



Update on the cholera epidemic in Haiti and proposals for elimination.

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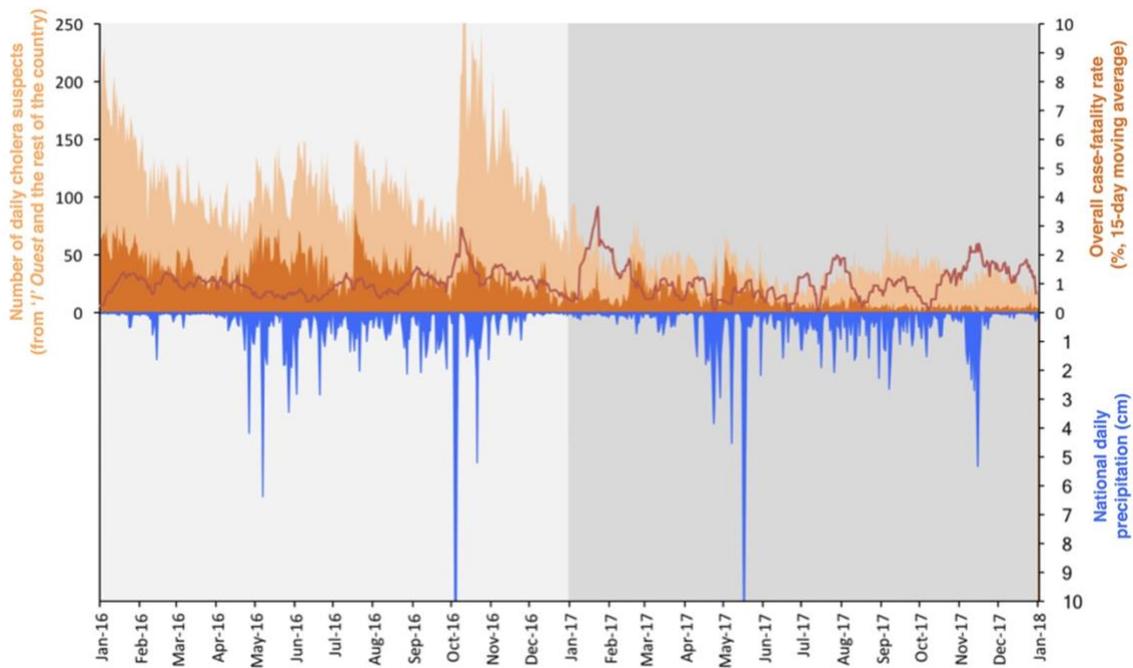
1. Dates and key facts of cholera since 2010

Cholera was introduced in Haiti in October 2010 following massive contamination of the Artibonite River by an imported strain of toxigenic *Vibrio cholerae*. For more than a year, the violence of the epidemic was such that most of the human and material resources had to be reserved for case-management and the reduction of disease-related case-fatality. From 2012, the cholera has moved along with a lull period at the beginning of the year, corresponding to the dry season, then a first peak in May, linked to the return of the rains and another in October, during the hurricane season. In the absence of a coordinated fight to limit community transmission, cholera remained at a particularly high level with more than 100,000 suspected cases and 900 deaths during the year. Starting in mid-2013, the implementation of a rapid response strategy to epidemic alerts has reduced this burden to about 60,000 cases in 2013 and 27,000 in 2014. That year, an early dry season markedly accelerated the decline of cholera which was around 30 to 50 new suspected cases per day between February and August 2014. Unfortunately, a lack of surveillance in the *l'Ouest* department has resulted in a resumption of cholera in the Port-au-Prince area. There, several outbreaks followed one another until February 2015, due to recurrent episodes of contamination of a water distribution network in the south of the municipality. These episodes of contamination were due to the infiltration of dirty rainwater into water system pipelines previously damaged by gangs trading in water drawn directly from these pipelines. In 2015 and 2016, due to lack of funding, the number of rapid response teams dedicated to fighting cholera in the communities was insufficient to control all outbreaks and cholera recovered its deadly path. Finally it was not until mid-2016, thanks to a loan of eight million dollars, that UNICEF was able to put enough teams on the ground to respond to almost all suspected cases in less than 48 hours. Since then, cholera has been in continuous decline for 20 months, with the exception of the period just after Hurricane Matthew (arrived October 4, 2016) which resulted in a peak of acute diarrheal diseases, resolved in a few weeks. Notably, the decline was already very apparent when a two-dose vaccination campaign was started. Cases had completely disappeared in both the vaccinated communes and in the neighboring unvaccinated communes even before the second dose was administered.

