

The Balikpapan dengue control project

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Introduction

In the city of Balikpapan, dengue hemorrhagic fever (DHF) is the leading cause of hospital admission for ages below 5 years of age and the fifth most common cause of death. The problem is increasing. The following report is a summary of a community-based proposal to reduce the impact of DHF on the community. The program uses proven techniques to target the mosquito vector.

The report is based on the original proposal presented to the local multinational companies Community Relations Departments, and the City Health Department (Durman 2001), and subsequent proposals from interested contributing parties (Dinas Kesehatan Kota 2001a; CORI 2001).

Background

Dengue

Dengue fever (DF) is a viral illness transmitted by a mosquito vector, presenting with symptoms of bone and joint pain, headaches, rash and leucopenia. There are four serotypes. Dengue hemorrhagic fever (DHF) is an auto immune reaction that occurs in 1 in 200 patients with DF. Some patients experiencing two or more separate attacks of the four different serotypes of the dengue virus are more likely to suffer DHF. It is characterized by fever, hemorrhage, shock and death mainly in young children or tourists (WHO 1997; CDC 2001)

Aedes aegypti mosquito vector

The major vector of the dengue virus within the city of Balikpapan is *Aedes aegypti*. The mosquito often breeds in small amounts of still water in discarded and water-storage containers, and remains usually within 150 m of its emergence site as an adult. Balikpapan provides many ideal breeding locations. The water supply is inadequate for a rapidly growing city and people store water in tanks, bins, drums and other containers. There are areas of the city with refuse problems and this species frequently breeds in tyres, old cans, old plastic containers, and any other freshwater collection (CORI 2001).

Balikpapan

This is a city of approximately 500,000 people, situated in the province of Kalimantan Timur in Indonesia. It is a major centre for the oil, gas, and coal industry in Kalimantan Timur, making the city relatively more prosperous than similar cities across the nation. Like the rest of Indonesia, the public health system, particularly at the community health level, suffered a major blow during the recent 1998 economic crisis, with the destruction of infrastructure and the abandonment of programs (CORI 2001)

The Problem

City Health Department figures are notoriously unreliable (Dinas Kesehatan Kota 2001b). Figure 1 was generated from hospital admissions data for the four main hospitals in Balikpapan. They under report the incidence of DHF in the city by a minimum of 50%. It can be seen that in recent years there has been a steady increase in the incidence of dengue fever above international increased prevalence, reflecting the abandonment of the previous prevention program. In 1999 one company provided once off funding to reinstate the DHF vector control program. Prior to 1988, there was an effective dengue vector control program that was abandoned due to loss of funding (Dinas Kesehatan Kota 2001b).

The control program

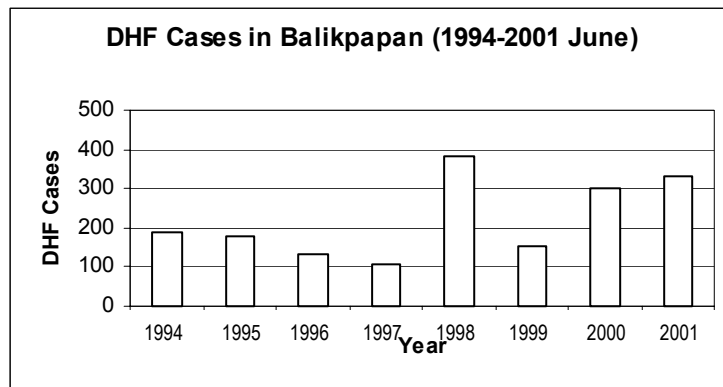
The target of the DHF vector control program is to reduce the incidence of the vector *Aedes aegypti*, thus reducing the incidence of transmission. The proposal is to restore and maintain the old proven program by seeking funding from local companies. These program was based on proven WHO programs. The custody and administration of the program will remain with the City Health Department

(DKK). The program will be based on and use existing health infrastructure, with one aim being to make the program sustainable in the long term (Durman 2001).

The different parts of the program will be:

- Restoration of community health service volunteers (Posyandu) by recruiting & training.
- Public education program.
- Monitoring program.
- Abate larviciding (temephos).
- Focal fogging.

Figure 1 - DHF case data from the four main city hospitals within Balikpapan, excluding health center incidence.



Restoration of the community health service volunteers (Posyandu) by recruiting and training

The program will include standard training in all aspects of Posyandu service including:

- The link between mosquitoes and dengue.
- The link between dengue and dengue hemorrhagic fever.
- Mosquito breeding.
- Reduction of mosquito habitat by covering water.
- Pesticide use.
- What to look for with regards to mosquito eradication.

