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Diffusion of community empowerment strategies for *Aedes aegypti* control in Cuba: A muddling through experience

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ABSTRACT

Effective participatory strategies in dengue control have been developed and assessed as small-scale efforts. The challenge is to scale-up and institutionalize these strategies within dengue control programs. We describe and critically analyze the diffusion process of an effective empowerment strategy within the Cuban *Aedes aegypti* control program, focusing on decision-making at the national level, to identify ways forward to institutionalize such strategies in Cuba and elsewhere. From 2005 to 2009, we carried out a process-oriented case study. We used participant observation, in-depth interviews with key informants involved in the diffusion process and document analysis. In a first phase, the data analysis was inductive. In a second phase, to enhance robustness of the analysis, emerging categories were contrasted with Rogers' five-stage conceptual model of the innovation-decision process, which was eventually used as the analytical framework. The diffusion of the empowerment strategy was a continuous and dynamic process. Adoption was a result of the perceived potential match between the innovative empowerment strategy and the performance gap of the *Ae. aegypti* control program. During implementation, the strategy was partially modified by top level *Ae. aegypti* control program decision-makers to accommodate program characteristics. However, structure, practices and organizational culture of the control program did not change significantly. Thus rejection occurred. It was mainly due to insufficient dissemination of know-how and underlying principles of the strategy by innovation developers, but also to resistance to change. The innovation-diffusion process has produced mitigated results to date, and the control program is still struggling to find ways to move forward. Improving the innovation strategy by providing the necessary knowledge about the innovation and addressing control program organizational changes is crucial for successful diffusion of empowerment strategies. Issues highlighted in this particular experience might be relevant in the innovation-diffusion process of other complex innovations within health systems.

Introduction

In many countries, dengue vector control is the responsibility of vertically-organized programs, usually within ministries of health (MOH). These programs typically conduct, at varying levels of intensity, entomological surveillance, chemical and biological vector control, and information-education-communication campaigns to promote preventive measures and behavior change. These activities are generally carried out with very little involvement of communities. In the international literature there is an increasing agreement that participatory strategies are the way forward for *Aedes aegypti* control and dengue prevention (Winch, Kendall, &

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Gubler, 1992; San Martín & Prado, 2004; Parks & Lloyd, 2004; Pérez et al., 2007; Toledo et al., 2008). However, most of these participatory strategies remain small-scale efforts, usually implemented in pilot projects.

The next steps but also the challenge for control programs, is scaling-up [a gradual and planned movement from micro to macro implementation, with significant resource mobilization] (Mangham & Hanson, 2010); as well as institutionalization [the process of establishing guidelines, norms and values to ensure widespread and consistent adoption of an innovation within an organization] (Goodman & Steckler, 1989). This is linked to the issue of diffusion [the process that occurs when an innovation (e.g., a new idea, product, practice or service) is introduced into a social system and eventually adopted or rejected by its potential users] (Rogers, 2003).

However, with the exception of Vietnam (Kay & Nam, 2005; Nam et al., 2012), little movement in these directions is being observed. In the last decade the Cuban Institute of Tropical Medicine "Pedro Kourí" (IPK) increased the evidence-based knowledge on effectiveness (Toledo et al., 2007a, 2011; Sánchez et al., 2009; Vanlerberghe et al., 2009; Castro et al., 2012), cost-effectiveness (Baly et al., 2007), replicability (Pérez et al., 2010) and sustainability (Toledo et al., 2007b) of empowerment strategies for *Ae. aegypti* control.

Many studies have been conducted on the diffusion of new products, services, clinical behaviors, technologies, technical procedures and training programs, and their adoption by individuals and/or organizations. Much less is known on the diffusion of evidence-based complex strategies and policy innovations within national health systems or control programs (Dennis et al., 2002; Riley, 2003; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).

We conducted research on how an evidence-based empowerment strategy was introduced within the national *Ae. aegypti* Control Program (*Aa*CP), so as to impact *Ae. aegypti* infestation levels and dengue transmission at large. We describe and critically analyze the diffusion process of the empowerment strategy, focusing on decision-making at the national level, to identify ways toward institutionalizing this kind of strategy in Cuba and possibly elsewhere.

Methods

Conceptual framework

Our conceptual framework draws on Rogers' Diffusion of Innovation theory (2003). In the particular case of diffusion of innovations within organizations, Rogers conceptualizes the innovation-decision process as a sequence of five stages that need to be unfolded: two stages (Agenda-setting and Matching) in the initiation subprocess and three (Redefining/restructuring, Clarifying, and Routinizing) in the implementation subprocess (Fig. 1).

During initiation, knowledge about the innovation is crucial. Rogers (2003) makes a distinction between three types of knowledge: awareness-knowledge [knowing that the innovation exists]; how-to knowledge [information on how to put the innovation into practice]; and principles-knowledge [information related to the underlying principles on how the innovation works].

