

# Strategies to increase community participation in controlling dengue mosquito breeding sites: a scoping review

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## Abstract

**Purpose:** Dengue Hemorrhagic Fever (DHF) is a growing global public health problem, particularly in low- and middle-income countries, and is influenced by social, environmental, and behavioral factors. Community participation plays a crucial role in the success and sustainability of dengue prevention. However, limited governance, weak cross-sectoral coordination, the dominance of top-down approaches, and a lack of resource support often hinder optimal community involvement. This study aims to identify literature on strategies to increase community participation in dengue prevention practices. **Methods:** This scoping review used the methodological framework by Arksey and O'Malley. A scoping review was conducted by searching the Scopus, PubMed, and ScienceDirect databases using keywords related to community participation, prevention, and dengue fever. Original English-language research articles published between 2015 and 2025 and relevant to community-based dengue prevention were selected using the PRISMA process. **Results:** Eight articles met the inclusion criteria. The review results indicate that strong multi-sectoral governance, a bottom-up, participatory approach, and the use of social capital and local leadership are key to effective dengue prevention. Health education through schools, youth engagement, incentives, and innovative, contextualized interventions contribute to increasing the sustainability of prevention practices. **Conclusion:** Dengue fever prevention requires an integrated approach that positions the community as the primary partner, supported by cross-sectoral collaboration, strengthening social capital, and sustainable resource support so that the impact of prevention can be sustained in the long term.

**Keywords:** community participation; dengue fever; scoping review

## INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is a significant public health problem worldwide, particularly in tropical and subtropical regions. The disease is caused by the dengue virus, transmitted by the bite of the *Aedes aegypti* mosquito. The health impact of DHF is significant, with millions of cases occurring annually,

resulting in high morbidity and mortality [1,2]. The World Health Organization (WHO) noted that in 2024, cases of dengue fever reached 14.6 million, with a death toll of 12,000, and that it is now an endemic disease in more than 100 countries [3]. In addition to its impact on health and mortality, dengue fever also has economic implications. A study in China estimated that the total economic burden of dengue fever patients in 2019 reached 46.8 million Chinese Yuan [4].

Several risk factors that contribute to the high incidence of dengue fever are social and environmental factors, such as population density, human mobility, access to water sources, water storage practices, and climatic conditions such as high temperatures, humidity, and rainfall [3,5,6]. Other studies also report that housing conditions that support vector presence, negative risk perceptions of dengue fever, and living in poor or slum areas are predictive factors for dengue fever [7–9]. This highlights the need for effective prevention and control strategies.

Active community involvement plays a crucial role in ensuring the operational efficiency of the health system and is the first step towards authentic community empowerment in the health sector [10]. In the WHO Global Strategy for dengue prevention and control 2021–2030, one of the five technical elements is to engage and mobilize communities [11]. Strong community participation in these aspects can help reduce the risk and impact of dengue epidemics [12]. For example, in Latin America, integrated management strategies for dengue prevention and control (IMS-Dengue) and integrated vector management (IVM) have been implemented to combine social mobilization and behavior change at the community level. These strategies aim to improve the efficacy, cost-effectiveness, environmental impact, and sustainability of vector control efforts. For example, the "Patio Limpio" campaign in Mexico involved training local communities to systematically identify, eliminate, monitor, and evaluate vector breeding sites within households under their supervision.

The program found that approximately 54% of households were clean and free of mosquito breeding sites. In contrast, unvisited households had a 2-to 4-fold higher risk of dengue infection than visited households [10]. In Cambodia, community participation in dengue prevention programs is influenced by historical, political, social, and economic factors, underscoring the need for comprehensive programs that engage local institutions and account for community dynamics [13]. Similarly, in Cuba, a community education model was implemented, combining action plans with reflection sessions to adapt strategies based on results. This approach resulted in a significant reduction in *Aedes aegypti* larval and pupal deposits and zero dengue cases detected in the intervention area [14].

Many studies show initial success, but difficulties in long-term sustainability [10]. In Puerto Rico, barriers such as misunderstanding of outdated educational materials and lack of acceptance of responsibility for dengue prevention have been identified [15]. In addition, in Brazil, there is a gap between government actions and societal realities [16]. A study in Hulu

Langat, Malaysia, showed that even though community-based programs have been implemented, maintaining behavioral change remains a challenge [1]. In addition, research in Thailand shows that local understanding of dengue can influence community participation in preventive measures [17]. Therefore, a specific and comprehensive strategy is needed to address the community's needs and challenges, including economic constraints and local interests [13]. In addition, the effectiveness of educational interventions varies, requiring continuous adaptation and program improvement to maintain community interest and engagement [18].

