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## Morbidity and Mortality Weekly Report (*MMWR*)

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### Update: Outbreak of Cholera --- Haiti, 2010

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#### *Weekly*

**December 10, 2010 / 59(48);1586-1590**

On December 8, 2010, this report was posted as an *MMWR Dispatch* on the *MMWR* website (<http://www.cdc.gov/mmwr>).

The first cholera outbreak in Haiti in at least a century was confirmed by the Haitian National Public Health Laboratory on October 21, 2010 (1). Surveillance data through December 3, provided by the Haitian Ministry of Public Health and Population (MSPP), indicated that the outbreak had spread nationwide and that cases of cholera and cholera-associated hospitalizations and deaths had climbed rapidly in November. As of December 3, MSPP reported 91,770 cases of cholera from all 10 departments and the capital city of Port-au-Prince; 43,243 (47.1%) patients had been hospitalized, and 2,071 (2.3%) had died. A rapid mortality assessment in Artibonite Department found that deaths occurred as rapidly as 2 hours after symptom onset and identified important gaps in access to life-saving treatments, including oral rehydration solution (ORS). Urgent activities are under way, and additional efforts are imperative to reduce cholera mortality by expanding access to cholera treatment and to reduce cholera transmission by improving access to safe water and adequate sanitation.

A nationwide cholera surveillance system has been established in Haiti. Hospitals and clinics send daily case counts to local MSPP officials; aggregate data are sent on to department-level officials and then to central government officials. A case of cholera is defined as profuse, acute, watery diarrhea in a resident of a department in which at least one case of cholera has been laboratory-confirmed by isolation of *Vibrio cholerae* from culture of a stool specimen. A hospitalized case occurs in a patient admitted to a health facility (i.e., a hospital or cholera treatment site) for at least one night. A cholera death is the death of a person with illness that meets the case definition for cholera. Any cholera death that occurs in a health facility, regardless of whether the decedent was admitted overnight, is considered a cholera hospital death. MSPP posts daily and cumulative tallies of cholera reports on a public website; tallies are stratified by department and age group (aged <5 years and all ages).\* Since November 16, nonhospitalized cases have been posted in addition to hospitalized cases.

All 10 departments and the capital city of Port-au-Prince have reported laboratory-confirmed cases of cholera. As of December 3, a total of 91,770 cases had been reported nationwide, and 43,243 (47.1%) patients had been hospitalized (Figure 1). The largest number of cases (42,596 [46.4%]) were reported from Artibonite Department, which comprises approximately 16% of the Haiti population (2) and is the department where cases were first laboratory-confirmed (Figure 2). As of December 3, of 2,071 deaths, 1,437 (69.4%) had occurred in hospitals. A total of 82,599 (90.0%) cases, 39,435 (91.2%) hospitalizations, and 1,908 (92.1%) deaths had occurred among persons aged ≥5 years.

Nationwide, during November 27--December 3, the median daily number of deaths was 41 (range:

18--64). As of December 3, the overall case-fatality ratio (CFR) (cumulative deaths divided by cumulative cases) was 2.3%. The hospital CFR (cumulative hospital deaths divided by cumulative hospitalized cases) was 3.3%. The daily nationwide hospital CFR has varied; however, simple linear regression indicates decreases in the rolling 7-day hospital CFR in Artibonite ( $p < 0.001$ ) and in all other departments combined ( $p < 0.001$ ) (Figure 3). In Artibonite Department, the rolling 7-day hospital CFR decreased from a high of 4.2% on November 9 to a low of 1.4% on December 1 (Figure 3).

