

Progress Toward Rebuilding

# Haiti's Health System



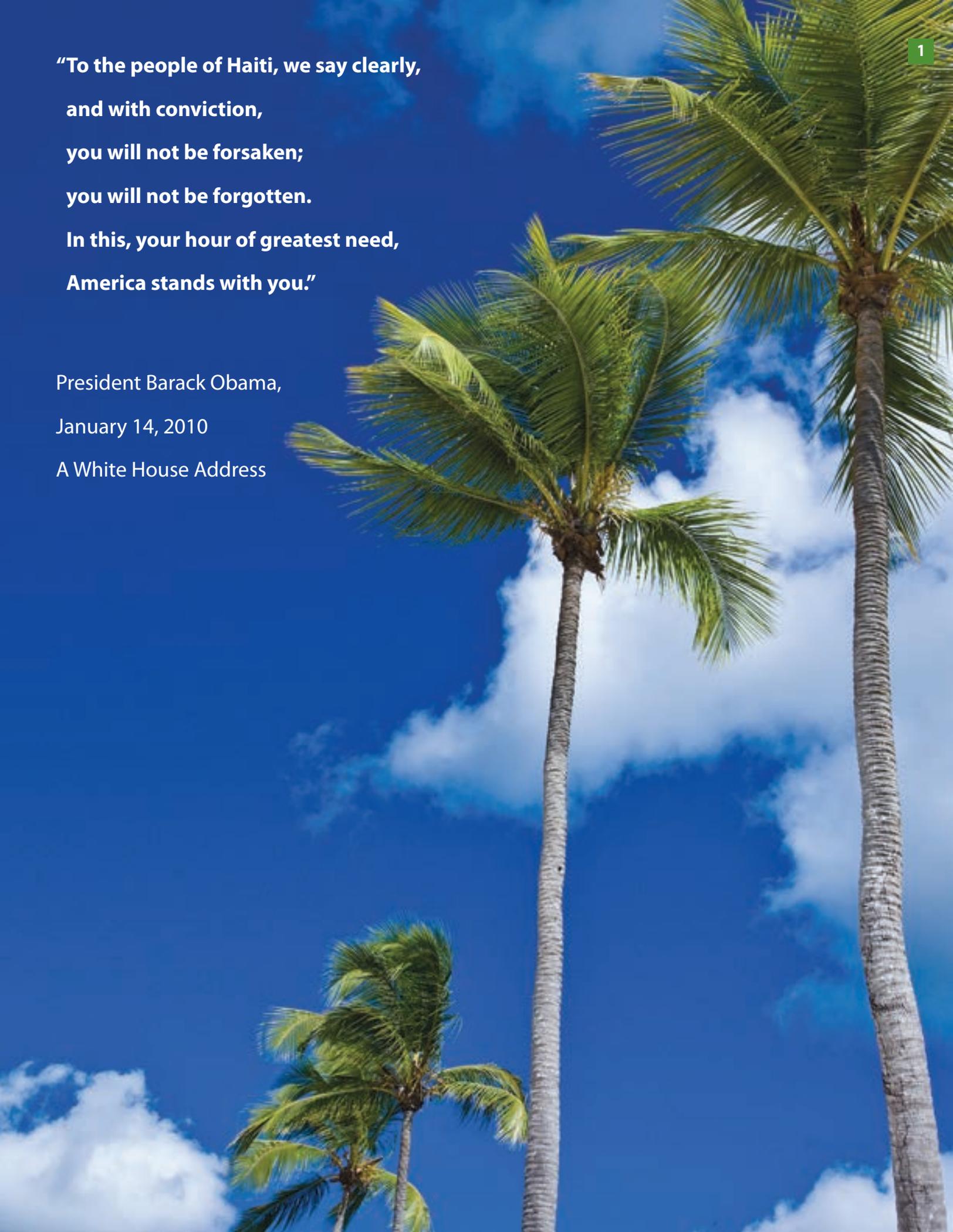
Center for Global Health  
Division of Global Health Protection



**November 2013**

**“To the people of Haiti, we say clearly,  
and with conviction,  
you will not be forsaken;  
you will not be forgotten.  
In this, your hour of greatest need,  
America stands with you.”**

President Barack Obama,  
January 14, 2010  
A White House Address





The National Palace, official residence of the Haitian president, was severely damaged in the 2010 earthquake.

# Table of Contents

**Health Systems Reconstruction Program** . . . . . 5

**Monitoring and Evaluation** . . . . . 8

**Cross-Cutting Public Health Systems Strengthening** . . . . . 11

    Laboratory . . . . . 11

    Surveillance . . . . . 12

    Field Epidemiology Training Program . . . . . 13

    Geographic Information Systems . . . . . 14

    Cold Chain . . . . . 15

    Water, Sanitation and Hygiene . . . . . 16

**Public Health Program Strengthening** . . . . . 19

    Vaccine Preventable Diseases . . . . . 19

    Cholera . . . . . 20

    Lymphatic Filariasis . . . . . 21

    Tuberculosis . . . . . 22

    Violence Against Children . . . . . 23

    Emergency Obstetric and Neonatal Care . . . . . 24

    Malaria . . . . . 25

    Rabies . . . . . 26

    Nutrition . . . . . 27

**Partner Acknowledgements** . . . . . 28





The site of the former Haitian Ministry of Public Health and Population headquarters. (Credit: David Snyder/CDC Foundation)

# Health Systems Reconstruction Program

On January 12, 2010, the world looked on as Haiti struggled with the aftermath of the massive 7.0 magnitude earthquake that killed over 200,000, left millions in need of urgent medical attention, and devastated an already weak national infrastructure. More than 2,000,000 people became displaced when their homes were destroyed, creating increased risk for infectious diseases from overcrowding and poor living conditions as they gathered in internally displaced persons (IDP) camps. The disaster triggered a response from nations around the world. The Centers for Disease Control and Prevention (CDC) was among the first U.S. government agencies to provide Haiti with assistance. Within days the Haitian Ministry of Public Health and Population (MSPP) was working with CDC's Haiti office in Port-au-Prince for assistance, and CDC's Emergency Operations Center was activated.

A dedicated, multi-disciplinary team at CDC with diverse subject matter expertise mobilized and quickly began deploying to provide direct support on the ground in Haiti. In partnership with MSPP, they identified priority public health needs in Haiti and developed a plan for obtaining funding to address those needs. This group of CDC experts filled a unique niche which had not previously existed at CDC, public health systems reconstruction. Recognizing the value and utility of public health systems reconstruction in Haiti and other countries recovering from war, genocide, natural disasters, and other catastrophic events, CDC established the Health Systems Reconstruction Program (HSRP).

The recently established HSRP leads CDC's public health systems reconstruction efforts in Haiti as well as the response to the deadly cholera epidemic (stories on pages 14, 16, 17, and 20) which emerged just ten months after the earthquake. Together, with the government of Haiti and other international partners, CDC is helping make a lasting impact by rebuilding Haiti's devastated public health infrastructure to be stronger than before.

*"Recognizing the value and utility of public health systems reconstruction in Haiti and other countries recovering from war, genocide, natural disasters, and other catastrophic events, CDC established the Health Systems Reconstruction Program (HSRP)."*



## HSRP Mission

Collaborate with host governments and international partners to reestablish and strengthen public health systems in need of reconstruction as a result of war, genocide, natural disasters, and other catastrophic events.

CDC staff conducted assessments in the Aviation camp five weeks after the earthquake. (Credit: David Snyder/ CDC Foundation)

## Approach to Public Health Systems Strengthening

HSRP engagement begins during the emergency response and accelerates as the emergency response activities begin to wind down. The first task is to work closely with the host country government to assess the current situation and to identify priority public health needs of the country. Using that information, HSRP develops a prioritized plan to address both the immediate public health needs and the long-term structural needs of the country. HSRP identifies and coordinates the appropriate technical experts both from within the program as well as from across CDC. Additionally, HSRP provides expertise in project management and monitoring and evaluation (M&E) to ensure integration and coordination among programs.

## Principles

HSRP's approach is guided by three principles:

- **Integration** – To create a highly functional public health system and to achieve multi-dimensional public health impact, the work of multiple partners and programs must be integrated.
- **Sustainability** – The citizens of the host-country are best served and the U.S. government gets the best return on its investment when the focus is on establishing sustainable public health systems. This is best accomplished by fully engaging with host-country governments and by empowering them with the information and tools they need.
- **Host-government sovereignty** – Programs have the best chance for success when the host country government leads and is fully engaged in all aspects of the process.

