



CDC
Center for Global Health
Accomplishments

2018



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

CDC's global health mission is to protect and improve health globally through science, policy, partnership, and evidence-based public health action.

Impact by the Numbers	4
Advancing Global Health Security	6
Outbreaks and Emergency Response	8
Ending the Burden of Diseases	12
HIV Research, Policy, and Practice	14
Vaccination Research for Action	16
Malaria and Parasitic Disease Control in the United States	17
Technology and Innovation	18

2018 Impact by the Numbers

CDC Center for Global Health

Workforce & Presence

Over **1,800** Staff in 59 country offices

Approximately **1,000** in the US

Outbreaks & Emergency Response

3,680+ Combined days CDC experts deployed to support emergency responses

139 International public health events monitored and reported

220 Threats across the globe investigated through the Field Epidemiology Training Program (FETP)

Measles

22 global measles outbreaks tracked through the Global Disease Detection Operations Center

Supported

15 measles outbreak countries & immunization activities in 4 nonoutbreak countries leading to more than **119** million people vaccinated globally

Ebola Provided technical support to improve strategies for implementing **Ebola vaccination** with

53,000+ people receiving Ebola vaccine

Vaccines

60 new vaccines introduced in **48 countries** including hepatitis B inactivated polio vaccine (IPV) rubella rotavirus

HIV & TB*

Provided **life-saving antiretroviral treatment (ART)** for **8.2M** men, women & children living with HIV globally

Identified an **additional 1.7M** people living with HIV globally

Supported **TB screening** for **6.5M** people living with HIV

*Through the US President's Emergency Plan for AIDS Relief (PEPFAR)

Parasitic Diseases & Malaria

Provided **otherwise unavailable life-saving medication** for **97** US patients with parasitic infections

Conducted **6,400+** diagnostic tests for parasitic diseases

Responded to **5,100+** hotline inquiries

Polio

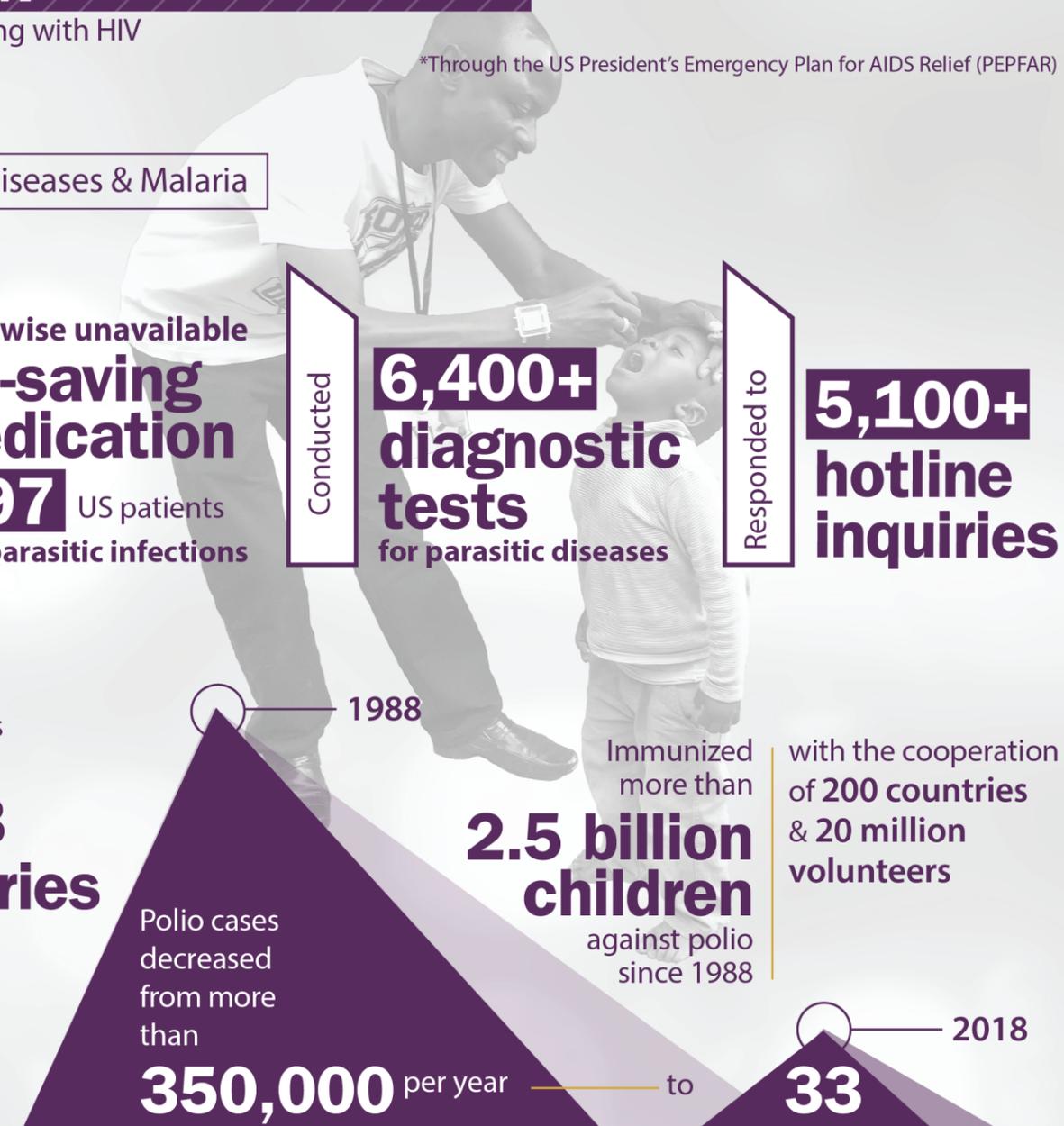
Polio remains endemic in **only 3 countries**

