health framework. For unusual events, the most frequent report was "2 people presenting with the same symptoms" (8 cases), and worrying serious accidents (6 cases).

Impact on communities

The CBS has proved to be a key driver of early detection, cross-sectoral coordination, and local prevention, thereby strengthening community resilience. It has revitalised the CVAC.i, increasing home visits and awareness-raising activities. Several public health events have been detected and reported, including maternal deaths, suspected cases of measles, animal rabies, and suspected cases of hemorrhagic fever.

The synergy with the 4S network has improved the system's responsiveness and expanded its coverage. Concrete examples further demonstrate its effectiveness, including the rapid identification of suspected cases of bloody diarrhea and Rift Valley fever, the management of skin conditions in Koranic schools (Daaras), and the organization of dog vaccination campaigns following bite incidents.

"*This enabled us to visit these Daaras and raise awareness about the spread of this disease. The neighbourhood midwives (Bajenu Gox) took charge of the children's care: washing them,*

applying dressings and medication, and we also explained the situation to the Koranic teacher." (PS, Darou Salam).

The professionalization of the CVAC.i strengthened their expertise in priority diseases and previously under-recognized zoonoses. The use of digital tools, particularly RedCap on smartphones, was seen as an important step forward, improving the real-time collection and transmission of data, even from remote areas. Beyond simply responding to alerts, the CBS contributed to lasting behavioral changes, greater community ownership of prevention practices, and improved local healthcare coverage. It has shown its potential as a powerful tool for transforming community and institutional practices, thereby consolidating the long-term prevention and control of epidemics.

Discussion

The initial implementation of the integrated Community-Based Surveillance (CBS) model in Senegal demonstrates the considerable potential of a participatory, cross-sectoral approach to enhance early warning systems for epidemic and zoonotic events. The findings align with a growing body of evidence suggesting that active community involvement is a cornerstone of resilient health systems, particularly in resource-limited settings [12]. The revitalization of the CVAC.i and the high level of community engagement observed in this study are critical success factors, echoing findings from systematic reviews that identify communication and engagement as paramount for effective community-based surveillance [13].

The effectiveness of the CBS in detecting a range of health events—from maternal deaths and suspected measles to animal rabies—showcases the value of an integrated 'One Health' framework. This approach moves beyond siloed disease programs to address the complex interplay between human, animal, and environmental health, which is essential for tackling zoonotic threats [4]. The synergy with the existing 4S network improved the system's responsiveness and expanded its coverage, demonstrating a successful model for integrating community-level data into national surveillance structures [14].

Despite these successes, the evaluation revealed several significant limitations that threaten the model's long-term sustainability and effectiveness. These challenges are not uncommon in programs relying on community health volunteers [15]. Logistical and equipment shortages, such as a lack of transport for referrals and insufficient veterinary supplies, directly delayed responses to alerts. This can lead to community disillusionment and undermine the trust essential to the system's functioning. Human resource constraints, including overburdened veterinarians and the occasional unavailability of key personnel, also posed a significant challenge.

The issue of motivation and incentives for the volunteer CVAC.i members is critical. While the provision of tools and training enhanced their status and motivation, the lack of consistent financial or material incentives is a well-documented barrier to the long-term retention and performance of community health workers [6]. Furthermore, weak cross-sectoral coordination, particularly with the environmental sector, and the presence of parallel, uncoordinated projects created confusion and inefficiency.

The introduction of digital tools like RedCap represents a significant advancement, but it is not without its challenges. Technical issues, such as poor network connectivity in rural areas, and linguistic barriers for volunteers with low literacy levels, hindered the smooth collection and transmission of data. This highlights the need for user-centered design and ongoing technical support when implementing technology-based surveillance systems [16,17].

For the CBS model to be sustainable, these challenges must be addressed proactively. This requires establishing clear policies on compensation and support for CVAC.i members, securing long-term funding beyond pilot project cycles, and institutionalizing the role of the CVAC.i within the national health system. Furthermore, strengthening cross-sectoral collaboration mechanisms and integrating the CBS's digital platform with other national health information systems are crucial steps [18]. The lessons learned from this pilot offer valuable insights for scaling up and strengthening the CBS, not only in Senegal but also in other countries aiming to build a more integrated and resilient response to health crises [19,20]. The shift of surveillance from purely hospital-based settings to community settings has been shown to be potentially cost-effective in other domains, offering an avenue for future research on the CBS model [21]. The accuracy of community-level diagnostics and reporting, while high in this pilot, remains a critical area for continuous quality assurance, as demonstrated in other large-scale community studies [22].

