May 2017 – SUPPORT Summary of a systematic review

Do multi-component community-based interventions improve dengue vector control?

Dengue is an infectious disease transmitted by mosquitoes. Dengue has dramatic negative impacts on health, the environment and the economy, particulary in the tropics. The use of community-based dengue control programmes has increased in the last few decades in order to address this major public health problem.

Key messages

➔ **Multi-component community-based dengue control programmes may reduce mosquito larval indices**

➔ **Multi-component community-based dengue control programmes combined with chemical larvicides may reduce mosquito larval indices**

➔ **Multi-component community-based dengue control programmes combined with fish and chemical larvicides may reduce mosquito larval indices**

➔ **Multi-component community-based dengue control programmes combined with the use of crustaceans that eat mosquito larvae (*Mesocyclops* copepods) may reduce mosquito larval indices**

➔ **It is uncertain whether multi-component community-based dengue control programmes combined with the use of crustaceans that eat mosquito larvae (*Mesocyclops* copepods) reduce dengue incidence**

➔ **Most studies were conducted in low- and middle-income countries**

Who is this summary for?

People deciding whether to introduce interventions to reduce vector populations for dengue control

! This summary includes:

- **Key findings** from research based on a systematic review
- **Considerations about the relevance of this research** for low-income countries

X Not included:

- Recommendations
- Additional evidence not included in the systematic review
- Detailed descriptions of interventions or their implementation

This summary is based on the following systematic review:

Heintze C, Velasco Garrido M, Kroeger A. What do community-based dengue control programmes achieve? A systematic review of published evaluations. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2007;101(4):317-325.

What is a systematic review?

A summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise the relevant research, and to collect and analyse data from the included studies

SUPPORT was an international project to support the use of policy relevant reviews and trials to inform decisions about maternal and child health in low- and middle-income countries, funded by the European Commission (FP6) and the Canadian Institutes of Health Research.

Glossary of terms used in this report: www.supportsummaries.org/glossary-of-terms

Background references on this topic: See back page

Background

Community oriented activities for dengue control have received increased attention in the last few decades. These efforts have included multi-component interventions to reduce larval, and ultimately adult, mosquito vector populations through chemical, biological and physical means as well as behavioural change interventions at the community level.

In this review, a community-based dengue control intervention was defined as any intervention in which at least one component targeted the community (e.g., educational meetings, involvement of local leaders) and whose aim was to reduce the incidence of dengue disease or infestation of communities with Aedes mosquitoes (as measured by any entomological index).

How this summary was prepared

After searching widely for systematic reviews that can help inform decisions about health systems, we have selected ones that provide information that is relevant to low-income countries. The methods used to assess the reliability of the review and to make judgements about its relevance are described here: www.supportsummaries.org/how-support-summaries-are-prepared/

Knowing what's not known is important

A reliable review might not find any studies from low-income countries or might not find any well-designed studies. Although that is disappointing, it is important to know what is not known as well as what is known.

A lack of evidence does not mean a lack of effects. It means the effects are uncertain. When there is a lack of evidence, consideration should be given to monitoring and evaluating the effects of the intervention, if it is used.

About the systematic review underlying this summary

Review objective: To assess the effectiveness of community-based interventions in reducing vector populations for dengue control.