A rapid assessment of mortality from cholera among persons aged  $\geq 5$  years was conducted in Artibonite Department during November 12--16. Teams visited homes of 22 cholera decedents identified through records in two hospitals. Family members were interviewed about decedents' use of ORS and other health-care services. Family and community members were asked about other cholera deaths in the community, resulting in identification of an additional 65 decedents, whose families also were interviewed. Among the total of 87 cholera decedents identified, 58 (67%) were male; eight (9.2%) were aged 5--18 years, and 79 (90.8%) were aged 19--100 years. Of the 87 deaths, 48 (55%) occurred in a hospital or other health facility, and 39 (45%) occurred in the community. For those who died in the community, median time to death from onset of symptoms was 12 hours (range: 2 hours--8 days). Only nine (23%) of the 39 persons who died in the community received ORS. Sixteen (41%) of the 39 had sought health care; eight died en route to a health facility, and eight died after discharge. When asked to cite reasons for not seeking health care, family members in 10 cases did not think the ill person had cholera; family members in seven cases reported difficulty getting to a health facility (including transport at night), and family members in six cases did not see the need to seek care.

## Reported by

*Ministry of Public Health and Population, Haiti. Pan American Health Organization. CDC.*

## Editorial Note

Surveillance data show that from October 21 to December 3, cholera spread rapidly across Haiti. Although decreasing, the hospital CFR of 3.3% remains high. Improvements in receipt of appropriate care in health facilities might be reflected in the decreasing hospital CFR. However, when cholera is recognized early and appropriate rehydration treatment is initiated rapidly, a CFR  $< 1\%$  can be achieved among patients who have sought care (3). The outbreak strain of cholera has been identified as a "hybrid" strain of the El Tor biotype and the classic toxin type; the classic toxin might be associated with more severe illness, and the El Tor biotype is associated with longer persistence in the environment (4,5).<sup>†</sup> Underlying poor nutritional status and other comorbidities also are likely to contribute to disease severity in Haiti (6,7). In 2008, only 63% of Haiti's population had access to an improved drinking water source,<sup>§</sup> and only 17% had access to adequate sanitation (8). The lack of safe water and sanitation infrastructure in Haiti and the devastation caused by the January 2010 earthquake have created conditions favorable for the rapid spread of cholera across the country.

A cholera epidemic in the Western Hemisphere began in 1991 and lasted for nearly a decade, spreading across Central and South America in countries that, like Haiti, were previously unexposed to cholera and thus lacked population immunity (9). Peru experienced the highest cholera incidence and mortality among affected countries. During the first 6 full epidemiologic weeks of the cholera epidemic in Peru, 19,431 hospitalizations (87.5 per 100,000 population) and 368 cholera deaths (1.7 per 100,000) were reported (10). By comparison, during the first 6 full weeks of the Haiti outbreak, 39,010 hospitalizations (393 per 100,000 population) and 1,882 cholera deaths (19.0 per 100,000) were reported. Thus, early rates of reported hospitalizations and deaths in Haiti were substantially higher than those in Peru (rate ratios: 4.5 and 11.5, respectively). In fact, the death rate during 6

weeks of the outbreak in Haiti (19.0 per 100,000) exceeded the death rate observed during the first 48 weeks of the Peru epidemic (13.1 per 100,000).¶

Urgent measures are being taken to expand access to treatment that will mitigate cholera morbidity and mortality; improvements in water quality and sanitation also are necessary to reduce transmission. Because cholera can progress quickly to severe dehydration, shock, and death, rapid rehydration is the mainstay of cholera treatment. In the mortality assessment presented in this report, only nine of 39 cholera decedents who died outside of health facilities had received ORS, and eight died en route to care. Early access to ORS in homes, in communities (e.g., at specially designated ORS sites), and at health facilities can slow disease progression, reduce the need for hospitalization, and reduce mortality. Because cholera can lead to death rapidly, ideally all persons at risk for cholera should be within 1 hour of a location where they can receive ORS and should have access to more advanced care at specially designated cholera treatment centers.