The community responses that are the spearhead of the fight are carried out by mixed teams involving EMIRA (mobile rapid response teams) dependent on the Ministry of Public Health and Population (MSPP) and WaSH teams (Water sanitation and hygiene) managed by NGOs coordinated by UNICEF. For each suspected case of cholera, these teams go to the patient's place of residence to trace the conditions in which the patient became infected, to sensitize the immediate entourage of the patient on the hygiene measures to adopt, to give them soap and chlorine tablets to treat water at home for a few weeks, to treat antibiotic contact (specific role of EMIRA) and to disinfect the floor and latrines of the house. The home visit is also used to carry out awareness-raising and distribution of chlorinated products in the immediate vicinity of the patient and if necessary, install a chlorination point (in practice, train and reward a person from the community responsible for chlorination of water at the point of drawing). Larger operations, called punch operations, are also being implemented to stop the most disturbing outbreaks or to control

the transmission of low-level cholera in urban spaces. Except in *Grand Sud* in October 2016, vaccination was used in a very limited way with less than 500,000 people vaccinated between 2012 and mid-2016 (Haiti has about 11 million inhabitants). Note that the effect of these vaccination campaigns fades over time (the protection period is believed to be about 5 years).

Figure 1 – Evolution of cholera in Haiti in 2016-2017. Number of suspected cases per day in the *l’Ouest* department and the rest of the country, 15-day overall case-fatality rate, and daily rainfall (sources: MSPP and NOAA).



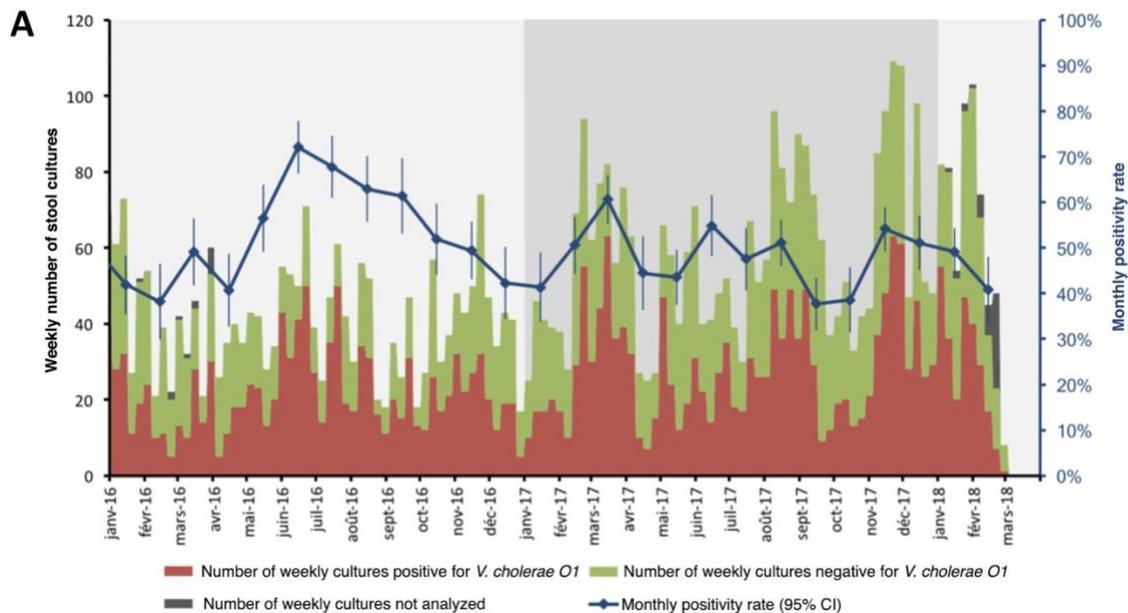
2. The current situation of cholera in Haiti

In March 2018, we can consider that cholera is no longer epidemic in Haiti. The vast majority of municipalities in the country have not declared any suspicious case for months and there are no more homes where transmission takes a really worrying turn. However, there are sporadic cases and even small clusters of cases in the Port-au-Prince greater metropolitan area that may lead to new outbreaks in the event of a response that is too late or insufficient. These cases are all the more difficult to detect because they are drowned in cases of acute diarrhea unrelated to cholera. It is for this reason that in recent months, each suspected case in *l’Ouest* department is subject to a microbiological confirmation. Currently, only one to two suspect cases in the department are confirmed each day. Outside Port-au-Prince, the situation is even calmer with one or two suspected cases a day in the departments of *Artibonite* and *Nord-ouest* and virtually nothing elsewhere.

In total, this represents only a few cases of cholera per day, which corresponds to a situation of pre-elimination.