Reinventions [bringing changes to an initial proposal] are of particular importance throughout implementation of the innovation-decision process (Rogers, 2003). Reinventions might lead to faster and sustainable adoption of the innovation. However, a certain degree of fidelity [strict adherence to the initial proposal] in the implementation of the innovation is also needed to maintain its intended effects (Dusenbury, Brannigan, Falco, & Hansen, 2003; Fixsen, Naoom, Blasé, Friedman, & Wallace, 2005; Rebchook, Kegeles, Huebner, & the TRIP Research Team, 2006; Pérez et al., 2010). Both reinvention and fidelity hinge on the concept of "mutual adaptation" (Leonard-Barton, 1988; Goodman & Steckler, 1989; Backer, 2001). The innovation will need to be reinvented by the users throughout the process of its adoption and implementation (Rogers, 2003), and organizational changes will need to occur within the host organization to accommodate the innovation (Fixsen et al., 2005).

Although some authors (Van de Ven, Polley, Garud, & Venkataraman, 1999; Meyer & Goes, 1988; Kitson, 2008) argue that Rogers' model suggests a linear pathway of the innovation-decision process, in practice the model considers the process as dynamic with back and forth movements and overlapping along the stages. Rejection or the decision not to adopt might also occur. Every stage in the process is a potential rejection point. Discontinuance is defined as a decision to reject an innovation after having previously adopted or even implemented it (Rogers, 2003).

The transition along the stages may be affected by various determinants that can play differently depending on the stage. Determinants can be divided into: characteristics of the innovation (e.g., relative advantage, complexity); characteristics of the organization (e.g., decision-making process, size); characteristics of individual users (e.g., knowledge, skills) and the socio-political context (e.g., social norms and legislation). A successful innovation-decision process requires the elaboration of an appropriate innovation strategy by innovation developers in order to accommodate such determinants (Fleuren, Wiefferink, & Paulussen, 2004). Additional information on Roger's framework can be found online.

In terms of Rogers, the empowerment strategy described in the proposal is the innovation to be diffused, *Aa*CP is the host organization and the IPK Social Research Group is the innovation developer.

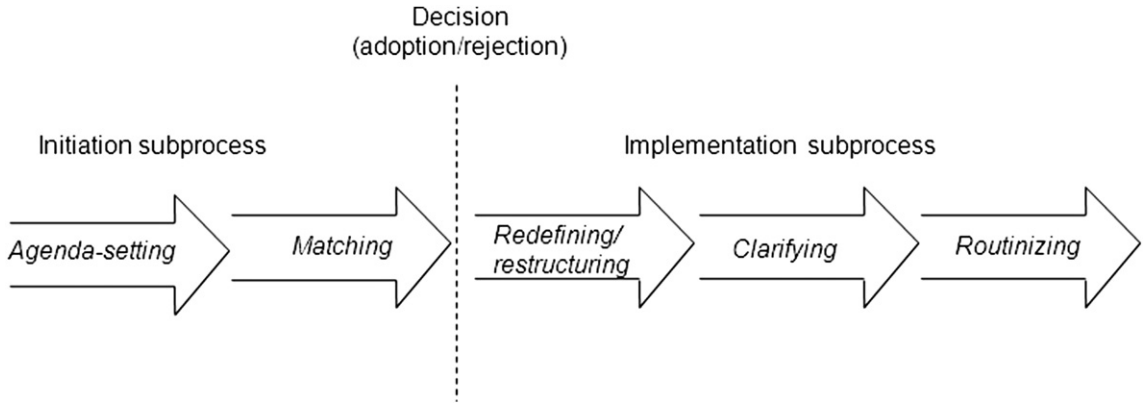

Fig. 1. Five-stage model of the innovation-decisions process in organizations (adapted from Rogers, 2003).

Background

The Cuban *Aa*CP, established in 1981, is nested within the MOH under the Direction of Hygiene and Epidemiology (Kourí, Guzman, Bravo, & Triana, 1989). It has country wide coverage and is structured alongside the organizational levels of the National Health System (i.e., national, provincial, municipal, and primary health care). The *Aa*CP is vertically structured and mainly managed at the national level although, to a certain extent, decentralized decision-making is possible in accordance with local characteristics and the epidemiological situation. Approximately 30,000 field workers conduct standard activities such as entomological surveillance, larval source reduction and adult mosquito control, health education, and enforcement of mosquito control legislation (i.e., use of fines when breeding sites are found in households). The population is just a passive recipient of such activities.

In early 2005, the *Aa*CP initiated a reorganization of the program to face a challenging entomological situation characterized by dengue outbreaks (Kourí et al., 1998; Peláez et al., 2004; PAHO, 2006). The inclusion of community participation as a program component was foreseen in the reorganization process. Previously tested empowerment strategies by IPK (referred to in the Introduction) alongside other Cuban research experiences (Spiegel et al., 2004; Díaz et al., 2009) served as the basis for the elaboration of the proposal.

The innovative strategy was grounded in basic empowerment principles such as developing a bi-directional and experience-based learning process for capacity-building and establishing mechanisms to ensure shared leadership and decision-making between stakeholders (Pérez et al., 2009). It implied that the *Aa*CP and other sectors would share responsibilities with the community in developing activities such as environmental management, vector surveillance and the elaboration of local communication strategies.

The strategy was conceived as a horizontal component to be integrated within the *Aa*CP. It included several core elements which would act interdependently to ensure *Aa*CP reorganization and the involvement of communities in controlling the mosquito vector.

