One Health Outlook

REVIEW

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One Health prevention and preparedness to vector-borne diseases: how should we deal with a multisectoral, multilevel and multigroup governance?

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Abstract

Introduction Multifactorial determinants of vector presence, distribution and ability of transmitting diseases, demand holistic approaches that consider eco-biosocial factors, such as One Health (OH), and engage institutions and communities to reduce vulnerability to vector-borne diseases (VBDs). Although the importance of multisectoral, multilevel and multigroup collaboration for prevention and preparedness to VBDs has been promoted by international guidance, evidence about practical experiences adopting a OH approach needs to be gathered and enabling factors for a successful governance highlighted.

Methods This study included a rapid literature review coupled with a stakeholder consultation process.

Results The peer-reviewed literature search identified 1674 articles and 13 articles were finally included in the review. The collaboration and coordination of different sectors and stakeholders allowed to focus resources, and share knowledge and perspectives. To support coordination and collaboration among the stakeholders synergistic interaction mechanisms were created, such as working groups and committees, and connection agents emerged as the main link between institution and communities. These synergies allowed to target the multidimensional drivers of VBDs, supported transversal capacity building and an holistic monitoring evaluation framework, and improved effectiveness and sustainability of the interventions.

Conclusion A OH model highlighting enabling factors for multisectoral, multilevel and multigroup interventions for VBDs prevention and preparedness was developed to support decision-makers and key stakeholders to deal with a OH governance.

Keywords One Health, Governance, Vector-Borne Diseases

Introduction

Vector-borne diseases (VBDs) account for more than 17% of all infectious diseases, causing more than 700,000 deaths annually worldwide and devastating socio-economic consequences [1]. 80% of the world population live in areas at risk for at least one major VBD, mostly in low resource settings [2]. Climate, environmental and global changes are expanding and shifting the distribution of VBDs, and, on top of that, disease programs budgetary and personnel constraints and

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insecticide resistance are hampering VBDs prevention and preparedness interventions coverage and impact, urging to find cost-effective and sustainable solutions [3]. Multifactorial determinants of vector presence, distribution and ability of transmitting diseases, demand holistic approaches, such as One Health (OH), which considers the complexity of eco-biosocial drivers and promotes multisectoral and multistakeholder collaborations to maximise the available human and financial resources and enhance the effectiveness and the sustainability of the interventions [4–7]. Multisectoriality, as recognized by the WHO guidance framework "Multisectoral approach to the prevention and control of vector-borne diseases", involves collaboration between different sectors (human health, animal health, environmental health etc.) and stakeholders (government, public and private institutions and organizations, civil society, communities etc.) to achieve public health outcomes [5]. The WHO Global Vector Control Response 2017–2030 (GVCR) includes as its foundational pillars, strengthening inter- and intra-sectoral action and collaboration, community engagement and mobilisation, surveillance, monitoring and evaluation of interventions, and the integration of different approaches [8]. The World Health Assembly resolution WHA70.16 called member states to align with the GVCR by adopting the OH approach across all sectors and levels of government, including municipality and local administrative structures, and with the engagement and mobilization of community actors [9]. As a matter of fact, vectors live within communities and their ecology is strongly influenced by local environmental, social and behavioural factors, therefore the engagement of households and communities has a prominent role in controlling vector presence and distribution and reduce the vulnerability to VBDs. Communities usually engage themselves, though informally, in vector control strategies. However, transforming these informal actions into organised activities communicating with the formal institutional system is essential to enhance prevention and preparedness actions (Fig. 1) [10, 11].

The OH approach should be adopted both within the formal system (government, research institutions, healthcare system) and its different levels (national, regional/district, municipal), and within the informal system and its groups (communities, civil society, private sector) to ensure the sharing of resources, knowledge and information. However dealing with a multisectoral, multi-level

