

# Social Capital in Dengue Control: A Systematic Literature Review

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**Abstract.** Dengue hemorrhagic fever (DHF) is a disease whose prevention and control depend on the participation of all community levels. Complex factors including social determinants, such as social capital, influence the prevention and control of DHF by the community. DHF is a neglected disease that commonly occurs in communities with limited resources. Increasing community social capital is among the major strategies to build successful and sustainable control. Therefore, this study aimed to identify the role of social capital in optimizing the implementation and sustainability of DHF prevention and control programs. A systematic literature review was conducted with PRISMA by searching for articles on PubMed, Scopus, and ScienceDirect databases. Articles were selected through several screening stages, and subjected to a quality assessment. A total of 10 articles concluded that social capital could increase the potential prevention and control of DHF in the community. These included six interventional or experimental and four observational studies. The results showed a diversity of social capital in each location, which was consistent with the characteristic condition of the community and capable of affecting DHF control. The role of social capital has been found as a direct target of intervention, a mediator, or segmentation at the individual or community level. Most interventions are targeted at strengthening social capital directly to influence control outcomes, program acceptance, and sustainability. Increasing social capital is essential to addressing the barriers against effective community engagement, enhancing the role of DHF control, and ensuring sustainable participation.

## 1 Introduction

Dengue hemorrhagic fever (DHF) is a disease with frequent outbreaks as well as recent cases increasing both globally and in Indonesia [1]. Numerous efforts carried out by the government to lower DHF incidence rate have not yet produced optimal results [2]. The effective prevention and control of this disease depend on the participation of all levels of the community [3–5]. Simultaneous and continuous control needs to be conducted to reduce the number of vector breeding sites [6–8]. The latest prevention and control initiatives are

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experiencing rapid development, while new evidence of Wolbachia mosquitoes reducing DHF incidence has been reported [9,10]. However, the implementation in the community faces challenges associated with public acceptance of safety and concerns about the potential decline in control that upholds the importance of clean and healthy living behaviors related to environmental management [11].

The transmission of DHF is influenced by individual factors, including demographics, knowledge, attitudes, intentions, motivation, nutritional status, and intake [12–14], along with environmental, vector, and management factors. Additionally, it is influenced by virus actors, health services, social capital, laws and regulations, community capacity [15], information sources [16], the participation of community stakeholders and relevant leaders, as well as potential public breeding sites [17,18]. Poorly managed buildings or places will allow the emergence of puddles suitable for breeding *Aedes* mosquitoes.

Efforts of the community to prevent and control DHF will fail when solely focused on one factor because social health determinants are influenced by the complex health determinants associated with this disease. Furthermore, social capital contributes to the success and sustainability of active community participation in prevention and control programs [19]. The sources of social capital are rules and values possessed by the community, which promote harmony as well as a favorable network of connection and communication.