## Core Capabilities

HSRP employs a range of capabilities when approaching public health systems strengthening in-country and is staffed by a team of public health experts specializing in an array of subject matter areas. This gives HSRP the capability to provide cross-cutting support and coordination to all public health programs operating in country while also providing direct support in disease-specific public health areas.

Technical Expertise Offered by HSRP		
Epidemiology	Project management	Nutrition
Surveillance	Monitoring and evaluation	Multi-lingual capacity
Laboratory	Vaccine preventable diseases	Diplomacy
Water, sanitation, and hygiene	Tuberculosis	Logistics
Geographic information systems	Maternal and child health	Procurements
Informatics	Reproductive health	

## CDC Contributions to Public Health Systems Reconstruction in Haiti

### January 12, 2010

7.0 magnitude earthquake strikes Haiti killing over 200,000 and leaving millions homeless

### January 25, 2010

Launch the national sentinel public health surveillance systems

### February 18, 2010

Launch sentinel surveillance in IDP camps

### July 2010

Approve three brands of rapid diagnostic tests to diagnose malaria

### October 2010

Expand rabies diagnostic capabilities in Port-au-Prince through advanced training on direct fluorescent antibody testing and through establishing the capability to perform the direct rapid immunohistochemistry test

### October 21, 2010

Confirm *Vibrio cholerae* outbreak. The outbreak becomes the largest cholera epidemic in modern history

### October 28, 2010

Launch cholera-specific surveillance system

## Leveraging PEPFAR

The post-earthquake response benefited from CDC's extensive administrative and implementation platforms that were established in Haiti prior to the earthquake, primarily as part of the President's Emergency Plan for Aids Relief (PEPFAR). The CDC Haiti office opened in 2002 with a focus on preventing the transmission of HIV/AIDS, providing care and treatment to those already infected, increasing laboratory and strategic information capacity, and building health care infrastructure. Because of CDC's existing platform in Haiti, the logistical and administrative structures, funding mechanisms, and well-established partnerships within MSPP and other partners made it possible to rapidly deploy and support CDC experts to the field.

Notably, HIV service provision recovered very rapidly following the earthquake. Key services, including interventions to prevent mother to child transmission of HIV and provision of antiretroviral therapy, were not only maintained but have been accelerated. Because PEPFAR-supported efforts engage specific segments of the population and affect many aspects of public health, they have served as the basis for much of the public health response. For example, the PEPFAR focus on preventing mother to child transmission of HIV provides an ideal access point for other interventions to improve maternal and infant health. During the same visit a mother may receive counseling on HIV, nutrition, safe water, sanitation, and hygiene. Also, because patients with HIV are more susceptible to infection with tuberculosis (TB), patients who receive care for one disease are usually screened for the other. Newly established programs are able to access target populations more effectively and begin implementing sooner by building on already established PEPFAR program activities.



Temporary clinics were established in internally displaced persons camps to treat women with HIV.

**January 2011**  
Substantially reduce cholera deaths; reach the international standard of <1% of patients who die from cholera, down from 4% at the epidemic's peak

**July 2011**  
Launch assessment of the prevalence and consequences of physical, emotional, and sexual violence against children

**October 2011**  
Establish capacity to perform rapid diagnostic tests for cholera

**October 2011**  
Install a self-contained TB laboratory and train laboratorians to perform improved diagnostic tests

**November 2011**  
Launch the national laboratory specimen referral network

**December 2011**  
Distribute 10,000 household water treatment systems

## Monitoring and Evaluation

Monitoring and evaluation (M&E) is an integral part of the HSRP's work in Haiti. HSRP utilizes a modified goals-based evaluation framework to mobilize stakeholders, track implementation, and demonstrate accountability and achievement. The goals-based approach served as a platform to bring together stakeholders from across CDC, other U.S. government agencies, the relevant ministries within the government of Haiti, and non-governmental and academic institutions to discuss public health priorities in Haiti. The process of defining these goals helped to mobilize stakeholders, to focus funding, and to shape program development.

Once these goals were agreed upon, HSRP led the development of a strategic plan that outlined CDC's measurable contribution to the goals and concrete steps for implementation. The planning process helped coordinate cross-cutting activities and eliminate duplication of efforts. The HSRP M&E system incorporates both qualitative and quantitative indicators to track implementation.

The end result is a system that includes:

- A single, living strategy document that encompasses all of CDC's major activities in Haiti related to post-earthquake reconstruction and controlling cholera;
- Qualitative and quantitative data to better inform management of programs by tracking implementation and progress towards stated goals, objectives, and strategies and make course corrections as necessary; and,
- The means to demonstrate accountability, to increase transparency, and to communicate activities and achievements to leadership, funders, and partners.

### Public Health Legacy Goals for Haiti by 2015

The Public Health Legacy Goals for Haiti are the framework upon which CDC's work in Haiti is organized and evaluated. The Legacy Goals are shared high-level public health goals that the U.S. government, the Haitian MSPP, and other partners are pursuing to leave a lasting, improved public health legacy from post-earthquake reconstruction efforts. While the Legacy Goals represent the shared public health priorities of CDC and its partners, they do not encompass all of the work in Haiti.

CDC's measurable contribution to the achievement of the Legacy Goals is outlined as the CDC objectives under each goal. Strategies that support achievement of each objective are further described in the strategic plan, along with quantitative indicators, performance targets, and qualitative implementation milestones. Data are analyzed and reviewed on a quarterly basis to inform program management, to develop communications materials, and to promote timely reporting of accomplishments.

**January 2012**  
Use Geographic Informational Systems (GIS) to map rural piped water systems

**March 2012**  
Launch multi-sector coalition for the improvement of Haiti's cold chain

**April 2012**  
Launch laboratory capacity assessment of departmental laboratories

**April to June 2012**  
National measles and rubella vaccination campaign together with routine immunization achieves 91% coverage in Haiti

**June 2012**  
All 12 of the first cohort of FETP trainees graduate

**September 2012**  
Distribute a cumulative total of 35,000 household water treatment systems

**November 2012**  
Introduce pentavalent vaccine as part of the routine immunization schedule for children

**January & February 2012**  
2.3 million people in Port-au-Prince receive drugs to prevent spread of lymphatic filariasis

**April 2012**  
Launch laboratory-enhanced surveillance for acute diarrheal diseases

**April 2012**  
Secretary Sebelius and Dr. Frieden participate in MSPP launch of pentavalent vaccine introduction

**May 2012**  
Launch implementation of solar-powered refrigerators at remote immunization sites

**September 2012**  
Launch an evaluation of effectiveness of insecticide treated nets to prevent malaria

**November 2012**  
Deploy 264 CDC-trained municipal water technicians to monitor water quality in community water systems

**December 2012**  
Distribute a cumulative total of 55,000 household water treatment systems

*"The Legacy Goals are shared high-level public health goals that the U.S. government, the Haitian MSPP, and other partners are pursuing to leave a lasting, improved public health legacy from post-earthquake reconstruction efforts."*

## Public Health Legacy Goals for Haiti by 2015

### Eliminate mother to child transmission of HIV<sup>1</sup>

CDC Objective 1: Increase to 80% the percentage of pregnant women who are tested for HIV and know their results

CDC Objective 2: Increase to 90% the percentage of known HIV-positive pregnant women who receive antiretroviral drugs to reduce risk of mother-to-child transmission

### Eliminate the threat of epidemic cholera

CDC Objective 1: Increase to 70% the percentage of Haitians with access to an improved drinking water source or means of treating their drinking water

CDC Objective 2: Maintain a consistent 14 day rolling mortality rate of  $\leq 1\%$ <sup>2</sup>

### Eliminate Lymphatic Filariasis

CDC Objective 1: Complete three rounds of MDA in Port-au-Prince

CDC Objective 2: Work with partners to secure commitments from donors to fund and administer any additional rounds of MDA needed to complete the elimination of lymphatic filariasis

### Ensure a robust, sustainable, self-correcting public health system

CDC Objective 1: Establish a sustainable FETP

CDC Objective 2: Strengthen and expand a functioning national public health surveillance system

CDC Objective 3: Strengthen and expand a functioning national laboratory network system

### Reduce the under-five mortality rate from vaccine preventable diseases by 35%

CDC Objective 1: Increase to >90% national coverage of measles-rubella vaccines through national vaccination campaigns, Child Health Weeks, and Vaccination Week of the Americas

CDC Objective 2: Increase to >90% national coverage for routine EPI antigens<sup>3</sup>, and the introduction of new antigens, including *Haemophilus influenzae* type b (Hib) and hepatitis B as part of pentavalent vaccine, and pneumococcal and rotavirus vaccines