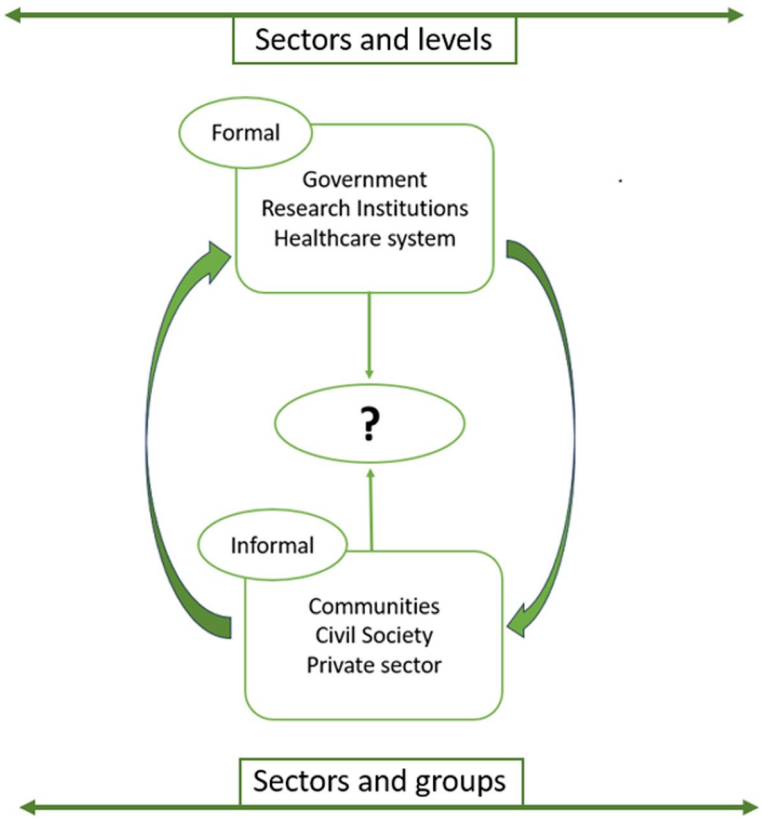

Fig. 1 The formal and informal systems engaged in VBDs prevention and preparedness

and multi-group governance is challenging and examples of practical experiences are rare in the literature.

This research aimed at gathering recent evidence about successful OH VBDs prevention and preparedness interventions supported by a multisectoral, multi-level and multi-group governance and highlighted enabling factors for its operationalisation.

Methods

Overview and aim

The study included a rapid literature review coupled with a stakeholder consultation process to explore enabling factors of successful multisectoral, multilevel and multigroup interventions for VBDs prevention and preparedness to guide decision-makers with the design and implementation of effective OH governance mechanisms.

Definitions for the scope of the research

Sector: Disciplinary sector.
Multisector: Including at least two sectors.
Community: Groups of people that may or may not be spatially connected, but who share common interests, concerns or identities [12].
Prevention: Regulatory and physical measures to ensure that emergencies are prevented, or their effects mitigated [13].
Preparedness: Activities that aim at preventing, mitigating and preparing for emergencies [13].
Formal: Referring to the institutional system.
Level: Different tiers of the formal system (national, regional/district, municipal)
Multilevel: Including more than one level.
Informal: Referring to the non-institutional system.
Group: Different actors supporting the informal system (citizens, NGOs, religious associations, private sector etc.)
Multigroup: Including more than one group.

Rapid Review

We chose a rapid review to produce timely and actionable information to be shared within the context of the MediLabSecure Project (https://www.medilabsecure.com/), that aims to mitigate the risk associated with VBDs in the Mediterranean, Balkans, Black Sea, Maghreb and Sahel regions. The rapid review followed the Cochrane guidance to conduct rapid reviews [14].

Search strategy

The peer-reviewed literature search was performed in PubMed® and Cochrane Central. The final search string was: (("Vector Borne Diseases"[Mesh]) AND ("prevention and control" [Subheading] OR "Communicable Disease Control"[Mesh]) AND ("Community Participation"[Mesh] OR community)). We decided not to us ethe term One Health and proceed during the screening phase to select only the records adopting a OH approach. The retrieved records were imported in the systematic review software Rayyan© [15].

Eligibility criteria

Inclusion criteria

i. Documents describing multisectoral interventions (at least two sectors involved) for VBDs prevention and preparedness engaging community members (any group) and members of the formal system (at any level), and showing a positive impact on entomological indices, disease rates, cost-effectiveness.
ii. Documents published in English with full-text available.
iii. Documents published from the 1st of January 2017 to the 31st of December 2022. We chose this timeframe to explore recent evidence in the context of the 2017 GVCR [8].
iv. Any type of document.

Exclusion criteria

i. Documents that do not answer the research objectives.
ii. Documents in other languages than English.
iii. Documents with no full-text available.
iv. Documents published before the 1st of January 2017 or after the 31st of December 2022.

Quality assessment of included literature

We minimised the risk of bias by following specific guidance for rapid reviews [14]. Two researchers were involved in all the steps of the research and were supported by a third researcher in case of disagreement. We followed a check-point approach, with regular exchange of information with the research team and definition of the next steps. The use of a software for systematic reviews during the screening phase helped to manage the high volume of articles.