*Aa*CP reorganization would include: modifying program guidelines and objectives to incorporate participatory planning as a program activity; incorporating assessment of risk and associated behaviors in the routine entomological surveillance; transforming *Aa*CP field workers into change agents for community empowerment; appointing the latter to specific neighborhoods; and strengthening intersectoral collaboration.

At the community level it was foreseen that the *Aa*CP field workers would train community leaders as health promoters for *Ae. aegypti* control; community working groups (CWGs) would be established and provided with capacity-building on participatory planning for vector control (e.g., problem assessment including at-risk behaviors, planning, execution, and evaluation of activities). CWGs would integrate broader intersectoral groups in the health area.

Fig. 2 shows the core elements of the empowerment strategy in relation to the *Aa*CP hierarchical levels and functions.

Study design, data collection and analysis

The research project is a process-oriented case study built on qualitative data. The case study is instrumental (Stake, 1995) since it aims to provide insights into an issue (i.e., diffusion and institutionalization). We used participant observation, in-depth interviews with key stakeholders and document analysis. The project took place over five years, from early 2005 to the end of 2009. The diffusion process was followed-up at the national and provincial levels of the *Aa*CP, in particular in four provinces where *Ae. aegypti* infestation levels were relatively high: La Habana, Camagüey, Santiago de Cuba and Guantánamo.

Participant observation. The participant observer was the principal investigator (DP) who was also part of the innovation developer team. Approximately 300 days of fieldwork were conducted consisting mainly of attending formal and informal meetings and informal conversations with stakeholders attending these meetings. They comprised routine *Aa*CP program manager meetings at the national level, specific meetings and workshops related to the reorganization of the *Aa*CP program at the national and provincial levels, internal meetings of the innovation developer team and advocacy meetings and workshops organized by the latter. All meetings relevant for studying the process were attended by DP.

In-depth interviews. We conducted in-depth interviews with 23 key actors at specific moments in the innovation-decision process (evaluations, major program reorientations, etc.). A total of 41 interviews were conducted as some informants were interviewed more than once. Interviewees, identified during the fieldwork, were actors with a potential significant role in the process, and included MOH and *Aa*CP decision-makers at the national and provincial levels ($n = 7$), innovation developers ($n = 4$), *Aa*CP staff ($n = 5$), and other individuals knowledgeable of or involved in the diffusion process ($n = 7$). The purpose of the interviews was to explore the actors understanding of the empowerment strategy, difficulties encountered during the diffusion process and perceived reasons for these, and to gain insights about the decision-making process. In addition, factors influencing the adoption of the strategy at the highest decision-making levels and implications for further institutionalization were explored. All interviews were audio-taped and transcribed.

Document analysis. A total of 58 official documents produced by the innovation developers, the MOH and *Aa*CP at the national and provincial levels and other organizational or individual actors involved in the innovation-decision process were included in the analysis. Sampling was exhaustive for the MOH and *Aa*CP official documents ($n = 18$), innovation developers' proposals ($n = 7$), and evaluation and follow-up reports of the changes introduced in the *Aa*CP control strategy ($n = 2$). In addition, we analyzed all available minutes of workshops and coordination meetings ($n = 31$).

Data analysis. Interview transcripts and documents were analyzed in Spanish, with the support of the QSR NVivo 7 (QSR International Pty LTD, Melbourne, Australia, 2007). In a first phase, the data analysis was mainly inductive. In a second phase, to enhance robustness of the analysis, emerging categories were contrasted with Rogers' five-stage model of the innovation-decision process (Fig. 1). Most of the categories fit the model conditional on some reordering of the coding tree, relabeling of categories and minor recoding. Accordingly, we decided to use Rogers' theory as our analytical framework. The remaining emerging categories (e.g., difficulties) were specific to the context or to this particular experience. To increase the internal validity of the analysis, progress was regularly discussed with the IPK investigation team composed of researchers from different backgrounds such as epidemiology, public health, and entomology. Reflexivity and control of bias due to the involvement of DP in the dissemination process was supported by her sociological background and continuous interaction with another sociologist (PL) not involved in the strategy development or the dissemination process. Finally, the results of the analysis were presented to and discussed with study participants (two of which are co-authors of this paper).

Ethical issues

The research protocol was reviewed and approved by IPK's Ethical Committee and the Cuban Ministry of Health Infectious

