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Community capacity for sustainable community-based dengue prevention and control: domain, assessment tool and capacity building model

Charuai Suwanbamrung*

School of Nursing, Walailak University, Nakhorn Si Thammarat, Thailand

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ABSTRACT

In order to understand the community capacity for sustainable community-based dengue prevention and control, this paper proposes the approach of a previous study about meaning and domains of dengue prevention and control, an assessment tool and a community capacity building model for sustainable community-based dengue prevention and control in the Southern Thailand. A study of dengue community capacity domains was conducted by utilizing a qualitative method, whereby ten initial community domains were identified by means of a literature review, in-depth interviews of sixty community leaders, and eight focus group discussions with sixty non-leaders in four sub-districts of southern Thailand. In the final study, there were 14 identifiable domains in leaders group and 11 domains in non-leaders. The resulting dengue community capacity-assessment tool (DCCAT) consisted of two parts: one for leaders (DCCAT-L) and the other for non-leaders (DCCAT-NL). DCCAT-L was composed of 115 items within 14 domains and 83 items within 11 domains for the DCCAT-NL. The key domains of leaders and non-leaders had a partial overlap of domains such as critical situation management, personal leadership, health care provider capacity, needs assessment, senses of community, leader group networking, communication of dengue information, community leadership, religious capacity, leader group and community networking, resource mobilization, dengue working group, community participation, and continuing activities. The application of the new tool consisted of five steps: 1) community preparation, 2) assessment, 3) a community hearing meeting, 4) interventions, and 5) conclusion and improvement step. All stakeholders in the community should use the new tool based on a clear understanding of the measurement objectives, the desired outcomes, resources available and characteristics of their community. If communities need to develop and build dengue community capacity, then the designed pre-post intervention assessments or serial assessments are essential.

1. Introduction

Dengue is a public problem, and, as a community problem, it requires the community's involvement in its solution. Sustainability is a continuing challenge and a major issue with community-based dengue prevention and control, and must be defined according to the characteristics of each specific setting^{1, 2}. In this study, sustainability is identified

as a necessary part of community capacity for successful community-based dengue programs which must include all stakeholders: individuals, groups, organizations, and networks. Sustainability must be evaluated by ongoing activities of leaders and non-leaders in the community, as well as at the outcome of the program¹⁻³.

In order to achieve sustainability, community capacity building is one of the instrumental factors contributing to a healthy community outcome and to the process of enhancing a community's abilities to define, evaluate, analyze and act on the dengue concerns of their members in that community⁴⁻⁶. Community capacity building not only includes prevention and control of communicable diseases, but also individual protection in the community^{7, 8}. It is a 'concept both of the means and the end⁹ and, as a dynamic process, it must be part of the strategy for sustainability of the

*Corresponding author: Charuai Suwanbamrung RN, NP, APN (Pediatric), Ph.D. (Research for health development), School of Nursing, Walailak University, Nakhorn Si Thammarat, Thailand 80160.

E-mail: scharuai@wu.ac.th; suwanbamrung_charuai@yahoo.com

intervention from the beginning to the end of the outcome^[10]. Nevertheless, by establishing a means or standard for its measurement, community health interventions would result in increased sustainability and capacity for future problem solving. Thus, the identification and assessment of community capacity, as both a process and an outcome, is important to those striving to develop healthy communities. Unfortunately, there are currently few tools to assess the capacity of the community for sustainable community-based dengue prevention and control and its qualitative assessment^[10].

In Thailand, the national dengue control and prevention program has endorsed community-based control programs by encouraging residents to take responsibility for control activities in households. However, current dengue prevention and control activities have not had much impact in reducing dengue transmission at the national level. Southern Thailand is at high risk of dengue transmission because of several factors which favor dengue incidence. A study carried out between the years 1993 – 2002 in Southern Thailand documented high incidence, partially due to more rainy days, greater total rainfall, higher average relative humidity, and warmer temperatures^[11]. An important issue is that people need a better understanding of measures for the prevention and control of the disease and for continuing community participation^[12–14]. According to the above studies mentioned, the high incidence of dengue in Southern Thailand community requires a strengthening of community action by building the capacity of all affected groups in meeting the common needs.

In order to conduct appropriate community capacity building for sustainable community-based dengue prevention and control, leaders and non-leaders group in the community need to understand factors involved in developing community capacity, identify appropriate tools and assess community capacity in these various domains. This paper describes the results of community capacity building of sustainable community-based dengue prevention and control, enumerates distinct factors or domains of community capacity for sustainable dengue prevention and control, describes an assessment tool and a community capacity building model for sustainable community-based dengue prevention and control in the Southern Thailand.

