Intersectoral coordination in Aedes aegypti control. A pilot project in Havana City, Cuba

L. Sanchez¹, D. Perez¹, T. Pérez¹, T. Sosa², G. Cruz³, G. Kouri¹, M. Boelaert⁴ and P. Van der Stuyft⁴

¹ Institute of Tropical Medicine ‘Pedro Kouri’, Havana City, Cuba
² Epidemiology Division, Policlinico ‘26 de Julio’, Playa Municipality, Havana City, Cuba
³ Epidemiology Division, Hygiene and Epidemiology Center, Playa Municipality, Havana City, Cuba
⁴ Epidemiology and Disease Control Unit, Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium

Summary

BACKGROUND  The 55th World Health Assembly declared dengue prevention and control a priority and urged Member States to develop sustainable intersectoral strategies to this end. To provide evidence for the reorientation of the dengue prevention policy in Cuba, we launched an intervention study to document the effectiveness of a local-level intersectoral approach.

METHODS  We used a quasi-experimental design. Social scientists introduced participatory methods to facilitate dialogue in the biweekly meetings of the intersectoral Health Council of the intervention area. This council subsequently developed an intersectoral plan for dengue prevention, of which the core objective was to design and implement activities for communication and social mobilization. In the control area, routine dengue control activities continued without additional input. Knowledge, attitudes and perceptions of dengue, and entomological indices were compared inside and between the areas before and after the 1-year intervention period.

RESULTS  In the intervention area the Health Council elaborated an intersectoral plan for dengue prevention focused on source reduction. The Aedes aegypti control methods consisted in eliminating useless containers in the houses and surroundings, covering tanks, and cleaning public and inhabited areas. It was implemented through communication and social mobilization. The Health Council in the control area occasionally discussed dengue issues but did not develop a coordinated action plan. Good knowledge about breeding sites and disease symptoms increased significantly (by 49.7% and 17.1% respectively) in the intervention area as well as the proportion of respondents eliminating containers in and around their houses (by 44%). No changes were observed in the control area. The House Index in the intervention area was 3.72% at baseline and decreased to 0.61% after 1 year. In the control area it remained stable throughout the study period (1.31% and 1.65% respectively).

CONCLUSION  The introduction of a participatory approach by social scientists promotes changes in intersectoral management. This facilitates social mobilization which, in its turn, leads to significant changes in knowledge, attitudes and dengue-related practices in the population and eventually to more effective control of Aedes aegypti.

keywords  Aedes aegypti control, dengue prevention and control, intersectoral coordination, social mobilization, Cuba

Introduction

Dengue prevention and control was declared a priority by the 55th World Health Assembly and every Member State was urged to develop sustainable intersectoral strategies to that end (World Health Assembly 2002). As there is no vaccine available, dengue control strategies must target the urban mosquito vector, Aedes aegypti (Lloyd et al. 1992). Studies carried out in several countries demonstrated that insecticide spraying has little impact on the female Aedes aegypti population (Gubler & Clark 1994). The only approach with demonstrated effectiveness is the elimination of larval habitats from the domestic environment, known as 'source reduction'. During the 1990s, Aedes aegypti control programmes shifted their emphasis from large-scale spraying to community-based programmes, mainly for reasons of sustainability. However, such programmes have not been very effective in preventing transmission (Gubler...
Health areas function within a larger structure called the Team that serves between 10,000 and 30,000 inhabitants. Family medicine teams work together in a Health Area management in dialogue with the community. Several care for 120 families (Iatridis 1990). It identifies local general practitioners and a nurse, that provides primary coverage, organized around the family medicine team (a country has a free healthcare system and universal health care exists down at the peripheral level. The community-based vector control in order to achieve sustainable strategies such as intersectoral coordination and community participation, perceived priorities, problems related to Ae. aegypti control in Havana. This outbreak prompted the health authorities to consider alternative activity that has been, in Cuba, the exclusive domain of the health sector (De la Cruz et al. 1999). To compound this, dengue is not perceived as an important issue in relation to other social and economic problems (Acosta et al. 1999). As in most places, the degree of community participation has often been limited to mere collaboration with the activities planned by the health sector. Moreover, health staff is not familiar with techniques to promote social participation, while community members and leaders lack awareness of their responsibility in health prevention (Terazon et al. 1999).

As part of a larger project to that contributes to provide evidence for a reformulation of the dengue control policy in Cuba, we launched an intervention study to document the effectiveness of a new intersectoral approach. We documented the process of participation and social mobilization and evaluated the effect of the intervention on knowledge, attitudes and practices related to dengue, as well as on Ae. aegypti infestation levels.