MSPP, the U.S. government, and multiple other governmental and nongovernmental entities have worked rapidly under challenging circumstances to establish, staff, and supply cholera treatment sites. To expand treatment options further, the United States is developing cholera treatment sites within health facilities supported by the President's Emergency Plan for AIDS Relief (PEPFAR). In addition, CDC, MSPP, and the International Centre for Diarrhoeal Disease Research, Bangladesh, have developed a train-the-trainer program\*\* in which health workers educated in cholera treatment and clinical management techniques are providing clinical training to health workers across the country. Ensuring sufficient supplies and staffing for cholera treatment sites during the evolving cholera outbreak will be challenging, and ensuring appropriate care will require systematic assessments of cholera treatment sites.

Short-term and long-term efforts also are needed to prevent cholera transmission. In the short-term, products for household water chlorination and safe water storage must be made available to all households and health facilities, including in communities not yet affected by cholera. Hand washing with soap and safe sanitation behaviors, including latrine use, need to be reinforced, and soap should be made more widely available. Safe food-handling practices, in homes and in open markets, ought to be encouraged. Although much work has been done by MSPP and its partners to improve access to safe drinking water and adequate sanitation in the areas of Haiti hardest hit by the January 2010 earthquake, additional activities are needed to ensure long-term access. In the coming months, certain efforts will be critical for reducing cholera transmission and mortality: 1) sustaining and improving drinking water chlorination; 2) improving access to safe drinking water sources; 3) enhancing water, sanitation, and hygiene education activities; and 4) ensuring appropriate sanitation measures in cholera treatment centers to prevent contamination of the environment.

The findings in this report are subject to at least four limitations. First, cholera cases and deaths, particularly those not evaluated or occurring in health facilities, likely are underreported, and how reporting might differ among facilities and age groups is not well understood. Second, the mortality assessment was conducted in one area of Artibonite Department, and sampling was not systematic; as such, demographic characteristics, circumstances of illness, and location of death might not be representative of all deaths in the country. Third, family member responses in the mortality assessment might not have provided an accurate account of the decedent's perceptions or experiences. Finally, population estimates used to calculate rates for cholera morbidity and mortality are uncertain, particularly because of the mortality caused by the earthquake in Haiti.

Despite strong responses from MSPP and governments and nongovernmental agencies, the size and speed of this cholera outbreak, combined with the lack of safe water and sanitation infrastructure in Haiti, indicate that further action is urgently needed to reduce cholera transmission and mortality. All

parties should extend their periods of involvement and redouble their efforts to support efforts in Haiti to reduce the burden of this disease.

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\* Available at [http://mspp.gouv.ht/site/index.php?option=com\\_content&view=article&id=57&Itemid=1](http://mspp.gouv.ht/site/index.php?option=com_content&view=article&id=57&Itemid=1).

† Most toxigenic cholera strains circulating in the world today are biotype El Tor with some variant of the classic toxin.

§ Defined as 1) a piped household water connection located inside the user's dwelling, plot, or yard; 2) public taps or standpipes; 3) tube wells or boreholes; 4) protected dug wells; 5) protected springs; or 6) rainwater collection.

¶ Cholera death total for Peru in 1991 derived from data available at [http://www.paho.org/english/sha/epibul\\_95-98/be971cho.htm](http://www.paho.org/english/sha/epibul_95-98/be971cho.htm). Peru population estimate for death rate calculations available at <http://ais.paho.org/phis/viz/basicindicatorbrowser.asp>.

\*\* Information available at [http://www.cdc.gov/haiticholera/training/hcp\\_materials.htm](http://www.cdc.gov/haiticholera/training/hcp_materials.htm).

What is already known on this topic?

Cholera is marked by profuse, acute, watery diarrhea that can lead to rapid dehydration and death; case-fatality ratios can be reduced to <1% with early recognition and appropriate rehydration. For at least a century, no cholera outbreak had occurred in Haiti.