Polio cases decreased from more than **350,000** per year

Immunized more than **2.5 billion children** against polio since 1988

with the cooperation of **200 countries & 20 million volunteers**

33 in 2018



Advancing Global Health Security

The Global Health Security Agenda: Keeping Us Safer at Home and Around the World

Because of the nature of infectious diseases, we all remain vulnerable, including in the United States, until every country in the world can rapidly identify and contain public health threats. Through the Global Health Security Agenda (GHSa), launched in 2014 to strengthen the world's ability to prevent, detect, and respond to public health emergencies, CDC invests in creating strong public health systems globally to lessen the chance that dangerous diseases will affect the United States. Because of these investments, many countries have reduced their outbreak response times and halted outbreaks in their tracks. In 2018, Vietnam trained nearly 9,000 public health workers and reported 4,323 potential public health events, 317 of which required a public health response. Similarly, in Burkina Faso, training of health care workers and community workers increased detection of unusual events from 14 cases in over a year to 23 cases in just over three months. In Uganda, CDC trained scientists used modern diagnostics to rule out Ebola and confirm cases of Crimean Congo hemorrhagic fever within 24 hours of alert. Through our unique public

health expertise in disease surveillance, laboratory science and networks, public health workforce development, emergency management, and real-time data for evaluation and action, CDC helps countries strengthen public health systems and contain outbreaks before they spread into regional epidemics or global pandemics.

We all remain **vulnerable** until every country in the world can rapidly **identify and contain** public health threats.



Global Health Security Agenda 2019-2024

At the 2017 GHSa Ministerial Meeting in Uganda, member countries supported extending GHSa from 2019 to 2024. This next five-year phase of GHSa, known as "GHSa 2024," was officially launched during the 2018 Ministerial Meeting in Indonesia and aims to facilitate high-level and multisectoral work toward sustainable and measurable advances in health security. GHSa 2024's target is for more than 100 countries to improve health security-related technical areas within five years. CDC is a major contributor to and leader of the US government's commitment to this next phase of GHSa and supports international collaboration, increased engagement, measured progress, and accountability across the GHSa community (i.e., the private sector, nongovernmental organizations, and others) for meeting and exceeding commitments.



