



Situation of Cholera in February 2017

Recommendations For the Implementation of a Elimination Strategy

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Contents

Introduction	2
Epidemiological situation in February 2017	3
The causes of failure of the struggle during the last three years	7
Persistence of the country's vulnerability	Error! Bookmark not defined.
Under-funding of patient care in healthcare facilities	7
Insecurity and lack of visibility of community funding	8
Failure of epidemiological vigilance	9
Excessive deficiencies and delays in diagnosis	10
Persistence of foci of transmission despite interventions by mobile teams	11
Recommendations	12
• Securing funding for control activities.....	12
• Better control of the work of the departmental health departments	12
• Intensify collection of stool specimens	12
• Modernizing methods for the microbiological diagnosis of cholera	12
• Better training for field teams	12
• Ensure better mobility of field teams.....	12
• Increasing the scope of action of teams around cases.....	12
• Re-launch small water security projects to be carried out rapidly in the affected areas.....	12

Table of figures

Figure 1. Evolution of suspected cases of cholera between January 2013 and February 2017	3
Figure 2. Evolution of the positivity rate of stool samples taken in the context of the microbiological diagnosis of cholera between January 2013 and February 2017.	5
Figure 3. Monthly incidence of cholera and location of deaths at the beginning of 2017.....	6

Introduction

More than six years have passed since Haiti became prey to cholera following the discharge of contaminated fecal matter in a tributary of the Artibonite river. Officially on December 31, 2016, the epidemic was responsible for 803,864 cases and 9434 deaths, of which 41,421 cases and 447 deaths occurred in 2016. Although these data are particularly impressive, studies conducted by Epicenter and MSF during the first months of the epidemic show that in reality cholera-related mortality has been much higher, reaching up to 5% of the population living in some rural areas of the north of the country. These deaths have never been accounted for because they occurred at home in areas where access to care is virtually nil and where no administrative entity accounts for deaths and their causes.

The fight against cholera in Haiti took a long time to organize. It took three years to develop the concept of a rapid response to outbreaks of epidemics. The implementation of this new program was not finalized until 2014, in the fourth year of the epidemic, when water and sanitation response teams (WASH) and hygiene promotion, mainly managed by NGOs coordinated by UNICEF, have begun to intervene systematically to limit the spread of epidemics at the local level. These teams were responsible for increasing awareness of hygiene measures in areas still affected by cholera and helping the population to protect their drinking water by distributing chlorine pellets and advising households on the best way to treat and conserve drinking water. Where appropriate, WASH mobile teams could decide to set up a chlorination point by recruiting on-site a person responsible for treating water with a chlorine solution. It is also in the course of 2014 that mixed mobile teams (medical and WASH, called EMIRA, mobile rapid response teams) managed by the Ministry of Public Health and Population (MSPP) were in place to strengthen the WASH teams. Thanks to this medicalization of the mobile teams, it is now possible to actively search for cases in the community, to treat them and to administer prophylactic antibiotic treatment to people in close contact with a patient suffering from cholera. However, financing problems, logistics, administrative hurdles from certain administrative departments and the lack of recognition of mobile teams greatly hampered the implementation of the control program. The motivation of the staff paid by the Ministry of Health was undermined by considerable delays in payment. For their part, the teams managed by the NGOs suffered from a lack of visibility in the medium term, their contracts being renewed for too short of durations, which prohibited stable recruitment and in-depth training of personnel. Despite this, the program has become the cornerstone of the fight against cholera in Haiti. Thus, since the program's implementation, episodes of high transmission have dramatically decreased, continuously falling below 350 suspect cases per day (Figure 1). In particular, the

last peak observed in October 2016 after Hurricane Matthew did not exceed the peaks of previous years and was followed by a phase of very rapid decline, initiated well before the completion of a vaccination campaign against cholera occurring from November 8th to 17th, 2016.

