Tropical Medicine and International Health

VOLUME 10 NO 1 PP 82–91 JANUARY 2005

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

L. Sanchez[1], D. Perez[1], T. Pérez[1], T. Sosa[2], G. Cruz[3], G. Kouri[1], M. Boelaert[4] and P. Van der Stuyft[4]

1 *Institute of Tropical Medicine 'Pedro Kouri', Havana City, Cuba*
2 *Epidemiology Division, Policlínico '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, Antwerpen, 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 *Ae. 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 *Ae. 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, *Ae. 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

 © 2005 Blackwell Publishing Ltd

& Clark 1996). Gubler and Clark (1996) also noted that exclusive reliance on the community to assume responsibility for vector control carries major risks. Recently 'intersectoral and multidisciplinary vector control programmes' have been proposed as an alternative by Halstead (1994), Kay (1994) and Guzman and Kouri (2002). According to these authors, sustained dengue control requires partnerships among donors, the public sector, civil society, non-governmental organizations, and the private for profit sector, and the interlinking of politicians, administrators, engineers, urban planners, sanitarians and environmental groups into intersectoral teams.

The Cuban dengue prevention programme has been hailed as one of the few success stories in *Ae. aegypti* control (Gubler & Clark 1994). It was initiated as a vertical programme in 1981 during the first and largest dengue haemorrhagic fever epidemic in the Americas (Kouri *et al.* 1986). The programme was successful in maintaining the *Ae. aegypti* house indices (HI) at very low levels, but after more than 15 years without reported dengue activity in the country, a dengue epidemic was detected in 1997 (Guzman *et al.* 1999). This outbreak prompted the health authorities to consider alternative strategies such as intersectoral coordination and community-based vector control in order to achieve sustainable dengue prevention.

In Cuba, the structural basis for intersectoral coordination for health exists down at the peripheral level. The country has a free healthcare system and universal health coverage, organized around the family medicine team (a general practitioner and a nurse), that provides primary care for 120 families (Iatridis 1990). It identifies local priorities and establishes an annual plan for healthcare management in dialogue with the community. Several family medicine teams work together in a Health Area Team that serves between 10 000 and 30 000 inhabitants. Health areas function within a larger structure called the *Consejo Popular* (People's Council), which involves representatives of the government, community organizations, the Health Area, and other sectors. Health matters are dealt with by one of its subcommittees: the Health Council. This subcommittee provides a platform for deliberation and negotiation, which is essential for intersectoral coordination. However, there are also factors that hinder intersectoral coordination or community participation, which both require citizens to assume responsibility for an 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 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 Sahan 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

© 2005 Blackwell Publishing Ltd

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 km^2, 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 km^2 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 Kourí', 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 and 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

 © 2005 Blackwell Publishing Ltd

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

Activities	Government	Public services	Educational sector	Cultural sector	Health sector	Community organizations	External experts
Sanitation activities.							
Identification of high-risk places		X			X	X	
Planning and coordination	X	X	X	X	X	X	X
Dissemination			X	X	X	X	
Social mobilization	X				X	X	
Providing resources	X	X					
Collection of recyclable materials							
Planning and coordination			X			X	
Execution of the activities			X			X	
Social communication strategy							
Identification of messages and target groups			X	X	X	X	X
Planning and coordination	X	X	X	X	X	X	X
Implementation	X		X	X	X	X	
Providing resources			X	X	X		X