Evidence extraction and analysis

After automatic duplicates removal, the articles titles and abstracts first and then the full-texts were screened according to the eligibility criteria using the software Rayyan© [15]. Finally the information related to the included articles was reported in an inclusion matrix with the support of a Microsoft Excel spreadsheet. The

evidence obtained was synthetised through a multi-step process. First a descriptive analysis summarised the main features of the included studies, then a two-stage thematic analysis (first inductive according to the study objectives, then deductive to highlight emerging themes) outlined enabling factors of successful multisector, multilevel and multigroup interventions for VBDs prevention and preparedness. The preliminary results guided the stakeholder consultation process.

Stakeholder consultation

Five stakeholders were consulted through open-ended online interviews (through video communication platforms) to refine the results of the rapid review. The stakeholders were identified through a web search for experts in community engagement, VBDs prevention and control, vector ecology and public health and contacted through email. They were working for research institutions, international organisations and donors.

Results

Rapid review

Selection of source of evidence

The peer-reviewed literature search identified 1674 articles. Finally 13 articles were included in the review (Fig. 2).

Characteristics of literature included

The majority of the included articles targeted *Aedes spp.* (7) in the region of the Americas (Central and South America) (6), and they were implemented in rural settings (9). The interventions included different sectors (entomology, public health, social sciences, animal health, environmental sciences, laboratory sciences, education), coming both from the formal system (governmental institutions, research institutions, healthcare system) and its different levels (municipal, regional, national), and from the informal system and its different groups (community members, community leaders, community networks and platforms, associations, non-governmental organisations). Community engagement activities for VBDs prevention and preparedness ranged from awareness and education campaigns to community members being actively involved in vector prevention and control strategies (e.g. water containers removal, spraying of insects, early warning, etc.) (see supplementary material for a description of the interventions). A description of the type of threat, region, and setting of the included studies is reported in Table 1.

Enablers of a multisectoral, multilevel and multigroup interventions governance

Results from the rapid review The active collaboration and coordination of different actors allowed to create synergies to focus resources and efforts, and share

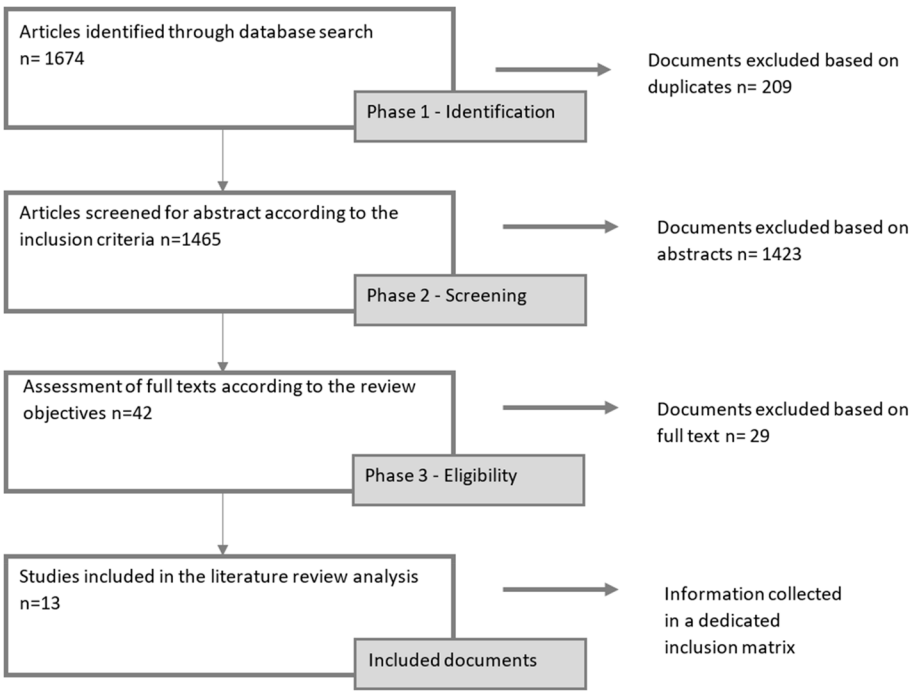

Fig. 2 Flow of information through the different phases of the rapid review

Table 1 Description of the type of threat, region, and setting of the included studies

Feature	Description	Number of articles	Reference
Threat	*Aedes spp.*	7	[16–22]
	Anopheles spp.	2	[23, 24]
	Triatoma spp.	2	[25, 26]
	Yersinia pestis	1	[27]
	Haemaphysalis longicornis	1	[28]
Region (WHO regions)	African region	3	[20, 24, 27]
	Region of the Americas	6	[16, 18, 21, 22, 25, 26]
	South-East Asian Region	4	[17, 19, 23, 28]
Setting	Rural (Village-level)	9	[16, 17, 19, 23–28]
	Urban (City-level)	4	[18, 20–22]

information and knowledge [19, 22, 24]. To support coordination and collaboration among sectors, levels and groups, synergistic interaction mechanisms were created, like ad-hoc committees [22] or established working groups, that were engaged for the specific scope of the interventions [19, 22].