Types of	What the review authors searched for	What the review authors found
Study designs & Interventions	Randomised trials, non-randomised trials, controlled before-after studies and interrupted time series studies of community-based interventions aimed at reducing vector populations for dengue control.	11 included studies: 2 randomised trials, 6 controlled before-after studies and 3 interrupted time series studies assessing community-based dengue control interventions alone (5 studies); combined with chemical larvicides (2 studies); combined with fish and chemical larvicides (2 studies); and combined with larvae-eating crustaceans (*Mesocyclops* copepods*)* (2 studies). Studies used educational materials (7 studies); educational meetings such as workshops (9 studies); and educational outreach visits (8 studies). Studies described the involvement of local opinion leaders (6 studies) and national institutions (5 studies), or the use of mass media (5 studies).
Participants	Community people and professionals serving the community.	Household inhabitants (mostly housewives), the elderly, children, health committees, healthcare personnel, government officers, teachers and community organisations.
Settings	Community.	Five studies were carried out in the Americas: Honduras (3), Mexico (1), and Cuba (1). Six studies were carried out in Asia: Vietnam (2), Thailand (1), Taiwan (1), French Polynesia (1), Fiji Islands (1).
Outcomes	Incidence of dengue disease or infestation of the community with Aedes mosquitoes.	Classical entomological/larval indices such as the House Index (HI), the Container Index (CI) and the Breteau Index (BI) – all measures of larvae infestation in the home or in water containers; seroconversion or incidence of dengue disease.
Date of most recent search: March 2005		
Limitations: This is a well-conducted systematic review with only minor limitations.		

Heintze C, Velasco Garrido M, Kroeger A. What do community-based dengue control programmes achieve? A systematic review of published evaluations. Transactions of the Royal Society of Tropical Medicine and Hygiene.2007;101(4):317-325.

Summary of findings

11 studies assessed community-based dengue control interventions alone or combined with other interventions. The studies varied with respect to target group, the interventions delivered, the length of the observation period after the intervention and the control groups used. Most studies compared intervention communities with 'untreated' control communities or did not describe what was done in the control communities.

1) Community-based dengue control programmes only

Five studies from Cuba, the Fiji Islands and Honduras (3 studies) assessed community-based programmes. These programmes included a mix of educational meetings, educational materials, the involvement of local opinion leaders and other stakeholders and the use of mass media for educational messages.

➔ **Multi-component community-based dengue control programmes may reduce mosquito larval indices. The certainty of this evidence is low.**

About the certainty of the evidence (GRADE) *

⊕⊕⊕⊕
High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕◯
Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate.

⊕⊕◯◯
Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕◯◯◯
Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

* This is sometimes referred to as 'quality of evidence' or 'confidence in the estimate'.

† Substantially different = a large enough difference that it might affect a decision

See last page for more information.

Multi-component community-based dengue control programmes

People	Elderly people, children, women, health committees
Settings	Communities
Intervention	Multi-component community-based dengue control programmes. Interventions included a mix of educational meetings, involvement of local opinion leaders and national institutions, mass media communication, educational materials and educational outreach visits
Comparison	Usual practice (1 study); not specified (3 studies); not applicable (1 study)

Outcomes	**Impact**	Certainty of the evidence (GRADE)
Mosquito larval indices	Multi-component community-based dengue control programmes may reduce mosquito larval indices	⊕⊕◯◯ Low

GRADE: GRADE Working Group grades of evidence (see above and last page)

2) Community-based dengue control programmes combined with the use of chemical larvicides

Chemical larvicides are used to eliminate mosquito larvae. Two studies from Mexico and Thailand evaluated programmes combining chemical larvicide use with multi-component community-based dengue control programmes.

➔ **Multi-component community-based dengue control programmes combined with chemical larvicides may reduce mosquito larval indices. The certainty of this evidence is low.**

Multi-component community-based dengue control programmes combined with the use of chemical larvicides		
People	Household inhabitants, healthcare personnel, government officers, schoolchildren, teachers and community organisations	
Settings	Communities	
Intervention	Multi-component community-based dengue control programmes (including educational materials and meetings, educational outreach visits, mass media communication and involvement of local opinion leaders and national institutions) combined with the use of chemical larvicides	
Comparison	No programme or not applicable	
Outcomes	**Impact**	Certainty of the evidence (GRADE)
Mosquito larval indices	Multi-component community-based dengue control programmes combined with the use of chemical larvicides may reduce mosquito larvel indices. One study suggested that this combination may be less effective than community-based control programmes alone.	⊕⊕◯◯ Low
GRADE: GRADE Working Group grades of evidence (see above and last page)		

3) Multi-component community-based dengue control programmes combined with fish and chemical larvicides

Larvae-eating fish can be used to eliminate mosquito larvae. Two studies from French Polynesia and Taiwan evaluated programmes combining fish and chemical larvicide use with multi-component community-based dengue control programmes.