© 2005 Blackwell Publishing Ltd

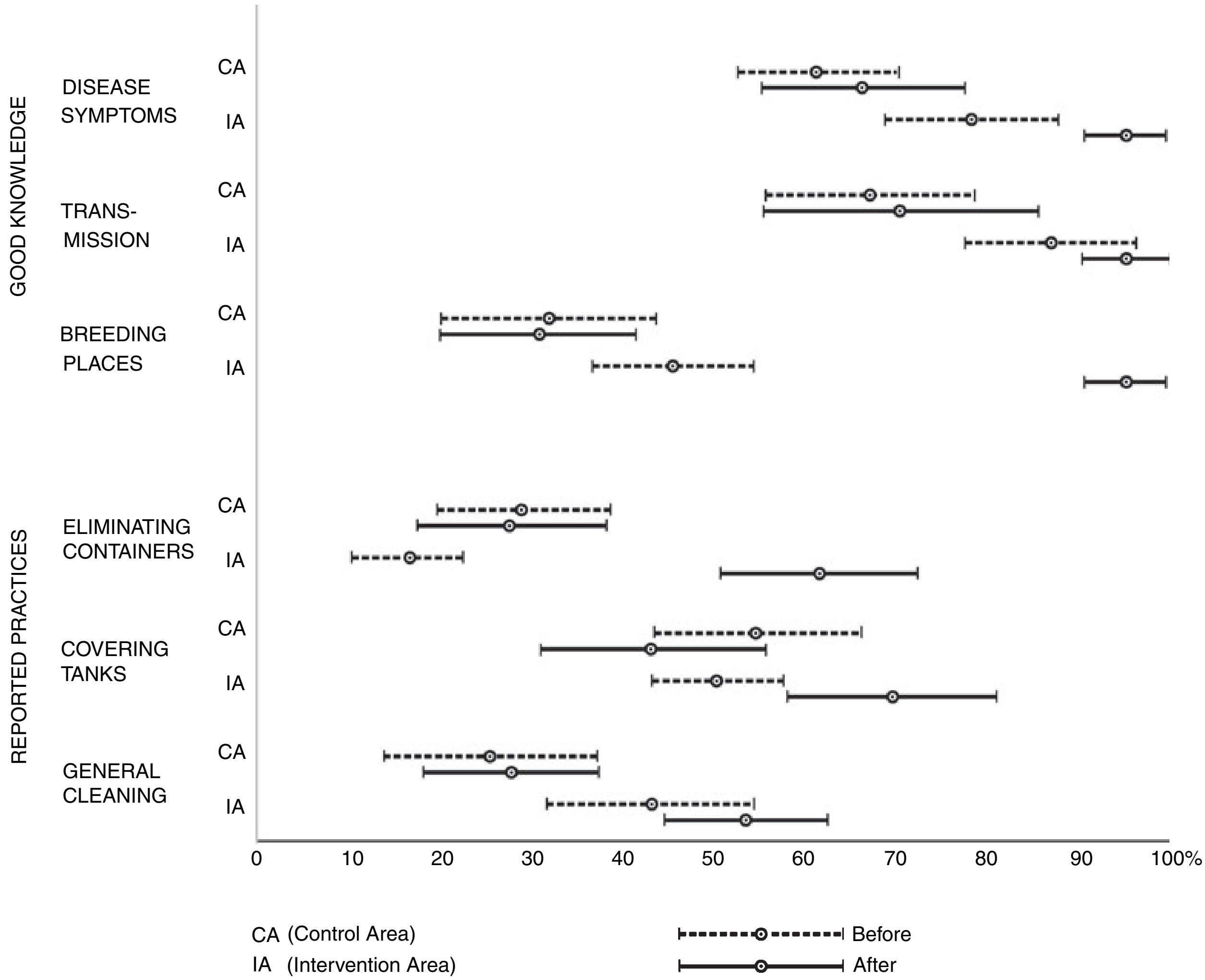

Figure 1 Percentage changes and 95% confidence interval in dengue-related knowledge and reported practices in the intervention and control area.