In India (Kerala) steering committees were organised with members of the local government, of the healthcare system and other governmental institutions, and community representatives, and played a crucial role for the coordination and collaboration of different sectors and actors [19]. In Uruguay intersectoral partnership and community engagement was supported by an executive group made of members of the Ministry of Social Development, municipalities, academia, and community representatives and its coordination was crucial to tackle Aedes-transmitted diseases multifactorial determinants [22]. In southwestern Ethiopia community engagement and mobilisation for malaria prevention relied on community-based platforms established years before within an integrated vector management program and included government officers (administrators), village health extension workers, village agricultural development agents, community elders, youth organisers and community members [24].

The synergistic approach of the interaction mechanisms was ensured by connection agents, local leaders recognized both from the formal and informal systems as trustable and knowledgeable figures who could bring together all the stakeholders and support collaboration and coordination (Table 2). The connection agents played various roles, including providing access to communities, mobilization and training of community members, supported logistics and implementation of the activities, data collection and monitoring activities, and fostered the exchange of knowledge and data between the formal and informal systems [17, 18, 21, 27, 28]. This allowed extensive data collection within time and space and helped to plan effective prevention and preparedness actions ahead of time [18]. The synergistic interaction mechanisms supported also horizontal interventions, by adopting the same strategies to target different threats with common

Table 2 Connection agents main activities and categories

Connection agents	
Main activities	**Categories**
In Uganda a surveillance and early response program for plague engaged volunteer village health teams, a program established in the country as a cost-effective way to link communities with health services, for notification of rat carcasses to local authorities and indoor residual spraying to prevent human plague cases [27] In Nicaragua the Health and Life Brigades supported an intervention for dengue prevention and control with the help of a software that allowed to collect data and share them with health authorities [18]	Health volunteers
In Mexico local leaders, in collaboration with the Ministry of Health, were in charge of community discussion groups and visits performed in randomly selected homes to identify potential dengue vector breeding sites [21]	Community leaders
In Cambodia school teachers and community health workers capacities were strengthened to provide health education sessions for students and communities for dengue prevention, together with participatory mapping activities to plot mosquitoes breeding sites based on local knowledge [17]	Teachers Community Health Workers (CHWs)
In China ticks control activities to prevent severe fever with thrombocytopenia syndrome, were supported by primary healthcare units which organised education sessions, distributed tick repellents and personal protective equipment to households, and trained healthcare workers to improve their diagnostic ability [28]	Primary healthcare units
In India (Rajasthan) an intervention for *Anopheles stephensi* prevention engaged community members under the supervision of the village head and local governmental officers to replace improperly covered domestic water tanks that harboured vector populations throughout the year [23]	Community leaders Local governmental officers
In Argentina (La Rioja province) designated municipal agents coordinated with householders to be promptly informed about the presence of *T. infestans* to timely spray the houses and the surroundings [25] In the Argentine Chaco a project for the surveillance of Chagas disease vectors engaged researchers and vector control officers to train the local communities through a series of workshops [26]	Municipality officers

characteristics and drivers, [16, 19], and the sharing of financial resources, contributing to the effectiveness and sustainability of the interventions [22].

The coordination and collaboration of different sectors, levels and groups allowed to characterize the multidimensional drivers of VBDs and the engagement of community actors, fostered hyper-localisation of strategies and approaches and the use of local innovation [17–19]. Moreover, it allowed to explore local knowledge about VBDs, map community assets and resources, identify at-risk groups, and understand what level of effort was reasonable to expect from community members [16–19, 21, 22, 24, 27].

The synergistic interaction mechanisms supported transversal capacity building activities, targeting all the different components of the interventions from vector ecology and control, to environmental management and communication strategies [26, 28]. In Cambodia the lessons-learnt were integrated into the National Health Education Curriculum to provide a continuous education opportunity [17]. The synergistic governance supported also an holistic monitoring and evaluation of the activities and outcomes, including feedback from all the involved sectors and actors, to consolidate the functionality and effectiveness of the interventions. Participatory approaches were used to gather observations also from community members during workshops and periodic meetings with key stakeholders [16, 18, 19, 27]. Data gathered from volunteers and community members were also used for monitoring activities [18].

Stakeholder consultation

The stakeholder consultation sessions were analysed with an inductive thematic analysis that allowed to highlight enablers of multisectoral, multilevel and multigroup VBDs prevention and preparedness interventions, that complemented the results of the rapid review (Table 3).