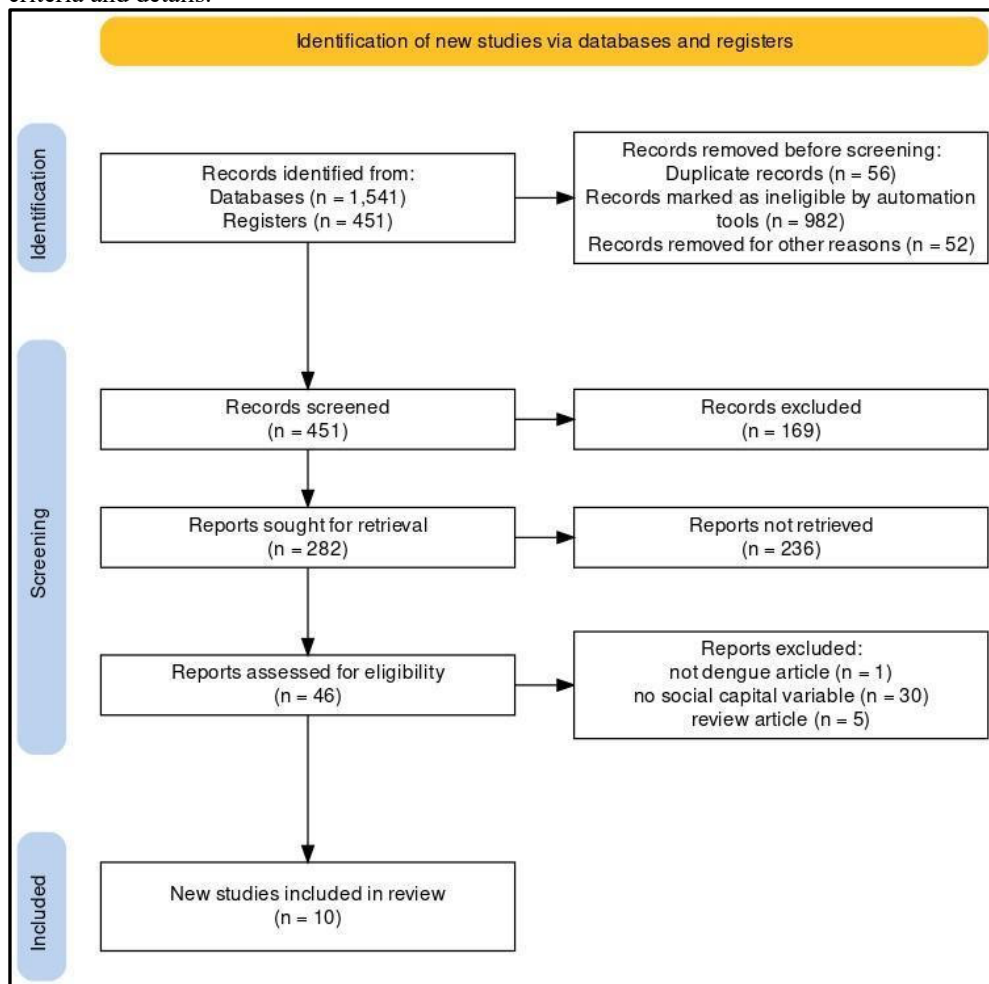
Social capital confers strength or power under certain societal circumstances [19] and has a relationship with health behaviors [20], hence low capital induces unhealthy behaviors [21]. Furthermore, it is not considered a strength in implementing DHF control programs among communities with limited resources. Social capital domains such as cooperation, civic engagement, personal relationships, social network support, and trust decrease along with the decline in social ties. A lack of trust between communities will reduce the sense of mutual support in DHF control. Maximum support from community leaders and stakeholders is needed to continuously foster social capital. To optimize the implementation and sustainability of dengue control programs, this study aimed to identify factors affecting DHF control and prevention that are associated with social capital as health determinants.

## 2 Method

The method used in this study was a systematic literature review following the item reporting guidelines for the systematic review of PRISMA 2020 [22]. Furthermore, articles published between 2013 and 2023 were searched in several English-language databases, including PubMed, Scopus, ScienceDirect, and Pubmed Central (PMC) using previously compiled and discussed keywords. The search terms used comprised "dengue control," "dengue and social," "dengue and social capital," and "dengue and community participation." The studies identified from the literature searches were screened in a two-stage screening process using title and abstract, followed by full text. Two independent reviewers conducted both stages, and a third reviewer resolved the discrepancies observed. The criteria for inclusion were population/community-based, prospective, cross-sectional, cohort, and experimental studies, as well as community participation. Meanwhile, the exclusion criteria were hospital-based study, not disclosing pertinent results or outcomes, and systematic literature review results. Data were imported from the database by selecting and exporting articles in BibTex format to Mendeley, then the imported data were finalized. Data unrelated to the theme of DHF and social capital were reduced using Mendeley application, while incomplete data were completed using Google Search. When clarification about the relevance of the title to the study theme was needed, the full text of the article was assessed. Every article was arranged and categorized according to author, year of publication, study location, design, sampling strategy, sample size, and outcomes.

### 3 Result and Discussion

A total of 1541 publications were found using the search method, out of which 1223, 155, and 163 were from PMC, Scopus, and ScienceDirect, respectively. Only 451 articles were acquired after deleting 56 duplicates, classifying 982 as ineligible using an automation method, and removing some for other reasons which included clinical study, the absence of social capital variable, and publishing years not being 2013–2023. Furthermore, 46 were obtained from 451 abstracts sifted based on the variables, study type, and full-text completeness. Out of the 30 articles that were not related to social capital, five were reviews, and one was published without correlation to DHF. Using the inclusion criteria, nine articles were selected from the screening results among which one Atlantis Press article satisfied these requirements, with Figure 1 showing the PRISMA flowchart comprising exclusion criteria and details.