➔ **Multi-component community-based dengue control programmes combined with fish and chemical larvicides may reduce mosquito larval indices. The certainty of this evidence is low.**

Multi-component community-based dengue control programmes combined with fish and chemical larvicides

People	Household inhabitants, teachers
Settings	Communities
Intervention	Multi-component community-based dengue control programmes (including educational materials and meetings and educational outreach visits) combined with fish and chemical larvicides
Comparison	Not specified

Outcomes	**Impact**	Certainty of the evidence (GRADE)
Mosquito larval indices	Multi-component **c**ommunity-based dengue control programmes combined with fish and chemical larvicides may reduce mosquito larval indices	⨁⨁◯◯ Low

GRADE: GRADE Working Group grades of evidence (see above and last page)

4) Multi-component community-based dengue control combined with crustaceans that eat mosquito larvae (*Mesocyclops* copepods*)*

Crustaceans that eat mosquito larvae (*Mesocyclops* copepods*)* can be easily harvested, bred and released into freshwater containers inhabited by Aedes aegypti mosquito larvae. It is possible to teach schoolchildren to recognize and collect Mesocyclops so that communities are able to undertake and sustain mosquito control themselves. Two studies from Vietnam evaluated programmes combining the use of crustaceans that eat mosquito larvae with multi-component community-based dengue control programmes.

➔ **Multi-component community-based dengue control programmes combined with the use of crustaceans that eat mosquito larvae (*Mesocyclops* copepods*)* may reduce mosquito larval indices. The certainty of this evidence is low.**

➔ **It is uncertain whether multi-component community-based dengue control programmes combined with the use of crustaceans that eat mosquito larvae (*Mesocyclops* copepods*)* reduce dengue incidence as the certainty of this evidence is very low.**

Multi-component community-based dengue control combined with the use of crustaceans that eat mosquito larvae (*Mesocyclops* copepods*)*

People	School children, teachers and women's union
Settings	Communities
Intervention	Multi-component community-based dengue control programmes (including educational meetings and materials, educational outreach visits and involvement of local opinion leaders and national institutions) combined with copepods (*Mesocyclops)*
Comparison	Not specified

Outcomes	**Impact**	Certainty of the evidence (GRADE)
Mosquito larval indices	Community-based dengue control programmes combined with the use of *Mesocyclops* copepods may reduce mosquito larval indices	⊕⊕◯◯ Low
Dengue incidence	It is uncertain whether community-based dengue control programmes combined with the use of *Mesocyclops* copepods reduce dengue incidence	⊕◯◯◯ Very low

GRADE: GRADE Working Group grades of evidence (see above and last page)

Relevance of the review for low-income countries

➔ Findings	▷ Interpretation*
APPLICABILITY	
➔ **10 of the 11 studies included in the systematic review were conducted in low- and middle-income countries.**	▷ *These findings are likely to be applicable to low-income country settings where dengue is prevalent. The acceptability, feasibility and costs of different community-based interventions for dengue vector control need to be considered in each setting.*
EQUITY	
➔ **There was no information in the included studies regarding the differential effects of the interventions among disadvantaged populations.**	▷*The interventions may decrease inequity in disadvantaged populations if resources to deliver the interventions are made available to those populations. Some community-based interventions (such as educational meetings, the involvement of local opinion leaders and the use of locally found crustaceans that eat mosquito larvae) may be implemented at low cost and may therefore contribute to reducing inequities.*
ECONOMIC CONSIDERATIONS	
➔ **The systematic review did not address economic considerations.**	▷ *Scaling up of many of the interventions will require resources. Some community-based interventions may require fewer resources (see above) and may therefore be more appropriate in settings where resources are very constrained.* ▷ *Local costings should be undertaken to inform decisions on implementation.*
MONITORING & EVALUATION	
➔ **Most of the available evidence is of low certainty** ➔ **Few studies assessed the impacts of these interventions on dengue incidence**	▷ *Larger and more rigorous comparative studies are required to determine the effects and the cost-effectiveness of the community-based dengue control strategies.* ▷ *Future studies should provide details of the interventions used and describe the contexts in which they were delivered.* ▷ *Attention needs to be paid to the sustainability of dengue vector control strategies over time.*