2018 Global Health Security Agenda Ministerial Meeting in Indonesia.

Advancing Global Health Security

The Economic Impact of Global Health Security

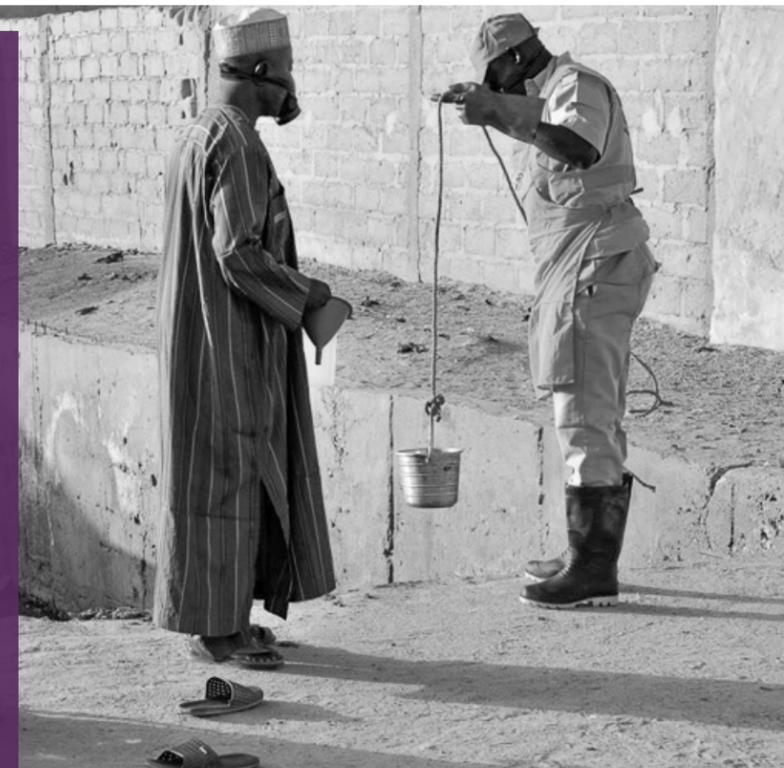
Global outbreaks can have devastating local impacts. In 2018, CDC published a series of articles demonstrating clearly that an outbreak in a single country overseas can put US exports and jobs at risk. When an uncontained outbreak becomes a regional or even global epidemic, potential costs skyrocket and the number of American jobs threatened multiplies.

The first article demonstrates how the US economy is linked to CDC's global health security focus countries, as these countries support more than \$308 billion in US exports and more than 1.6 million US jobs. The second article models the impact of a hypothetical outbreak and how it could put more than 1.37 million US jobs at risk if not controlled. The third article describes the relevance of global health security to US domestic interests, including state and local preparedness, travel, tourism, education, exports, jobs, agriculture, and partnerships.

In our increasingly interconnected world, advancing global health security can help protect Americans and people around the world from the health and economic consequences of disease outbreaks and public health emergencies.



A hypothetical outbreak could put more than **1.37M** US jobs at risk.



Trade with global health security focus countries supports more than **1.6M** US jobs.

Disease outbreaks can cause economic disruption

Decreasing demand for US exports and



Putting US export-related jobs at risk.

Global health security helps safeguard America's health and economic stability.

Outbreaks and Emergency Response

Ebola Outbreak in the Democratic Republic of the Congo

On July 30, 2018, the Democratic Republic of the Congo (DRC) confirmed an outbreak of Ebola in North Kivu, an area that has suffered years of insecurity. This is now the second largest Ebola outbreak in history. CDC is working closely with other US government agencies and international partners to support DRC to control the outbreak. CDC has deployed experts to DRC, neighboring countries, and the World Health Organization (WHO) headquarters. At CDC headquarters in Atlanta, a team is providing technical guidance and cross agency coordination. The CDC DRC country office is supporting this response, and CGH's long-term disease control and capacity building investments in DRC have been valuable assets. CDC has helped DRC train 196 Field Epidemiology Training Program (FETP) graduates since 2013, many of whom are deployed to support Ebola case investigations, active case finding, and contact tracing in North Kivu. CDC is also helping DRC establish a Center for Excellence for Ebola. Initial implementation will focus on strengthening outbreak coordination and data management, using practical experience from the current Ebola response.

CDC offices in Uganda, Rwanda, South Sudan, and Kenya are actively supporting Ebola preparedness, leveraging CDC in country investments to improve surveillance, laboratory capacity, and rapid response, in collaboration with ministries of health and international partners.