2. Dengue community capacity domains

The main constituents of dengue community capacity were determined by the qualitative method, with ten initial community domains identified by means of a literature review, followed by in-depth interviews of sixty community leaders, and eight focus group discussions with sixty non-leaders in four sub-districts of southern Thailand^[15]. Then the initial domains were verified by construct validity in order to develop and test this tool. There were 14 domains in the leaders' group and 11 domains in the non-leaders'. All domains of the leaders' and non-leaders' instruments were consonant with previous studies and qualitative findings as follows:

2.1. Critical situation management

The critical situation management focuses on quick preventive action and the control of the dengue problem by key dengue stakeholders. This domain is associated with the common domain of community capacity building of asking 'why' that determines the ability of the community to critically assess crucial stages towards developing appropriate personal and social change strategies^[6, 9, 16]. Laverack^[17] pointed out that this process has been termed 'critical awareness', 'critical thinking' and 'critical consciousness' and is an important domain in enhancing ability. Similarly, Maclellan-Wright *et al*^[18] found asking 'why' represents a critical domain in community capacity for community-based funding programs in Canada. In Thailand, a qualitative study found community thinking toward DHF prevention and control can be divided into areas of urgent thinking and thinking to eliminate the cause of disease^[19]. However a few dengue studies, Toledo *et al*^[10] did not present this domain in achieving sustainability of community-based dengue prevention and control because that study did not use this term in evaluating the community.

2.2. Personal leadership

Personal leadership was included as a constituent domain for both leaders and non-leaders. It is defined as the characteristic of people in the community presenting skills to lead other members in the community. In these findings, effective community leadership was demonstrated through supporting, dealing with conflict, acknowledging and encouraging community members to voice, create strategies, share, trust, model, to bring people with diverse skill sets together and to facilitate the process of community resource utilization. It means that the personal characteristics of both formal and informal local leaders have the necessary insider knowledge of neighborhood practices to participate in the dengue program, to invest time and to go to identify mosquito breeding sites^[20].

2.3. Religious capacity

The religious capacity domain was an important domain of both leaders and non-leaders alike. An examination of the domain focused on the capacity of imams and monks to take activities of dengue prevention and control into the community. This domain reflected the local culture of the sub-districts in Southern Thailand of having been two religions in a community. Irrespective of whether the community is rural, semi-urban or urban, the religious leader played a central role amongst the community members.. For example, a participant said:

2.4. Community leadership

The overall group perception included the characteristic of community leadership showing capabilities such as strength, consultation, management, assuming clear

responsibility, listening, and creative thinking for dengue prevention and control. Hawe *et al*[21] discusses leadership as one of five strategies to building capacity. NSW[22] defines leadership as the characteristic of a leader who thinks systematically and is future oriented, who searches out opportunities for change and growth, enabling others to act by empowerment, sets an example by behaving in such a way that is consistent with shared values. The non-leader's group perceived that accepting a dengue prevention and control method by all community members of the local group and did not mention creating a new method like the leader's group. In the dengue prevention program, the local group led the process of social mobilization and human resources development[10].

2.5. Health care provider capacity

The health care provider capacity focused on VHVs capacity because they were key stakeholders of the health care service of the community in Thailand. The VHVs identified that local health workers had an important role in linking the local community health. In this case, local community health staff advocated for local health promotion priority[23,24]. The VHVs in each community was also an important driving force for the development and maintenance of an effective and sustainable dengue program. For example, in the education program in schools, village health volunteers and women who have been key organizers for several years. The lead taken by district health workers was the first important variable for success in dengue hemorrhagic fever prevention and control[25].

2.6. Sense of community

This domain focused on the overall perception of the community member's and leader's groups. It conveys the perception of all community members of belonging, and feeling that the dengue problem matters to one another as a major problem of the community. They also share a common faith that the community member needs will be met through their commitment to working together. In addition, a sense of community led to a feeling of belonging and emotional safety leading to self-investment in the community, which has the consequence of giving the members the sense of having earned his or her membership[26].

2.7. Communication of dengue information

Communication of dengue information is the ability of a community to develop, exchange and use information about dengue within and between groups within the community and with organizations outside the community. The information was measured by assessing dengue knowledge and skills based on programs such as entomology, epidemiology, ecology and sociology[20, 27–30]. In this study, health educational campaigns needed to be shared by all stakeholders locally and adapted seasonally to potentially changing ecologies of both the human and mosquito[20]. There were dengue information channels that provided

accurate information quickly and comprehensively and information was provided by an authorized media spoken person of the health care centers in the sub-districts[2].