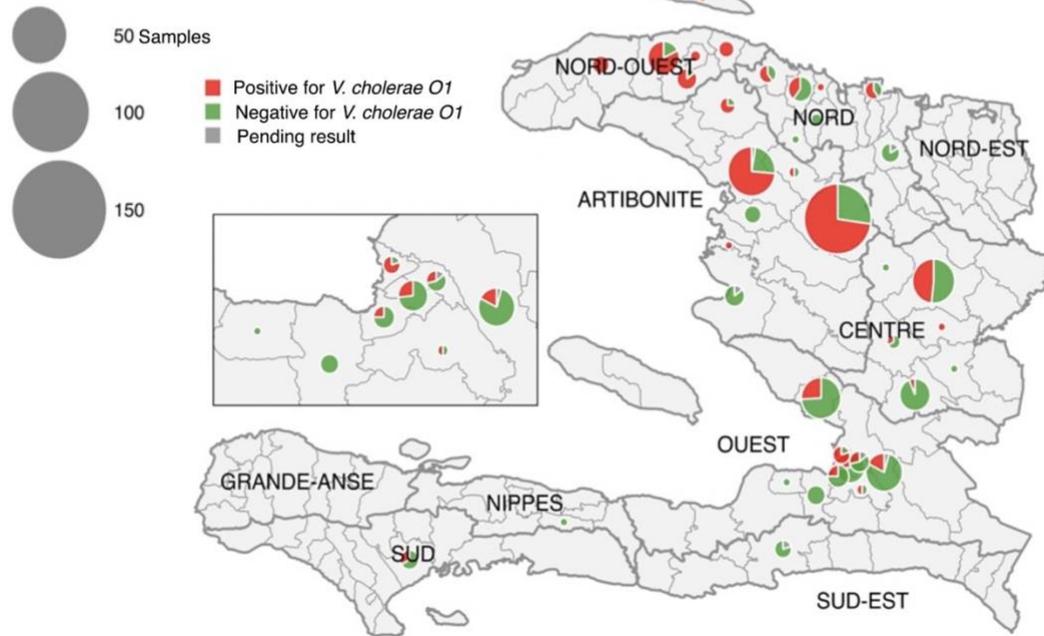
That said, even if we are no longer in an epidemic, the risk of outbreak persists as long as there are still cases. The objective is to arrive at zero cases confirmed for several consecutive months before easing the control program. The experience of Guinea in 2012 showed us that once the epidemic was over (end of 2012), there were sporadic cases for six months before cholera disappeared completely. Since then, and after five years, there has been no more cholera in the country. Many West African countries are currently experiencing a similar situation (no cases of cholera for a shorter or longer period), as well as Madagascar and, closer to Haiti, all the countries of Latin America (except Mexico which has recently experienced a small outbreak). All these countries may one day be faced with the return of cholera, but this requires re-importation from an active household. Indeed, it has recently been formally demonstrated that all the outbreaks that have hit Africa and the Americas in recent years have been related to the transcontinental importation of strains of *Vibrio cholerae* and not to the local emergence of a microbe of environmental origin.

Figure 2 - Microbiological confirmation of cholera cultures in Haiti. (A) Weekly evolution since early 2016. Commune-level distribution (B) in January 2018 and (C) in February 2018. (Source : MSPP, laboratoire de ZL à St Marc, laboratoire de GHESKIO à Port-au-Prince)



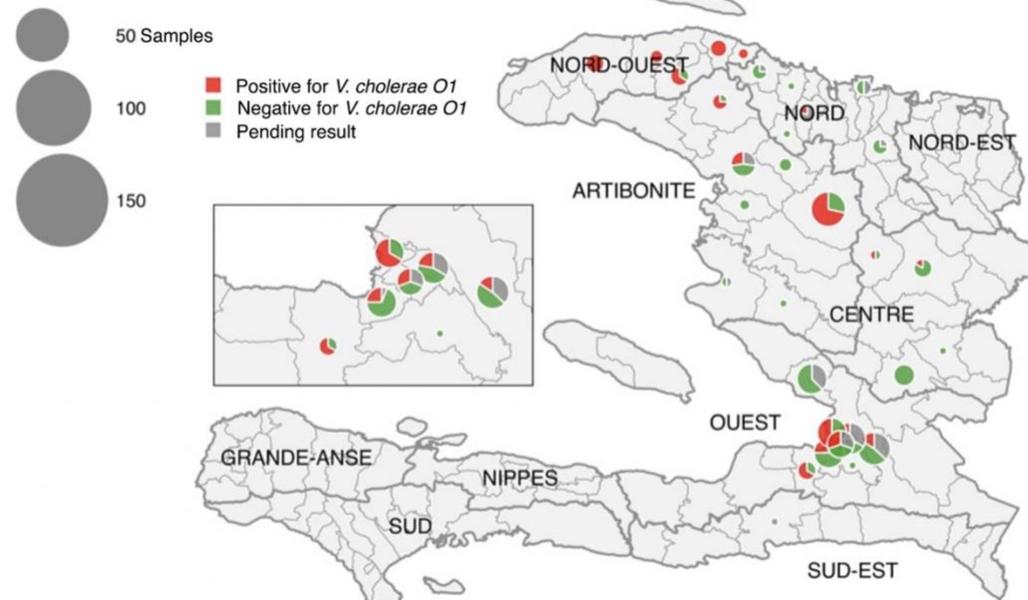
B
Cholera in Haiti
Stool cultures in January 2018