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 inter-sectoral management structures by providing support from

 © 2005 Blackwell Publishing Ltd

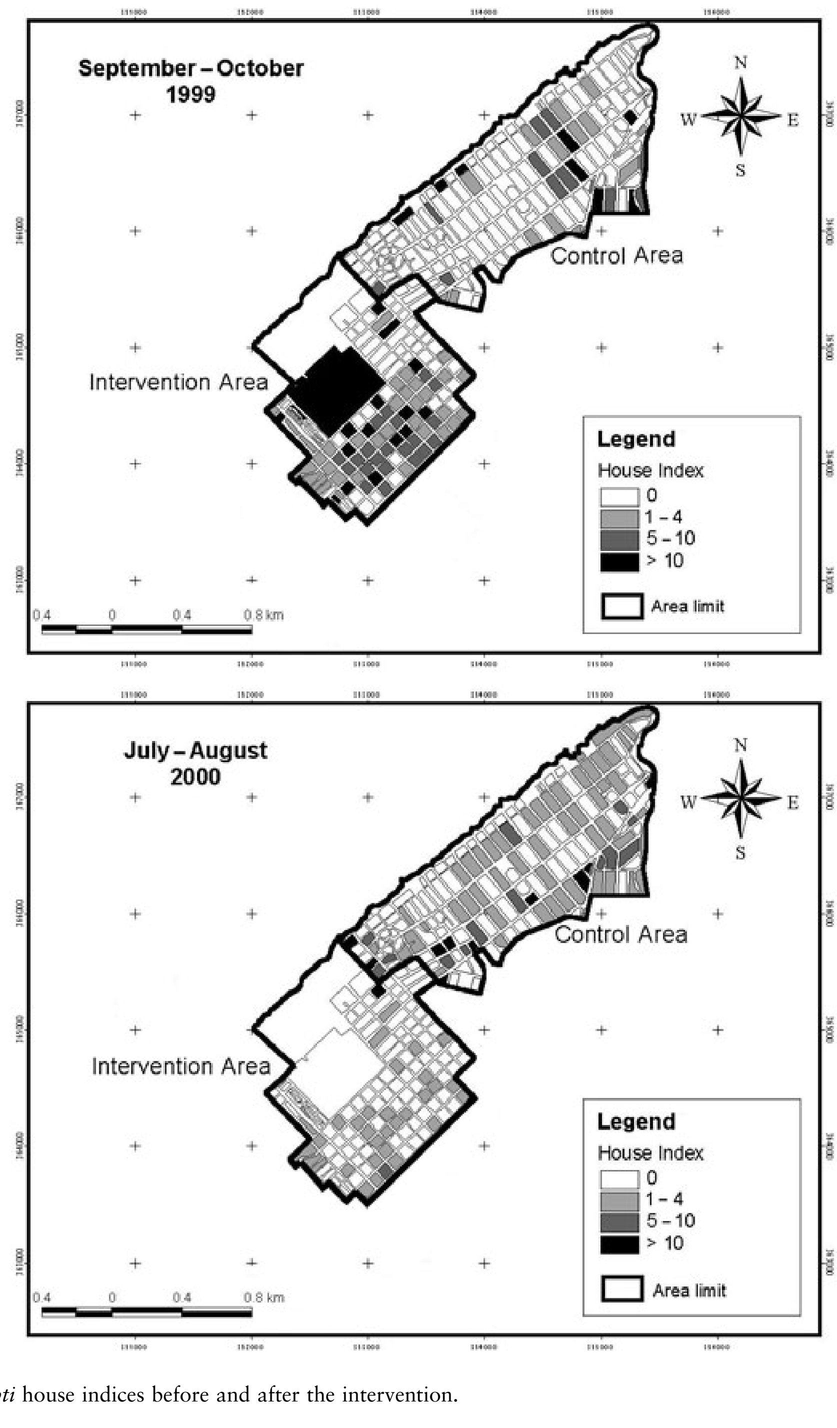

Figure 2 *Aedes aegypti* house indices before and after the intervention.