A multisectoral, multilevel and multigroup governance model for VBDs prevention and preparedness

The enabling factors that emerged from the review and the stakeholder consultations supported the refinement a OH multisectoral, multilevel and multigroup governance model for VBDs prevention and preparedness (Fig. 3).

The OH model proposes an in-between approach, where the top-down approach of the formal system and the bottom-up approach of the informal system meet to create synergistic interaction mechanisms liaised by connection agents and regulated by agreed alignment frameworks, that define roles, responsibilities, sharing of resources and data. Synergistic interaction mechanisms supported the sharing of resources, the targeting of multidimensional drivers, multisectoral capacity building and monitoring and evaluation, including data and knowledge from communities, and finally the effectiveness and sustainability of the interventions.

Discussion

Multisectoral and multistakeholder approaches, including the engagement of communities are recommended by international guidance for prevention and preparedness to VBDs and evidence showed their effectiveness [5, 29]. Previous reviews investigated community intervention for VBDs, however a multisectoral OH approach wasn't specifically included [30]. This review explored VBDs interventions adopting a multisectoral, multilevel and multigroup OH approach, and pointed out enabling factors of an effective governance to support decision-makers with the design and implementation of these interventions. Finding effective and sustainable strategies for VBDs prevention and preparedness is fundamental in the context of climate, environmental and global changes [31]. This study emphasised that a OH approach including multiple sectors, levels and actors is "sine qua non" for effective

Table 3 Main themes that emerged from the stakeholder consultation process

Enablers that emerged from stakeholder consultations
Engage stakeholders from relevant sectors and establish regulated platforms for collaboration and coordination.
Produce an alignment framework among the different actors including resource mobilization and data sharing. Support communities in the process to understand and improve the quality of the data collected.
A common language and tools between stakeholders need to be agreed to harmonize formal and informal, quantitative and qualitative, and hard and soft sciences knowledge exchange.
Diversity, equity and inclusion should guide all the steps of the interventions to promote equity and effectiveness by engaging all the perspectives and sources of knowledge and action.
Ownership, commitment and trust between actors could be promoted by co-development and co-implementation of the intervention and sharing of the results. Community leaders and members approval is ethically and strategically important to ensure the intervention's acceptability.
Rely on existing community initiatives and resources could enhance acceptability, effectiveness, coverage and sustainability of the intervention, and especially in challenging settings characterized by conflict and insecurity.
Provide the necessary equipment and plan for sustainability.

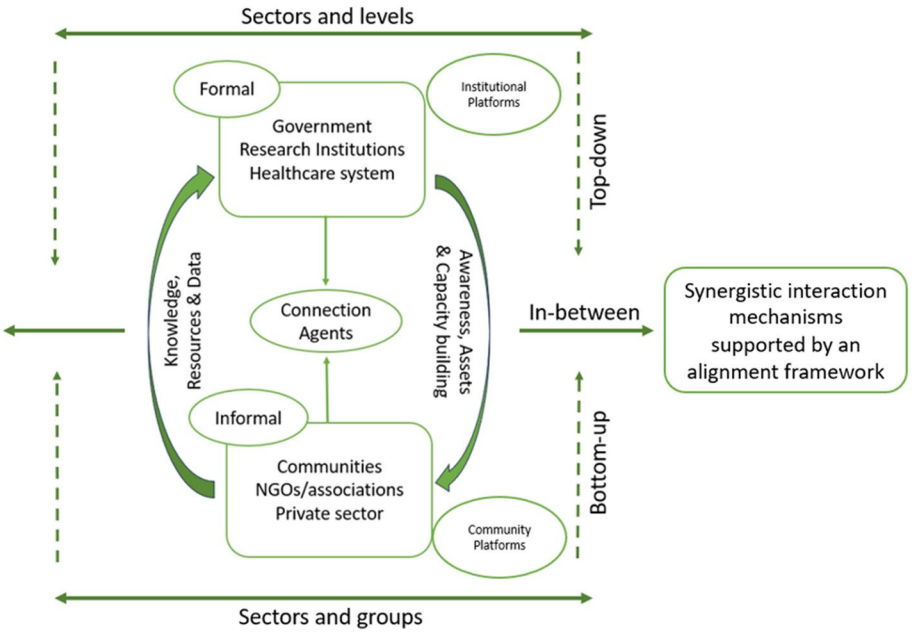

Fig. 3 The OH model for multisector, multilevel and multigroup VBDs prevention and preparedness interventions

and sustainable VBDs prevention and preparedness, particularly through the creation of synergies regulated by an alignment framework. Collaboration and coordination among sectors and stakeholders of the formal and informal systems were supported by connection agents, who linked the different actors and sectors, also by promoting data sharing. Oftentimes data at institutional level are not shared among the different sectors and the information collected outside the formal system is perceived of questionable quality and validity. In Nicaragua the question of perceived low quality of the data collected by community members was solved by comparing data collected by the community with the data obtained by professional external entomological inspections [18]. The connection agents fostered also co-development, co-implementation and co-evaluation of the interventions, and by doing so, promoted effectiveness and sustainability [16, 18, 19, 24].