2.8. Continuing activities

Continuing dengue activities need program management that empowers the community, including control by primary stakeholders, over decisions in planning, implementation, evaluation, finance, administration, reporting and conflict resolution. The clear role, responsibilities and line of all stakeholders are important in program management[6, 9, 16]. A study using social mobilization strategies, education and communication for dengue prevention in Columbia suggested that for development of a behavior change project, it was necessary to have at least three years of continuous work before any significant changes were observed[31]. Glubler and Clark[24] mentioned that the community organization at the local level must provide the guidance, leadership, enforcement of the community standards for effective and sustainable community-based *Aedes aegypti* (*Ae. aegypti*) control. Thus, this domain requires clear, continuing activities of village health volunteers because each community has village health volunteers as the key group providing public health service.

2.9. Dengue working group (DWG)

The dengue programs will not succeed in dengue transmission prevention if that program ignores the community structure[20]. The results of a study demonstrated that when new organizational structures were created, still there needed to be functional areas of work such as coordinator groups at municipal, provincial and community levels. In other words, for the control areas, there was no new organization[10]. The core leaders group refers to the community group who led capacity building for dengue prevention and control. Leaders and non-leaders group perceived all stakeholders as the core leader of sustainable community-based dengue prevention and control. The study showed that practical teams could achieve sustainability of dengue prevention and control as a community working group (CWG), formed by formal and informal community leaders, primary health care workers, and workers from the dengue program[10].

2.10. Resources mobilization

The domain refers to adequacy of the amount and competencies of village health volunteers who maintain dengue prevention and control, and work closely with the people in community. The ability of the community to mobilize resources both from within and the ability to negotiate for resources from beyond itself was an indication of a high degree of skill and organization[32]. Associated with a previous study, Raymond *et al.* discussed three dimensions of resources as human, physical, and financial resources. First, human resource management skills are needed to maintain a harmonious working environment.

Second, physical resources are required as access to basic equipment and appropriate facilities contribute to staff moral and willingness to actively serve in the program. The last, financial resources require skills including preparing financial reports, managing budget, payroll, invoicing and payments, and applying for funding^[30].

2.11. Needs assessment

Needs assessment is defined as the capacity of the community to identify the components of the dengue problem, potential solutions to dengue problems and action by the community to resolve problems. In this study, needs assessment was measured by assessing the ability of the two groups to define and analyze the problems of prevention and control in the sub-district^[4, 6, 9, 16, 33, 34]. This domain showed the importance of the local administrative organization (LAO) as the centre of dengue solution provider. If the local governments are committed to implement policies, provide facilities of the community and are involved in Ae. aegypti control, sustainability can be achieved^[24].

2.12. Leaders group networking

Network partnerships are defined as the relationship between groups and organizations within a community or a network for building capacity of community-based dengue prevention and control. This domain is confirmed by Bush *et al*^[29] described partnerships in terms of network partnerships as the relationship between groups and organizations within a community or network. His study confirmed the identification of mutual benefits of becoming network partners increases the sustainability of the capacity to achieve health development^[29]. Community network partnerships are measured by relationships between groups such as local politicians, public health units, schools, groups of parents. In addition, network partnerships can also mean organizations that are outside of the community group^[10, 34, 35].

2.13. Leader group community and networking

Leader and non-leader groups participate in dengue prevention and control activities. Toledo^[10] pointed out participation of actors in the different steps of the program represented by formal and informal leaders and the health working promotes participation in the sustainability of dengue prevention program.

2.14. Community participation

Participating in dengue prevention and control means the two target groups are involved in defining, planning, implementing and evaluating activities^[6, 9, 16, 34]. This is basic to community capacity. Only by participating in small groups or larger organizations can individual community members better define, analyze and act on issues of general concern to the broader community^[6, 9, 16]. This domain of community participation (CP) recommends that this is the most important strategy in dengue management and

remains a guiding principle in tropical disease. It involves a spectrum of activities such as process, organization, planning, evaluation, cooperation. and the contribution of time and resources by the host community^[34].

3. The dengue community capacity assessment tool (DCCAT)

From the development and testing of the DCCAT in 2008^[36], this study generated item pools which then divided these items into dengue community capacities of non-leaders (243-item) and leaders (249-item). After that, the format of a five point rating scale for measurement was determined, and content validity was verified by seven experts serving as a review panel. The Content Validity Index (CVI) was deleted and revised, resulting in 221 items for non-leaders (CVI= 0.90) and 227 items for leaders (CVI= 0.91). Moreover, face validity was confirmed by two leaders and two non-leaders reviewing the contents, questions and formatting while responding to ensure that the questions and instructions were free of ambiguities; comments were obtained on how to improve the questionnaires. The pilot-testing and item improvement were conducted with 60 non-leaders and 60 leaders who had the same characteristics as the overall population in this study. The researcher used purposive sampling at a sub-district to test and improve items. Pilot-testing resulted in Cronbach's alpha coefficient for total items of non-leaders of 0.89 and total items of leaders of 0.98. Deleting and revising items totaled 167 items for the non-leader's tool and 182 items for the leader's tool.