This research is significant because it aims to address gaps in previous research by developing more sustainable and specific strategies to increase community participation in dengue prevention. By understanding the factors influencing community engagement and addressing the barriers identified in previous studies, this research can contribute to more effective and sustainable dengue control efforts that maintain behavioral change.

## METHODS

This scoping review used the methodological framework by Arksey and O'Malley. This framework consists of five fundamental sequential stages: (i) identifying the research question, (ii) identifying relevant studies, (iii) selecting studies, (iv) charting the data, and (v) collecting, summarizing, and reporting the results. The framework was used in conjunction with the extension of the Preferred Reporting Items for Systematic Reviews to Scoping Reviews (PRISMA-ScR). PRISMA-ScR provides reporting guidelines with 20 essential items and two optional items for scoping reviews. These guidelines also facilitate methodological transparency and the acceptability of research findings.

### Identifying the research question

The research question for this scoping review was "What are the strategies for increasing community participation in implementing dengue prevention practices?" The Population-Concept-Context (PCC) approach was used to identify key elements of the research question. This PCC guideline will ensure that study selection aligns with the given research question. Population (P): People of all ages and genders; Concept (C): Strategies that can increase community participation in implementing dengue prevention practices; Context (C): Articles published in English from 2015 to 2025. Broadly, the inclusion criteria were defined as follows: 1) articles published from 2015 to 2025, 2) articles written in English, 3) original research studies,

4) available as full text, and 5) focused on dengue prevention through community engagement. Exclusion criteria included: 1) articles in the form of reviews, editorials, conference abstracts, and newspaper articles, 2) incomplete text publications, and 3) studies that did not focus on strategies that can improve dengue prevention practices in the community.

### Identifying the relevant studies

The research databases used in this study include Scopus, PubMed, and ScienceDirect. We adjusted the search terms in each database to suit their respective requirements. In PubMed, the search was conducted by entering keywords such as "community participation" OR "community engagement" AND "dengue fever" OR "dengue hemorrhagic fever" AND "prevention" OR "control" OR "intervention" in the title and abstract, and adding relevant MeSH terms. Meanwhile, searches in ScienceDirect and Scopus used the following keywords: ("community participation" OR "community engagement") AND ("dengue fever" OR "dengue hemorrhagic fever") AND ("prevention" OR "control" OR "intervention").

### Study selection

Search results from the aforementioned databases were then exported as .nbib files from PubMed and as .ris files from other databases. All exported files were then uploaded to Rayyan, an open-source review management software that performs article deduplication. Rayyan supports both .nbib and .ris file formats and was chosen for article deduplication due to its high sensitivity for reference deduplication. Following the initial data search, 651 studies were subjected to duplicate checking and a thorough review of titles, abstracts, and full texts using Rayyan. Three reviewers conducted this process, and any discrepancies in the review results were resolved through rigorous discussion, ensuring the reliability of our findings. The lead author screened and coded the studies. The study selection process was thorough and transparent.

The duplication-checking process was conducted using an initial pool of 651 studies, comprising 135 from Scopus, 77 from PubMed, and 439 from ScienceDirect, yielding 611 studies for title and abstract review. After excluding 72 studies that did not match the title and abstract, 22 studies were included in the full-text review. Seven studies did not focus on community engagement; four were unclear; and three described the program without assessing its effectiveness. Finally, eight articles that met the inclusion criteria were included for synthesis.

### Charting the data

In this process, the first author developed a data graphing form in Microsoft Excel, which the second and third authors reviewed and then iteratively repeated. The form included key information such as author name, year of publication, location, participants/target population, study design, type of intervention, outcomes, and key findings (Table 1).