Methods

Rationale

Intersectoral collaboration is most often defined as an alliance between professional experts from several sectors (e.g., agriculture, health, education) working together to achieve a common purpose (Schaefer 1981, 1982; Abdul Khalid bin Sahal 1988; Kilonzo 1994). Our hypothesis was that effective community-based vector control could be achieved by changing the concept of the existing intersectoral management from a technocratic towards a participatory approach that involves the community in all phases of planning and implementation. The background information for the preparation of the intervention was obtained in a preparatory phase. Qualitative and quantitative methods were used to study the perception of community participation, perceived priorities, problems related to Ae. aegypti control, existing organizational structures and training needs (Sanchez et al. 2004). We identified the Consejo Popular as the most decentralized existing intersectoral team, and strengthened the technical expertise available at this level. We designed the intervention aiming at a collaborative partnership between the technical experts on the one hand and the local authorities and the community on the other.

Study site

The research was carried out in Playa Municipality, located in the north-west of La Habana, Cuba, between September 1999 and August 2000. In this municipality, foci of Ae. aegypti have persisted since 1992. It has an average annual temperature of 25°C, a precipitation of 56 mm in the dry season (between November and April) and 132.9 mm in the rainy season (between May and October). Vector density does not vary much during the year, because...
the most productive breeding places of *Ae. aegypti* are water containers inside or close to the house (Marquetti *et al.* 1995). Amongst the nine *Consejos Populares* of Playa Municipality, we selected #4, the one with the highest *Ae. aegypti* infestation levels, as the intervention area. It measures 4.5 km², has 27 030 inhabitants and is served by the polyclinic ‘26 de Julio’ and 47 family doctors. We chose *Consejo Popular* #5, with a surface of 4.0 km² and a population of 14 219, as the control area. It has living standards similar to the intervention area and is served by the polyclinic ‘Ana Betancourt’ and 24 family doctors.

**Intervention**

The intervention lasted 1 year and was carried out in different phases. In the first phase, investigators from IPK contacted the *Consejo Popular* in the intervention area, explained the planned activities and their objectives and obtained permission to work with the Health Council on dengue prevention. The preliminary studies had shown a need for strengthening the technical expertise at this level, mainly in the field of social communication and education. This expertise was provided by social scientists, a medical doctor, a geographer and a biologist from the Institute of Tropical Medicine ‘Pedro Kouri’, La Habana. Whereas the latter experts worked on demand, the social scientists participated in every fortnightly meeting of the Health Council during the study period. Initially their work focused on team building. Participatory methods were used to create confidence, to facilitate dialogue and exchange and to increase motivation and risk perception. The intersectoral group was trained to design and to implement a communication and social mobilization strategy to *Ae. aegypti* control. The control methods consisted in eliminating unused containers in the houses and surroundings, covering tanks, and cleaning public and inhabited areas. The group of technical experts also organized training for the family doctors of the intervention area: two conferences were given on dengue and *Ae. aegypti* control, and one group session was organized on communication and participatory techniques. The family doctors subsequently trained the health promoters of their area on the same topic. In the control area, the national dengue control programme continued to be carried out without interference.

**Data collection**

*Process and output.* In the intervention area, the investigators were participant observers and a social scientist attended all meetings of the Health Council. Written notes were taken to document record group dynamics and the decisions regarding the project were recorded. In the control area, key informants amongst the health authorities were interviewed to assess the degree of intersectoral collaboration for dengue prevention.

**Outcome.** A two-stage random cluster sample survey was organized before the start and after 1 year of intervention in both the intervention and the control area. A questionnaire was designed to document knowledge, attitudes, and practices (KAP) related to dengue, its transmission, and prevention. It was administered, by specially trained nurses, to a random sample of 125 households in the intervention and control areas respectively. In the first sampling stage, we selected five family medicine clinics, and subsequently 25 households from their registers. The head of the household was interviewed.

**Impact.** We used entomological surveillance data that were independently recorded by the national *Ae. aegypti* eradication programme, both in the intervention and control area. As elsewhere in Cuba, vector control technicians inspected every house in the area bimonthly for larval stages of *Ae. aegypti*. Each water container was recorded and examined for mosquito larvae. A sample of larvae was taken and sent to the municipal laboratory to identify the species. Each container was classified as used or unused, with the latter being destroyed. The system was subject to quality control by the supervisors of the municipality, who revisited one-third of the houses. Data were compiled by the epidemiologist of the municipality.