Posyandu responsibilities also include tuberculosis identification and treatment, vaccination and well baby programs. It is expected that these programs will be restored and strengthened as a fringe benefit of the DHF vector control program. These groups will be at the forefront of the program since they will do the initial mosquito survey, follow-up mosquito surveys, conduct public health education and eventually modify public behaviour. Each group of two to three cadre will be responsible for 30 to 40 households. Mosquito control will focus on identification and elimination of breeding sites, the coverage and proper storage of home water stores, the clean up of rubbish, and the cleaning out of drains. This will lead to a clean up of the entire city and will result in a more pleasant environment for the city's residents (CORI 2001).

Public education program

The public will be taught basic concepts of dengue and dengue hemorrhagic fever through discussion groups, film nights, brochure handouts and advice to newly elected village consultant councils.

Figures of community surveys (Figs. 2 and 3) will be presented to public meetings to show the magnitude of the program and progress made in the program.

There are planned local radio spots and newspaper inserts. A seminar on all aspects of dengue inviting experts from the national capital to meet with local officials consultants and doctors, to inform them of the program and to make them fully aware of the health issues is also planned.

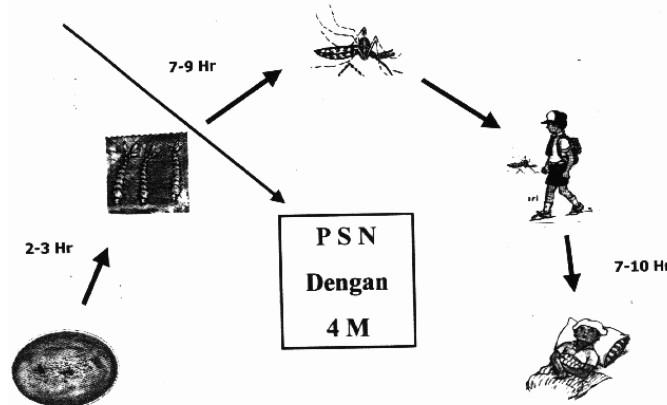
Figure 2 – “Symptoms of Dengue Hemorrhagic Fever”, handout to the community for general distribution.

Figure 3 – “Breeding sites of and control of DHF vectors”, handout to the community for general distribution.



It is hoped that inaccurate national beliefs implied by the following diagram (Fig. 4) will be remedied with this education program.

Figure 4 - From hatching to time of infection can be as little as 22 hours!! as shown from this diagram from the City Health Department (Dinas Kesehatan Kota 2001b) PSN; 4 M.



Monitoring program

Some form of quality assurance is required to help maintain the impetus of the program. This will be in the form of monthly and yearly reports of larvae infestations based on Posyandu, and major hospital admission and death rates for dengue hemorrhagic fever. These measures, broken down by area, will allow focusing of efforts onto target hot spots, particularly as the program gets under way.

Abate

Many collections of water will be too large or otherwise difficult to keep free from breeding. This includes small to large tanks, dams and ponds, and household water. The solution is to use small amounts of the persistent, but low residue, granular Abate (Temphos) (Gubler 1991; Extonet 2001).

Temephos is considered to be safe to mammals, however, excess pesticide use will interfere with local fish and prawn farms, interrupting food production in a city where there is malnutrition. The public is well informed on this. Care will need to be taken not to impact on local fish and prawn farms.

Focal fogging

Citywide fogging is not currently an option. Using the pesticide of choice, malathion (Extonet 1996), the cost is prohibitive at around USD\$200,000 each time the entire city is fogged or USD\$1,040,000

for a year (Dinas Kesehatan Kota, 2001a). This level of funding is not available. In addition, there would be collateral environmental damage. Malathion is moderately toxic in birds, highly toxic in some insects (such as honey bees), and very toxic to some types of marine life. This would impact adversely on the human food chain as these groups are actively farmed within the city. Life can be precarious and any small impact on food production could lead to malnutrition or starvation. In addition, a change in the balance in surviving animal life would be expected to impact on farming. The community is well aware of this and as a whole, with the exception of pockets of foreigners, the community at large is not receptive to long-term broad fogging programs. Fogging will be used in focal "Hot Spots" of raised incidence, to be followed up with more intense monitoring and education programs. The funding and the equipment for hot spot fogging already exists.

End Point

The complete eradication of dengue virus from Balikpapan is considered unrealistic (Gubler and Casta-Valez 1991; WHO 1997).

The aims are to:

1. Reduce child morbidity and mortality from dengue hemorrhagic fever (measured through admission to the four main hospitals).
2. Reduce the prevalence of the *Aedes aegypti* mosquito.