**Fig. 1.** PRISMA flowchart with details and exclusion criteria

**Table 1** Characteristics of Eligible Articles

No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
1	Alvarado, et al., 2019 [21]	Mexico, Population Health Metrics, Q1	Social capital is associated with lower mosquito vector indices: Secondary analysis from a cluster randomized controlled trial of community mobilization for dengue prevention in Mexico.	Randomized control trial: 45 intervention and 45 control groups in a Mexican arm from the Camino Verde group.	Social capital construction was assessed through four components, namely engagement, participation, investment, and communication. Rural communities tend to have high social capital scores. Households in intervention locations owned higher social capital. Households with high social capital had better larval indices.
2	Asri, et al., 2017[23]	Indonesia, International Journal of Nursing Science, Q1	Community Social Capital on fighting dengue fever in suburban Surabaya, Indonesia: A qualitative study	A total of 13 participants were interviewed in-depth using qualitative descriptive methods.	The results showed that social capital—a characteristic of a community—became the main building block for group behavior. Creating social networks, collaborating across sectors, helping each other with personal cleanliness, and performing community service were concrete examples of social capital that could be used to prevent and manage DHF. Strong assistance from leaders also produced a big difference.
3	Siyam, et al., 2022[24]	Indonesia, Studies on Ethno-Medicine, Q2	Social Capital of Health Cadres and Community Figures in Overcoming	Survey, with a quantitative and qualitative descriptive method in urban and suburban endemic areas	Social capital of community leaders greatly influenced the role and activeness of cadres in addressing diseases. Care,

No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
			DHF at Endemic Areas		mutual trust, and good social relations between cadres and the community contributed to the sustainability of DHF control. Additionally, the motivation and role model of stakeholders supported the participation of all parties in DHF prevention at the village level.
4	Kasjono, et al., 2019[25]	Indonesia, Proceedings of the 5th International Conference on Health Sciences (ICHS 2018), Atlantis Press.	Effect of Counseling Using Social Capital Implementation on Container Index (CI) of <i>Aedes aegypti</i> Larvae	A quasi-experiment with pre and post-tests as well as control design was used in the study. There were 60 families in the treatment group and 60 in control.	The application of social capital and trust by community leaders affected the Container Index (CI) ( $p=0.001$ ). Counseling using social capital, specifically from people trusted by the community, could be applied in mosquito nest eradication programs as a health promotion effort.
5	Sukesi, et al., 2021[26]	Indonesia, Open Access Maced J Med Sci, -	Effects of Health Education-Based Intervention on Community Perception, Healthy House, and Social Capital of Dengue in Endemic Area of Sleman Regency Indonesia	Participation/ Intervention action study, Population: Dengue endemic community of Sleman Regency	There was an increase in the mean scores related to DHF perception ( $p = 0.000$ ), perception of DHF control ( $p = 0.000$ ), social conditions for the components of care, trust, and readiness to learn new ideas ( $p < 0.05$ ), and all components of healthy home conditions ( $p < 0.05$ ) after six months of intervention.
6	Subaru, et al., 2016[27]	Indonesia, International Journal of	Social Capital Capacity as Prediction of Dengue Control	Cross-sectional study. In the population investigation, the	There was a significant correlation ( $p < 0.05$ ) between social

No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
		Public Health Science, Q4		area surrounding the Bantul district was included. A total of 600 houses were included in the sample, which was split into endemic and potential areas.	capital and perceptions of family, disease, individual, environment, and larval density. The DHF program, family perception, and counseling perception were all correlated ( $p < 0.05$ ), with environmental participation ( $r = 0.296$ ) being the most significant influence. According to the route analysis for possible locations, social capital was useful in raising the larval-free index through family perception.
7	Echaubard, et al., 2020	Cambodia, BMC, Infectious Diseases of Poverty, Q1	Fostering social innovation and building adaptive capacity for dengue control in Cambodia: A case study	Community-based DHF management in two areas of Cambodia was based on the process of transdisciplinary collaboration and community participation in primary schools and rural households. Additionally, a focus was placed on engaging communities through participatory epidemiology mapping, empowerment education, and behavior-changing communication.	Several social innovation products originated from interactions with the community. These included 1) adult mosquito traps developed locally from waste collection, 2) a revised DHF curriculum with experiential learning activities, 3) a community-led guppy distribution system, 4) community and student co-design of DHF prevention communication materials, and 5) community mapping.
8	Caprara, et al., 2015[28]	Brazil, Transactions of the Royal	Entomological impact and social	The use of eco-health methods to lower the Aedes	Differences were found in terms of social participation,