**Data analysis**

In order to allow for the cluster design, the information obtained in the KAP household surveys was analysed using the CSAMPLE program in Epi-info. The median design effect was 1.70. Differences in proportions before and after 95% confidence intervals were calculated. We analysed the following variables from the municipal entomological surveillance database for each inspection cycle: number of houses inspected, positive containers, destroyed containers, unused containers (trash), and the number of houses with *Ae. aegypti* infestation. We computed the HI (House Index: number of houses with at least one container with *Ae. aegypti* larvae/houses examined × 100) per block; and the container index (CI) (number of containers with *Ae. aegypti* larvae/number of all containers × 100) per area (PAHO 1994). The entomological indices were transformed to approximately normalize the distributions, by using square root transformation. The
mean values of HI by block and standard errors in the intervention and control area were calculated by cycle. All data were entered in Excel 2002 (Microsoft), and imported into the geographical information system platform SIGEpi (Martinez et al. 2001). The boundaries of intervention and control areas were digitalized by the IPK researchers and introduced in 1:25 000 maps obtained from GEOCUBA. The vector density in each block of houses was displayed per cycle of inspection.

Results
Process and output
During its first fortnightly meetings after the start of the project, the members of the Health Council in the intervention area shared past experiences with dengue control and discussed mutual responsibilities. This leads to defining a common vision. The attendance of the community leaders was above 90%. In the second month, a situational analysis of the area was conducted. The technical experts transmitted their knowledge to the other group members, reported the results of the baseline KAP survey, and assisted in the risk mapping of the area. They also provided training on how to link strategic planning and community participation. In the next step, the Health Council elaborated an intersectoral plan for dengue prevention and defined the responsibilities of each actor. A strategy for communication and social mobilization was developed. The main messages targeted children and elderly and focused on eliminating useless containers and covering water tanks. Formats varied from interactive puppet shows, drawing competitions and educational chats for children, over community gatherings and debate to drama sessions played by senior citizens at clubs for the elderly. The community leader’s contribution was crucial: they advised on adapted relevant formats, assisted in producing and validating messages, and activated existing networks for communication and social mobilization. Table 1 gives an overview of the implemented activities and of the participation of each sector.

In the control area, the Health Council met irregularly to discuss health problems of the community. The communication within this Health Council was limited to the sharing of information. The public service sector collected solid waste. The family doctors developed educational activities with the community on the topic of sanitation, but dengue prevention and vector control were not specifically addressed.

Outcome
At baseline, the communities had slightly different knowledge on dengue prevention, but the practices they reported were comparable (Figure 1). Changes in knowledge and reported practices after the intervention were striking. Only in the intervention areas knowledge increased, particularly with regard to breeding sites. Reported practices did not change in the control area, but they improved significantly in the intervention area, most notably for eliminating (trash) containers.

Impact
Figure 2 shows the spatial distribution of the *Ae. aegypti*-infested blocks before and after the intervention.

Table 1 Contribution of the different sectors in the dengue prevention plan in the intervention area

<table>
<thead>
<tr>
<th>Activities</th>
<th>Government</th>
<th>Public services</th>
<th>Educational sector</th>
<th>Cultural sector</th>
<th>Health sector</th>
<th>Community organizations</th>
<th>External experts</th>
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</thead>
<tbody>
<tr>
<td>Sanitation activities.</td>
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<tr>
<td>Identification of high-risk places</td>
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<td>Planning and coordination</td>
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<td>Social mobilization</td>
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<td>Providing resources</td>
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<td>Collection of recyclable materials</td>
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<td>Execution of the activities</td>
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<td>Social communication strategy</td>
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<td>Identification of messages and target groups</td>
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<td>Planning and coordination</td>
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<td>Implementation</td>
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<td>Providing resources</td>
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At baseline, the overall HI in Consejo Popular #4 was 3.72%, decreasing to 0.61% after 1 year. In the control area the HI fluctuated between 1.31% and 1.65%. The percentage of Aedes-free blocks in the intervention area increased from 44.5% at baseline to 74.0% at the end of the study; in the control area it decreased from 79.4% to 56.6%. The decline in the intervention area occurred between the inspection cycles of November-December 1999 and January-February 2000, which corresponds to the launch of the Health Council’s intersectoral activities for dengue control. The large single block touching the west edge of the intervention area is inhabited. Garbage accumulated in it was removed by the public service workers and by the population of the surroundings. The changes in the estimated mean HI and 95% confidence interval for each area are given in Figure 3. An average of 47,765 and 80,675 containers was inspected per cycle in the intervention and control areas respectively, between 40% and 60% of them were classified as useless containers. The evolution for the CI was similar to the one for the HI: they remained approximately stable in the control area, while they sharply decreased in the intervention area, again after the intersectoral dengue control plan in the intervention area was launched (Figure 4).

Discussion
In this intervention study, we strengthened existing intersectoral management structures by providing support from...
social scientists. The intersectoral Health Council team adopted participatory techniques, launched social mobilization and designed targeted communication messages. This approach to *Ae. aegypti* control resulted in improved community knowledge and practices and led to more effective vector control.