Both measures will be surveyed.

The benefits of the program are expected to compound year on year as per previous programs. Accurate statistics and a strong lobby will be essential for the maintenance of funding. The program should continue for a period of five to ten years until a safe, effective and affordable vaccine, which is currently being developed, is available (CDC 2001).

Implementation Framework

The project should be sustainable in the long term with the beneficiaries having some sense of ownership. One company can initially sponsor the project, but not own the project, and in the long run the sponsor will be a group of private companies sharing the expense (Fig 5). The City Health Department has a proven program for implementation that has been used in the past. It also has a framework that is known and understood by the general population, even if that framework is in need of repair due to external causes.

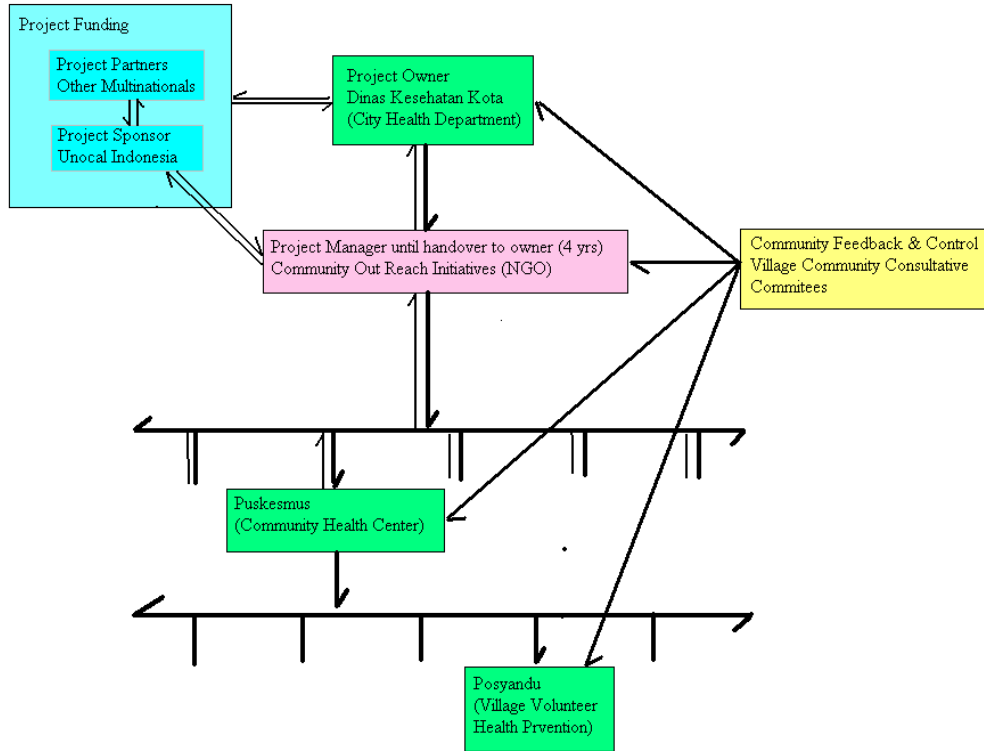
The proposal is to set up supporting structures (CORI 2001).

- Funding companies - to assist and raise project funding from year to year. Unocal Indonesia will act as the sponsor for the project, organize seed funding and do initial needs analyses. Unocal will also work in assisting the City Health Department to restore community health care infrastructure.
- Village Community Consultative Committees - The community must be educated and be able to provide feedback on program progress in local areas. This is expected to come through an advisory body set up by newly established elected Community Consultative Councils.

An NGO (a not for profit Non Governmental Organization) specializing in such projects with expertise in the field will be selected to accept company funding. It will be expected to set up the initial implementation phase of the project, then phase out over three to four years. Private companies do not have the resources or the interest in day-to-day management of the project.

The key to the program is the reestablishment of the public health system at the grass root level with Posyandu volunteers. The volunteers are expected to educate the general public in the need to stop mosquitoes breeding. If successful, this should result in a major environmental cleanup involving the entire city. The more successful this clean up program, the less pesticide use there will be. Reestablishment of the Posyandu system will have the fringe benefits of the reestablishment of a number of public health programs, compounding community benefits.

Figure 5 - Diagram of Organization.



Green: existing health infrastructure, to be repaired by the project.

Pink: Facilitator, a non-profit NGO providing targeted education, funding and assistance.

Blue: Private companies funding the project.

Yellow: Newly created Village Consultative Committees, providing feed back on the project, and assisting with education programs.

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