### Reduce maternal mortality by 30%

CDC Objective 1: Increase to 50% pregnant women in targeted areas who have access to emergency obstetric care

CDC Objective 2: Increase to 75% pregnant women in targeted areas who receive recommended prenatal care

CDC Objective 3: Increase to 75% pregnant women in targeted areas who receive recommended postnatal care

CDC Objective 4: Implement a scalable maternal mortality surveillance system

### Reduce the prevalence of TB by 25%

CDC Objective 1: Increase to 70% the TB case detection rate

CDC Objective 2: Increase to 85% the TB treatment success rates for new smear-positive cases

---

1. Activities that support this goal are funded through PEPFAR.  
 2. Calculated on a daily basis based on the previous 14 day period  
 3. Antigens for TB, diphtheria, tetanus, pertussis, and polio

#### January 2013

Launch program to capture and test suspected rabid dogs (and other animals) in the greater Port-au-Prince area

#### January 2013

Independent assessment by the American Society for Microbiology finds the new TB laboratory to be fully proficient

#### January & February 2013

Conduct a national assessment of the need for emergency obstetric and neonatal care services at the community level

#### February to June 2013

Deploy Stop Transmission of Polio team of four epidemiologists to implement vaccine preventable diseases (VPD) surveillance

#### March 2013

Distribute a cumulative total of 70,000 household water treatment systems

#### April 2013

St. Nicholas Hospital achieves status of a comprehensive emergency obstetric and neonatal care center

#### April 2013

Conduct a second round of mass drug administration (MDA) in Port-au-Prince for the elimination of lymphatic filariasis

#### June 2013

Implement rabies surveillance system linked with laboratory diagnostics in Carrefour and Petionville (two communes in Port-au-Prince)

#### December 2013

Planned introduction of rotavirus vaccine as part of the routine immunization schedule for children



**Before the earthquake, laboratories conducted manual counts of CD4 cells, a method where the accuracy is entirely dependent on the skill and training of the laboratorian. Now testing is conducted on specialized equipment by CDC-trained laboratorians to ensure accuracy. (Credit: David Snyder/CDC Foundation)**

# Cross-Cutting Public Health Systems Strengthening

## Laboratory

CDC's HSRP is working closely with the National Public Health Laboratory (LNSP) and international partners in providing technical assistance, training, and funding to support the Haitian public health laboratory network to develop the capability to perform a wider range of tests, increase the capacity of the network to refer specimens, develop a robust specimen transport system, and strengthen laboratory management through accreditation processes. Before the earthquake, LNSP performed basic bacteriology, serology, parasitology, molecular biology, and testing for TB. As of April 2013, CDC has helped improve these testing capabilities (TB story on page 22, malaria story on page 25, and rabies story on page 26), enhance cholera testing, and establish a new environmental testing. CDC has also helped develop a training and research unit, a quality management unit, a logistical coordination unit, and a laboratory based surveillance program to quickly identify and respond to outbreaks.

### Strengthening the National Laboratory Network: The Hub and Spoke Model

As agencies and resources from around the world converged to help Haiti recover from the earthquake, it quickly became apparent that a functional national public health laboratory system would be the cornerstone for successful surveillance, outbreak detection, disease control, and public health interventions. Working closely with CDC's Division of Global HIV/AIDS and LNSP, HSRP focused on developing a national specimen referral network using a "hub and spoke" model. The initial focus was on specimen transport related to CD4 testing, a critical service for HIV treatment. Once established, the network would serve as a platform on which additional testing could be added.

The first step was to identify and assess potential hubs, departmental laboratories, and larger hospital laboratories with adequate infrastructure and trained personnel to provide testing services to neighboring, lower capacity laboratories. Next, the lower capacity laboratories that make up the spokes of the network were each mapped to a hub laboratory, and formal processes were established for sending specimens and providing results.

As of April 2013, 7 of the 16 hub laboratories were operational, providing laboratory coverage for 58 requesting "spoke" sites in the 3 most populated departments. This dramatically increases the percentage of HIV positive patients who have access to CD4 testing from 12% before the earthquake to 82% now. Although this is a remarkable accomplishment, CDC and LNSP are already focusing on expanding and improving the network. In 2013, viral load testing and multi-drug resistant TB testing capabilities will be added to the hub laboratories, moving Haiti's laboratory network beyond HIV. Thanks to this effort, even patients at the far end of the spokes will have access to laboratory services through these testing hubs.

**Haiti's public health laboratory referral network has 16 testing "hub" laboratories that provide support for 400 laboratories in the "spokes" of the network.**

## Surveillance

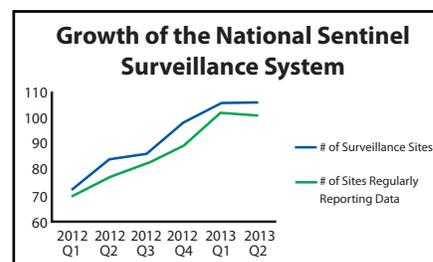
Prior to the earthquake, Haiti did not have the technology, trained staff, or systems capable of providing timely disease surveillance to public health officials. There was a need to establish surveillance systems and to develop the capacity to maintain and expand these systems within MSPP. Functioning surveillance systems provide the data necessary for public health officials to identify disease threats, prioritize public health interventions, and make evidence-based decisions. CDC's strategy focuses on establishing and expanding a functioning national sentinel surveillance system and a national laboratory-enhanced sentinel surveillance system for priority conditions.



CDC staff worked closely with MSPP staff to analyze data from the national surveillance system.

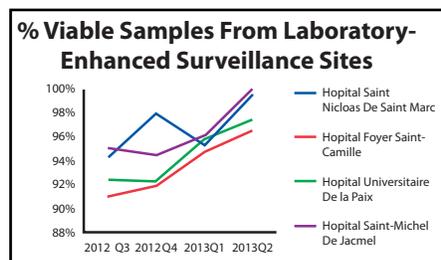
### Surveillance Guiding the Way

Without effective surveillance it is difficult to respond to outbreaks and to implement public health programs. Working with the Pan American Health Organization (PAHO) and other partners, CDC supported the MSPP to launch a national surveillance system within weeks of the earthquake. The system consists of a network of health care providers looking for symptoms that might indicate specific illnesses. However, this did not cover the millions of Haitians living in IDP camps. CDC worked rapidly with partners working in the camps to extend the system to cover 100 IDP camps.



Sites within the National Sentinel Surveillance System provide reports in near real time on illness clusters to help public health officials track disease and identify outbreaks.

In October 2010, a cholera epidemic began in Haiti. CDC responded and within days of detection of the cholera outbreak a cholera-specific surveillance system was developed and ready for use on a national scale. At the peak of the outbreak it received reports from close to 400 cholera treatment facilities managed by a variety of partners. The system has been critical for monitoring the impact and spread of the epidemic and guiding the public health response.



To add a powerful diagnostic tool to the surveillance system CDC provides extensive training to laboratory-enhanced surveillance sites on how to properly collect and ship specimens for testing at the LNSP.

To strengthen the link between laboratory and epidemiology, CDC helped MSPP launch a laboratory-enhanced sentinel surveillance system in April 2012, forming a powerful information tool by linking laboratory test results from priority infectious diseases to epidemiologic data.

Thanks to these efforts, MSPP has credible information to guide future public health activities.

## Field Epidemiology Training Program (FETP)

The FETP works with ministries of health and other partners around the world to strengthen national and local public health systems and to address the severe shortage of skilled epidemiologists worldwide. FETP is a two year, in-service applied epidemiology training program. The program emphasizes practical experience, with residents spending 25% of their time in the classroom and 75% of their time conducting mentored field work. Classroom instruction focuses on epidemiology, surveillance, outbreak investigation, and biostatistics. In the field, residents conduct epidemiologic investigations and field surveys, design and evaluate surveillance systems, collect and analyze data, report their findings to decision- and policymakers, and train other health workers.



An FETP resident takes a sample from a water source.

### The Road to Haiti's Recovery: Establishing the First FETP Cohort in Haiti

In the wake of the earthquake and subsequent outbreak of cholera, it quickly became clear that epidemiological support for MSPP was needed. The ability to collect and evaluate surveillance data, as well as to respond to possible outbreaks of disease, would be paramount in helping MSPP respond to future outbreaks.