### Collating, summarizing, and reporting the results

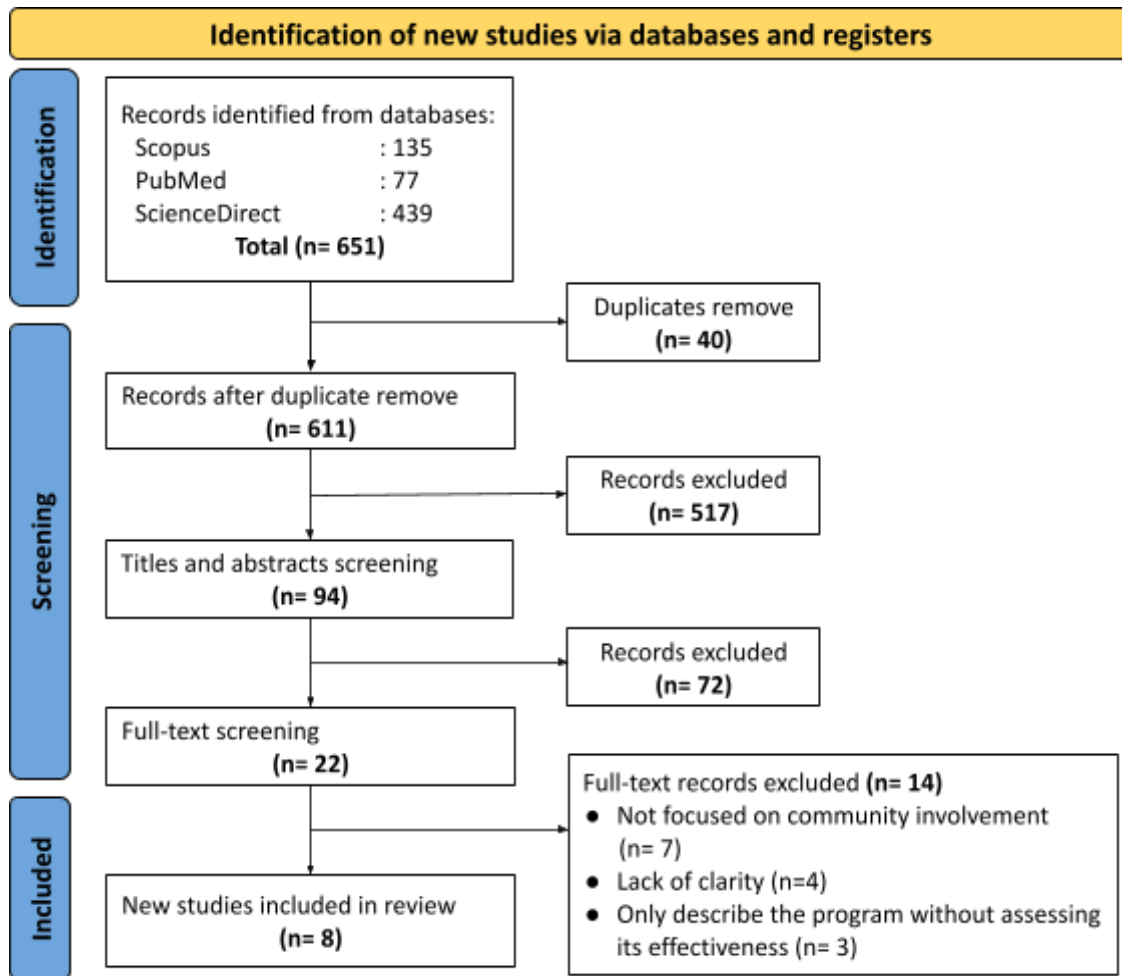
The PRISMA flowchart (Figure 1) was used in this scoping review to demonstrate the number of evidence sources screened, evaluated for eligibility, and included in the review. We used three stages to rigorously present our results: (i) analyzing the data, (ii) reporting the results, and (iii) interpreting the results. First, we analyzed the data by categorizing the selected articles based on their aims, research questions, and PCC approach. Information analyzed included author names, year of publication, location, participants/target population, study design, type of intervention, outcomes, and key findings. Second, we reported the results in tabular form to systematically and sequentially map the data, making it easier for readers to understand the characteristics and findings of each study. Finally, we interpreted the results and discussed their significance for future research, health policy, and practice. Each emerging theme in the results was derived from the key findings in the selected studies, which were then further analyzed. This stage aims to facilitate the formulation of relevant and adaptive recommendations.

In this review, a critical appraisal was not conducted because the study's primary objective was to comprehensively map the various strategies used to increase community participation in controlling dengue mosquito breeding sites. In accordance with the PRISMA-ScR guidelines, the purpose of a scoping review is to identify and categorize available evidence, not to assess the effectiveness of interventions or to compare methodological quality across studies. Therefore, a study quality assessment (critical appraisal) was not a methodological prerequisite for this review. The absence of a crucial appraisal does not undermine the study's primary objective, as the results of this scoping review are interpreted descriptively and intended to provide a broad overview of community participation strategies and to identify research gaps that can serve as a basis for further studies.