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

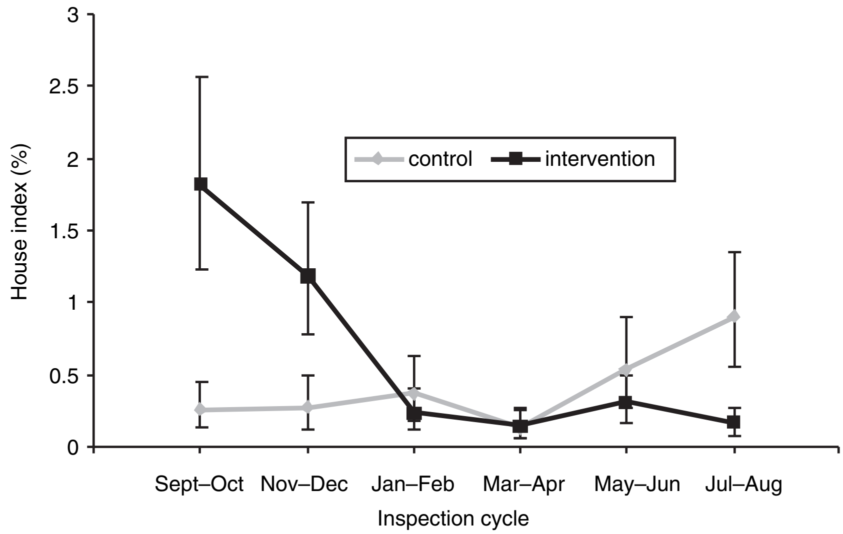

Figure 3 Mean values of the house indices per block with 95% confidence interval in the intervention and control area. September 1999–August 2000.

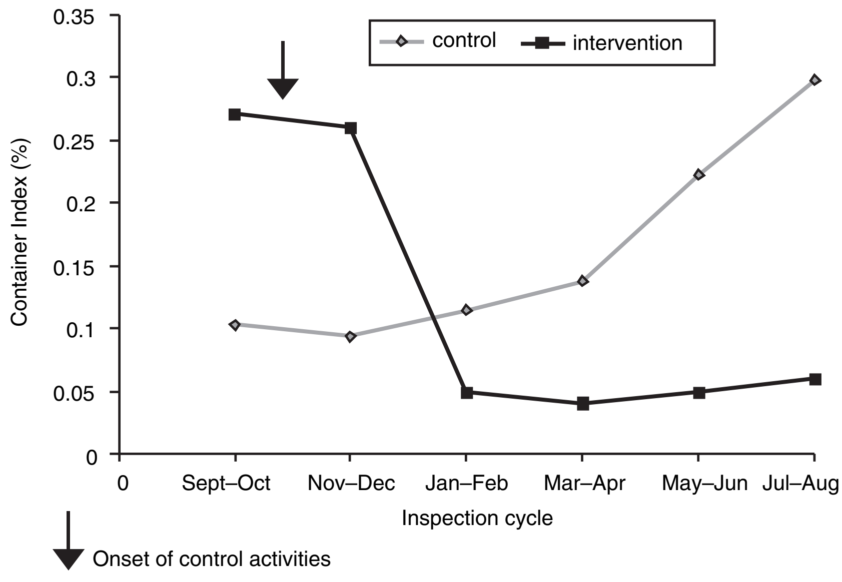

Figure 4 Evolution of the area container index in the intervention and the control area. September 1999–August 2000.

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.

 © 2005 Blackwell Publishing Ltd

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 (Kittayaong & 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 intersectorial 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 *et al.* 2004). However, the key features of our strategy were the use of the existing Health Council and the support given by external social scientists in order to change the dynamics of its intersectoral work. They introduced participatory techniques that created a climate of trust and openness, motivated and integrated the actors and permitted collective construction of know-how from the diversity of their experiences. Furthermore, family doctors and community organizations participated actively in the dissemination of the educational messages and in obtaining feedback through community meetings.

Our intervention was designed to suit the specific conditions and social structures of the Cuban context and this may limit its international replicability. Notwithstanding, at the municipal level in Cuba, there already exist health education teams – integrated, as our research team, by professionals from various disciplines – that can be trained to replicate the intervention with the also existent intersectoral Health Council's *Consejo Popular*. 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.

Acknowledgements

We are grateful to Harish Padmanabha for his helpful comments on the manuscript. The Study was partially funded through the framework agreement between the Institute of Tropical Medicine and the Belgium Directorate-General for Development Co-operation.