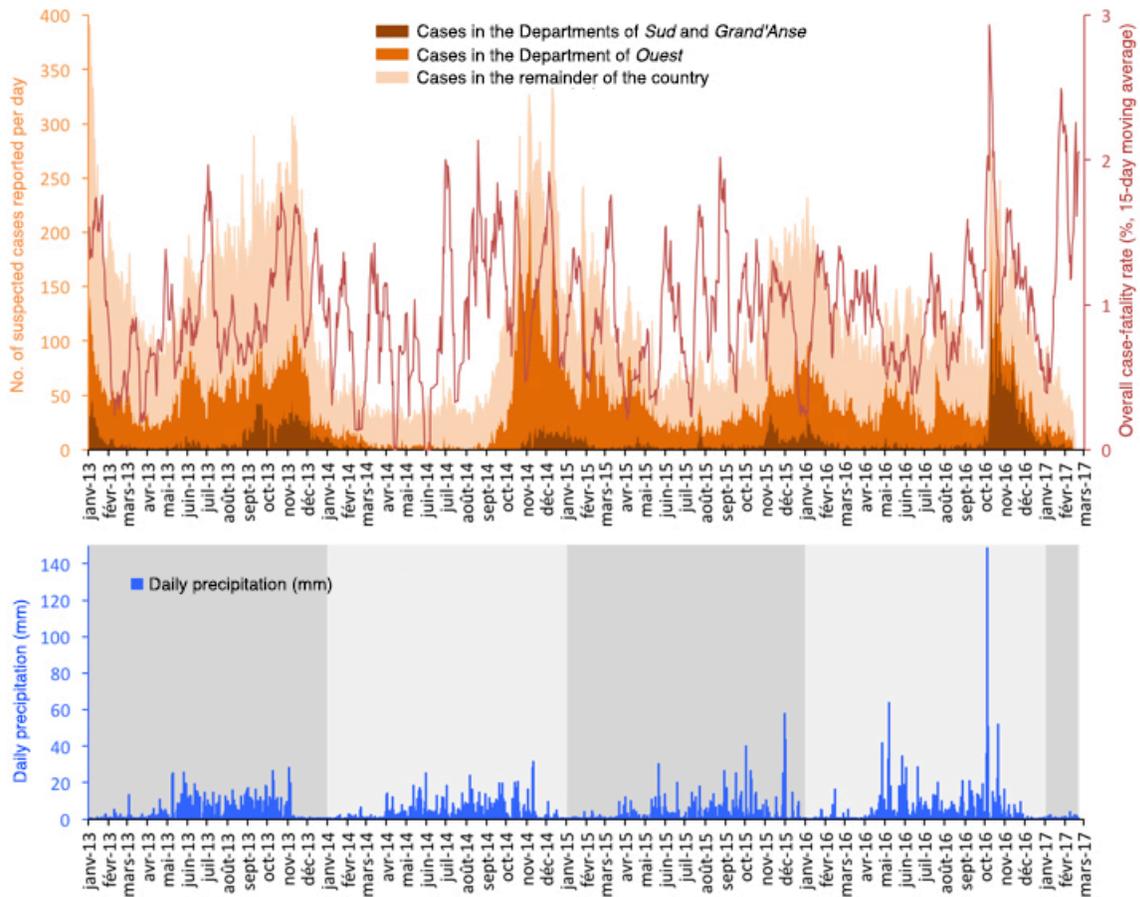


Figure 1. Evolution of suspected cases of cholera between January 2013 and February 2017.

The decline in the incidence of cholera, which has become particularly acute in recent months, and the improved response potential of mobile teams (both more numerous since the strengthening of the system in the aftermath of Hurricane Matthew, and more experienced than when they were introduced in 2013 and 2014) suggest a possibility of completely interrupting the transmission, or at least considerably reducing it during the dry season up to May. However, the intervention strategy needs to

be repositioned and the objectives of responses to each alert should be redefined, aiming at a total elimination of local transmission whenever possible in order to concentrate actions in the persistence zones. This change of direction requires a reframing of the current program, which has been the focus of the mission carried out in February 2017 and of this report.

Epidemiological situation in February 2017

The year 2016 had started badly due to the lack of sufficient mobile teams, the late start of the decline usually noted during the dry season (only in January, one to two months later than in previous years), and the interruption of the dry season as the rains returned in mid-April. Thus, between April and July, the number of suspected cases of cholera was well above that observed during the same period during the two previous years. In the field, the lack of response teams had resulted in an inability to effectively block ongoing outbreaks, particularly in the *Centre* department where a major epidemic peak had been reached in June. Subsequently, cholera spread to neighboring departments, particularly into the *Artibonite* and the *Ouest* departments.