*"This is the beginning of a Haitian owned epidemiology program."*

A little over a year after the earthquake, CDC began identifying and screening candidates for the Haitian FETP, which mirrors the CDC's Epidemic Intelligence Service program. It utilizes a three-tiered structure with a curriculum tailored to the resident's work functions at the local, departmental, and national levels of government.

MSPP decided to focus on the intermediate curriculum, which could be completed in 9 to 12 months. Intermediate level training in Haiti officially began in November 2011, and included 12 residents: four physicians, five nurses, and three statisticians. Additionally, two highly qualified candidates were selected to attend the advanced two-year course in the Central America Program based in Guatemala.

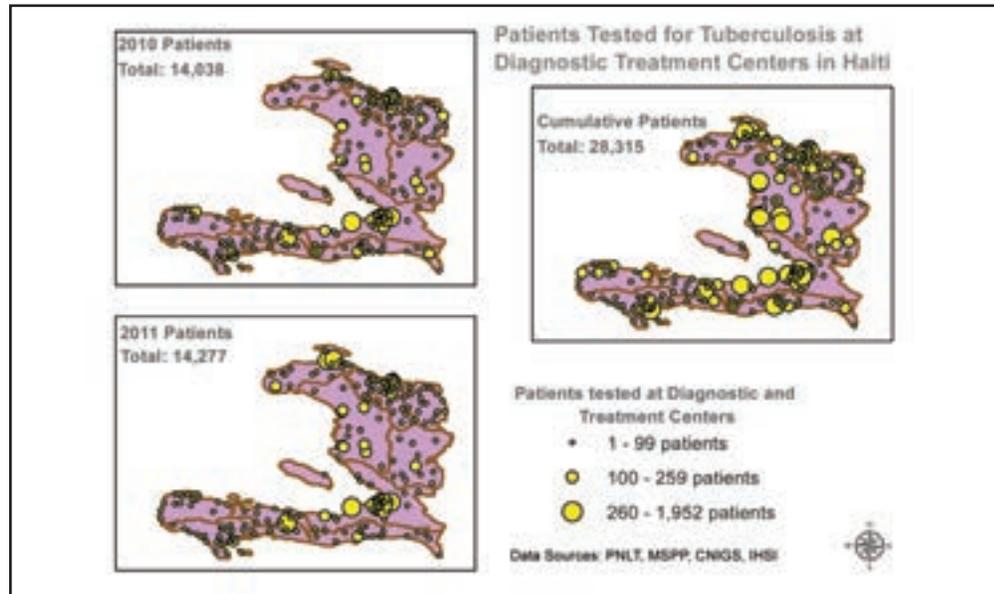


FETP residents split their training 25%/75% between classroom and in-the-field work.

In the summer of 2012, all 12 of the first cohort of Intermediate FETP residents graduated and currently work within the MSPP. According to Dr. Magloire, from the Department of Epidemiology and Laboratory Research, "The MSPP is fully engaged and pleased with CDC's support to Haiti in helping us establish FETP as a program that will help build capacity as well as change the culture of MSPP by introducing epidemiology into the community. This is the beginning of a Haitian owned epidemiology program."

## GIS mapping capabilities provide actionable information to guide many programs in Haiti.

*"Mapping surveillance data from the cholera-specific surveillance system (story on page 12) made it easy to see a geographic distribution of cholera cases and to check that against the number of cases that officials expected for an area with a given population density."*



### Geographic Information Systems

Early in the reconstruction efforts the value of having in-country Geographic Information Systems (GIS) capability became apparent. GIS is a powerful tool that captures, manages, analyzes and displays geographically referenced information. It has a wide range of public health applications, from ensuring the accuracy of survey results to managing, analyzing, and displaying data. Haiti marks the first time that CDC has worked to establish institutional GIS capacity in a country beyond a specific outbreak, project, or emergency response. CDC has worked closely with MSPP providing training, collaborative project implementation, and ongoing technical assistance. Through sustained engagement that promoted MSPP ownership of GIS tools and products, CDC is helping to ensure robust GIS capacity in Haiti.

### Seeing the Big Picture during the Cholera Response

Coordination of efforts and resources was a major challenge during the cholera response. Information about the number of cases in different locations and the locations of Cholera Treatment Centers (CTCs) where patients could get life-saving treatment were needed to prioritize response activities, to direct resources, and to monitor the ever-changing situation. CTCs presented a special challenge. They are run by various organizations throughout Haiti, and because there is no standardized address system, different groups refer to CTCs using different names. Many minor and rural roadways leading to the CTCs are not mapped, making logistics planning difficult. Additionally, when an organization ceases operation of a CTC, there is frequently no way of knowing, leaving people in that area without access to life-saving treatment.

GIS quickly proved to be an invaluable tool. Mapping surveillance data from the cholera-specific surveillance system (story on page 12) made it easy to see a geographic distribution of cholera cases and to check that against the number of cases that officials expected for an area with a given population density. A smaller than expected number of cases could mean that a CTC was not reporting cases to the surveillance system, or perhaps that they had ceased operation. GIS mapping also provided a common means of identification, enabling partners to be aware of where each others are working and to avoid duplication of efforts. Mapping of CTCs also provided partners with a sense of where a CTC was located, enabling better planning and logistics. The ability to visually present data using GIS enabled public health officials to rapidly assess and understand the situation, to allocate resources, and to efficiently and effectively guide the response.

## Cold Chain

“Cold chain” refers to the infrastructure and logistics necessary to successfully deliver and store vaccines, laboratory specimens, blood samples, and medication which must be maintained at a specific temperature to be viable. Establishing a cold chain is vital to the success of many public health programs. Traditionally, CDC has not had to establish a cold chain in foreign countries. However, the extraordinary circumstances in post-earthquake Haiti required that CDC act quickly to ensure that vital public health programs had a functional, reliable cold chain system. HSRP worked closely with the United Nations Children’s Fund (UNICEF), PAHO, United Nations, International Red Cross, and the Brazilian Ministry of Health to establish a temporary cold chain that could begin supporting programs immediately; there are ongoing efforts to support development of the infrastructure and expertise for a long-term, sustainable cold chain.



In remote areas, vaccines have to be transported on foot using a portable cold pack container.

*“Transporting vaccines from the central warehouse to 38 intermediate supply depots, and eventually to over 750 remote vaccination sites on the front lines, is a critical and difficult process.”*

## Getting Vaccines to the Front Lines

Vaccines need to be maintained within a specific temperature range at all times to be effective. In the spring of 2012, CDC supported a national measles and rubella vaccination campaign (story on page 19). Transporting vaccines from the central warehouse to 38 intermediate supply depots, and eventually to over 750 remote vaccination sites on the front lines, is a critical and difficult process. Vaccines first arrive at a central warehouse in Port-au-Prince before being driven to intermediate depots where the individual shipments are separated and sent to vaccination sites. Most vaccination sites are in rural areas, so vaccines must be delivered from the depot to the front lines on foot, by donkey or by motorcycle. Vaccines that are not maintained at their holding temperature must be discarded. This presents a unique set of challenges, especially in Haiti, where roads and trails leading to remote vaccine sites can be nearly impassable and electricity can be unpredictable or nonexistent.



Vaccines are transported to dispensaries like this one which serve as vaccination sites.

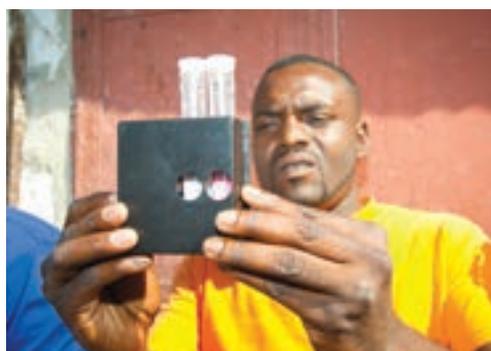
As a temporary measure, CDC helped acquire refrigerated trailers to provide additional cold room capacity at the central depot. There, individual vaccine shipments were packaged into smaller portable, ice-filled cold boxes for delivery to the vaccination sites. The temporary cold chain successfully supported the 2012 national measles and rubella vaccine campaign, but more was needed to ensure a sustainable cold chain. CDC is purchasing solar powered refrigerators capable of maintaining cold temperatures in places with inconsistent or no electricity. The project has encountered some unique challenges. To get the equipment to more remote sites, it needs to be disassembled, transported by foot, by donkey, or by motorcycle piece by piece, and then reassembled onsite. The goal is to have the solar powered refrigerators in place and ready to support implementation of routine vaccination in Haiti by September 2014. The development of a sustainable cold chain in Haiti will be a critical resource to support public health efforts in Haiti for years to come.