These results could support decision-makers with the design and implementation of multisectoral, multilevel and multigroup interventions for VBDs prevention and preparedness and their governance mechanisms. Further research would need to better describe the sustainability of the interventions in the long-term, the impact on human epidemiological indices, the specific contribution of the different sectors and actors and define integrated indicators to evaluate the added value of the OH approach. Finally, a prototype of an alignment framework to regulate coordination and collaboration of synergistic interaction mechanisms would need to be developed.

Limitations

The studies retrieved with the review included only few vector species and countries and didn't always describe carefully the contribution of the different actors and sectors.

Conclusion

The main conclusions from the study are the importance of multisectoral, multilevel and multigroup approaches to VBDs prevention and preparedness and the need to create synergies between the formal and informal systems to support effectiveness and sustainability of the interventions. This implies that stakeholders from the formal system would need to be open to collaborate and facilitate an enabling policy and investment framework and community actors would need to understand the importance of their role. The model developed is an useful tool to support decision-makers with the governance of OH interventions for VBDs prevention and preparedness, that engage different sectors, levels and actors from institutions and communities.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s42522-024-00114-8.

Supplementary Material 1.

Authors' information
Not applicable.

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Authors' contributions
CR, MGD, AM, SD: Conceptualisation, methodology—CR, AM, MGD, SD: Investigation, data curation, formal analysis, writing- Original draft preparation: CR, MGD, AM, SD: Writing- Reviewing and Editing.

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Availability of data and materials
Not applicable.

Declarations

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Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors do not have any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