From July, under the pressure of the field actors relayed by local officials of MINUSTAH, UNICEF and WHO, as well as editorials and articles in the international press, the UN General Secretariat expressed concern about the deteriorating situation and provided an emergency loan which enabled UNICEF to strengthen the mobile teams. The number of such teams has grown from thirty to sixty between June and September 2016 and then to about a hundred in order to face the health problems posed by Hurricane Matthew in early October. At the end of September, the situation seemed to be under control and the number of suspected cases (around 500/week) had returned to that of previous years at the same time. The arrival of Hurricane Matthew at epidemiologic week 40 resulted in a tripling of suspected cases within two weeks, mainly in the departments of *Sud* and *Grand'Anse*. It should be noted, however, that this peak corresponds largely to an increase in cases of non-choleraic diarrhea in the aftermath of the hurricane, as evidenced by the low rate of positivity of cholera cultures carried out for the two departments most affected: 31% between weeks 40 and 47 [95% confidence interval: 23-39%]; compared with 64% [44-84%] of the 8 weeks before the hurricane. Subsequently, measures taken to improve access to drinking water made it possible to rapidly control the situation which had virtually returned to normal during the first half of November, when a vaccination campaign was conducted in

several municipalities in the departments of *Sud* and *Grand'Anse*. The decline of suspected cholera cases has continued since then, both in vaccinated and unvaccinated areas. Thus, in January 2017, the number of suspected cases (1,854 suspected cases for the whole country) was the lowest recorded since the beginning of the epidemic with the exception of January 2014 (4504 in 2012, 7195 in 2013, **1595 in 2014**, 4314 in 2015 and 5322 in 2016). This reduction in the number of suspected cases is all the more encouraging in that it is accompanied by a steady decline in the percentage of positive cultures on a national scale. While the culture positivity rate exceeded 70% in June 2016, it fell below the 40% mark in early 2017 (Figure 2).

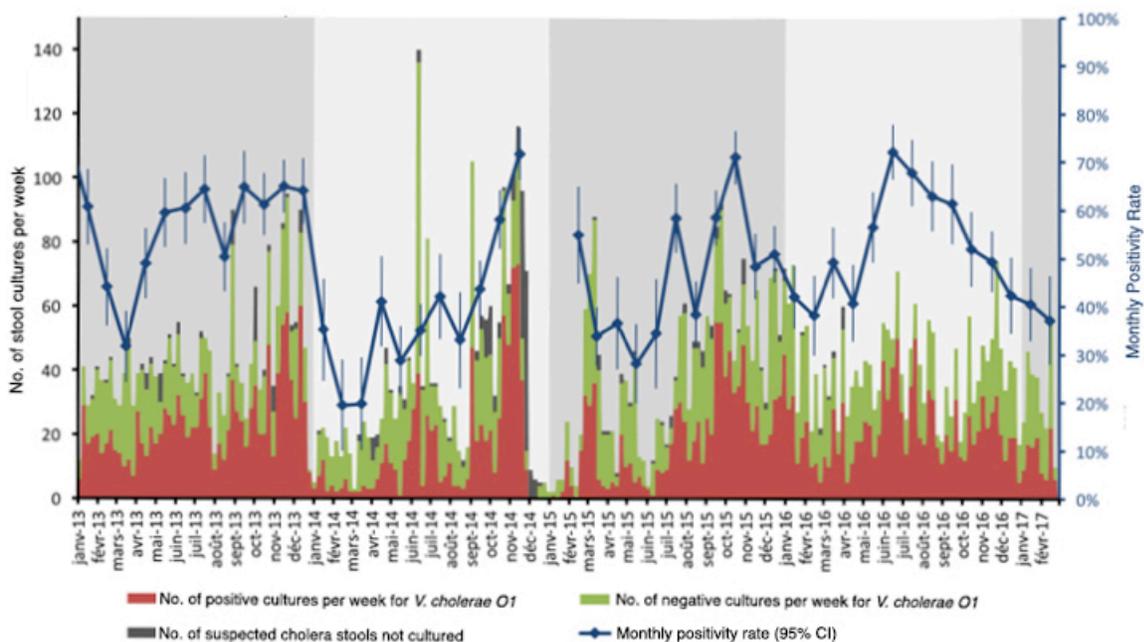


Figure 2. Evolution of the positivity rate of stool samples taken in the context of the microbiological diagnosis of cholera between January 2013 and February 2017.