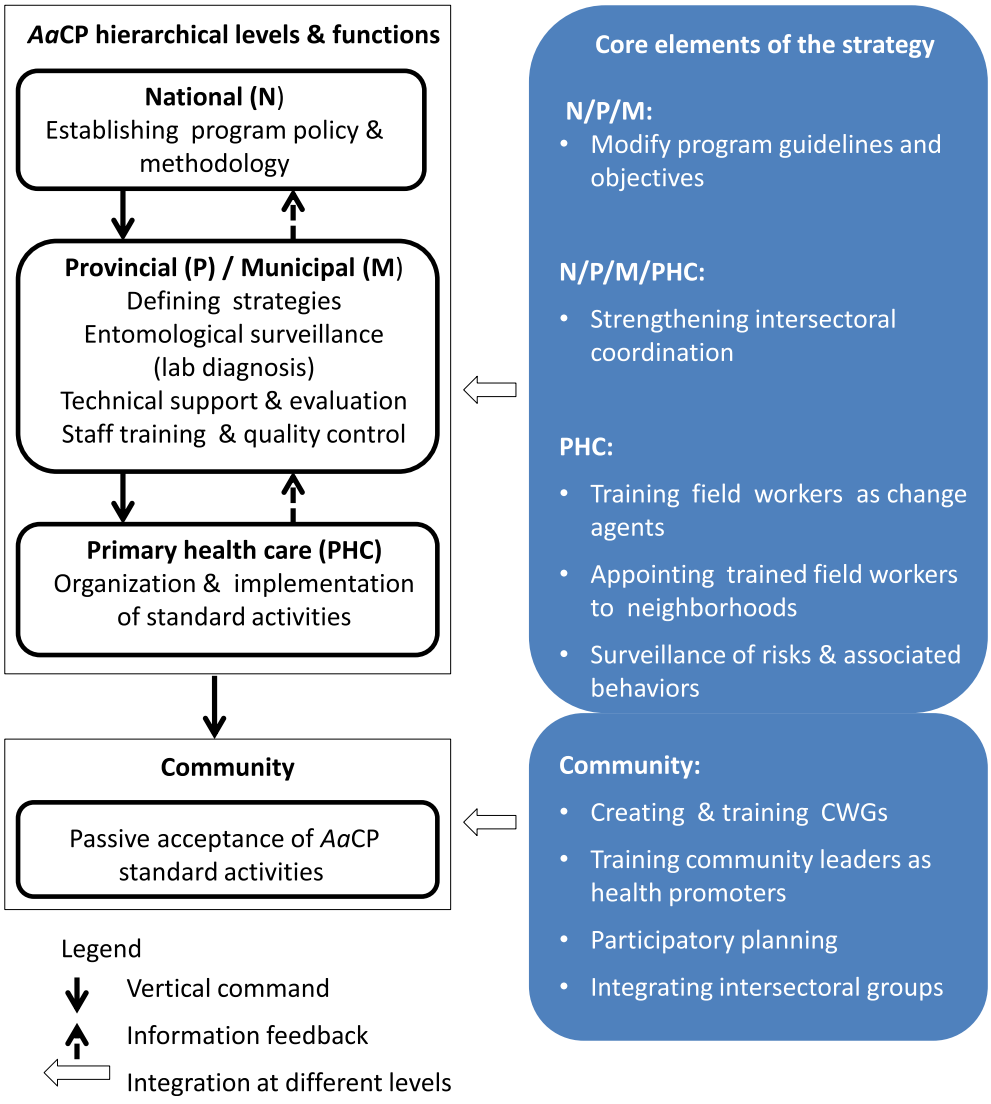

Fig. 2. Core elements of the empowerment strategy intertwined with *Aa*CP hierarchical levels and functions.

Diseases Research Committee. The MOH and national *Aa*CP decision-makers were provided with a verbal and written explanation of the objectives and procedures of the study. Verbal informed consent was obtained from interviewees. Quotations presented in this paper are anonymous to preserve confidentiality.

Results

Our results are presented in two parts. First we describe the diffusion process of the empowerment strategy within the *Aa*CP through the lens of Rogers' five-stage model, focusing on decision-making at the national level. In the second part we examine more specifically the interplay of the determinants on the innovation-decision process.

Rogers' five-stage model

Initiation subprocess

Our data analysis shows that the *agenda-setting* and *matching* stages were initiated in 2002, previous to our research project. Indeed, after an important dengue outbreak at the end of 2001 and under political pressure, the *Aa*CP showed interest in the empowerment strategies being developed by IPK researchers through small-scale pilot projects. Although preliminary and encouraging results were available, the empowerment strategy was not yet fully developed and IPK researchers could not formally describe it in a format useful for the *Aa*CP. As a result, the *Aa*CP decided not to adopt the strategy (Fig. 3).

Renewed *agenda-setting* and *matching* stages lasted to early 2005 when the *Aa*CP decided to elaborate the "Reorganization Program of Vector Surveillance and Control" (UNVLA, 2005) (Fig. 3). The Reorganization Program aimed to improve *Aa*CP performance in terms of human resources selection, training and management, quality control, implementation of entomological surveillance and vector control methods, and enforcement of existing legislation. The *Aa*CP requested IPK to prepare a proposal for a community empowerment strategy to be included in the program. The proposal was the basis of the section on "community participation and intersectoral collaboration" in the policy document. Although "community participation" was frequently encountered in the discourse of *AaCP* decision-makers, it had never been described in an *Aa*CP official document before.