References

Abdul Khalid bin Sahan TS (1988) Intersectoral coordination for health. *Asia Pacific Journal of Public Health* **2**, 163–166.

Acosta OS, Chalgub AM, Baydes RO & Abraham EA (1999) Modificacion de los conocimientos, actitudes y practicas de la poblacion sobre la prevencion de los mosquitos. *Revista Cubana de Higiene y Epidemiologia* **37**, 6–12.

Bos R, Fèvrier M & Knudsen AB (1988) Saint Lucia revisited. *Parasitology Today* **4**, 295–298.

Chiaravalloti F, de Moraes MS & Fernandes MA (1998) Result of activities encouraging community participation in dengue control in an outlying neighborhood of São Jose do Rio Preto, São Paulo, and the relationship between the population's knowledge and habits. *Cadernos de Saúde Pública* **14**, 101–109.

De la Cruz AM, Figueroa D, Chacon L, Gomez M, Diaz M & Finlay CM (1999) Conocimientos, opiniones y prácticas sobre

Aedes aegypti. *Revista Cubana de Medicina Tropical* **51**, 135–137.

Dos Santos AH, Camargo MF, Araujo E, Abrao N, Alves RB & Isac E (1999) Controle de criadouros dos vetores de dengue e da febre amarela urbana na cidade de Goiânia, com participação popular. *Revista de Patologia Tropical* **28**, 233–241.

Fernandez EA, Leontsini E, Sherman C *et al.* (1998) Trial of a community-based intervention to decrease infestation of *Aedes aegypti* mosquitoes in cement washbasins in El Progreso, Honduras. *Acta Tropica* **70**, 171–183.

Gorrochotegui N, Fernandez I & Gomez-Dantes H (1998) Field evaluation of *Mesocyclops longisetus* (Copepoda: Cyclopoidea) for the control of larval *Aedes aegypti* (Diptera Culicidae) in Northeastern Mexico. *Journal of Medical Entomology* **35**, 699–703.

Gubler DJ & Clark GG (1994) Community-based integrated control of *Aedes aegypti*: a brief overview of current programs. *American Journal of Tropical Medicine and Hygiene* **50**, 50–60.

Gubler DJ & Clark GG (1996) Community involvement in the control of *Aedes aegypti*. *Acta Tropica* **61**, 169–179.

Guzman MG & Kouri G (2002) Dengue: an update. *The Lancet Infectious Disease* **2**, 33–42.

Guzman MG, Alvarez M, Rodriguez R *et al.* (1999) Fatal dengue hemorrhagic fever in Cuba, 1997. *International Journal of Infectious Disease* **3**, 130–135.

Halstead SB (1994) Dengue in the health transition. *Gaoxiong Yi Xue Ke Xue Za Zhi.* **10** (Suppl), S2–S14.

Iatridis DS (1990) Cuba's health care policy: prevention and active community participation. *Social Work* **35**, 29–35.

Kadt E (1989) Making health policy management intersectoral: issues of information analysis and use in less developed countries. *Social Science and Medicine* **29**, 503–514.

Kay BH (1994) Intersectoral approaches to dengue vector control. *Gaoxiong.Yi.Xue.Ke.Xue.Za Zhi.* **10**(Suppl), S56–S61.

Kay B, Nam VS, Tien TV *et al.* (2002) Control of *Aedes* vectors of dengue in three provinces of vietnam by use of *Mesocyclops* (Copepoda) and community-based methods validated by entomologic, clinical, and serological surveillance. *American Journal of Tropical Medicine and Hygiene* **66**, 40–48.

Kilonzo BS (1994) Importance of intersectoral co-ordination in the control of communicable diseases, with special reference to plague in Tanzania. *Central African Journal of Medicine* **40**, 186–192.

Kittayaong P & Strickman D (1993) Three simple devices for preventing development of *Aedes aegypti* larvae in water jars. *American Journal of Tropical Medicine and Hygiene* **49**, 158–165.