To prepare for and limit cross border spread of Ebola, CDC staff, working with WHO colleagues, have helped ministries of health in Uganda, South Sudan, and Rwanda provide Ebola vaccine to health care staff and frontline workers. During 2018, 3,000 health care and frontline workers were vaccinated in Uganda; Ebola vaccination was introduced in South Sudan in January 2019 and in Rwanda in March 2019. CDC staff also worked with countries to update vaccination protocols, develop standard operating procedures and training materials for Ebola outbreak preparedness and response, and define high risk target populations. CDC's work across multiple countries has helped standardize processes and facilitate dissemination of best practices.



The Ebola outbreak in the DRC is now the **second largest** in history.



Rwanda performs full-scale Ebola exercises. (Courtesy, RBC/MOH)



Ebola vaccine



A map of the Democratic Republic of the Congo.

Outbreaks and Emergency Response

Ebola's Deadly Lasting Effects

More than four years after the 2014 Ebola epidemic in West Africa that infected 28,000 people and claimed 11,000 lives, new information is being uncovered about the lasting effects of the virus on survivors. In 2018, CDC and partners published a study in *The Lancet Infectious Diseases* documenting how a small cluster of Ebola cases occurred in Liberia in November 2015 after the end of the Ebola epidemic, raising the possibility of transmission from a persistently infected person.

CDC and partners conducted an outbreak investigation that revealed evidence that a patient in the November 2015 cluster survived Ebola in 2014 and may have had viral persistence or recurrent disease and transmitted the virus to other family members a year later. Evidence from this investigation suggests that Ebola can persist after a patient recovers from acute infection. It highlights the risk that Ebola may reemerge, even after active transmission is interrupted. Transmission from latent infections is rare, but the findings

show the importance of continued surveillance once countries are declared Ebola free. Resurgence can occur, and countries must remain vigilant and continue to focus efforts on strengthening health systems to prevent, detect, and respond to Ebola and other infectious diseases. These diseases can spread rapidly and have a devastating impact on countries, communities, families, and patients.



Countries must remain **vigilant and continue to focus on strengthening health systems** to prevent, detect, and respond to Ebola virus infections.



A mother and her three children in Liberia. Credit: Leslie R. McCree

Outbreaks and Emergency Response

Fighting Zika at Home and Abroad



A blood-engorged female *Aedes albopictus*, a Zika-transmitting mosquito, feeding on a human host.

The 2015–2017 Zika outbreak posed a significant public health challenge globally. CDC worked closely with US government agencies and local and international partners to minimize the number of pregnancies affected by Zika virus infection and to build capacity to better understand the virus. Through partnerships, CDC rapidly implemented Zika activities across Latin

America and the Caribbean, Asia, and Africa, with a focus on six functional areas: emergency response; vector control and management; innovations; laboratory capacity; maternal and child health; and surveillance, epidemiology, and public health investigations.

By the fall of 2018, the majority of these activities had been completed, advancing a deeper understanding of Zika and its long-term consequences on affected countries and at-risk populations. CDC and partners established regional networks of entomological surveillance and expertise in Central America, the Caribbean, and West Africa, covering more than 45 countries; strengthened laboratory capacity in 123 countries; and conducted pregnancy cohort studies in Haiti, Colombia, Panama, El Salvador, Guatemala, Kenya, and Thailand.

Measles Outbreaks Around the World

Since 2000, measles deaths have been reduced by 80%, and measles elimination efforts have prevented an estimated 21.1 million deaths globally.

However, from 2017 to 2018, provisional data indicate the number of measles cases has risen by 50%, with many regions around the world experiencing large, often prolonged outbreaks of the disease. During this time, major outbreaks occurred in Brazil, the Democratic Republic of the Congo, Israel, Madagascar, the Philippines, Venezuela, and Ukraine.

CDC staff in Atlanta and staff deployed to key countries are working with partners to address global measles outbreaks. CDC is supporting in-country immunization activities, specialized laboratory testing, and regional and national trainings on preparedness for importation of measles. Additionally, CDC is helping countries and partners identify and investigate suspected measles cases and assisting with ongoing vaccination strategies and outbreak response.



In Nigeria, a little girl prepares to receive her measles vaccination.

In 2018, CDC supported 15 countries with outbreak investigation and response and supported 4 countries with supplemental immunization activities to address endemic measles virus transmission. These activities led to more than 119 million people getting vaccinated globally in 2018.