Conclusion

The integrated CBS model in Senegal represents a key step forward in strengthening the resilience of the national health system. By empowering communities as key actors in detecting and preventing health threats, the model enhances preparedness for health crises within a 'One Health' framework. The initial evaluation demonstrates its relevance and effectiveness in improving the early detection of epidemic-prone diseases, zoonoses, and maternal health events. However, its long-term success and scalability are contingent on addressing critical challenges in logistics, human resources, and sustainable financing. The sustainability of the CBS will require robust institutional support, innovative and consistent funding mechanisms, continuous training for community volunteers, and better integration of digital tools. By building on the successes of this pilot and proactively addressing its limitations, Senegal can consolidate a participatory, cross-sectoral surveillance system capable of delivering a durable response to current and future health threats.

List of acronyms

CBS: Community-based surveillance

CVAC.i: Integrated Community Surveillance and Alert Committees

DMCH: Directorate of Mother and Child Health

DP: Prevention Directorate

HN: Head Nurses

HVP: Heads of Veterinary Posts

MHPH: Ministry of Health and Public Hygiene

OECD: Organisation for Economic Co-operation and Development

PHCU: Primary Health Care Unit

RHD: Regional Health Directors

4S: Senegal's Syndromic Sentinel Surveillance Network

Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki (as revised in 2013) and the guidelines for Good Clinical Practice. The study protocol was reviewed and approved by Comité National d'Ethique pour la Recherche en Santé, CNERS, Senegal, under reference No: 00000011/MSAS/CNERS/SP, Protocol SEN23/110, Version 2:27_12_2023. Before conducting interviews activities, community consent was obtained by explaining the study's aims and objectives to participants in Kédougou, Agnam and Darou Salam.

Consent for publication

Not applicable.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Authors contributions

MYM and RD collected and analyzed the qualitative and quatitative data. HT coordinated the CBS project. MCD was responsible for alert management. ASam, ASyl, and BD, from the Ministry of Health, facilitated field data collection. MYM, RD, HT, MCD, RL, AS, and AGY drafted the manuscript. AGY, CMH, MM, CSCM, RL, and AS reviewed the manuscript. All authors contributed to the interpretation of the findings and reviewed and approved the final manuscript.

Acknowledgements

We would like to thank the Ministry of Health and Public Hygiene, the Medical Regions of Matam, Dakar, and Kédougou, and the Public Health Department of the Pasteur Institute for their valuable support and collaboration.

Funding

This evaluation study received financial support from the UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR).

Disclaimer

AGY, CMH, MM, and CSCM are part of the workforce of the World Health Organization. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

References

1. Rosillo N, Del-Águila-Mejía J, Rojas-Benedicto A, Guerrero-Vadillo M, Peñuelas M, Mazagatos C, et al. Real time surveillance of COVID-19 space and time clusters during the summer 2020 in Spain. BMC public health. 2021;21:961. https://doi.org/10.1186/s12889-021-10961-z

2. Fazli G, Creatore M, Matheson F, Guilcher S, Kaufman-Shriqui V, Manson H, et al. Identifying mechanisms for facilitating knowledge to action strategies targeting the built environment. BMC public health. 2017;17:1. https://doi.org/10.1186/s12889-016-3954-4

3. Yosef D, Ahad A, Arog H, Ahmed A. Zoonotic transmission risk in flood-prone river basins: community knowledge and behavioral determinants of leptospirosis in eastern Ethiopia. BMC public health [Internet]. 2026; https://doi.org/10.1186/s12889-026-27618-4

4. Yadana S, Cheun-Arom T, Li H, Hagan E, Mendelsohn E, Latinne A, et al. Behavioral-biological surveillance of emerging infectious diseases among a dynamic cohort in Thailand. BMC infectious diseases. 2022;22:472. https://doi.org/10.1186/s12879-022-07439-7

5. Mary M, Tappis H, Scudder E, Creanga A. Community-based maternal and perinatal death surveillance and response: a comparative case study of implementation realities from humanitarian contexts. BMC public health. 2025;25:3256. https://doi.org/10.1186/s12889-025-24440-2

6. Sanou H, Korbéogo G, Meyrowitsch D, Samuelsen H. How community-based health workers fulfil their roles in epidemic disease surveillance: a case study from Burkina Faso. BMC health services research. 2024;24:1372. https://doi.org/10.1186/s12913-024-11853-9

7. Gérardin P, Guernier V, Perrau J, Fianu A, Le Roux K, Grivard P, et al. Estimating Chikungunya prevalence in La Réunion Island outbreak by serosurveys: two methods for two critical times of the epidemic. BMC infectious diseases. 2008;8:99. https://doi.org/10.1186/1471-2334-8-99

8. Ramsey K, Hingora A, Kante M, Jackson E, Exavery A, Pemba S, et al. The Tanzania Connect Project: a cluster-randomized trial of the child survival impact of adding paid community health workers to an existing facility-focused health system. BMC health services research. 2013;13 Suppl 2:S6. https://doi.org/10.1186/1472-6963-13-S2-S6