Testing tools consisted of collected data, analyzed by Factor analysis technique, compiling and naming the final domains of two sub-tools. Sample size included at least five participants per item. The leaders testing tool was administered to 964 leaders and the non-leaders tool to 1 248 non-leaders in the eight sub-districts of eight provinces in Southern Thailand. Construct validity was analyzed by Principal Component Analysis (PCA), Factor loading 0.5, and Eigenvalue >2. The tool consisted of two sub-tools, with 115 items within 14 domains for the dengue community capacity of leader assessment tool and an 83 items within 11 domains for the dengue community capacity of non leader. A total of 58 items overlapped between two sub-tools in combined items.

In summary, DCCAT consists of DCCAT-L (115 items within 14 domains), DCCAT-NL (83 items within 11 domains) and the 58 overlap items of both sub-tools.

DCCAT-L, with a factor analysis yielding 115 items within 14 domains of DCCAT-L produced the best fit. The initial Eigenvalue for the domains ranged from 2.06 to 50.39, with % of variance of 27.68 and communality % indicated in 14 domains together explained 57.58% of the variance and Cronbach's alpha coefficient 0.97. The 14 domains of DCCAT-L were critical situation management (9 items), personal leadership (12 items), health care provider capacity (8 items), needs assessment (8 items), sense of community (11 items), leader group networking (11 items), communication of dengue information (10 items), community leadership (8 items), religious capacity (9 items), community and leader group networking (7 items), resource mobilization

(4 items), dengue working group (6 items), community participation (6 items), and continuing activities (6 items).

As for the DCCAT–NL, the final domains of DCCAT–NL were evaluated by factor analysis yielding 83 items within 11 domains producing the best fit. Initial Eigenvalue for the domain ranged from 2.07 to 52.96, % of the variance was 32.69 and communality % indicated 11 domains together explained 57.11% of the variance. The 11 domains of DCCAT–NL were critical situation management (13 items), personal leadership (8 items), religious capacity (10 items), community leadership (8 items), health care provider capacity (6 items), sense of community (8 items), communication of dengue information (7 items), continuing activities (6 items), dengue working group (7 items), resource mobilization (5 items), and needs assessment (4 items).

Of those community capacity 58 items which overlapped between those domains of the DCCAT–NL (11 domains and 83 items) and DCCAT–L (14 domains and 115 items) were critical situation management (5 items), personal leadership (4 items), religious capacity (9 items), community leadership (7 items), health care provider capacity (5 items), sense of community, (7 items), communication of dengue information (4 items), continuing activities (4 items), dengue working group (5 items), resource mobilization (4 items), and needs assessment (4 items).

4. Practical guideline in using DCCAT

Community participatory action research was conducted in two communities in a sub–district in Southern Thailand that was at high risk of dengue incidence^[37,38]. The final results pointed out the 5 steps of using DCCAT: 1) community preparation step– meeting of all stakeholders to evaluate the dengue problem and to determine solutions to their needs, to set a dengue leader’s group, and to form a support team. 2) assessment step – to determine sample size of at least 100 households per community, to collect data by the dengue working group (DWG) and to analyze data by descriptive statistics, environment characteristics and larval indices, 3) community consensus step–meeting of researcher dengue leader group and support team to determine what interventions were required, 4) intervention step–to conduct a set of activities as interventions to prevent and control dengue and 5) conclusion and improvement step – to analyze and discuss community capacity building for overcoming the problem of dengue.

5. Conclusion

The concept of community capacity building for sustainable community–based dengue prevention and control consists of four steps, namely, determining community capacity, assessing community capacity, implementation and evaluation or improvement. Based on the author’s studies^[15, 36–38], the results point out that the initial distinctive features of community capacity needed for sustainable community–

based dengue prevention and control were 10 domains. Then, after development, testing and assessment the tool, it was confirmed that there were 14 factors or domains involved in dengue community capacity in the leaders group and 11 domains in non–leaders group. The DCCAT as a new assessment tool could be used in areas of high dengue incidence. The application model of the new tool consisted of five steps: 1) community preparation, 2) assessment, 3) community hearing or meeting, 4) interventions, and 5) conclusion and improvement step. All stakeholders in the community should use the new tool based on a common understanding of measurement objectives, desired outcome, available resources and communal characteristics. If communities need to develop community capacity for dengue prevention and control, designed pre–post intervention assessments or serial assessments are essential.

Conflict of interest statement

We declare that we have no conflict of interest.

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