## Water, Sanitation, and Hygiene

Access to safe water, adequate sanitation, and education about proper hygiene can reduce illness and death from disease. According to the World Health Organization (WHO) Joint Monitoring Program, after the 2010 earthquake only 69% of all Haitians had access to improved drinking water, and only 17% had access to improved sanitation facilities. The cholera outbreak underscored the need for greater access to safe water and adequate sanitation.

Haiti Coverage Estimates, 2010 (Post-Earthquake)			
	Urban	Rural	Total
Improved Sanitation	24%	10%	17%
Improved Water	85%	51%	69%

The role of safe water in public health programs is often taken for granted. Interventions such as those for HIV, TB, and lymphatic filariasis (LF) rely on administering oral medication with a swallow of water. If that water is contaminated, it could lead to infections that further complicate those conditions. CDC is supporting the government of Haiti and partners to improve access to safe water at the community and household level by building the capacity of the government of Haiti and partners to improve water safety, expanding access to household water treatment and safe storage and improving access to water and sanitation facilities in communities and public institutions.



CDC provided equipment and training to test the quality of water in the village of Trianon. (Credit: David Snyder/CDC Foundation)

### Building Capacity to Safeguard the Municipal Water Supply

Established in 2009, the Department for Water Supply and Sanitation (DINEPA) coordinates and regulates the water and sanitation sector in Haiti. In the wake of the 2010 earthquake and the subsequent outbreak of cholera, the need for municipal water and sanitation technicians greatly increased while human resources have not. There were only about five DINEPA staff members stationed in each of the country's 10 departments, which were located only in urban centers. This small number of water and sanitation staff was inadequate to meet the needs of the country, and DINEPA needed a much larger workforce.

CDC supported DINEPA in the creation and training of this workforce, termed Potable Water and Sanitation Technicians for the Communes (TEPACs). TEPACs are responsible for monitoring quality in community water systems; helping the community understand the importance of water, sanitation, and hygiene issues; and managing and maintaining water systems through local water committees. CDC helped develop the training curriculum, written in Haitian Creole, with topics including risk assessment of water supply infrastructure, methods for chlorine disinfection and water quality testing, guidelines for safe sanitation and hygiene, and strategies for effectively mobilizing local water committees. The TEPACs were subsequently deployed to all communes except the metropolitan Port-au-Prince area, providing a national water and sanitation workforce that did not previously exist at the commune level. The deployment of TEPACs throughout Haiti expanded DINEPA's presence in rural areas and was a critical step in ensuring a standardized strategy for safe water and sanitation provision throughout the country.

#### Training

- 264 TEPACs trained and deployed to 133 communes
- 2,112 total training hours

## Increasing Access to Safe Water for Rural Families

In 2010, Haiti experienced the largest documented epidemic of cholera in the world. Since cholera is easily spread through contaminated water, safe water is key to controlling this outbreak. In rural areas beyond the current reach of piped water systems, a variety of water treatment products have been supplied intermittently to the public. A lack of understanding of correct use, due to varied dosing requirements for each product, coupled with inconsistent availability, may be the reasons why a 2012 survey conducted by CDC in Artibonite Department showed that only 12% of rural households used these products correctly.



TEPACs monitor drinking water quality and work with communities to improve it. (Credit: David Snyder/CDC Foundation)

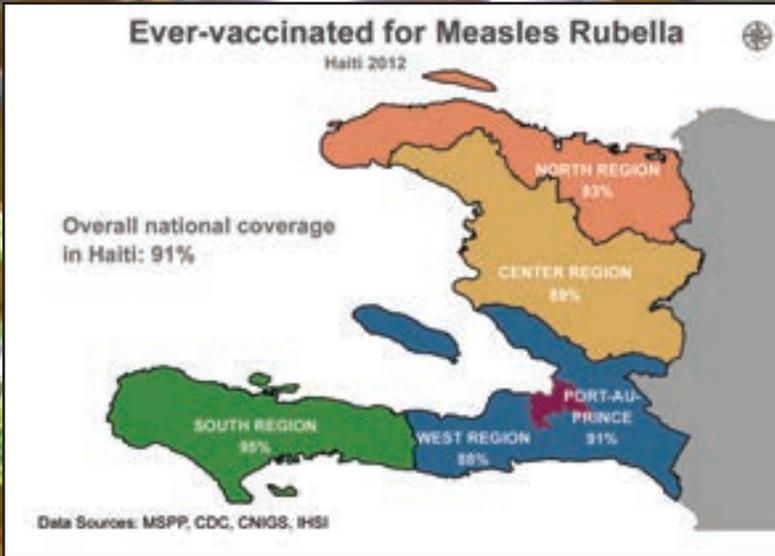


A CDC supported survey in Artibonite Department in 2012 found that approximately  $\frac{1}{3}$  of households had the means to treat drinking water but only about 12% of water samples tested indicated adequate treatment on the day of the visit.

CDC's approach was multi-faceted. CDC supported DINEPA in the creation of national guidelines, which standardize and regulate the types of household water treatment systems products used, and provide technical guidelines and norms for implementing household water treatment systems projects. Simultaneously, CDC partnered with the private sector in providing technical assistance to develop an inexpensive, dilute chlorine solution, which can be produced locally with simple dosing requirements. Concurrently, CDC is partnering with UNICEF and Population Services International to create targeted communication campaigns in high-risk areas to increase awareness of the importance of water treatment products to increase use. CDC is also providing technical and financial assistance for the implementation of various pilot projects to increase product availability, with the end goal of supporting the development of sustainable, well-accepted programs and products. These efforts are helping ensure that families throughout Haiti will know how to protect themselves from waterborne diseases and will have access to an affordable means of doing so.

### Access to Safe Water

- 70,000 household water storage vessels distributed through partners
- Over 5,600 bottles of locally produced chlorine solution (Aquajif) distributed, or enough to treat approximately 9.5 million liters of drinking water



# Public Health Program Strengthening

## Vaccine Preventable Diseases

Immunization is considered a first line of public health defense and is one of the most efficient and cost-effective public health interventions available. A high level of vaccination coverage in a population can prevent the spread of vaccine preventable diseases (VPDs) by reducing the proportion of people who are susceptible to infection. The protection afforded by an effective national immunization program also decreases the potential for VPDs to spread to other countries. Before the 2010 earthquake, routine immunization coverage in Haiti was not adequate, due to, in part, longstanding challenges with vaccine management and safe vaccine storage and shipping. CDC's Global Immunization Division is working in Haiti to increase national vaccination coverage for all routine vaccines to adequate levels (above 90%) and to introduce new vaccines: pentavalent, which protect against diphtheria, pertussis, tetanus, hepatitis B and *Haemophilus influenzae* Type b (known as Hib), pneumococcal conjugate, and rotavirus vaccines.

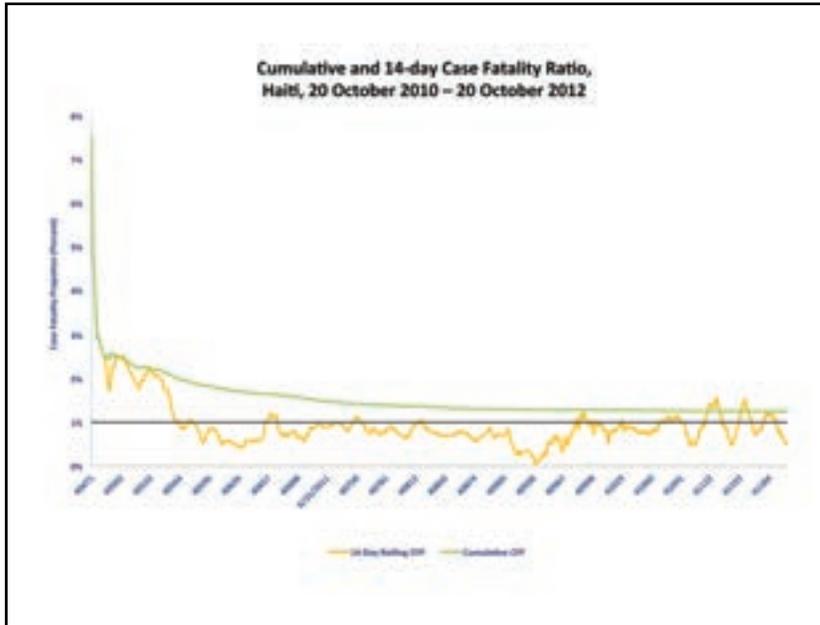
## Protecting Children from Preventable Diseases

Measles and rubella are among the most contagious infectious diseases. In developing countries, up to 10% of children who become sick with measles die. Rubella infection during pregnancy can severely affect the unborn baby, resulting in miscarriage, fetal death, or a combination of devastating birth defects known as congenital rubella syndrome, which includes heart disease, blindness, and deafness. As a result of efforts in 2007 and 2008, Haiti almost eliminated measles and rubella. However, the initiative was not sustained, and by 2011, only 59% of children under one year old received measles-rubella (MR) vaccine. A vaccination rate above 90% is necessary to ensure that a country's population is protected from the spread of measles or rubella viruses.