These cases of cholera are not regularly distributed throughout the Haitian territory and despite the marked decrease in the incidence of cholera, pockets of persistence have been formed, one in the north of the country, one in the south, in the area affected by hurricane Matthew, and the latter around Port-au-Prince (Figure 3).

January – February 2017

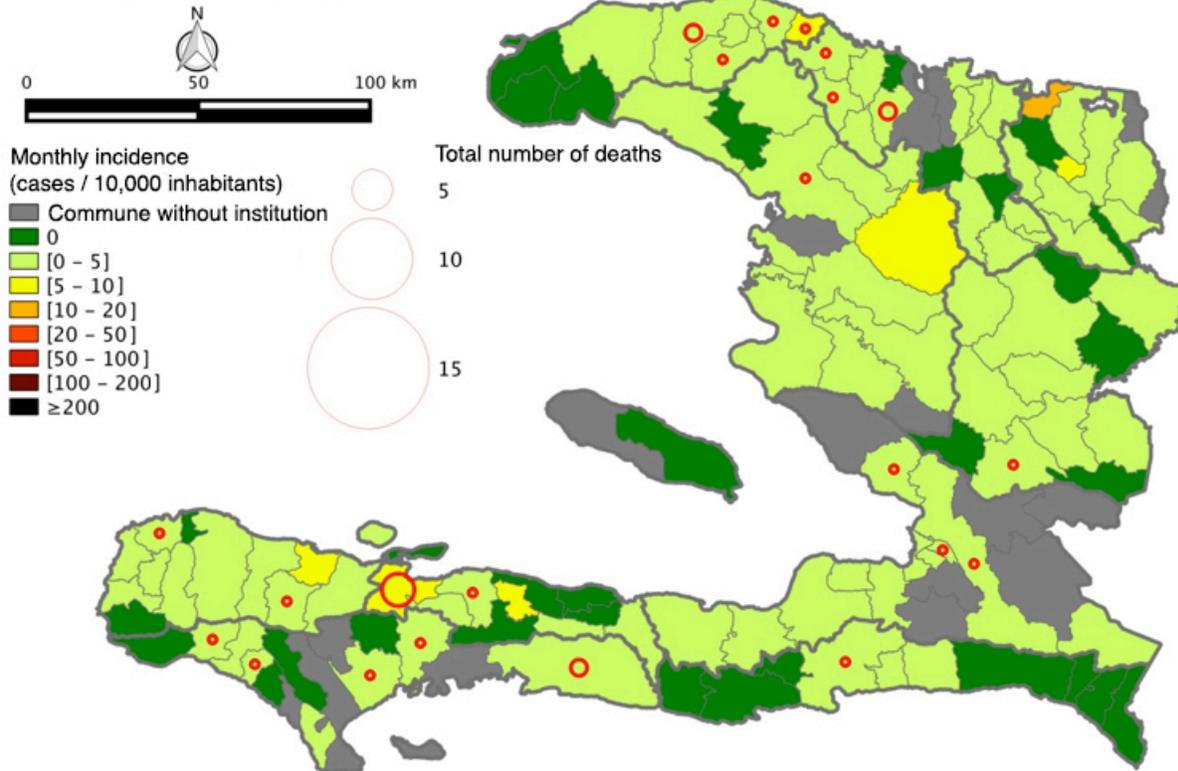


Figure 3. Monthly incidence of cholera and location of deaths at the beginning of 2017.