(Per commune and month of collection. Source: LNSP, ZL and GHESKIO)



C
Cholera in Haiti
Stool cultures in February 2018 (incomplete)

(Per commune and month of collection. Source: LNSP, ZL and GHESKIO)



3. What needs to be done to end cholera

Let's start with what should not be done: ease the control program by saying that cholera no longer kills anybody (at the time of writing, it seems that there has been no new deaths since the beginning of February). The Haitian population remains particularly vulnerable to cholera because access to drinking water, sanitation and care remains very problematic in the country, both in urban areas and in rural areas. Moreover, over time, the immunity conferred by the large epidemic waves of the years 2010 and 2011 has faded, especially since the circulating strain has mutated and the serotype that is currently circulating (Inaba) differs from the one circulating at the beginning of the epidemic (Ogawa). The effects of vaccination should not be overstated as the number of people vaccinated, even with the large vaccination campaign in the South following Hurricane Matthew, does not exceed 12% of the country's total population, a percentage insufficient to establish collective protection. In addition, the effects of the first vaccination campaigns, which are five years old or more, have now faded, and the populations concerned must now be considered unprotected.

It is therefore important to continue the fight by intensifying efforts on residual foci. This will be in the form of increasingly early interventions and more and more powerful rapid response teams to alerts and by setting up punch operations where cholera persists despite the responses.

In some areas, for example in the Port-au-Prince greater metropolitan area, the percentage of true cholera cases decreases among the suspected cases. However, the lower this proportion, the more important it will be to have a microbiological diagnosis carried out in a sufficiently short time to strengthen the fight around confirmed cases. The project of equipping the National Public Health Laboratory (LNSP) with a mass spectrometer is part of this logic. To make the fight more effective, it will be important to speed up the flow of the analysis - which is being set up with the support of the US Centers for Disease Control and Prevention (CDC) - as well as providing quick results for those engaged in the struggle.

It would also be interesting to facilitate cholera extinction in the last homes by implementing targeted vaccination campaigns in the most difficult areas, adding to the existing control programs. The mobile rapid response teams and vaccination efforts should not be opposed to each other; they are complementary. However, it must be ensured that funding for mobile teams does not come at the expense of immunization financing.

A rigorous implementation of this strategy should make it possible to gradually extinguish the last foci, and as has already been observed in many other countries, completely eliminate cholera in Haiti as well as the current strain. Then, since Haiti is situated far from the world's other cholera outbreaks, one can hope to avoid reimporting a new strain. Such a successful elimination program, however, should not prevent working to improve the living conditions of Haitians, in particular to improve access to drinking water and sanitation, focusing initially on areas where cholera has been most evident during all these years of epidemic. Cholera is indeed a disease whose transmission is facilitated by problems of access to drinking water in both urban and rural areas. In this sense, it is a revealer of the vulnerability of populations.

4. Required budget

Expenses programmed for the continuation of the strategy alert-response throughout the year 2018 amount to ten million dollars (exactly \$10,116,360 USD). This mainly includes the funding of NGO partners, DINEPA and the Ministry of Health (80%). The rest is the cost of coordinating and operating UNICEF, purchasing the inputs needed for the operations and indirect costs of the organization (cost of headquarters).

Taking into account the need to repay a loan from UNICEF New York, the ensured receipts amount to USD \$6,318,000 (Japan, Canada, CERF, World Bank, UNICEF France Committee, UNICEF Regional Internal Fund). The gap to be filled to ensure the financing of the struggle throughout the year 2018 is therefore \$3,798,360 USD.

These funds do not take into account the needs associated with the care of cholera patients (fortunately limited since there are almost no more cases) and the cost of a possible vaccination campaign to accelerate the elimination of cholera in areas where it persists.

Budget line	Support for 12 months (USD)
IEC (including local NGOs and municipal support)	\$500,000.00
DINEPA	\$252,000.00
Laboratory support and expertise	\$155,000.00
ONG	\$7,110,000.00
UNICEF coordination operational costs, including the purchase of inputs (chlorine, soap, antibiotics, etc.)	\$1,350,000.00
Total direct costs	\$9,367,000.00
Indirect costs UNICEF	\$749,360.00
Total	\$10,116,360.00
Budget already secured	\$6,318,000.00
Gap	\$3,798,360.00