Measles outbreaks illustrate how fragile gains in disease elimination are. To make further progress, case-based surveillance must be strengthened, vaccination uptake should increase, and political commitment and investment in immunization programs must be secured.

Outbreaks and Emergency Response

Vaccine-Derived Poliovirus (VDPV) Outbreaks

Outbreaks of vaccine-derived poliovirus (VDPV) have occurred in geographic areas in several countries where populations are under-immunized or not immunized, including the Democratic Republic of the Congo, Nigeria, Niger, Papua New Guinea, Somalia, and Syria. These outbreaks have occurred mostly in countries that are free from wild poliovirus but where polio vaccine coverage among children is low because of weakened health infrastructure. CDC and partners use the same proven strategies for stopping wild poliovirus to respond to VDPV cases—strengthening surveillance systems and increasing vaccination coverage. Because of these strategies and the rapid mobilization of resources on the ground, outbreaks can be controlled quickly. For example, in Syria, CDC and partners deployed a comprehensive outbreak response and successfully stopped a VDPV outbreak in months, despite protracted conflict and instability.

Significant global progress against polio in recent years demonstrates that the resources, political will, technical and scientific know-how, and infrastructure for eradication are in place to stop both wild and vaccine-derived polio outbreaks.



CDC uses the **same proven strategies** for stopping wild poliovirus to respond to VDPV cases.



CDC's Field Epidemiology Training Program trains health workers on how to investigate health threats wherever they occur.

Monitoring and Responding to Global Health Threats

CDC works 24/7 to collect information about events around the world that could be serious risks to public health. In 2018, scientific and technical experts in Atlanta closely monitored 30–40 threats per day worldwide and tracked 139 events of public health importance.

Through CDC's Global Emergency and Alert Response Service (GEARS), CDC has more than 400 CDC experts ready to deploy in response to a public health emergency anywhere in the world. In 2018, GEARS mobilized staff over 50 times to more than 45 countries to support outbreak response, including for yellow fever and Ebola, and to provide public health expertise, logging more than 3,680 cumulative days of deployment.

CDC does not rely solely on sending people to respond to outbreaks; we also work to build capacity in other countries for timely response and long-term sustainability in countries. CDC trains "boots-on-the-ground" disease detectives through the Field Epidemiology Training Program (FETP). In 2018, CDC-trained disease detectives investigated more than 220 threats across the globe. To expand detection and response capabilities at the local level, the FETP-Frontline program trained more than 1,130 individuals to serve at the forefront of the fight against infectious diseases. These FETP-trained responders were among the first on the scene to identify and contain outbreaks of international concern, like anthrax and polio. FETP graduates are working in more than 70 countries to stop outbreaks at their source before they spread.

Ending the Burden of Diseases

Eradication and Elimination Efforts

Global Polio Eradication

October 24, 2018, marked World Polio Day and 30 years since the Global Polio Eradication Initiative (GPEI) was formed. GPEI is one of the largest public-private partnerships in public health, led by national governments with five spearheading partners—CDC, the World Health Organization (WHO), Rotary International, the United Nations Children's Fund (UNICEF), and the Bill & Melinda Gates Foundation. With 20 million volunteers and 200 countries involved, GPEI is working to meet its goal of eradicating polio worldwide.

In the past 30 years, the world has made incredible strides toward achieving a polio-free future, with 80% of the world's population now living in certified polio-free regions and only three countries that have never interrupted wild poliovirus transmission (Afghanistan, Nigeria, and Pakistan). Since 1988, wild polio cases have been reduced by over 99%—down to just 33 cases reported in two countries (Afghanistan and Pakistan) in 2018.

We must take bold steps in this challenging last mile of eradication. Continued innovation and program improvements to reach children everywhere and detect and stop outbreaks, along with increased investment, are necessary to finish the job. This worldwide effort will bring about the eradication of the second human disease in history.



Vaccination teams transport polio vaccine under challenging conditions.

Since 1988, wild polio cases have been **reduced by over**

99% 

Just 33 cases in two countries occurred in 2018.



A girl's marked finger shows she has been vaccinated for polio.

Ending the Burden of Diseases

Eradication and Elimination Efforts

Ending Lymphatic Filariasis in Haiti and American Samoa

Lymphatic filariasis (LF) is one of the world's most stigmatizing and debilitating diseases. More than 120 million people have LF worldwide, and another 1.3 billion are at risk of acquiring the infection.