To achieve elimination of measles and rubella, Haiti decided to conduct a national MR vaccination campaign targeting children younger than 10 years of age. Between April and June 2012, CDC facilitated trainings, developed protocols and tools for data collection, monitored immunization activities, and provided funding to the Haitian MSPP, PAHO, and UNICEF. In addition, at the request of MSPP and PAHO, CDC designed and funded a nationwide survey to evaluate the success of the MR vaccination activities. A cadre of 25 CDC-trained Haitian interviewers went door-to-door to administer the survey to 7,000 households representing 10,000 children. A CDC analysis of the survey showed that 91% of children aged 1-9 years received at least one dose of MR vaccine. Almost 30% of the children received their first dose of MR vaccine during the campaign. The campaign also provided a second dose of MR vaccine to over half of children 1-9 years of age, ensuring that these children have complete protection against these diseases. These results indicate a real improvement in vaccination in Haiti. The survey also identified a need for improved vaccination coverage among children younger than four years of age. To meet this challenge, CDC is focusing efforts on strengthening routine immunization. During 2012, with support from the Global Alliance for Vaccines and Immunization, pentavalent vaccine<sup>4</sup> was introduced, while the rotavirus vaccine is scheduled for introduction in 2013, and pneumococcal conjugate vaccine will be introduced in 2014. These efforts will protect more children from sickness and death from VPDs, and will reduce the risk of VPD outbreaks in Haiti and the Americas.

4. Pentavalent vaccine offers protection against five diseases: diphtheria, tetanus, pertussis, hepatitis B, and *Haemophilus influenzae* type b.





Thanks to a rapid, coordinated response by MSPP, CDC, and international partners, the cholera case fatality rate was lowered from 4% at the peak of the epidemic to the internationally recognized standard of  $<1\%$ .

## Cholera

On October 21, 2010, roughly ten months after the earthquake that devastated Haiti and left the public health infrastructure in shambles, the LNSP and CDC confirmed *Vibrio cholerae*, the cause of cholera, in two regions of Haiti. The situation that unfolded marked the first cholera outbreak in Haiti in over a century and the largest cholera epidemic in modern history. Scientists across CDC worked with MSPP and nonprofit organizations to rapidly respond to the outbreak and to bring it under control. As of March 2013, over 650,000 cases of cholera and 8,000 deaths have been reported in Haiti. CDC's ongoing work in Haiti focuses on several key strategies: improving access to care and quality of treatment for cholera and other diarrheal diseases; educating the public on how to prevent cholera through a cadre of trained community health workers; and building capacity within the government of Haiti and partners to prevent and control cholera and to improve water safety in Haiti.

### Saving Lives and Preventing the Spread of Cholera

When epidemic cholera was first detected in Haiti, the Haitian medical community had little experience with the disease and needed rapid training as the epidemic spread throughout the country. CDC developed clinical training materials specific to Haiti and launched a cascading training effort in November 2010. Over the following three weeks, a train-the-trainers program reached more than 500 people who could then train and equip staff at the hospitals where they worked. In addition, CDC developed a training manual (in French, Creole, and English) on cholera education and prevention for community health workers, the backbone of the health system in rural Haiti. More than 1,000 community health workers were trained using CDC's cholera materials. The early training of health professionals helped reduce mortality among hospitalized cholera patients from a high near 4% at the start of the outbreak to levels at or below the international standard of 1% throughout most of 2011 and 2012.

### Lab Monitors *V. cholerae* in Patients and the Environment

After the earthquake CDC's Enteric Diseases Laboratory (EDL) experts trained Haitian public health scientists to rapidly diagnose diarrheal illness, including cholera. As a result, LNSP was able to rapidly confirm *V. cholerae* as the cause of the outbreak. As part of the outbreak response, EDL continued working with LNSP to expand capacity for diagnosis and surveillance of diarrheal illness. EDL also worked with LNSP and other partners to determine the antimicrobial susceptibility, genetic relatedness, and evolution of cholera isolates collected during the outbreak. CDC's Environmental Microbiology Laboratory (called the "Water Lab") led the effort to collect and analyze water and seafood samples for *V. cholerae* and subsequently transferred this technology to LNSP. The Water Lab continues to conduct ongoing environmental surveillance for *V. cholerae* and other diarrhea-causing pathogens in Haiti.

*"The situation that unfolded marked the first cholera outbreak in Haiti in over a century and the largest cholera epidemic in modern history."*

## Lymphatic Filariasis

Lymphatic Filariasis (LF) is an infection caused by microscopic worms, transmitted to humans by mosquitos. LF infection can lead to permanent disability from swollen limbs and breasts (lymphedema), damage to the genitals (hydrocele), or swollen limbs with thickened, hardened skin (elephantiasis). As of June 2011, the WHO estimated that over 8.6 million Haitians were at risk for LF, with a national infection prevalence of approximately 10%.

CDC's Division of Parasitic Diseases and Malaria has been working with MSPP and other international partners since 2000 to scale up mass drug administration (MDA) in Haiti in an effort to eliminate LF. CDC is currently building on these efforts by completing three rounds of MDA in Port-au-Prince and working to secure commitments from donors to fund and administer additional rounds needed to eliminate LF.



Mass drug administration campaigns were promoted over the radio, using print materials, and by community health workers using megaphones.



LF mostly affects the legs, but can also occur in the arms, breasts, and genitalia.

### Eliminating Lymphatic Filariasis in Haiti Is Within Reach

Haiti has one of the highest burdens of LF in the Americas. In some communities, 30% of children were infected by age four, a level of infection among the highest in the world. Since LF-transmitting mosquitos breed in polluted water, post-earthquake conditions made this program's success even more crucial.

In order to break the transmission cycle and thereby eliminate LF, a majority of the population must receive about five consecutive annual doses of MDA. Less than twenty years ago in Haiti, a single dose of treatment in Haiti required 12 days of pills. Today, only a single pill is needed for each dose. In 2012, CDC procured millions of doses of the drug needed for the most recent round of MDA, providing treatment for 2.3 million people in Port-au-Prince. CDC is funding the next two rounds of MDA in Port-au-Prince and will assist MSPP in administering them during 2013 and 2014. So far, three of ten departments in Haiti have successfully implemented five rounds of MDA.

*"In 2012, CDC procured millions of doses of the drug needed for the most recent round of MDA, providing treatment for 2.3 million people in Port-au-Prince."*

Currently, CDC is training MSPP and other partners to conduct the LF Transmission Assessment Survey, a tool that determines if LF has indeed been interrupted and that therefore MDA can be safely scaled back. Continued LF program success in Haiti moves the Americas and the world one step closer to wiping out this dreaded, neglected parasitic disease.

## Tuberculosis

Tuberculosis (TB) is among the most serious infectious health threats globally. Haiti has the highest TB rates in the Americas. Factors that contribute to this high rate include poverty, crowded living conditions, the concurrent HIV epidemic (the risk of TB is dramatically increased in people with HIV), and a public health infrastructure that was under-resourced prior to 2010 and further weakened by the earthquake. CDC's HSRP is working with the Haitian National Tuberculosis Program, the LNSP, and local and international partners to reduce the prevalence of TB in Haiti. CDC support focuses on increasing the national case detection rate; increasing treatment success rates; increasing TB prevention efforts; and monitoring implementation efforts.

### Developing Tuberculosis Diagnostic Testing Capacity at the National Public Health Laboratory

Diagnosis of TB in Haiti is based primarily on evaluation of sputum samples using a microscope. This test is important but inadequate—it may miss TB more than 60% of the time. There are tests that can diagnose TB more accurately, and in some cases very rapidly, but some of these tests are complicated and require specialized laboratories to be done safely. One nongovernmental organization (NGO) partner in Haiti has been doing these more complex tests. However, for the long-term sustainability of the program, it is critical to establish this capacity at the Haitian LNSP.