The epidemiological situation in February 2017 is therefore very similar in terms of the number of suspected cases, the positivity of suspected cholera and the location of persistent foci to that prevailing at the beginning of 2014. At that time, the incidence of cholera had abruptly fallen during the arrival of the dry season. This lull would last for seven months, between February and August 2014, with about 1,000 suspected cases per month. Unfortunately, a lack of surveillance in the *Ouest* department (where various care structures were not taken into account in the epidemiological surveillance of cholera) and a poor adequacy of response to the persistence of cholera in some households, half of the country (especially in the Matheux Mountains, around Gonaïves and Saint Michel de l'Attalaye) had resulted in increased cholera transmission from September and then to major outbreaks in metropolitan Port-au-Prince from October onwards. These outbreaks, linked to a contamination of the drinking water network in the southern part of the capital, had allowed cholera to disseminate again to all the departments, annulling the results acquired at the beginning of 2014. A study currently being finalized on the strains of *Vibrio cholerae* isolated in 2013 and 2014 throughout the Haitian territory, indicates that the recovery of

cholera at the end of 2014 was linked both to the persistence of the transmission of cholera in the department of *Ouest*, not detected by the surveillance system, and the poor response to persistent foci detected in the northern half of the country. This study shows that: (1) just before the low-transmission episode of 2014, two sets of strains were circulating in the country, both originating from the clone introduced in Haiti in 2010; 2) that the first set covered the Port-au-Prince area and the second, the departments in the northern half of the country; 3) that these two sets of strains persisted despite the decline in transmission and 4) that these strains recolonized their respective territories at the outbreak resumption in October 2014. Thus, the decline in incidence of cholera had not been sufficiently intense and prolonged to interrupt transmission, neither in the rural areas of the north of the country nor in the metropolitan Port-au-Prince. It is therefore important to analyze in detail the causes of past failures in order avoid similar problems.

The causes of failure of the struggle during the last three years

Persistence of the country's vulnerability

Six years after the introduction of cholera in the country, Haiti remains in the front line of the countries most affected by the disease. In rural areas, lack of access to drinking water and source contamination by fecal matter, particularly after rain, are widespread problems. In urban areas, water systems serve only part of the districts, are undersized and poorly maintained. Some have even been vandalized causing outbreaks of cholera in Port-au-Prince (late 2014 and early 2015), Carrefour (idem), Plaisance (late 2015) and Pilate (late 2015). In short, virtually no major project has been finalized to improve access to drinking water in rural and urban areas, and the vulnerability of the country to cholera in particular has not evolved favorably since the beginning of the epidemic. However, the plan for the elimination of cholera in Haiti 2013-2022 had put forward very ambitious objectives (such as increasing access to drinking water for at least 85% of the population and increasing access to sanitation facilities to at least 90 per cent of the population), but this plan, amounting to \$ 2.2 billion, has never been funded.

Under-funding of patient care in healthcare facilities

In addition to the problems of access to drinking water and sanitation, Haiti suffers from a major underfunding of State services, which has worsened over the past five years, in particular of all services relating to health. This underfunding of health results in a demotivation of the staff, especially in certain

centers of treatment of cholera and places of transmission of the disease. In February 2017, during the investigation of a cholera outbreak in Saint-Michel de l'Attalaye, we noticed the absence of medical staff (neither doctor nor nurse) in the cholera treatment center despite the presence of a dozen patients, three of whom were under an infusion. On this occasion, we learned that, due to lack of funding, the NGO supporting the center had packed up since January 31st and no one was taking care of the cholera treatment center except for a volunteer not trained in the practice of care. Eventually a nurse from the neighboring hospital could come to the rescue when an infusion was needed, but she did not stay to monitor the progress of the patient's condition. It was in this context that a few days before, a patient had died just after leaving the treatment center to go home. Clearly, the severity of his condition had not been properly assessed. Two days after our passage, we learned of a new death in the same center. This is all the more worrisome since the same problem of interruption of external aid applies to several care facilities, all of which have been left to themselves since January 31st, when WHO and donors funds traditionally used to support the management of cases of cholera were no longer available. This lack of case management results in an increase in case-fatality (estimated at 1.35% for the first six weeks of 2017), while the absence of an outbreak and the high proportion of suspected cases not due to cholera should have maintained case-fatality well below 1%. Moreover, such a decay in the operation of these treatment centers can only facilitate the nosocomial transmission of cholera, as well as its community transmission from hospital waste if, due to lack of surveillance, such waste is discharged into the environment.