Kouri G, Guzman MG & Bravo J (1986) Hemorrhagic dengue in Cuba: history of an epidemic. *Bulletin of the Pan American Health Organization* **20**, 24–30.

Kroeger A, Dehlinger U, Burkhardt G, Atehortua W, Anaya H & Becker N (1995) Community based dengue control in Columbia: people's knowledge and practice and the potential contribution of the biological larvicide Bti (*Bacillus thuringiensis israelensis*). *Tropical Medicine and Parasitology* **46**, 241–246.

Leontsini E, Gil E, Kendall C & Clark GG (1993) Effect of a community-based *Aedes aegypti* control programme on mosquito larval production sites in El Progreso, Honduras. *Transactions of the Royal Society of Tropical Medicine and Hygiene* **87**, 267–271.

Lloyd LS, Winch P, Ortega-Canto J & Kendall C (1992) Results of a community-based *Aedes aegypti* control program in Merida, Yucatan, Mexico. *American Journal of Tropical Medicine and Hygiene* **46**, 635–642.

Marquetti MC, Carus F, Aguilera L & Navarro A (1995) Influencia de factores abióticos sobre la incidencia de *Aedes aegypti* en el municipio 10 de Octubre de Ciudad de La Habana, 1982–1992. *Revista Cubana de Medicina Tropical* **47**, 88–92.

Martinez R, Vidaurre M, Najera P, Loyola E & Castillo C (2001) SIGEpi: sistema de información geográfica en epidemiología y salud pública. *Boletín Epidemiológico* **22**, 4–10.

PAHO (1994) Dengue and dengue hemorrhagic fever in the Americas: guidelines for prevention and control. *Scientific Publication* **548**, 29–30.

Sanchez L, Perez D, Cruz G, Silva LC, Boelaert M & Van der SP (2004) Community participation in the control of *Aedes aegypti*: opinions of the population in one section of Havana, Cuba. *Revista Panamericana de Salud Publica* **15**, 19–25.

Schaefer M (1981) Intersectoral coordination and health in environmental management. An examination of national experience. *Public Health Papers* **74**, 1–122.

Schaefer M (1982) Intersectoral coordination for health. *WHO Chronicle* **36**, 37–39.

Swaddiwudhipong W, Chaovakiratipong C, Nguntra P, Koonchote S, Khumklam P & Lerdlukanavonge P (1992) Effect of health education on community participation in control of dengue hemorrhagic fever in an urban area of Thailand. *Southeast Asian Journal of Tropical Medicine and Public Health* **23**, 200–206.

Terazon O, Miyar R, Orozco I, Alvarez N & Vallejo G (1999) Administracion estrategica local y su repercusion en la participacion social en salud. *Revista Cubana de Medicina General Integral* **15**, 386–390.

Tsai S & Fawcett SB (2000) A review of collaborative partnerships as a strategy for improving community health. *Annual Review of Public Health* **21**, 369–402.

Wang CH, Tai N, Hui H & Mei CH (2000) Integrated control of dengue vector *Aedes aegypti* in Liu-Chiu Village, Ping-Tung county, Taiwan. *Journal of the American Mosquito Control Association* **16**, 93–99.

Winch P, Leontsini E, Rigau-Pérez J, Ruiz-Pérez M, Clark GG & Gubler DJ (2002) Community-based dengue prevention programs in Puerto Rico: impact on knowledge, behavior, and residential mosquito infestation. *American Journal of Tropical Medicine and Hygiene* **67**, 363–370.

World Health Assembly (2002) *Dengue Prevention and Control*. Document A55/19. Available at: http://policy.who.int/cgi-bin/om_isapi.dll?infobase=whadoc-e&softpage=Browse_Frame_Pg42, accessed November 2004

© 2005 Blackwell Publishing Ltd

Authors
Lizet Sanchez (corresponding author), **Dennis Perez**, **Tamara Perez** and **Gustavo Kourí**, 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

© 2005 Blackwell Publishing Ltd