CDC plays an important role in the global fight against LF by offering strategic guidance on how to plan and implement mass drug administration campaigns that reach many people in a short time period. Mass drug administration campaigns are the primary tool used to stop the spread of LF, by providing preventative medication annually to the at risk population.

CDC and partners have been supporting Haiti to eliminate LF and, over the past year, have dramatically increased the number of people in the capital of Port au Prince who have

received treatment, reaching an additional 600,000 people and achieving mass drug administration targets of 65% for the first time in more than five years. CDC experts worked on community level planning to improve local engagement and drug distribution, as well as real time tracking to confirm drugs were reaching those in need.

Another priority is eliminating LF in American Samoa, one of the last US territories where the disease remains. In American Samoa, CDC supported the department of health to plan, implement, and monitor a mass drug administration campaign that launched in September 2018. In 2019, CDC is supporting a coverage survey in American Samoa, which will serve as an independent measurement of true drug coverage. The results of the coverage survey will inform the strategy for the second round of mass drug administration.

Getting to Malaria Zero in Hispaniola

Hispaniola, the island that includes Haiti and the Dominican Republic, is the only place with endemic malaria transmission in the Caribbean. Malaria Zero has one bold goal: to eliminate malaria from Hispaniola, thereby creating a malaria-free zone across the Caribbean. The CDC-led Malaria Zero consortium has gathered evidence, developed a strategy, and is now implementing efforts to accelerate malaria elimination on the island. The interventions launched in late 2017 include strengthening vector control, disease surveillance, case management, and community engagement to ensure that every case of malaria is tested, treated, and tracked within the national surveillance system. Additionally, two new malaria elimination activities—door-to-door mass drug administration and indoor residual spraying of houses—were successfully piloted in the fall of 2018, reaching approximately 10,500 households in 12 areas where malaria transmission is high.



Malaria Zero has one bold goal:
To eliminate malaria from Hispaniola

These interventions are aimed at local interruption of malaria transmission by 2020 in the Grand Anse Department of Haiti, a region that accounts for more than 50% of the island's malaria burden.



Two laboratory technicians with Haiti's ministry of health are processing blood samples in order to test for malaria. Credit: Alaine Knipes.

HIV Research, Policy, and Practice

14

HIV Epidemic Control: Progress and Challenges

In 2018, we commemorated the 15th anniversary of the US President's Emergency Plan for AIDS Relief (PEPFAR), of which CDC is a key implementer. PEPFAR collaborations have saved more than 17 million lives through the generosity of the American people and our partnerships with countries and communities around the world.

CDC-supported population-based HIV impact assessments (PHIAs) measure the reach and impact of HIV programs in PEPFAR-supported countries through national household-based surveys. PHIAs are the most comprehensive evaluation of national HIV outcomes and impact globally. Results from PHIAs are providing an increasingly complete body of knowledge regarding HIV epidemics around the world.

PHIA results indicate the progress that countries have made toward controlling their HIV epidemics. Progress toward the UNAIDS target for national HIV viral load suppression (73%) ranged from 40% in Côte d'Ivoire to 77% in Namibia. These results are driven by transparent, accountable, cost-effective, and innovative efforts, in which CDC is proud to have played a leading role. PHIA findings highlight important progress, as well

Research to Inform the Treat All Policy in India

WHO's Treat All Policy recommends antiretroviral therapy (ART) for all people with HIV infection immediately after HIV diagnosis.

In honor of 2018 World AIDS Day, CDC released an article in *Morbidity and Mortality Weekly Report (MMWR)* describing CDC and partners' support of India to rapidly implement Treat All after its adoption in April 2017.

PHIA SURVEYS

2016	Zimbabwe	Lesotho	Tanzania
2017	Malawi Zambia	Eswatini Uganda	Namibia
2018	Ethiopia Cameroon Côte d'Ivoire	South Africa Nigeria	Kenya * Rwanda *

*data collection began

as targeted work that remains to end HIV globally. For example, CDC is using data to identify effective approaches for finding and linking undiagnosed HIV-positive men to treatment and reaching more HIV-negative men with prevention services.