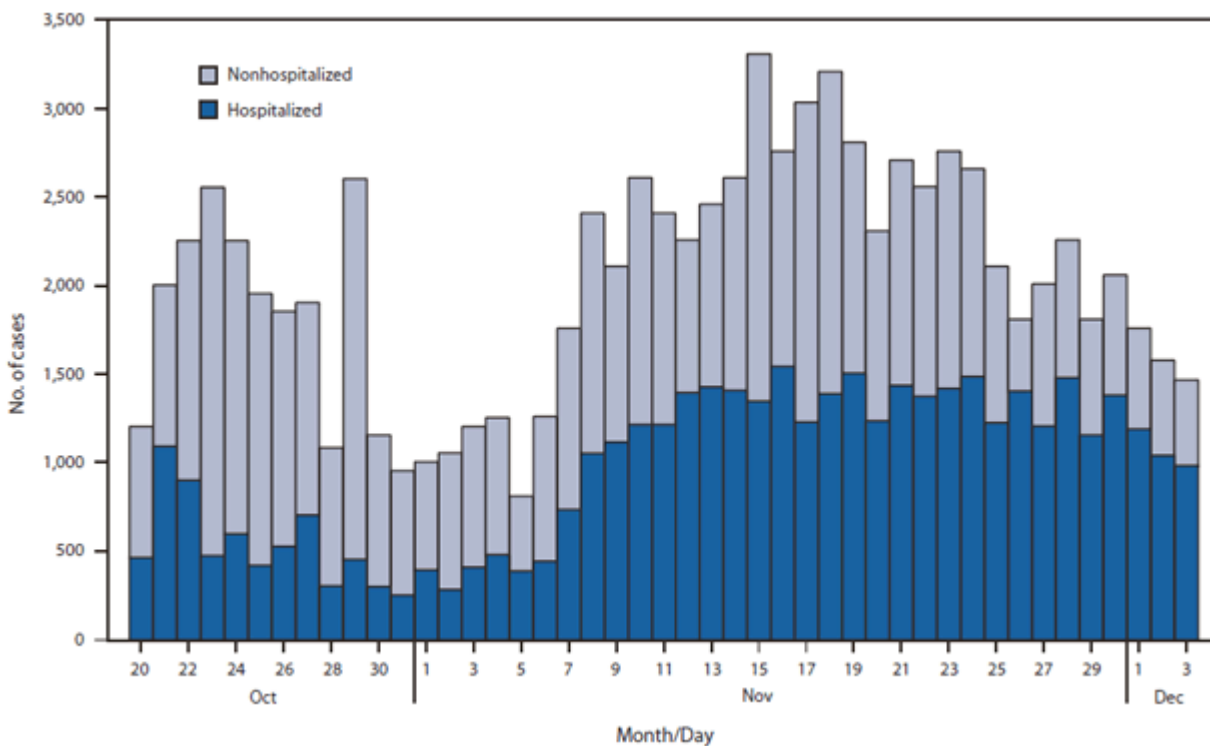
What is added by this report?

As of December 3, a total of 91,770 cases of cholera had been reported in Haiti from all 10 departments and the city of Port-au-Prince, including 43,243 hospitalizations and 2,071 deaths; the case-fatality ratio was 2.3% overall and 3.3% among persons hospitalized. A mortality assessment of 87 decedents indicated that some deaths occurred within 2 hours after symptom onset and important gaps exist in access to life-saving rehydration.

What are the implications for public health practice?

The potential exists to prevent many cholera deaths in Haiti; to do so, urgent efforts are needed to recognize affected patients early, provide ready access to oral rehydration solution, and provide access to more advanced care at cholera treatment centers as needed. Short-term and long-term measures to improve water and sanitation in Haiti also are necessary.