## RESULTS

The initial database search yielded 651 records. After removing duplicates, 611 studies remained for title and abstract screening. Review articles and clinical studies related to dengue fever were excluded from further screening. After this stage, 22 full-text articles were assessed for eligibility, resulting in a final inclusion of 8 studies that met the criteria. The study selection process is illustrated in the PRISMA flowchart (Figure 1), which outlines each step of the screening

and inclusion process. Based on the study characteristics presented in Table 1, eight articles were selected and analyzed in this review following a systematic selection process outlined in the PRISMA flowchart. The studies were published between 2015 and 2025 and originated from various geographic regions, including Asia (Iran, Malaysia, Pakistan, Indonesia, and India), Australia, and Latin America (Argentina and Uruguay). Most studies were conducted in low- and middle-income countries (LMICs), reflecting the high dengue burden in these settings.



**Figure 1. PRISMA flow diagram**

The primary objective of all studies focused on community-based dengue prevention and control is to identify community determinants and needs, evaluate intervention effectiveness, and explore the role of community participation and social capital in vector control.

### Governance, policy, and multi-sector cooperation

The studies in this scoping review consistently identified weak governance and poor cross-sectoral coordination as key barriers to dengue prevention. Studies in Iran, Pakistan, and India show that even

when public health policies are in place, their implementation is often suboptimal due to overlapping authority, lack of inter-agency communication, and the absence of a systematic coordination mechanism among the health, environment, education, and local government sectors [12,19,20]. This lack of coordination has a direct impact on weak control of environmental risk factors, such as waterlogging and waste management [19]. Several studies highlight that violations of environmental regulations are often not dealt with firmly, thereby lacking a deterrent effect [1]. This condition reflects a weak accountability and

monitoring system, which ultimately hinders sustainable dengue fever prevention efforts [21].

In response to these issues, several studies recommend strengthening governance through formal cross-sectoral mechanisms, such as legally binding memoranda of understanding (MoUs) among all stakeholders. These MoUs are considered essential for clarifying the roles and responsibilities of each sector, mandating regular coordination meetings, and ensuring transparent joint evaluations and audits [22]. Furthermore, the active involvement of provincial or municipal governments as primary coordinators is crucial for enforcing cross-sectoral commitments.

The Iranian study specifically recommended that higher government authorities oversee policy implementation and ensure compliance across all sectors, including by publishing regular compliance reports [19]. In contrast, studies from Uruguay, Australia, and Indonesia show that when multisectoral collaboration is effective, dengue prevention programs become more adaptive and sustainable [23-25]. A good partnership enables the integration of health programs with local development agendas, resource optimization, and greater legitimacy of interventions in the community's eyes [26].

### **Community participation model in dengue fever prevention**

While the top-down approach undoubtedly offers advantages in terms of response speed and coverage, it often results in passive public participation. The majority of the public views dengue prevention as solely the government's responsibility, limiting their involvement to temporary compliance with official recommendations [24,27]. Studies in Australia clearly show that over-reliance on top-down approaches requires significant resources and is not always effective in the long term [24]. This is reinforced by a study in Uruguay showing that when communities are involved in the planning, implementation, and evaluation of interventions, their sense of ownership and collective responsibility increases significantly [23]. The bottom-up approach allows prevention strategies to be tailored to the local context and specific needs, creating a stronger foundation for long-term dengue prevention [1,27,28].

### **Social capital, local leadership, and trust**

Social capital, encompassing social networks, norms of mutual assistance, mutual trust, and volunteerism, is a key foundation for collective action in dengue prevention. The formation of social groups such as mosquito larval monitoring cadres, environmental

working groups, and volunteer communities is a concrete example of leveraging social capital [25]. Through this social structure, communities can share information, conduct routine monitoring, and carry out prevention activities collectively [1,29]. Local leadership plays a crucial role as role models, liaisons between communities and formal institutions, and facilitators of cross-sector collaboration, thus enhancing public trust. When trust is built, communities are more willing to receive information, follow health recommendations, and actively participate in prevention programs [19,25].

### **Health education through schools and youth involvement**

Schools are seen as strategic institutions for shaping dengue prevention behavior from an early age [30]. A study in Córdoba demonstrated that school-based interventions, including student-led science, improved understanding of mosquito biology and dengue prevention. Students then transferred the knowledge they gained to their homes, creating a ripple effect of behavioral change. Schools also played a role in instilling individual and social responsibility for environmental health. This approach complemented government public health campaigns and reinforced prevention messages on an ongoing basis [31]. Young people, including students, have great potential as agents of change who can influence the behavior of their families and communities [1]. The use of digital technology and social media to reach young people has also been identified as an effective means of increasing awareness and participation of the younger generation [1,27].