*"In January 2013, an independent consultant reviewed the lab activities and reported that the lab staff is fully proficient—a remarkable achievement in such a short time frame."*

CDC is providing intense support to the LNSP in Haiti to expand the ability to diagnose TB. A self-contained laboratory was installed in late 2011. In collaboration with other partners, CDC has supported the installation and equipping of the laboratory and has obtained needed supplies. CDC and other partners have worked with the laboratory staff to develop standard procedures and to design and install a laboratory information system. Technicians continue to undergo extensive training, but are already routinely doing cultures and testing for susceptibility to TB treatment drugs. In January 2013, an independent consultant reviewed the lab activities and reported that the lab staff is fully proficient—a remarkable achievement in such a short time frame.

This improved ability to carry out TB diagnostic tests will allow better identification of patients with TB, and will dramatically enhance the capacity to identify TB that is resistant to standard treatment drugs (allowing provision of optimal treatment). Development of this capacity at the LNSP is a vital step in supporting MSPP in taking on full leadership of the TB program.



Contact tracing is a strategy used to find persons potentially infected with TB.



CDC provided funding and training to establish the new TB laboratory.



A mentored training conducted in the new TB laboratory.

## Violence Against Children

Violence leads to more than 1.6 million deaths worldwide every year, and more than 90% of these occur in low- and middle-income countries. Death from violence is only part of the story. Many victims of violence survive and are left with permanent physical and emotional scars. Violence against children is thought to be a hidden global epidemic. In the wake of the 2010 earthquake in Haiti, millions of people lost their homes and were forced to live in crowded camps, and children lost their parents and caregivers to death from injury and disease. This tragedy left many children vulnerable to physical and sexual violence. However, there was a severe lack of information about the magnitude of this problem and the government of Haiti had limited evidence for planning, prevention, and response strategies.



The results of this study indicate that sexual, physical, and emotional violence are common for children growing up in Haiti.

### Children and Violence in Haiti

CDC, in partnership with a task force made up of the government of Haiti, the U.S. government, United Nations agencies, NGOs, and private sector partners, designed and implemented a Violence Against Children Survey (VACS) to measure the number of Haitian children impacted by physical, emotional, and sexual violence.

VACS wanted to estimate the lifetime prevalence of childhood violence in Haiti (defined as violence occurring before 18 years of age and violence that occurred in the 12 months prior to the survey among 13-17 year olds). CDC used qualitative research methods to inform the development and implementation of the national survey. Field work for the survey was conducted from April–June 2012. This research helped to identify common types of violence committed against children and the circumstances under which they occur; to identify the terminology that Haitians use when talking about these issues; to clarify concepts for use in the questionnaire; and to identify specific cultural perceptions and practices that may be unique to Haiti.

#### The Violence Against Children Survey showed that:

- 25.7% of females and 21.2% of males aged 18-24 years experienced sexual abuse as a child.
- 60.5% of females and 57.2% of males aged 18-24 years experienced physical violence as a child.
- In the 12 months preceding the survey, nearly 1 out of 5 females and 1 out of 10 males aged 13-17 years experienced at least one incident of sexual abuse.
- Approximately one-third of females and males aged 13- 17 years experienced physical violence in the 12 months prior to the survey.

CDC provided assistance for all aspects of survey design and implementation. The results of VACS provided estimates which describe the significance and type of violence experienced by children in Haiti. Data from this survey represent the first nationally representative information on violence against children in Haiti and will be used to develop a national plan of action for addressing violence against children. Haiti now has the information necessary to design, implement, and evaluate violence prevention programs and to build successful child protection systems in the future.

## Emergency Obstetric and Neonatal Care

Maternal mortality in Haiti is the highest in the Americas. Complications during pregnancy or delivery such as eclampsia and hemorrhaging are the main cause of maternal death in Haiti. The risk of these complications increases when the mother has a disease such as HIV or malaria. CDC's HSRP is working closely with MSPP and other international partners to identify and address the barriers to optimal maternal health in Haiti. The goal is to increase access to institutional deliveries and quality emergency obstetric and neonatal care, increase access to quality antenatal care and postnatal care, and to establish a scalable maternal death surveillance and response system.



Increased access to quality emergency obstetric care will help reduce death from complications during pregnancy.

### Preventing Maternal Deaths

The best information in Haiti is that for every 270 live births an estimated 35 mothers will needlessly die during or shortly after delivery. However, since most births do not occur in a health care facility and there is no systematic way to track all of the deaths, the actual number of maternal deaths is believed to be much higher. These deaths are preventable when timely, adequate, and quality emergency obstetric and neonatal care services are available.

CDC is assisting in efforts to increase access to emergency obstetric care for an estimated 3,664 women and access to services such as antenatal care and postnatal care for an estimated 24,430 women. CDC favors the integration of services to ensure women have access to a range of services including family planning, prevention of mother to child transmission of HIV, cervical cancer screening, and sexually transmitted infection diagnosis and treatment.



CDC is working to identify and reduce barriers to access to emergency obstetric and neonatal care clinics.

To have a more accurate picture of the magnitude and the major causes of maternal death in Haiti, CDC, in collaboration with its partners, is supporting the MSPP in developing a national framework for a Maternal Death Surveillance and Response System. CDC will directly support MDSR implementation in selected regions. This system will provide information for action to prevent future maternal deaths.

CDC investments are to help the MSPP in achieving its goal of having a network of health institutions with adequate personnel, infrastructure, and equipment to provide high-quality emergency obstetric care and to ensure every mother-to-be receives the care she needs for herself and her baby.

**CDC is setting the tone and is helping the MSPP and international partners effectively direct resources and capacity building efforts to increase access to emergency obstetric care.**

## Malaria

Haiti and the Dominican Republic (DR) occupy the only Caribbean island where malaria is still being transmitted. An estimated 70%-80% of the population of Haiti is at risk for malaria. However, because the presence of the parasite that causes malaria is low in Haiti (national estimate of <1%), and the number of new cases in the DR is also low, a concerted, coordinated effort between the two countries could completely eliminate malaria from the island. CDC is working to develop the capability of MSPP to eliminate malaria in Haiti. CDC is focusing on strengthening surveillance, improving diagnostics, developing risk models, evaluating intervention options, and monitoring resistance to chloroquine, the chief drug used to treat malaria.

### Improving Diagnosis and Treatment to Stop the Spread of Malaria

Because the earthquake severely damaged the laboratory infrastructure serving Port-au-Prince, if a person came to a clinic with a fever, a common symptom of many diseases including malaria, there was no capacity to determine the cause of the fever. Without the ability to accurately diagnose malaria and appropriately treat it, a patient could become severely ill and possibly die.

Prompt and accurate diagnosis of malaria coupled with effective treatment and drugs for the prevention of malaria are the cornerstones of the national strategy for malaria control in Haiti. CDC has procured approximately 5,000 malaria rapid diagnostic tests (RDTs) and conducted training to ensure proper use for partners who provide health care in IDP camps. The gold standard for malaria diagnosis is microscopy, which relies on a trained laboratorian identifying the malaria parasite with a microscope. RDTs are more flexible and easier to use than microscopy, but they had not been tested in these field settings. Together CDC and MSPP assessed whether the two diagnostic methods performed as well in the field. The results showed that the two methods gave comparable results, and the national malaria control policy was then revised to recommend RDT test kits. CDC also assisted in revising the national malaria diagnostic and case management policies, strengthening the MSPP's ability to conduct surveillance to track the disease and improving clinicians' ability to treat it. Now when a person comes to a clinic with a fever, clinicians are able to confidently diagnose malaria and provide effective antimalarial medications. These changes not only help the patient, but protect the community at large by preventing further spread of malaria.



Stagnant water sources such as this are breeding grounds for mosquitos.

*"CDC has procured approximately 5,000 malaria rapid diagnostic tests (RDTs) and conducted training to ensure proper use for partners who provide health care in IDP camps."*

### CDC is working to establish malaria rapid diagnostic tests (RDT) capacity in laboratories throughout Haiti. As of April, 2013:

- 40 laboratories in 5 departments have received RDTs and training in proper use.
- 65% of these have successfully passed quality assurance assessments.
- 14 unsuccessful laboratories will receive intensive technical assistance in 2013 to become proficient.