*Judgements made by the authors of this summary, not necessarily those of the review authors, based on the findings of the review and consultation with researchers and policymakers in low-income countries. For additional details about how these judgements were made see: www.supportsummaries.org/methods

Additional information

Related literature

These systematic reviews provide complementary information:

Al-Muhandis N, Hunter PR. The value of educational messages embedded in a community-based approach to combat dengue Fever: a systematic review and meta regression analysis. PLoS Negl Trop Dis. 2011;5(8):e1278.

Bowman LR, Donegan S, McCall PJ. Is Dengue Vector Control Deficient in Effectiveness or Evidence?: Systematic Review and Meta-analysis. PLoS Negl Trop Dis. 2016;10(3):e0004551.

Erlanger TE, Keiser J, Utzinger J. Effect of dengue vector control interventions on entomological parameters in developing countries: a systematic review and meta-analysis. Medical and veterinary entomology. 2008;22(3):203-221.

Horstick O, Runge-Ranzinger S, Nathan MB, Kroeger A. Dengue vector-control services: how do they work? A systematic literature review and country case studies. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2010; 104(6):379-386.

This summary was prepared by

Agustín Ciapponi, Instituto de Efectividad Clínica y Sanitaria, Buenos Aires, Argentina.

Conflict of interest

None declared. For details, see: www.supportsummaries.org/coi

Acknowledgements

This summary has been peer reviewed by: David Sinclair and Christopher Heintze.

This review should be cited as

Heintze C, Velasco Garrido M, Kroeger A. What do community-based dengue control programmes achieve? A systematic review of published evaluations. Transactions of the Royal Society of Tropical Medicine and Hygiene. 2007;101(4):317-325.

The summary should be cited as

Ciapponi A. Do multi-component community-based interventions improve dengue vector control? May 2017. www.supportsummaries.org

About certainty of the evidence (GRADE)

The "certainty of the evidence" is an assessment of how good an indication the research provides of the likely effect; i.e. the likelihood that the effect will be substantially different from what the research found. By "substantially different" we mean a large enough difference that it might affect a decision. These judgements are made using the GRADE system, and are provided for each outcome. The judgements are based on the study design (randomised trials versus observational studies), factors that reduce the certainty (risk of bias, inconsistency, indirectness, imprecision, and publication bias) and factors that increase the certainty (a large effect, a dose response relationship, and plausible confounding). For each outcome, the certainty of the evidence is rated as high, moderate, low or very low using the definitions on page 3.

For more information about GRADE:
www.supportsummaries.org/grade

SUPPORT collaborators:

The Cochrane Effective Practice and Organisation of Care Group (EPOC) is part of the Cochrane Collaboration. The Norwegian EPOC satellite supports the production of Cochrane reviews relevant to health systems in low- and middle-income countries .
www.epocoslo.cochrane.org

The Evidence-Informed Policy Network (EVIPNet) is an initiative to promote the use of health research in policymaking in low- and middle-income countries. www.evipnet.org

The Alliance for Health Policy and Systems Research (HPSR) is an international collaboration that promotes the generation and use of health policy and systems research in low- and middle-income countries.
www.who.int/alliance-hpsr

Norad, the Norwegian Agency for Development Cooperation, supports the Norwegian EPOC satellite and the production of SUPPORT Summaries.
www.norad.no

The Effective Health Care Research Consortium is an international partnership that prepares Cochrane reviews relevant to low-income countries. www.evidence4health.org

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