Insecurity and lack of visibility of community funding

For the time being, with the increase in mobile teams and the increase in their effectiveness in the field, the major failure in cholera patient care is compensated by the reduction in cases (especially when considering that most of the suspected cases currently registered are not due to cholera). As a result, the absolute number of deaths (35 deaths, 25 of which were in health centers for the first six weeks of the year) remains far below what Haiti had experienced at the beginning of the epidemic. This situation will continue as long as the mobile teams are able to prevent outbreaks from occurring upstream. In the event of a failure in prevention, cholera mortality could rapidly become catastrophic.

Alongside the underfunding itself, the fight has suffered greatly from the lack of visibility in the medium term. Thus, mobile teams, whose financing was only provided for periods of a few months, were not managed as if they were to last, with all that this implies in terms of management and training. The fact

that these teams were permanently in a financially precarious situation and that they lacked the necessary visibility to put in place an adequate training plan certainly had important consequences for the quality of the work carried out on the ground.

Unfortunately, available information on funds collected by the UN for the elimination of cholera in Haiti suggests the worst. Six months after the appointment of a special adviser appointed by the Secretary-General of the United Nations to implement a phase-out strategy and to collect \$400 million, has resulted in failure. Only a few countries (South Korea, France, India, Lichtenstein and Peru) have agreed to contribute to a common fund, currently worth less than \$2 million. Even taking into account contributions directly provided by Canada and Japan, funds available for cholera control are only 2% of the \$400 million required by the United Nations. The United Nations must do much more as emphasized by the Secretary General of the United Nations before the General Assembly. For now, the support is even less than before.

Failure of epidemiological vigilance

The fragmentation of epidemiological surveillance - with a normative central level that has no real authority over the departmental operational level - has generated significant disparities in the obtained results. As a result, geographical areas and health care facilities have repeatedly escaped the vigilance of the system, being weak points in the system of protection against cholera outbreaks. It is because of one of these weaknesses - in this case a lack of integration of several care structures in epidemiological surveillance in the *Ouest* department - that an outbreak north of the metropolitan area of Port-au-Prince in September 2014 was detected only after a period of six weeks. At that moment it was too late to master it. Acts of vandalism on the water network of the capital then took over, allowing cholera to be transmitted in certain districts via the water consumption of the network. By the time of finding a solution to this major public health problem, cholera had spread at a distance, losing all the ground gained during the first eight months of the year 2014.

Upstream of the response, the success or failure of the program will depend on the quality of epidemiological surveillance and its ability to identify areas where the disease is still circulating. To do this, and taking into account the uncorrected failures of routine surveillance in some departments, the system needs to be strengthened by gathering information at its source, even if it is necessary to visit daily care structures that can accommodate cases of cholera. UNICEF recruitment of departmental officers in the *Ouest*, *Centre*, *Artibonite* and *Nord* departments should help to strengthen the system and

avoid mistakes made in 2014. Being expensive, this control process concentrated on the departments most frequently involved in the persistence of cholera.

Excessive deficiencies and delays in diagnosis

The precise diagnosis of cholera is one of the most critical points of the struggle because it is from the patients seen in the care facilities that the community struggle is organized. For a time, the use of rapid diagnostic tests had been recommended to carry out a first selection among the suspected cases of cholera. Unfortunately, despite considerable efforts to disseminate them on the ground and train health care providers and technicians to use them, the results were so disconcerting when confronted with the results of bacterial cultures that the use of these tests was abandoned. So we have come back to the clinical definition of cases, which is also questionable. This results in a burst of energy and prevents efforts to be concentrated on areas where cholera is actually prevalent. This is not a major problem in the event of an outbreak, however, as soon as the transmission decreases, the absence of a reliable diagnosis does not make it possible to find the background noise of diarrheal diseases caused by a wide variety of etiologies.