The empowerment strategy thus completed the two first stages of Rogers' diffusion model. This resulted in the formal decision to

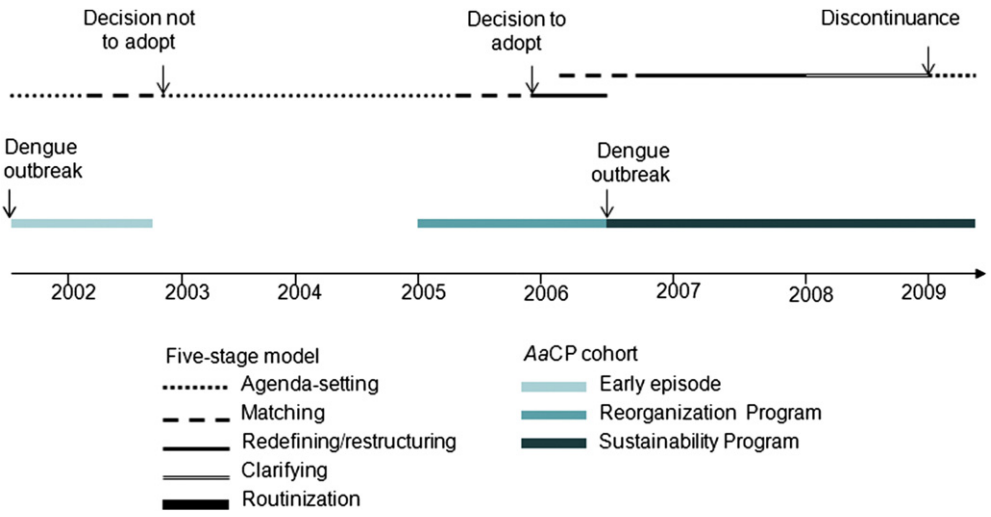

Fig. 3. Diffusion process of the empowerment strategy within the *Aa*CP, Cuba, 2001–2009.

adopt it at the national level in December 2005. The decision was triggered by various factors: the epidemiological situation, political pressure from the central government, a perceived performance gap of the *Aa*CP, and advocacy by the innovation developers.

Mid 2006, new dengue outbreaks occurred in several provinces of the country. As a response, a new program, the Sustainability Program (MINSAP, 2006) was developed by the *Aa*CP. At that time the first stage of the implementation subprocess in Rogers' model, *redefining/restructuring*, had already started with the dissemination of the Reorganization Program policy (Fig. 3).

The Sustainability Program was conceived as a broad intersectoral program coordinated by the MOH that included the *Aa*CP and other sectors and social organizations. During the elaboration of the Sustainability Program document many actors were consulted for advice including the innovation developers who were, at some moments, able to provide additional explanations on their proposal.

The content analysis of the Sustainability Program document shows that the chapter on vector control draws heavily on the *Aa*CP Reorganization Program document, although the core elements of the empowerment strategy are spread throughout the whole document. The link between the two successive programs is expressed in the following statement from an interviewee:

> *"The reorganization of the AaCP somehow is contained within the Sustainability Program… the reorganization was just for the health sector… vector control… It was something very specific related to the activities that we* [*Aa*CP] *carry out; we wanted to have a new look at them. This is now within the Sustainability Program complemented with other health and intersectoral actions."* [*Aa*CP staff]

Analysis of the interviews and official documents reviewed from the agenda-setting and matching stages showed an imbalance between the three types of knowledge about the empowerment strategy among the *Aa*CP staff. The main knowledge type was awareness-knowledge. This included knowing about the empowerment strategy and its effectiveness. References to how-to knowledge (how to put the innovation into practice) were much less frequently encountered and were mainly related to the absence of such knowledge (e.g., lacking guidelines for capacity-building in participatory planning and practical information on the conduct of the process with diverse stakeholders). There were no references to principles-knowledge (information related to the underlying principles on how the innovation works).

This lack of knowledge could be at the origin of feelings of uncertainty about the strategy by the *Aa*CP staff:

> *"Most of disease control is based on community participation. Today there is nothing we achieve in the world without community participation but… Who will motivate people? Who will give them the necessary tools? How will we do it? How will we do it everywhere… because all the settings are different."* [*Aa*CP staff]

Innovation developers generally attributed the low levels of how-to and principles-knowledge to weaknesses in the innovation strategy:

> *"When we elaborated the proposal we did not do everything we could do to allow it to be generalized by decision-makers. The strategies are effective from a research point of view but we did not conceive them to be executed by others … We did not present our results* [to decision-makers] *in an accessible and understandable way, and we were lacking practical guidelines for implementation at different levels…"* [Innovation developer]

> *"They* [decision-makers] *did not know what the proposal was* [in the pilot studies] *and what happened in the settings where it was implemented. We need a compilation of experiences with how-to-do-it information and a comprehensive description."* [Innovation developer]

The document analysis triangulates this finding. Indeed, it shows that the innovation developers' proposal lacked detailed how-to guidelines and a description of the innovation's underlying principles.

Implementation subprocess

Implementation at the *Aa*CP national level included making sense of the proposed empowerment strategy, establishing and disseminating guidelines for action, and decision-making on resources (e.g., technical, financial, material, human) to ensure field level implementation. Both innovation developers and *Aa*CP staff recognized the essential role of *Aa*CP higher level decision-makers in developing steps to move forward through the implementation stages.