No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
		Society of Tropical Medicine and Hygiene, Q2	of participation in dengue control: A cluster randomized trial in Fortaleza, Brazil	egypti vector densities and increase acceptance, viability, and sustainability. Additionally, the northeastern city of Fortaleza in Brazil hosted the intervention from 2012 to 2013. Comparing 10 intervention clusters with 10 control clusters helped create the cluster randomized controlled trial. The community participated in cleanup campaigns, workshops were held, raised containers were closed, cans inside the home were disposed of, schoolchildren and the elderly were mobilized, and KIE materials were distributed.	commitment, and leadership in the cluster. Social participation and environmental management could be carried out to improve DHF vector control and reduce vector density significantly.
9	Nguyen, et al., 2019[29]	Vietnam, American Journal of Tropical Medicine and Hygiene, Q1	Barriers to Engaging Communities in a Dengue Vector Control Program: An Implementation Research in an Urban Area in Hanoi City, Vietnam	A total of 14 focus group discussions were conducted in four districts of Hanoi city, while data were collected in April-June 2017. Discussions were recorded and transcribed verbatim. Content analysis was used to analyze the data. Secondary data from DHF vector control program reports were used to support	Effective community engagement was hindered by several factors. These included 1) a lack of interest and reliance on the work of local community committees in the health sector, 2) a lack of zeal from mass organizations and community leaders, 3) an overworked and unprepared workforce from the health sector, 4) a

No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
				qualitative evidence.	lack of preparedness and public awareness, 5) a lack of comprehensive policy guidelines and lax enforcement of related policies, and 6) a limited budget.
10	Macêdo, et al., 2021[30]	Brazil, International Journal of Environmental Study and Public Health, Q2	Scaling up of Eco-Bio-Social Strategy to Control <i>Aedes aegypti</i> in Highly Vulnerable Areas in Fortaleza, Brazil: A Cluster, Non-Randomized Controlled Trial Protocol	A cluster-based, non-randomized controlled clinical experiment to examine how well Eco-Bio-Social (EBS) methods work in high-risk communities. Two groups for the intervention and two groups for control were selected to have a sample of 16,000 attributes. EBS interventions included community surveillance of arboviruses, along with the creation and validation of booklets on the prevention of arbovirus in pregnant women. Other interventions comprised environmental management through the closure of large water tanks, beta fish introduction into water sources, removal of potential breeding sites, as well as mobilization and training of school children, endemic disease workers, health workers,	Increasing the participation of governments, professionals, communities, and academics in DHF control strategies could improve the acceptance, and sustainability of control.



No	Author and Year	Country, Journal, Quartile	Title	Method and sample criteria	Result
				social mobilizers, and community leaders.	

Among journals exploring social capital and DHF, 10 were reviewed and the results all pointed to the possibility of social capital to boost prevention and control in the community (Table 1). These included six interventional or experimental and four observational studies, which the results showed social capital diversity consistent with the characteristic condition of the community in each location and capable of affecting DHF control. The role of social capital was found to be a direct target of intervention, a mediator, or segmentation, and the individual or community level of intervention. Most interventions were targeted at strengthening social capital directly to influence DHF control outcomes and improve program acceptance and sustainability.

Alvarado et al. (2019) identified social capital dimensions, including norms of cooperation, civic engagement, personal relationships, social network support, and trust. Compared to households in urban areas, rural households possessed greater potential to have high social capital scores (58% vs. 23%, OR 4.51, 95% CI: 3.26–6.26). The tendency of intervention group households to have high social capital ratings was greater than households in the control group (OR 1.31, 95% CI: 0.87–1.98), but this difference was not statistically significant. Families with high social capital ratings could substantially impact detrimental effects on larvae, pupae, or both, particularly on pupae. Across four distinct social capital indices, the association between social capital and vector indices was consistent [21].

Apart from a small study conducted in Indonesia that identified a correlation between social capital elements and vector indices, other locations found a strong relationship between high levels of social capital and a low DHF vector index [27]. Social capital is a crucial factor in supporting the sustainability of health programs [24]. According to pathway analysis for possible locations, increasing social capital is a realistic objective for improving the larvae-free index through family perception. A theory states that social capital method uses community environmental participation to effectively increase the number of larvae-free indices. Social capital was found to more successfully raise the larvae-free index through individual participation in DHF-prone locations.

Different circumstances may require distinct components of social capital, where engagement and participation are the constructs contributing most significantly to social capital index. Participation reflects the degree to which individuals agree to work on a project freely or as a result of coercion or special incentives and frequently provide labor as well as other resources in exchange for anticipated rewards. Meanwhile, engagement shows the number of community members who recognize societal issues and search for sustainable, independent solutions. This is an action with a purpose, in which the community or group devises a method to accomplish the objective [17]. Moreover, the development of social capital indices specifically targeted at DHF needs to consider the advantages that people or organizations anticipate from spending money and efforts carried out to eradicate mosquito breeding grounds in houses. Communication constructions of social capital index reflect communication regarding mosquito avoidance, even though discussions with friends, family, and communities can be included in the index [31].