### **Sustainable resource, incentive, and intervention innovation support**

Funding and resource availability are key challenges in implementing dengue prevention programs in various contexts. Several studies have shown that budget constraints hinder optimal ongoing education and vector control efforts. However, providing incentives, both financial and non-financial incentives, has proven effective in increasing community motivation and participation [1,19,25]. Funding and resource availability are key challenges in implementing dengue prevention programs in various contexts. Several studies have shown that budget constraints hinder optimal ongoing education and vector control efforts. However, providing incentives, both financial and non-financial incentives, has proven effective in increasing community motivation and participation [29].

Table 1. Studies characteristic

Author (year)	Country	Participants	Study design	Intervention type	Outcomes	Key findings
Toghroli, et al. (2025) [19]	Iran	Health department officials, municipal managers, port authorities, and community leaders	Qualitative study (focus group discussion)	Interventions include identifying determining factors, priorities, and dengue fever control strategies.	The main determinants of dengue fever prevention were identified, including environmental factors; therapy and health care; interdisciplinary cooperation; administrative, legal, and regulatory factors; financial and budgetary factors; and educational and social factors.	Effective community empowerment and health program decision-making requires collaboration across multiple organizations, improving high-risk environments, and fostering a sense of responsibility and participation among community members.
Allen et al. (2023) [24]	Australia	Local government and state government agencies are working on <i>Aedes</i> mosquito management in the Torres Strait	Qualitative study (semi-structured interview)	The intervention involved exploring community participation approaches used in <i>Aedes</i> mosquito management and the factors influencing these choices.	Identification of community participation strategies used in the management of <i>Aedes</i> mosquitoes in the Torres Strait.	Both top-down and bottom-up approaches are used to prevent dengue fever. A combination of regulatory, cognitive, and resource factors influences decision-making behind these strategies.
Samsudin et al. (2024) [1]	Malaysia	Gatekeepers, members of the local community, and among local community members	Mixed-method design	Intervention to identify community needs by exploring community perspectives and needs related to preventing DHF.	Designing effective strategies to prevent dengue fever according to community needs.	The need for decisive action by authorities, the importance of community engagement through partnerships and participatory approaches, the potential benefits of incentives and rewards to increase community participation, and the need for ongoing community engagement and education, particularly through youth involvement, in prevention efforts.
Estallo et al. (2024) [31]	Argentina	Senior high school students and adult family members ( $\geq 18$ years old)	Mixed-method design with a contributory citizen science approach.	Intervention in the form of identifying knowledge, attitudes, and prevention practices related to dengue fever and its vectors.	Effectiveness of community engagement through student-led science in promoting dengue prevention and addressing socioecological factors.	Student-led science has been identified as a valuable tool for reaching households and leading to behavior change at home.
Basso, et al. (2015) [23]	Uruguay	Communities/households	Cluster randomized trial design using an intervention and control approach	Innovative intervention methods, including technology integration, public education, and community-based vector control	Reducing mosquito breeding sites and increasing preventive practices at the household level	Innovative, context-specific interventions, when combined with community participation, have proven more effective than conventional top-down approaches.
Zahir, et al. (2016) [12]	Pakistan	Individuals affected by the 2013 dengue fever outbreak	Cross-sectional study	Interventions aimed at identifying the role of community participation in preventing dengue fever.	Communities, religious leaders, and government agencies are not organized to participate in the prevention and eradication of dengue fever. Thus increasing the risk of dengue fever infection in the community.	The spread of the dengue epidemic is aided by the public's ignorance and government agencies' laziness.
Asri et al. (2017) [25]	Indonesia	Village heads, directors of sub-district public welfare	Qualitative descriptive methods and	Intervention in the form of identifying social capital that exists in a	Social capital is an essential resource that, when managed, used, and appropriately	The formation of social groups, intersectoral collaboration, mutual assistance in cleaning,

Author (year)	Country	Participants	Study design	Intervention type	Outcomes	Key findings
		and security offices, community nurses working at local community health centers, and health volunteers	in-depth interviews	community, and how this social capital is used to combat dengue fever.	accessed, can provide ideas for solving community problems.	and volunteer work are forms of social capital. Support from strong leaders also has significant implications.
Mathur, et al. (2020) [20]	India	Communities/ households, health workers and field officers, health program officials and managers at the city level, and key informants	Mixed-method design	Community-based health education interventions through pamphlets and counseling.	Public knowledge about dengue has increased, but attitudes and practices are still low.	Health education needs to be sustained and supported by a robust surveillance system, cross-sector coordination, and community participation.