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References

1. Vector-borne diseases. World Health Organization. World Health Organization; n.d. URL: https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases (Accessed 2 August 2023).
2. Chala B, Hamde F. Emerging and Re-emerging Vector-Borne Infectious Diseases and the Challenges for Control: A Review. Front Public Health. 2021;9:715759. Epub 20211005. https://doi.org/10.3389/fpubh.2021.715759. PubMed PMID: 34676194; PMCID: PMC8524040.
3. Bardosh KL, Ryan SJ, Ebi K, Welburn S, Singer B. Addressing vulnerability, building resilience: community-based adaptation to vector-borne diseases in the context of global change. Infect Dis Poverty. 2017;6(1):166. Epub 20171211. https://doi.org/10.1186/s40249-017-0375-2. PubMed PMID: 29228986; PMCID: PMC5725972.
4. A Alonso Aguirre A, Basu N, Kahn LH, Morin XK, Echaubard P, Wilcox BA, Beasley VR. Transdisciplinary and social-ecological health frameworks-Novel approaches to emerging parasitic and vector-borne diseases. Parasite Epidemiol Control. 2019;4:e00084. Epub 20190111. https://doi.org/10.1016/j.parepi.2019.e00084. PubMed PMID: 30701206; PMCID: PMC6348238
5. Multisectoral approaches for controlling and preventing vector-borne diseases. World Health Organization. World Health Organization; n.d. https://tdr.who.int/activitaies/multisectoral-approaches-for-controlling-and-preventing-vector-borne-diseases. Accessed 2 Aug 2023.
6. Antonio CAT, Bermudez ANC, Cochon KL, et al. Recommendations for Intersectoral Collaboration for the Prevention and Control of Vector-Borne Diseases: Results From a Modified Delphi Process. J Infect Dis. 2020;222(Suppl 8):S726–31. https://doi.org/10.1093/infdis/jiaa404.
7. Adisasmito WB, Almuhairi S, Behravesh CB, Bilivogui P, Bukachi SA, Casas N, Cediel Becerra N, Charron DF, Chaudhary A, Ciacci Zanella JR, Cunningham AA, Dar O, Debnath N, Dungu B, Farag E, Gao GF, Hayman DTS, Khaitsa M, Koopmans MPG, Machalaba C, Mackenzie JS, Markotter W, Mettenleiter TC, Morand S, Smolenskiy V, Zhou L. One Health: A new definition for a sustainable and healthy future. PLoS Pathog. 2022;18(6):e1010537. Epub 20220623. https://doi.org/10.1371/journal.ppat.1010537. PubMed PMID: 35737670; PMCID: PMC9223325.
8. Global Vector Control response 2017–2030. World Health Organization. World Health Organization; n.d. URL: https://www.who.int/publications/i/item/9789241512978 (Accessed 2 August 2023).
9. World Health Assembly, 70. Global vector control response: draft resolution. Geneva: World Health Organization; 2017.
10. Atkinson JA, Vallely A, Fitzgerald L, Whittaker M, Tanner M. The architecture and effect of participation: a systematic review of community participation for communicable disease control and elimination. Implications for malaria elimination Malar J. 2011;10:225.
11. Bartumeus F, Costa GB, Eritja R, Kelly AH, Finda M, Lezaun J, Okumu F, Quinlan MM, Thizy DC, Toé LP, Vaughan M. Sustainable innovation in vector control requires strong partnerships with communities. PLoS Negl Trop Dis. 2019;13(4):e0007204. https://doi.org/10.1371/journal.pntd.0007204. PMID: 31022178; PMCID: PMC6483154.
12. Community engagement: A Health Promotion Guide for Universal Health Coverage in the hands of the people. World Health Organization. World Health Organization; n.d. URL: https://www.who.int/publications-detail-redirect/9789240010529 (Accessed 2 August 2023).
13. A. Alwan, S.B. Yahmed, A. Mandil, P. Koob, World Health Organization, 2008. https://cdn.who.int/media/docs/default-source/documents/publications/global-assessment-of-national-health-sector-emergency-preparedness-and-response27286c88-4c84-4214-8b44-0b7d78d4f45e.pdf (accessed February 23, 2023).
14. Garritty C, Gartlehner G, Nussbaumer-Streit B, King VJ, Hamel C, Kamel C, Affengruber L, Stevens A. Cochrane Rapid Reviews Methods Group offers evidence-informed guidance to conduct rapid reviews. J Clin Epidemiol. 2021;130:13–22. Epub 20201015. https://doi.org/10.1016/j.jclinepi.2020.10.007. PubMed PMID: 33068715; PMCID: PMC7557165.
15. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210. Published 2016 Dec 5. https://doi.org/10.1186/s13643-016-0384-4
16. Marten GG, Caballero X, Larios A, Bendaña H. Proof of concept for eliminating Aedes aegypti production by means of integrated control including turtles, copepods, tilapia, larvicides, and community participation in Monte Verde, Honduras. Acta Trop. 2022;227:106269. Epub 20211208. https://doi.org/10.1016/j.actatropica.2021.106269. PubMed PMID: 34896104.
17. Bigio J, Braack L, Chea T, Set S, Suon S, Echaubard P, Hustedt J, Debackere M, Ramirez B, Prasetyo DB, Bunleng S, Wharton-Smith A, Hii J. Entomological outcomes of cluster-randomised, community-driven dengue vector-suppression interventions in Kampong Cham province, Cambodia. PLoS Negl Trop Dis. 2022;16(1):e0010028. Epub 20220125. https://doi.org/10.1371/journal.pntd.0010028. PubMed PMID: 35077452; PMCID: PMC8789142.
18. Holston J, Suazo-Laguna H, Harris E, Coloma J. DengueChat: A Social and Software Platform for Community-based Arbovirus Vector Control. Am J Trop Med Hyg. 2021;105(6):1521–35. Epub 20211011. https://doi.org/10.4269/ajtmh.20-0808. PubMed PMID: 34634779; PMCID: PMC8641316.
19. Gopalan RB, Babu BV, Sugunan AP, Murali A, Ma MS, Balasubramanian R, Philip S. Community engagement to control dengue and other vector-borne diseases in Alappuzha municipality, Kerala, India. Pathog Glob Health. 2021;115(4):258–66. Epub 20210318. https://doi.org/10.1080/20477724.2021.1890886. PubMed PMID: 33734036; PMCID: PMC8168773.
20. Ouédraogo S, Benmarhnia T, Bonnet E, Somé PA, Barro AS, Kafando Y, Soma DD, Dabiré RK, Saré D, Fournet F, Ridde V. Evaluation of Effectiveness of a Community-Based Intervention for Control of Dengue Virus Vector, Ouagadougou. Burkina Faso Emerg Infect Dis. 2018;24(10):1859–67. https://doi.org/10.3201/eid2410.180069.PubMedPMID:30226159;PMCID:PMC6154160.
21. Mendoza-Cano O, Hernandez-Suarez CM, Trujillo X, Ochoa Diaz-Lopez H, Lugo-Radillo A, Espinoza-Gomez F, de la Cruz-Ruiz M, Sánchez-Piña