The quasi-experimental design of our study compared one intervention with one control area only, but several
factors allow us to attribute the reduction of *Ae. aegypti* infestation levels, at least partly, to our intervention. First, the observed changes in entomological indices in the intervention area occurred from the fourth month of the study onwards, which coincides with the launch of the intersectoral control activities. Secondly, the observed changes were consistent at three levels: process, community outcome and entomological findings. Thirdly, our intervention area, the worst-off within the municipality, previously showed increasing *Ae. aegypti* infestation levels over the past 10 years. Finally, although we were unable to control for ecological and climatic factors that might bias our results, we are not aware of such factors affecting differently both areas.

**Figure 3** Mean values of the house indices per block with 95% confidence interval in the intervention and control area. September 1999–August 2000.

**Figure 4** Evolution of the area container index in the intervention and the control area. September 1999–August 2000.
Several studies of community-based dengue control have been reported in the literature, most of them without a control group, but none specifically uses an intersectoral approach (Kay 1994). It is not easy to relate those studies to the present one, as there is a huge variation in the ecological and social environments in which they were conducted and in the type of intervention implemented: communication campaigns (Chiaravalloti et al. 1998), educational initiatives (Lloyd et al. 1992; Swaddiwudhipong et al. 1992; Winch et al. 2002), attempts at specific behavioural change (Kittayong & Strickman 1993), biological control efforts (Kroeger et al. 1995; Gorrochotegui et al. 1998; Kay et al. 2002), integrated control projects (PAHO 1994; Fernandez et al. 1998; Wang et al. 2000), and a mixture of the above strategies (Bos et al. 1988; Leontsini et al. 1993). Still, almost all designs involved to some extent the participation of actors from outside the health sector, frequently the educational sector, community leaders and other volunteers. The different studies also proposed various indicators to measure the impact on Ae. aegypti infestations. We adopted the HI and the CI as they are easier to interpret than the Breteau index, which is an advantage in intersectoral communication. After the intervention we found a reduction in the HI similar to the ones obtained by other interventions that have combined educational and source reduction strategies (Leontsini et al. 1993; Dos Santos et al. 1999; Winch et al. 2002). Interestingly, interventions that relied on educational strategies only, had less impact on behaviour and entomologic indices (Lloyd et al. 1992).

Individual behaviour is not only the result of knowledge but also of social influences at different levels. Changing behaviour may thus require mobilizing social networks and organizations, as well as firm public policy (Kadt 1989). Political will was also an important element in the success of the intervention: the local government was a catalyst and at least one of its representatives contributed to all coordinated activities. It also provided financial support and facilitated the adoption of the activities at all levels. Cubans also have a large experience with social mobilization and previous research has shown that existing organizations are perceived by the population as very suitable for achieving it (Sanchez 2005). The involvement of these external professionals may potentially affect the sustainability of the approach, but in our pilot experience the teaching–learning process permitted the appropriation of new participatory techniques and tools for group work by the Health Council. These continued to be used once the external investigators had retired. A final central question in any pilot project is whether the community efforts can be sustained long enough to have a lasting effect (Tsai & Fawcett 2000), in this case on both vector control practices and Ae. aegypti infestation levels. We carried out an evaluation after 1 year, which is a longer period than in most reports on community-based Ae. aegypti control, and our results are also encouraging in this respect.

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**Authors**

Lizet Sanchez (corresponding author), Dennis Perez, Tamara Perez and Gustavo Kouri, Department of Informatics and Biostatistics, Tropical Medicine Institute ‘Pedro Kouri’, Autopista Novia del Mediodía, Km. 6, La Lisa. AP 601, Marianao 13, Havana City, Cuba. Tel.: +53 7 202 04 49; Fax: +53 7 204 60 51; E-mail: lsanchez@ipk.sld.cu, dennis@ipk.sld.cu, tami@ipk.sld.cu, gkouri@ipk.sld.cu

Teresita Sosa, Epidemiology Division, Policlinico ‘26 de Julio’, Calle 72 e/13 y 15, Playa, Havana City, Cuba. Tel.: +53 7 202 36 69; E-mail: cervera@infomed.sld.cu

Guillermo Cruz, Epidemiology Division, Hygiene and Epidemiology Center, Calle 18 e/7ma y 31, Playa, Havana City, Cuba. Tel.: +53 7 202 83 19; E-mail: cruzora@infomed.sld.cu

Marleen Boelaert and P. Van der Stuyft, Epidemiology and Disease Control Unit, Department of Public Health, Institute of Tropical Medicine, Nationalestraat 155, 2000 Antwerpen, Belgium. Tel.: +32 3 247 62 83; Fax: +32 3 247 62 58; E-mail: mboelaert@itg.be, pvds@itg.be