> *"We are researchers; they are the decision-makers… The implementation of the strategy requires a whole process developed at several levels… however, to make it possible someone has to take the decision. If that person is not motivated or does not understand*

it [the strategy] *or does not approve it, nothing will happen."* [Innovation developer]

"We decided, and it is included in the Sustainability Program, to do what IPK has been advocating for…. to institutionalize community participation projects in the whole country…so people don't have to develop participation on their own [without support]. *Today it is approved at the national level that it should be done everywhere, we did it with that purpose."* [AaCP staff]

At the first stage of the implementation subprocess, *redefining/restructuring*, a certain degree of reinvention occurred. At the start, the Reorganization Program document closely reflected the innovation proposal but with the elaboration of the Sustainability Program reinventions were gradually introduced and the strategy lost its coherence.

Capacity-building and functions of health promoters were focused on vector control. Shifts in emphasis were also progressively brought in to the strategy components. For instance, the establishment of local communication strategies was discarded in favor of traditional mass communication strategies. Other structures of the National Health System and various social organizations were put in charge of working with the community. Essential activities to empower the community were thus externalized and removed from the responsibility of the *Aa*CP.

The terminology used by innovation developers and *Aa*CP staff was quite similar, although understanding of the concept was often different. The approach to participation proposed by innovation developers was empowerment as compared to the utilitarian and technocratic approach used by *Aa*CP. For instance, the word "*autofocal*" [destruction of *Ae. aegypti* foci by householders] used by the *Aa*CP, reflects an understanding of participation as a behavioral change to be achieved at the individual and household levels:

"For me… what is needed is that everyone does at home what he/she has to do. For me that is community participation." [*Aa*CP staff]

However, for the innovation developers participation was conceived as empowering the communities in order for them to take decisions on how to change the factors that favor dengue transmission. The following statement extracted from a document prepared by the innovation developers illustrates this:

"To promote at the community level the creation of groups for community work integrated by formal and informal leaders, Primary Health Care and vector control staff. These groups (guided by health promoters) conduct community needs assessment, establish priorities and elaborate action plans for vector control."

Restructuring was also problematic. *Aa*CP organizational changes occurred to a much lesser extent than reinvention. Structure and practices and, most importantly, the organizational culture of the *Aa*CP did not change significantly. Some interviewees attributed this fact to resistance to change among decision-makers:

"Some people do not want to try them out [participatory strategies] *despite knowing the strategies are good. They prefer that others do it. They are low risk-taking decision-makers. They say, it could be generalized but I'm not going to do it. And you cannot generalize something if you don't try it out."* [Innovation developer]

"They [AaCP decision-makers] *do not see the training as something important, they do not see the new communication strategies as important; they just see resources… they continue asking for higher salaries for their staff but the salaries will not change the situation if there is no commitment… all kind of resources are welcomed* [by the AaCP decision-makers] *but how about change to their own mentalities…because sometimes we think that mentalities just should change for field level staff. If you ask them* [AaCP decision-makers], *to participate in a communication and participatory management training, they do not have time to do it…"* [Key actor]

During the *clarifying* stage, *Aa*CP and the other sectors and social organizations included in the Sustainability Program elaborated detailed proposals and guidelines for the actions they had to undertake to contribute to sustainable *Ae. aegypti* control. These were included in the Sustainability Program document and vertically disseminated through the official communication channels of the sectors involved. The program was then implemented throughout the country. In early 2008, monthly "sustainability meetings" were officially established and held at national, provincial and municipal levels to follow-up the actions undertaken by each sector.

Finally, the reinvented empowerment strategy never reached the *routinizing* stage before discontinuations were observed mid 2009. This is illustrated using the particular case of the health promoters for *Ae. aegypti* control, a core element of the empowerment strategy which was reinvented during the elaboration of the Sustainability Program document. The *Aa*CP established the Community Workers for Vector Control (CWVCs). These were retired individuals or housewives from the community who acted as health promoters for *Ae. aegypti* control. Instead of being volunteers, the CWVCs received remuneration, were considered part of the *Aa*CP staff, and trained on vector control. Consequently, their function was to facilitate and support routine vector control activities of the *Aa*CP in their communities and no longer to guide participatory planning of CWGs.

The idea of CWVCs emerged in response to the outbreak in 2006, and was strongly supported by the MOH and advocated by top level *Aa*CP decision-makers. The official document on CWVCs (UNVLA, 2007) was written by the *Aa*CP between November 2006 and May 2007. The CWVCs were progressively introduced, from the end of 2007 onwards, into selected municipalities in Ciudad de La Habana, Camaguey, Santiago de Cuba, and Guantánamo (these provinces had the highest *Ae. aegypti* infestation levels):

"… I think it [the CWVCs] *is very good, it is a typical example of the recognition of community participation as a vital action for mosquito control or for other diseases… It is a way to institutionalize it, to establish it by law."* [AaCP staff]

"It is true; first it [the CWVCs experience] *was a response to the epidemic. It means we had the urgent need to find a solution to the epidemic… it was an administrative initiative, supported by many top level decision-makers, which seemed pertinent at that time…"* [MOH staff]

The CWVCs deployment was formally evaluated by the *Aa*CP at the request of the MOH after a period of 16 months of field level implementation. It was finally discontinued due to dissatisfaction with its performance. Interviewees highlighted disenchantment with the experience and other contextual issues:

"The CWVC unfortunately is disappearing…it was born in a difficult situation and it was utilized for multiple activities. The MOH asked for an evaluation and there was no impact, so the decision was made to take them out." [AaCP staff]

"…in some places the experience [CWVC] *worked better, but neither of the two places evaluated provided evidence of its impact in relation to its cost* [to the AaCP]… …*The epidemic was already stopped and the conditions that favored the adoption of the CWVC as an urgent need had changed…. In the assessment we noticed, first, that areas with community workers did not achieve a better impact than the areas without them… In addition it* [the CWVC

experience] *was a huge expenditure on salaries for the health system…"* [MOH staff]

However, all actors did not agree with the results and consequences of the evaluation of the CWVCs:

"In my opinion the arguments to take CWVCs out were insufficient. We lost personnel that were really important for me." [*Aa*CP staff]

"Related to the CWVCs, it works depending upon how it is conducted. In some places they have worked as fundamental personnel to coordinate vector control and health education activities. But in other places of the municipality they did not receive the necessary training. The importance of CWVCs has not been understood in some health areas, and they were conducting actions different from those they were created for." [*Aa*CP staff]

Innovation developers attributed the main problems observed with the implementation of the CWVC experience to the understanding that *Aa*CP had of "participation" and the indicators they used to assess its effectiveness:

"In our experience, decision-makers talk about participation as if it is just one single thing and in most of the cases they are talking about collaboration with the actions of the program [*Aa*CP]*."* [Innovation developer]

"I think the Sustainability Program succeeded in achieving its objectives, but social objectives are more difficult to accomplish and there is no structure to generalize them, maybe their scaling-up should be slower. Regarding the CWVCs, it proved to be a link between vector control staff and the community. We cannot assess their effectiveness just by measuring [*Ae. aegypti*] *infestation levels."* [Innovation developer]

Influence of the determinants of the innovation-decision process

Neither the characteristics of the *Aa*CP and the perceived attributes of the empowerment strategy favored the innovation-decision process. The *Aa*CP, as part of the MOH, is an authoritarian, highly hierarchical and rational organization (as defined by Weber) with centralized decision-making, standardized rules and procedures, and authority mainly based on technical expertise. Additionally, the *Aa*CP has no uncommitted financial, material and human resources available to experiment with new avenues. On the other hand, although during the initiation stages *Aa*CP decision-makers perceived the empowerment strategy as appealing, their view on its added value changed over time. The strategy was perceived as difficult to implement, time consuming and incompatible with the *Aa*CP organizational culture and behavior.

The epidemiological situation characterized by recurrent outbreaks and high infestation levels of *Ae. aegypti* in several provinces of the country had a positive influence during the first two stages of the innovation-decision process. The recurrent outbreaks created and increased the perception of an *Aa*CP performance gap. In parallel, governmental political will and commitment to prevent dengue transmission was an opportunity for the innovation developers to promote the empowerment strategy. All these elements played an important role in the *agenda-setting* and the *matching* stages and led finally to the decision to adopt the empowerment strategy. However, the recurrent outbreaks also played negatively. When confronted with outbreaks, which were considered as emergency situations, the *Aa*CP tended to apply its traditional and well known strategies and control methods that were perceived as more efficient in the short term.

Other determinants favorably influenced the innovation-decisions process: supportive policies of international health organizations toward community participation in disease control; prestigious Cuban scientists advocating for the adoption of the innovation; the existence of individual change agents at *Aa*CP intermediate levels; and previous successful pilot projects that increased the visibility of the potential benefits of the innovation.

Discussion

Our research, together with few others (Riley, 2003; Atun, Kyratsis, Jelic, Rados-Malicbegovic, & Gurol-Urganci, 2007; Greenhalgh et al., 2008) demonstrates the usefulness of Roger's framework to analyze the diffusion of policies and complex interventions aimed at reforming health systems and disease control programs. In our particular case, the framework clarified the diffusion pattern of a complex innovation (an empowerment strategy) at high decision-making levels in a national control program, and the determinants of the pattern.

The present paper contributes to a better understanding of a top-down diffusion process of an empowerment strategy for *Ae. aegypti* control. A close look at the process revealed that the diffusion of the empowerment strategy within the *Aa*CP was a continuum rather than a set of isolated diffusion efforts at different points in time. Stages were not discrete and not always mutually exclusive. Back and forth movements were observed at *Aa*CP top decision-making levels, as well as several adoption/rejection points. Adoption was a result of a gradual perceived potential matching between *Aa*CP needs and the promising solutions offered by the empowerment strategy to improve performance. However, the adopted strategy was, in all likelihood, oversimplified and difficulties in implementation and required organizational changes underestimated by *Aa*CP decision-makers. The innovation-diffusion process has produced mitigated results to date, and the control program is still struggling to find ways to move forward.

As stated by Rogers (2003), diffusion of an innovation is a cognitive process in which change agents reduce the degree of uncertainty of potential users by providing them three types of knowledge (awareness, how-to and principles-knowledge). However, the type, the relative weight and critical timing of knowledge diffusion vary according to the nature of the innovation, the characteristics of the decision-makers, and the diffusion stage.