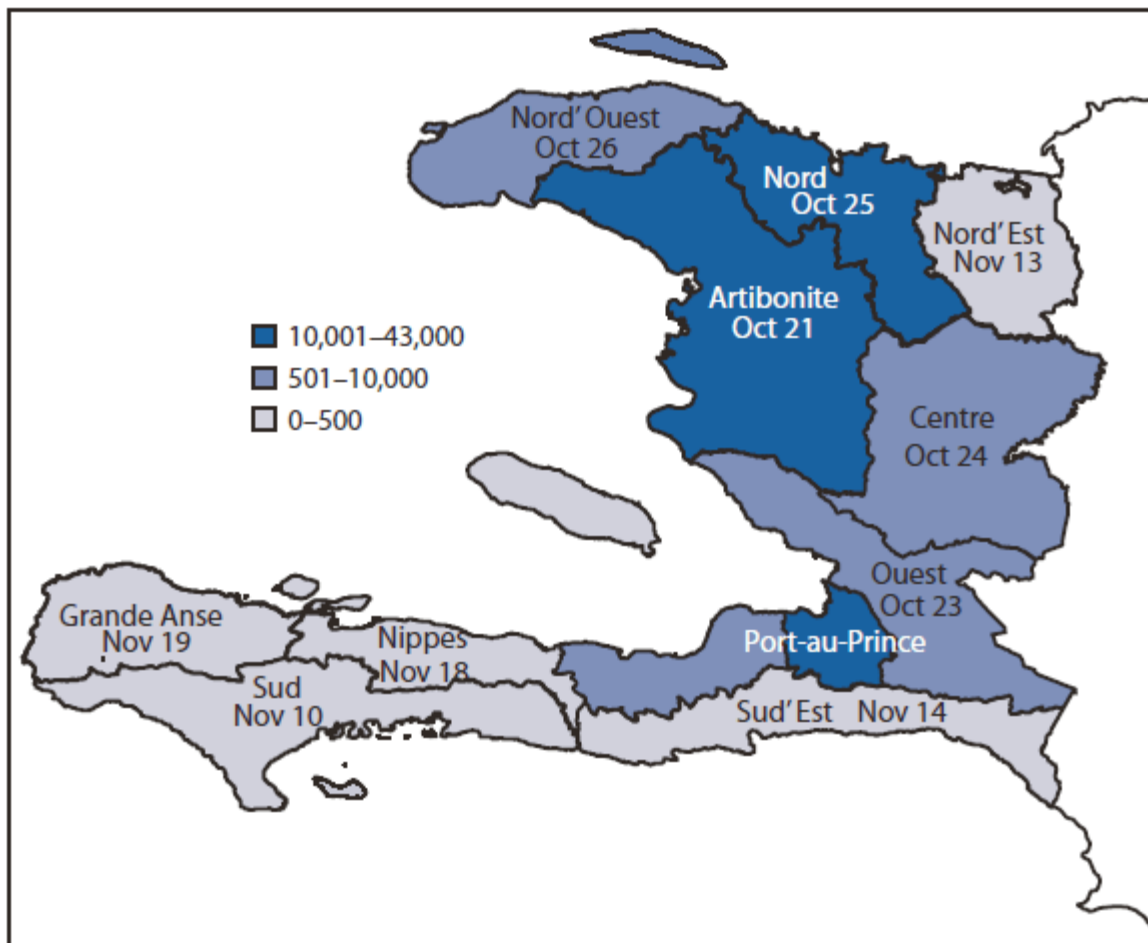
**FIGURE 1. Reported number of new cases of cholera (N = 91,770), by hospitalization status --- Haiti, October 20--December 3, 2010\***



\* Because of time delays in reporting, case counts for the most recently reported days likely are underestimated.

**Alternate Text:** The figure above shows the daily reported number of new cholera cases in Haiti, including hospitalized and nonhospitalized cases, during October 20-December 3, 2010.