9. Zalwango J, Naiga H, Nsubuga E, Akunzirwe R, Buhuguru R, Zalwango M, et al. Understanding the delay in identifying Sudan Virus Disease: gaps in integrated disease surveillance and response and community-based surveillance to detect viral hemorrhagic fever outbreaks in Uganda, September 2022. BMC infectious diseases. 2024;24:754. https://doi.org/10.1186/s12879-024-09659-5

10. Vanek M, Shoo B, Mtasiwa D, Kiama M, Lindsay S, Fillinger U, et al. Community-based surveillance of malaria vector larval habitats: a baseline study in urban Dar es Salaam, Tanzania. BMC public health. 2006;6:154. https://doi.org/10.1186/1471-2458-6-154

11. Diese M, Kalonji A, Izale B, Villeneuve S, Kintaudi N, Clarysse G, et al. Community-based maternal, newborn, and child health surveillance: perceptions and attitudes of local stakeholders towards using mobile phone by village health volunteers in the Kenge Health Zone, Democratic Republic of Congo. BMC public health. 2018;18:316. https://doi.org/10.1186/s12889-018-5186-2

12. Hashimoto K, Zúniga C, Nakamura J, Hanada K. Integrating an infectious disease programme into the primary health care service: a retrospective analysis of Chagas disease community-based surveillance in Honduras. BMC health services research. 2015;15:116. https://doi.org/10.1186/s12913-015-0785-4

13. Inns T, Harris J, Vivancos R, Iturriza-Gomara M, O'Brien S. Community-based surveillance of norovirus disease: a systematic review. BMC infectious diseases. 2017;17:657. https://doi.org/10.1186/s12879-017-2758-1

14. Fernàndez-López L, Baros S, Niedźwiedzka-Stadnik M, Staneková D, Rosińska M, Simic D, et al. Integration of community-based testing data into national HIV surveillance in Poland, Serbia and Slovakia within the framework of INTEGRATE project. BMC infectious diseases. 2021;21:800. https://doi.org/10.1186/s12879-021-06498-6

15. Owusu L, Tuwor R, Ackam N, Loglo A, Agbavor B, Agbanyo A, et al. Role and capacity needs of community based surveillance volunteers in the integrated management of skin neglected tropical diseases (skin NTDs): a qualitative study from central Ghana. BMC public health. 2023;23:1086. https://doi.org/10.1186/s12889-023-16015-w

16. Zheng W, Hua L, Tan J, Zhang J, Liang Y, Pan J, et al. Development and evaluation of an IoT-based hypertension surveillance system in community health settings: a mixed-methods quasi-experimental study protocol. BMC health services research. 2025;25:1399. https://doi.org/10.1186/s12913-025-13562-3

17. Davies R, Iturriza-Gómara M, Glennon-Alty R, Elliot A, Vivancos R, Alvarez Nishio A, et al. Public acceptability of a technology-mediated stool sample collection platform to inform community-based surveillance of infectious intestinal disease: a pilot study. BMC public health. 2022;22:958. https://doi.org/10.1186/s12889-022-13307-5

18. Fernàndez-López L, Klavs I, Conway A, Kustec T, Serdt M, Baros S, et al. Recommendations for collection and integration of community-based testing and linkage to care data into national surveillance, monitoring and evaluation systems for HIV, viral hepatitis and sexually transmitted infections: results from the INTEGRATE Joint Action. BMC infectious diseases. 2021;21:794. https://doi.org/10.1186/s12879-021-06499-5

19. Lu S, Ding W, Wang J, Yin S, Li S, Zhou X, et al. Application of an innovative grid-based surveillance strategy to ensure elimination and prevent reintroduction of malaria in high-risk border communities in China. BMC public health. 2022;22:1347. https://doi.org/10.1186/s12889-022-13753-1

20. Auer A, Dobmeier T, Haglund B, Tillgren P. The relevance of WHO injury surveillance guidelines for evaluation: learning from the aboriginal community-centered injury surveillance system (ACCISS) and two institution-based systems. BMC public health. 2011;11:744. https://doi.org/10.1186/1471-2458-11-744

21. de Ligt K, Witteveen A, Siesling S, Steuten L. Shifting breast cancer surveillance from current hospital setting to a community based setting: a cost-effectiveness study. BMC cancer. 2018;18:96. https://doi.org/10.1186/s12885-018-3992-7

22. Piwowar-Manning E, Fiamma A, Laeyendecker O, Kulich M, Donnell D, Szekeres G, et al. HIV surveillance in a large, community-based study: results from the pilot study of Project Accept (HIV Prevention Trials Network 043). BMC infectious diseases. 2011;11:251. https://doi.org/10.1186/1471-2334-11-251