## DISCUSSION

Community-based dengue prevention is an approach that cannot be understood narrowly as a collection of technical vector control interventions, but rather as a social process shaped by the interaction between governance structures, community participation patterns, social capital, health education, and the availability and sustainability of resources [1,29]. From a public health perspective, communities are not only sites of program implementation but also social arenas where values, norms, power relations, and daily practices interact to influence the effectiveness of dengue prevention efforts [20]. Therefore, the success of a community-based approach is primarily determined by the interconnectedness of its elements, which form a system that supports sustainable health behavior change [27].

Governance frameworks play a fundamental role in creating an enabling environment for community engagement. Strong, inclusive, and multisectoral governance fosters cross-actor coordination and policy continuity, enabling sustained community action [29]. Integration among the health, education, environment, and local government sectors positions dengue prevention as a collective responsibility, not solely the health sector's [19]. In this context, fragmented, short-term-oriented policies have the potential to undermine community participation, as they lack clarity about roles, institutional support, or program continuity needed to build long-term commitment [24].

Community participation itself needs to be understood as a gradual and multi-layered social process, not merely physical involvement or attendance at program activities. Participation that grows from the bottom up allows communities to engage in decision-making, interpret disease risks according to the local context, and adapt prevention practices to the social and cultural conditions they face. This process is

crucial for encouraging the internalization of prevention behaviors into everyday life, rather than treating them as a temporary response to campaigns or outbreaks [27]. Within this dynamic, social capital serves as a reinforcing mechanism that connects individuals, groups, and institutions.

Social trust, norms of reciprocity, and strong social networks facilitate coordination and collective action in dengue prevention [29]. Social capital also helps bridge communities with formal institutions, thereby strengthening program legitimacy and increasing access to resources and information. Local leadership, both formal and informal, is a key element in activating this social capital, as it can mobilize participation, mediate interests, and sustain activity amid limited external support [25]. Health education is another integral dimension of community-based dengue prevention.

Effective health education focuses not only on increasing knowledge but also on shaping socially and culturally relevant meanings, attitudes, and practices [23]. A participatory and contextual educational approach enables communities to connect information about dengue fever to their daily experiences and routines [12]. The involvement of academic institutions, particularly schools and youth groups, has strategic potential in building long-term awareness, as prevention values and practices can be instilled early and disseminated through family and community networks [31].

In addition to social and cultural aspects, the sustainability of dengue prevention also depends on adequate and consistent resource support [1]. However, the availability of resources alone does not guarantee program success if it is not integrated with social mechanisms that foster community acceptance and ownership [20]. Incentives, both financial and non-financial, should be positioned as supporting tools to strengthen local motivation and capacity, rather than

as a substitute for meaningful participation. Within this framework, strengthening community capacity is a crucial strategy to ensure that prevention practices continue even when external support is reduced [1,27].

Conceptually, community-based dengue prevention requires a paradigm shift from episodic vector control approaches to an integrated, community-centered approach [1,24,27]. This approach views dengue as a health issue closely linked to social structures, risk perceptions, and broader environmental conditions [19]. Although this scoping review did not assess methodological quality and has limitations related to contextual variation and a lack of longitudinal evidence, the resulting synthesis provides a strong theoretical basis for research and policy development. Therefore, future dengue prevention efforts need to be designed holistically, culturally sensitive, and multi-sectoral, with communities as central actors in disease control rather than simply recipients of interventions.

## CONCLUSION

This review confirms that dengue prevention and control rely heavily on a strong integration of effective governance, meaningful community participation, and sustained social and institutional support. Community engagement facilitated through multisectoral collaboration, strong local leadership, and active social capital has been shown to enhance program ownership and the sustainability of prevention practices at the household and neighborhood levels. Conversely, weak cross-sectoral coordination, resource constraints, and a predominantly top-down approach tend to undermine community engagement and limit the long-term impact of interventions.

Contextual factors, including social norms, community dynamics, and the role of local institutions such as schools, also influence the effectiveness of dengue prevention strategies. Therefore, public health policies need to integrate community-based approaches that focus on the local context, strengthen community building, and foster support for cross-sectoral collaboration. Future research is recommended to adopt longitudinal designs and participatory approaches that are sensitive to the social and cultural context to develop effective, adaptive, and sustainable dengue prevention interventions.

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