**FIGURE 2. Cumulative number of cases of cholera reported overall\* and date of first laboratory-confirmed case, by department and in Port-au-Prince†--- National Cholera Monitoring System, Haiti, December 3, 2010**

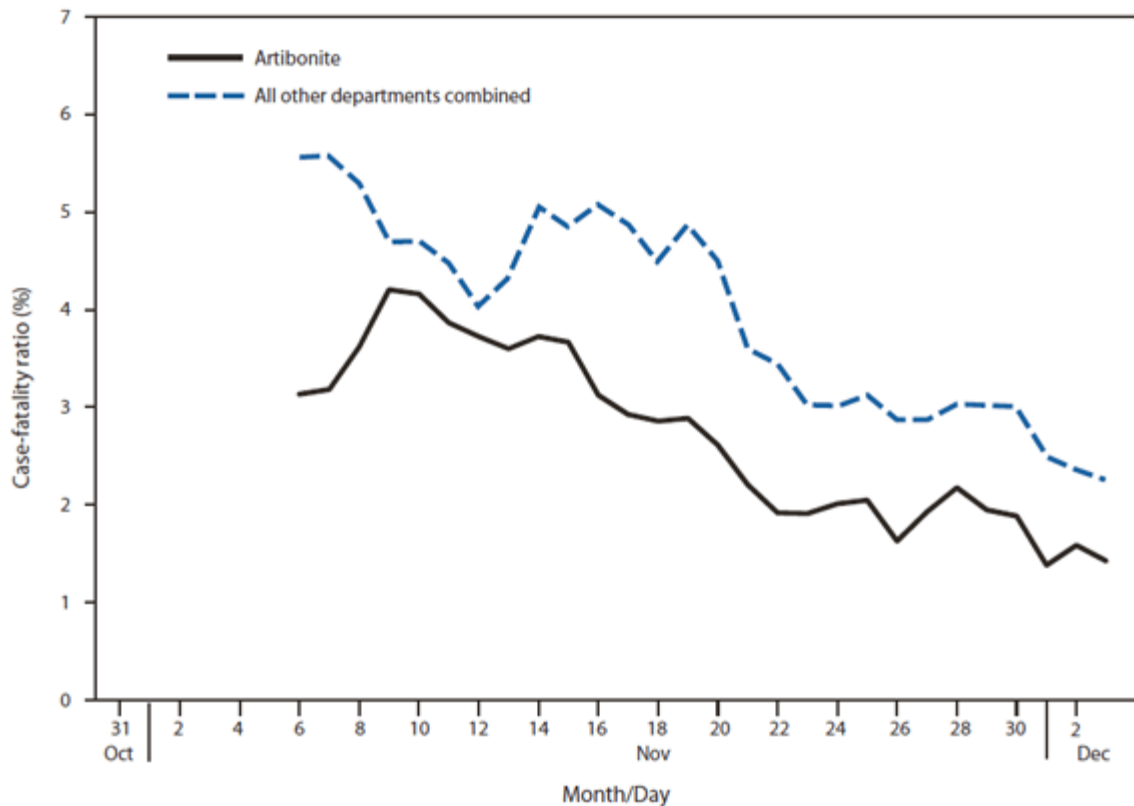


\* Artibonite 42,596; Port-au-Prince 12,566; Nord 10,436; Nord' Ouest 9,735; Centre 9,527; Ouest 4,899; Sud 419; Nord' Est 341; Grande Anse 205; Sud' Est 76; Nippes 34.

† Includes the following communes: Carrefour, Cite Soleil, Delmas, Kenscoff, Petion Ville, Port-au-Prince, and Tabarre.

**Alternate Text:** The figure above is a map showing the cumulative number of cases of cholera in Haiti's 10 departments and the capital, Port-au-Prince, as of December 3, 2010. The largest number of cases (42,596) were reported from Artibonite Department, which comprises approximately 16% of the Haitian population and is the department where cases were first laboratory-confirmed.

**FIGURE 3. Rolling 7-day hospital case-fatality ratio\* for Artibonite and all other departments --- Haiti, October 31--December 3, 2010**



\* Case-fatality ratio calculated as new hospital deaths divided by new hospitalizations during the 7-day period ending on that date.

**Alternate Text:** The figure above shows the rolling 7-day cholera hospital case-fatality ratio for Artibonite Department and all other departments combined in Haiti during October 31-December 3. In Artibonite Department, the rolling 7-day hospital CFR decreased from a high of 4.2% on November 9 to a low of 1.4% on December 1.

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