## Rabies

For decades Haiti had the highest number of human rabies infection in the Americas. Without immediate and timely exposure prophylaxis, rabies infection is almost always fatal. Conditions after the 2010 earthquake increased the risk for exposure to rabies as displaced Haitians had the potential for more frequent contact with rabid dogs. Limited public health resources following the earthquake led to a reduction in national efforts for rabies prevention and control. The CDC's Division of High-Consequence Pathogens and Pathology has stepped in to support the Ministry of Agriculture, Natural Resources, Rural Development, and MSPP with a goal of reducing the incidence of human and canine rabies in Haiti by half by 2015. CDC is providing financial and technical assistance to improve laboratory diagnostic capacity and surveillance, as well as the risk assessments and decision making regarding the administration of post-exposure prophylaxis. Additionally, CDC is supporting the development of binational guidelines for rabies control and prevention for Haiti and the Dominican Republic, conducting risk assessments, and developing targeted educational outreach methods.

*"CDC plans to fill existing gaps in the national rabies surveillance system and build laboratory capacity to support it."*

### Improving Diagnostic Tests for Rabies

Currently rabies prevention efforts in Haiti are hampered by the fact that most suspected rabid animals are not tested; thus surveillance in Haiti likely does not capture the total number of rabies cases. CDC plans to fill existing gaps in the national rabies surveillance system and build laboratory capacity to support it. Laboratory capacity, in particular, is critical to the effective diagnosis of suspected rabies cases. In order to accurately diagnose rabies in animals, it is necessary to identify viral antigens in tissue from the central nervous system. The standard rabies diagnostic test, which is the direct fluorescent antibody test, requires expensive specialized equipment such as a fluorescent microscope and an electrical power supply for the laboratory. As an alternative method, a new test developed by CDC, the Direct Rapid Immunohistochemical Test can be performed using a light microscope, making diagnosis faster and easier. The CDC has supported training 26 professionals from the Ministry of Agriculture, Natural Resources, Rural Development, and MSPP to perform the Direct Rapid Immunohistochemical Test for laboratory diagnosis of rabies. With a positive result in a suspected animal, doctors can confidently treat exposed individuals, and public health investigations can be initiated to identify additional potentially exposed cases. Accurate diagnostics strengthen rabies surveillance, which is the first step in controlling and eliminating rabies in Haiti and the Dominican Republic.



MSPP professionals are trained to use a new test developed by CDC that makes diagnosing rabies faster, easier, and less expensive than traditional methods.

## Nutrition

Prior to the 2010 earthquake, the nutritional status of children under five years of age was already precarious. Food insecurity, inadequate feeding practices, limited access to safe drinking water, and lack of sanitation all contributed to the poor nutritional status of children and women. Suboptimal nutritional status at birth was evident in Haiti prior to the earthquake: one in four children were born with low birth weight. Since the existing national data about the state of food security, nutritional status, and magnitude of malnutrition predated the earthquake, MSPP and international partners had difficulty prioritizing interventions to effectively and efficiently address the problem. CDC is helping to reverse this information deficit by establishing routine, health-facility based surveillance for nutritional status and supporting implementation of activities aimed at reducing under-nutrition.

### Building Lasting Capacity to Address Malnutrition

In March 2012, CDC helped MSPP and UNICEF conduct a national survey on malnutrition using the Standardized Monitoring and Assessment of Relief and Transitions (SMART) methodology, which assesses the severity of a humanitarian crisis based on the nutritional status of children less than five years of age and the mortality rate of the population.



Malnutrition can have negative consequences for a child's mental and physical health.

CDC utilized the fledgling FETP program to help administer the survey, a strategy that had multiple benefits. Training FETP fellows in the SMART methodology not only provided the manpower necessary to conduct a survey of this magnitude, it also establishes nutritional epidemiology capacity within Haiti as the fellows typically hold positions within the MSPP. This type of coordinated program implementation has immediate and long-term benefits for the MSPP and for the people of Haiti.

Conducting periodic SMART surveys provides a good snapshot, but it is only the first step in understanding the nutritional status of children less than five years of age and pregnant and lactating women. To accurately document the magnitude of malnutrition and food insecurity in the population and provide the correct response, the MSPP needs to gather valid and reliable data in an ongoing, continuous manner at both the departmental and national levels. CDC is helping MSPP and its partners to implement a National Sentinel Nutrition Surveillance System. With this new information, MSPP is better able to manage and evaluate nutrition programs to help prevent children suffering from malnutrition in the future.

*“Training FETP fellows in the SMART methodology not only provided the manpower necessary to conduct a survey of this magnitude, it also establishes nutritional epidemiology capacity within Haiti as the fellows typically hold positions within the MSPP.”*

**According to the SMART survey conducted in March 2012, while the national prevalence of acute malnutrition is low (4.1%), the rate of chronic malnutrition remains high (23.4%). This means that almost one out of every four children under five years of age has stunted growth due to improper nutrition.**

## Partner Acknowledgements

While this report focuses on the contributions and efforts of CDC in supporting health system recovery in Haiti, these accomplishments would not have been possible without the contributions of partner organizations. From the acute response in the days and weeks immediately following the earthquake to the long-term, sustainable investments in training and infrastructure, our partners continue to demonstrate their commitment to improved health. Nongovernmental, governmental, academic, and international organizations have each had a unique role in this recovery. The government of Haiti provided strong commitment and leadership for this effort, and contributions of expertise, resources, funds and political support from partners have strengthened the government's ability to ensure improved health and well-being for their nation. Some of these contributions have been identified within this report, but CDC would like to acknowledge and voice appreciation for the individual and collective efforts thus far in supporting health system recovery in Haiti. Thank you.



A young boy stands outside of a tent where relief workers meet with camp leaders in the Aviation camp in Port-au-Prince five weeks after the earthquake killed more than 200,000 people in the city. (Credit: David Snyder/CDC Foundation)

## CDC Partners

### Government of Haiti

Ministry of Agriculture, Natural Resources,  
and Rural Development  
Ministry of Economics and Finance

- Institute of Statistics and Information

Ministry of Justice and Public Security

- Brigade for the Protection of Minors

Ministry of Public Health and Population

- National Malaria Control Program
- National Public Health Laboratory

Ministry of Public Works, Transportation, and  
Communication

- National Directorate for Water Supply  
and Sanitation

Ministry of Social Affairs and Labor

- Institute of Social Welfare and Research

Ministry of Women's Affairs and Women's  
Rights

### U.S. Government

United States Agency for International  
Development

United States Department of State

United States President's Emergency Plan  
for AIDS Relief

### Other Government Agencies

Brazilian Ministry of Health

Canadian International Development Agency

National Center for the Control of Tropical  
Diseases, Dominican Republic

National Malaria Control Program for the  
Dominican Republic

### United Nations Organizations

Inter-American Development Bank

Joint United Nations Program on HIV/AIDS

Pan-American Health Organization

United Nations Children's Fund

United Nations Entity for Gender Equality and  
the Empowerment of Women

United Nations Office for the Coordination  
of Humanitarian Affairs

United Nations Population Fund

World Bank

World Food Programme

World Health Organization

### Nongovernmental Organizations

Action Against Hunger

Agency for Technical Cooperation and  
Development

American Society for Clinical Pathology

American Society for Microbiology

Association of Public Health Laboratories

Bill and Melinda Gates Foundation

CARE International

CDC Foundation

Centers for Development and Health

Commission of Women Victims for Victims

Concerned Haitian Americans of Illinois

Direct Relief International

Deep Springs International

Foundation for Innovative New Diagnostics

Foundation for Reproductive Health and  
Family Education

Global Alliance for Vaccines and  
Immunization

Global Alliance for Rabies Control

Global Fund to Fight AIDS, Tuberculosis, and  
Malaria

Haiti Adolescent Girls Network

Haitian Group for the Study of Kaposi's  
Sarcoma and Opportunistic Infections

Hospital Albert Schweitzer

Institute of Medicine

International Training & Education Center for  
Health

Interuniversity Institute for Research and  
Development

Johns Hopkins Program for International  
Education in Gynecology and Obstetrics

Kay Fanm

National Alliance of State and Territorial AIDS  
Directors

National Association for the Protection  
of Haitian Women and Children

Partners in Health

Population Services International

PotoFanm+Fi

RTI International

Save the Children

Together for Girls

Training Programs in Epidemiology and  
Public Health Interventions Network

William J. Clinton Foundation

World Vision

## Private Sector

BD

Grupo ABC

Nduna Foundation

## Academic Institutions

University of Maryland

University of Miami

University of Notre Dame

University of Washington

## Faith Based Organizations

Catholic Medical Mission Board

IMA World Health

International Child Care









For additional information, please contact  
Centers for Disease Control and Prevention  
1600 Clifton Road NE, Atlanta, GA 30333  
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348  
E-Mail: [cdcinfo@cdc.gov](mailto:cdcinfo@cdc.gov)/Web: [www.cdc.gov](http://www.cdc.gov)