The microbiological diagnosis, as produced by culture of stool at the National Public Health Laboratory, is much more reliable. There are no false positives (perfect specificity), and the risk of missing a diagnosis (lack of sensitivity) is quite limited if the transport conditions of the stool samples are respected. On the other hand, it is limited by the technical time required, related to the use of techniques now abandoned in modern microbiology laboratories. The use of new approaches, such as MALDI-TOF-type mass spectrometry that allows immediate identification of a bacterial colony, or DNA amplification (by quantitative PCR or LAMP [Loop-mediated isothermal amplification]) would save a lot of time in rendering the result and increase the number of samples treated every day.

In addition to technological innovations, there is also the question of how to organize sampling flows upstream of the laboratory and in the laboratory, as well as rendering real-time results. It is therefore the whole process that must be questioned in order to put the biological diagnosis back at the heart of the strategy of rapid intervention, targeted on the areas really affected by cholera.

Persistence of foci of transmission despite interventions by mobile teams

In 2014 we saw that some outbreaks persisted when they were detected and a response was implemented. This lack of effectiveness can be the result of a number of factors, some of which are improving and others are not. Over time, mobile teams have gained experience. If we get a little more visibility on their funding, it will be possible to better train them, motivate them and supervise them. In addition to the first-line response from mobile teams, the implementation of small-scale water security projects can be essential to improve the performance of cholera control, especially in rural areas. In urban areas, failure to solve problems of water supply and sewerage remains a handicap for the struggle. In areas most vulnerable to cholera, vaccination could facilitate control of transmission, provided that it is done in optimal conditions (two doses accompanied by public awareness and chlorine distribution to protect water in homes). Finally, it is necessary to recall how complicated it is to evaluate precisely the effectiveness of field actions in a context where no one can predict how an epidemic will evolve over a given territory.

To improve the performance of the response to alerts, a training module was developed in partnership with UNICEF and the Cholera Control Coordination Unit at the Ministry of Health and Population. It is intended for mobile teams, whether they are dependent on the Ministry of Health or partner NGOs. This module presents the main body of knowledge about cholera and its epidemiology and details, in the form of twelve successive steps, the procedure to be followed when responding to a suspicion of cholera transmission in a given community. Teaching, which includes a presentation phase followed by field implementation, takes into account all the activities to be carried out since the identification of a suspect case in a healthcare facility or following up a rumor in the community up to the drafting of a final report, analysis of the situation at the treatment center, the starting point of the investigation, and the various activities to be carried out on the ground to better understand the context of the transmission of cholera and put in place protective measures at the patient's home and in the vicinity. Particular emphasis is placed on identifying factors favoring local transmission of cholera, actively detecting possible new cases in the neighborhood, and implementing effective measures to limit the risk of transmission to other people. Finally, it is a question of getting the teams out of a routine activity where a repetitive procedure is applied to each intervention without taking into account the local context.

Recommendations

A new window of opportunity opens to eliminate cholera in Haiti. Thanks to the active work of the alert response teams, the epidemiological situation is much better than that of the last two years. On the other hand, the general context has not changed (Haiti's vulnerability to water-borne diseases) or has evolved unfavorably (management of the patients). The coming months will therefore be decisive for the outcome of the cholera epidemic in Haiti, with a real chance of elimination if the response is maintained and intensified as the number of active households decreases. This virtuous circle can be set up now, and in the longer term, lead to a complete halt of the transmission if the pressure is maintained until the last case.

However, most of the other components of the control provided by the updated version of the phase-out plan had to be abandoned or postponed due to lack of funding. Early warning response activities are thus the only component of the current funding struggle. This makes the task even more complicated and poses the risk of a major health catastrophe if, in spite of everything, a new outbreak should occur in such a context. It will therefore be necessary to be particularly vigilant in the coming months so as not to lose, in a few weeks, the achievements of several years of struggle.

Here are our key recommendations for the coming months:

- Securing funding for control activities
- Better control of the work of the departmental health units
- Intensify collection of stool specimens
- Modernizing methods for the microbiological diagnosis of cholera
- Better training for field teams
- Ensure better mobility of field teams
- Increasing the scope of action of teams around cases
- Re-launch small water security projects to be carried out rapidly in the affected areas.

Finally, let us not lose sight of the fact that long-term solutions must be implemented in parallel, since they will ultimately limit the vulnerability of the Haitian population to cholera and many of the diseases transmitted by non-potable water.