RA, Murillo-Zamora E. Cost-Effectiveness of the Strategies to Reduce the Incidence of Dengue in Colima, México. Int J Environ Res Public Health. 2017;14(8). Epub 20170808. https://doi.org/10.3390/ijerph14080890. PubMed PMID: 28786919; PMCID: PMC5580594.
22. Basso C, García da Rosa E, Lairihoy R, Caffera RM, Roche I, González C, da Rosa R, Gularte A, Alfonso-Sierra E, Petzold M, Kroeger A, Sommerfeld J. Scaling Up of an Innovative Intervention to Reduce Risk of Dengue, Chikungunya, and Zika Transmission in Uruguay in the Framework of an Intersectoral Approach with and without Community Participation. Am J Trop Med Hyg. 2017;97(5):1428–36. Epub 20170818. https://doi.org/10.4269/ajtmh.17-0061. PubMed PMID: 28820690; PMCID: PMC5817745.
23. Singh H, Gupta SK, Vikram K, Saxena R, Sharma A. The impact of mosquito proof lids of underground tanks "tanka" on the breeding of Anopheles stephensi in a village in western Rajasthan, India. Malar J. 2021;20(1):412. https://doi.org/10.1186/s12936-021-03939-0. Epub 20211019. PubMed PMID: 34666794; PMCID: PMC8527675.
24. Asale A, Kussa D, Girma M, Mbogo C, Mutero CM. Community based integrated vector management for malaria control: lessons from three years' experience (2016–2018) in Botor-Tolay district, southwestern Ethiopia. BMC Public Health. 2019;19(1):1318. https://doi.org/10.1186/s12889-019-7606-3. Epub 20191021. PubMed PMID: 31638928; PMCID: PMC6805624.
25. Abrahan L, Cavallo MJ, Amelotti I. Impact of involving the community in entomological surveillance of Triatoma infestans (Klug, 1834) (Hemiptera, Triatominae) vectorial control. Parasit Vectors. 2021;14(1):98. https://doi.org/10.1186/s13071-021-04608-6. Epub 20210205. PubMed PMID: 33546756; PMCID: PMC7866874.
26. Cecere MC, Rodríguez-Planes LI, Vazquez-Prokopec GM, Kitron U, Gürtler RE. Community-based surveillance and control of chagas disease vectors in remote rural areas of the Argentine Chaco: A five-year follow-up. Acta Trop. 2019;191:108–15. https://doi.org/10.1016/j.actatropica.2018.12.038. Epub 20181226. PubMed PMID: 30593817.
27. Boegler KA, Atiku LA, Enscore RE, Apangu T, Mpanga JT, Acayo S, Kaggwa J, Mead PS, Yockey BM, Kugeler KJ, Schriefer ME, Horiuchi K, Gage KL, Eisen RJ. Rat Fall Surveillance Coupled with Vector Control and Community Education as a Plague Prevention Strategy in the West Nile Region, Uganda Am J Trop Med Hyg. 2018;98(1):238–47. https://doi.org/10.4269/ajtmh.17-0502. Epub 20180101. PubMed PMID: 29141768; PMCID: PMC5928726.
28. Wang Y, Li K, Li P, Sun J, Ye L, Dai Y, Tang A, Jiang J, Chen C, Tong Z, Yan J. Community-based comprehensive measures to prevent severe fever with thrombocytopenia syndrome. China Int J Infect Dis. 2018;73:63–6. https://doi.org/10.1016/j.ijid.2018.06.002. Epub 20180609. PubMed PMID: 29894732.
29. Ho SH, Lim JT, Ong J, Hapuarachchi HC, Sim S, Ng LC. Singapore's 5 decades of dengue prevention and control-Implications for global dengue control. PLoS Negl Trop Dis. 2023;17(6):e0011400. https://doi.org/10.1371/journal.pntd.0011400. PMID: 37347767; PMCID: PMC10286981.
30. Questa K, Das M, King R, Everitt M, Rassi C, Cartwright C, Ferdous T, Barua D, Putnis N, Snell AC, Huque R, Newell J, Elsey H. Community engagement interventions for communicable disease control in low- and lower-middle-income countries: evidence from a review of systematic reviews. Int J Equity Health. 2020;19(1):51. https://doi.org/10.1186/s12939-020-01169-5. Epub 20200406. PubMed PMID: 32252778; PMCID: PMC7137248.
31. Ramirez B. Support for research towards understanding the population health vulnerabilities to vector-borne diseases: increasing resilience under climate change conditions in Africa. Infect Dis Poverty. 2017;6(1):164. https://doi.org/10.1186/s40249-017-0378-z. Epub 20171212. PubMed PMID: 29228976; PMCID: PMC5725740.

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