A study conducted in England on the adoption and implementation of new technologies in hospital settings concluded on the importance of how-to knowledge in the earlier stages of the diffusion process that was underestimated by clinical and non-clinical staff in favor of principle-knowledge (Kyratsis, Ahmad, & Holmes, 2012). In our research, decision-makers were mainly national policy-makers unfamiliar with the issue of empowerment. For these decision-makers it appears that principles-knowledge together with how-to knowledge is crucial in early diffusion stages. Indeed for complex and disruptive innovations such as empowerment strategies, it is of particular importance that decisions-makers properly understand the proposed required organizational changes implied and how they might alter program culture and behaviors.

The lack of principles and how-to-knowledge about the innovation identified at the *Aa*CP national level was problematic for further implementation of the strategy. This level was responsible for disseminating the strategy at lower organizational levels and they could only communicate the knowledge and understanding they had of it. Indeed, this lack of knowledge resulted in re-inventions that altered some of the basic underlying principles of how empowerment strategies work and thus their commitment to implement required organizational changes. As a consequence the "reinvented strategy" failed to achieve the intended effects of the initial proposal, leading to dissatisfaction with the innovation and discontinuance.

These reinventions could have two origins. On the one hand, they can be explained by the ambiguities attached to the concept of participation extensively discussed in the literature (Rifkin, 1996; Laverack & Labonte, 2000; Morgan, 2001; Pérez et al., 2009). The strategy was not understood as community empowerment by *Aa*CP. On the other hand, some reinventions seem to fit better with *Aa*CP staffs' traditional expertise, or were considered easier to implement and did not require significant organizational changes.

Our results also show that the changes that occurred within the *Aa*CP were limited. *Aa*CP modified the innovation to accommodate its needs, structure, expertise, goals and organizational culture but did not significantly attempt to change itself in order to adapt to the innovation. The process was closer to what Berman and McLaughlin (1976) call "cooptation": adaptation of the innovation without changes in the organizational culture. This is in line with previous findings (Toledo et al., 2007b; Vanlerberghe et al., 2009; Pérez et al., 2010) that indicated the need to address changes in the organizational culture, capacity and expertise of *Aa*CP staff to achieve sustainable adoption and widespread implementation of empowerment strategies.

Other authors have also highlighted the importance of internal organizational factors in the diffusion of community-based health promotion innovations (Riley, 2003). As stated by Greenhalgh et al. (2004), an organization maybe amenable to innovate in general but not actually be ready or willing to assimilate a particular innovation. It often requires that host organizations learn new competencies and modes of functioning (Dennis, Hébert, Langley, Lozeau, & Trottier, 2002). The issue of how the diffusion process could be supported and enhanced should be consciously tackled.

A critical reflection on the diffusion of the empowerment strategy revealed weaknesses in the innovation strategy. It failed to accommodate main categories of determinants influencing adoption by *Aa*CP decision-makers: characteristics of the innovation and of the host organization. Indeed, information provided about the innovation was insufficient in content and in scope. Additionally, actions to increase *Aa*CP readiness to assimilate the strategy were overlooked.

Lessons and conclusions

Our research provides insights and lessons for further diffusion and institutionalization of empowerment strategies in Cuba that could have value elsewhere and for other disease control programs.

While empowerment strategies will never present themselves as blueprints, they will usually be complex, lengthy, disruptive and uncertain for the host organization. Control programs are often bureaucratic, centralized, hierarchical and characterized by high internal resistance to change. These characteristics of empowerment strategies and of host organizations are likely to present similarities among countries. According to the diffusion of innovation theory, the combination of these two sets of characteristics generally leads to low levels of adoption.

An innovation strategy should be developed to increase the likelihood of sustainable adoption. Efforts should be made to increase the fit and compatibility of empowerment strategies with the control programs, without sacrificing the underlying principles. Possible avenues are the elaboration of a comprehensive description of the proposal encompassing more principles-knowledge and practical how-to knowledge and the establishment of appropriate mechanisms to provide the information required so the proposal is properly understood and implemented at field level.

The innovation strategy should also be more responsive to satisfy potential users' needs and reduce uncertainties at later stages of implementation. Awareness of the relative advantages of empowerment strategies and their cost-effectiveness needs to be raised through advocacy efforts, to counter the tendency to rely on short-term vector control methods. Closer monitoring and follow-up of the diffusion process and experiences as well as operational and implementation research need to be enhanced by strategy developers. Establishing an exchange platform to share information and experiences between innovation developers and users is another avenue to consider. How-to and principles-knowledge could also be increased through the use of demonstration sites. Whatever the avenues chosen, they need to be precisely defined and planned (Smith, Williams, Owen, Rubenstein, & Chaney, 2008).

To address resistance to organizational change a necessary condition is to secure decision-makers' long term commitment to introduce required changes within their program and to drive the process forward. Changes encompass staffing, resource allocation, organizational culture and capacity for planning, monitoring and follow-up on the diffusion of large scale field implementation, and institutionalization of innovative strategies (Riley, 2003; Toledo et al., 2007b; Pérez et al., 2010). A way forward could be to establish within control programs a special unit comprising high level program managers, skilled change agents at intermediate levels and even innovation developers to drive the process.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2013.02.003.

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