The results regarding higher social capital scores in rural households compared to urban households were consistent with previous reports [21,23]. Social relations between heterogeneous and highly mobile communities may be higher in urban areas than rural ones. The interaction between community mobilization interventions and social capital in reducing vector indices is crucial for sustainability in implementing DHF surveillance systems that

require continuity [32]. Understanding interactions and social capital in the community can help optimize the impact of future mobilization interventions. Additionally, engaging and communicating with stakeholders is essential to building social innovations to meet the needs of the community in addressing DHF problems [17].

In Indonesia and other countries, DHF control efforts are not practical and have failed in several ways. The leading causes are failure to mobilize all social capital of the community, a lack of space for participation, and unclear guidelines regarding entities that should be included in the activities of community-based control programs. These collectively affect the long-term sustainability and effectiveness of control programs. Most community-based prevention and control programs require community participation, resource mobilization, cross-sectoral collaboration between various stakeholders, and community capacity building. Additionally, social capital is essential for areas with health problems that lack resources and information [23]. This is a characteristic embedded in the community through norms, beliefs, and networks, which are shown in activities such as meetings, larvae monitoring groups, volunteer work, behavior change efforts, and cross-sectoral collaboration [33]. To effectively harness social capital in DHF prevention and control activities, there is a need to focus on the existence, role, experience, and connectedness of participants in the community.

Health cadres' role in DHF control is social capital that has relational, cognitive, and structural aspects. The cognitive includes a sense of belonging, reciprocal trust, as well as concern for family, community, cadres, and healthcare professionals. Based on shared values, cooperation and communication are part of the relational aspect. Meanwhile, communities, associations, and social networks particularly comprise the structural aspect. The roles of community leaders in DHF control include providing motivation, example, inspiration, as well as an environment to ask questions and consultations, holding regular meetings, increasing staff capacity, managing activities, and raising donations. These leaders implement control programs through activities to mobilize larvae monitoring by cadres, provision of DHF control-related information to the community, invitations to participate in mosquito nest elimination, and DHF eradication practices [24].

Social capital of health cadres and community leaders is critical in encouraging as well as motivating the community to participate in DHF prevention. Cadres and leaders in rural and urban areas comprising civil population structures, low levels of mobility, and some indigenous people are generally near communities with high social capital. These two entities provide information and support directly to the community through regular meetings of the Mothers Group (PKK) or *dasa wisma* (group of mothers from 10 households) to facilitate the implementation of control programs. Additionally, community leaders can use WhatsApp communication media to socialize and announce control-related activities [24].

The community in suburban and urban areas is challenging to access due to the heterogeneous population and high mobility of several migrants infected from workplaces. Furthermore, DHF can be contracted from public environments such as restaurants, facilities, offices, and difficult-to-reach factories, geographically located near coastal areas prone to tidal floods. These factors lead to difficulty in controlling DHF [12,21,23,13], but the capacity of health cadres plays a role in the active monitoring of larvae regularly and correctly [34]. The capacity determines the performance, attitude, and ability of cadres to carry out primary duties to help conduct control programs [35]. Moreover, solid social capital at community levels will maintain the sustainability of control programs by the community [28,30].

Recent results show that social responsibility reduces hesitancy in accepting DHF control programs for *Wolbachia* mosquitoes [36]. A sense of social responsibility can prompt the community to participate in *Wolbachia* mosquito release programs. This will promote actions including prioritization of social interests above individual interests or benefits to change the perception about accepting the programs despite doubts or concerns regarding the

impact of Wolbachia mosquitoes. Social responsibility serves as social capital to increase the success of the release of Wolbachia mosquitoes, and health education improvement can strengthen public acceptance of DHF control technology.

## 4 Conclusion

In conclusion, this study shows that a high social capital community has the potential to work collaboratively with others to resolve health issues. The community upholds certain norms which are rules and guidelines strictly followed, leading to the growth of social capital along with roles played in DHF prevention and control, such as the provision of infrastructure, funding sources, human resources, and community mobilization. Therefore, stakeholders and leaders need to consistently cultivate as well as enhance social capital and community capacity to ensure the long-term viability of control programs.

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## Data availability

Data are available upon reasonable request from the corresponding authors.

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