As a key implementer of PEPFAR, CDC has played a leading role in accelerating data-driven global progress toward HIV epidemic control. In 2018, through PEPFAR, CDC has provided life-saving antiretroviral treatment for 8.2 million men, women, and children living with HIV globally; identified an additional 1.7 million people living with HIV; and supported tuberculosis (TB) screening for 6.5 million people living with HIV.



PHIA evaluation being conducted in Rwanda. Credit: Victor Balaban.

Staff at 46 PEPFAR supported ART centers in the six most populated districts of India worked to contact people enrolled in HIV care but not receiving ART. People reached through these efforts were educated about Treat All and tracked for ART initiation.

India scaled up activities nationwide to build capacity to implement Treat All. The *MMWR* article highlights that active tracking and tracing combined with education about benefits of early treatment can facilitate ART initiation and inform approaches to bring people with HIV to care.

HIV Research, Policy, and Practice

Preventing TB to End TB

CDC is leading the way to address historical gaps in provision of life-saving TB preventive therapy (TPT) for those most vulnerable to TB, including people living with HIV (PLHIV). In 2017, fewer than one million PLHIV were receiving TPT globally. CDC's goal is to increase that number to five million by 2020 with support from PEPFAR.

On September 26, 2018, the United Nations General Assembly (UNGA) held the first-ever high-level meeting on TB, only the fifth time that a high-level meeting has been called on a health issue. This meeting provided an opportunity to focus attention on the world's leading infectious disease killer, a disease that took the lives of 1.6 million people globally in 2017.

A staggering 1.7 billion people—nearly one-fourth of the world's population—are infected with TB. These 1.7 billion people are at risk of developing active TB disease, which can cause sickness and death and can be transmitted to others. TPT can reduce the risk that individuals exposed to TB will develop the disease. While people in high-risk groups, such as people living with HIV, children, and others with compromised immune systems, benefit greatly from TPT, fewer than 20% of people living with HIV and children received TPT in 2016.

To address these issues, more than 200 global health leaders and advocates attended Preventing TB to End TB, a CDC Foundation- and CDC-sponsored unofficial side event to the UNGA high-level meeting on TB. This event brought together government leaders from South Africa, India, and the United States; representatives from the world's leading multilateral institutions; and prominent clinicians and advocates to speak about the importance of prevention to end TB and reach the ambitious targets outlined in the Political Declaration on the Fight Against TB signed at UNGA.

Reducing HIV Incidence in Botswana

In partnership with the Botswana Ministry of Health, CDC developed and led the intervention protocol for the Botswana Combination Prevention Project (BCPP). BCPP aims to reduce HIV incidence among adults in 15 communities through a combination of proven HIV prevention measures.

This study compared HIV incidence in 15 control communities with 15 intervention communities receiving expanded HIV testing services, strengthened voluntary medical male circumcision programs, and expanded antiretroviral therapy (ART). The study found a decrease of 30% or more in new HIV infections in communities receiving these enhanced services compared to communities receiving standard care. BCPP results suggest that interventions to identify at least 90% of HIV positive people in the community, provide universal ART, and monitor viral suppression among all HIV infected people can significantly reduce new HIV infections over time.

Based on the success of BCPP, the government of Botswana adopted a number of successful BCPP interventions as part of its national guidelines.



Medical professional reviews x-rays to diagnose TB infection. Credit: Tom Maguire.

Vaccination Research for Action

Vaccination Coverage Among Displaced Rohingyas in Bangladesh

From November 2017 through January 2018, more than 4,000 suspected cases of diphtheria and 30 diphtheria-related deaths were reported among displaced Rohingyas refugees in Cox's Bazar District, Bangladesh. In January 2018, CDC conducted a qualitative assessment to understand vaccination barriers and opportunities to enhance vaccine demand among refugees. The assessment consisted of focus group discussions and key informant interviews with mothers and fathers who had children under 5 years old, community volunteers, *majhis* (camp leaders), Islamic religious leaders, traditional and spiritual healers, and teachers. Although participants understood vaccination as an important intervention to prevent childhood diseases, they reported numerous barriers to vaccination, including concerns about multiple vaccines given on the same day, worries about vaccination side effects, and lack of sensitivity to cultural gender norms at vaccination sites. Vaccine demand and acceptance were enhanced by improving vaccine delivery practices and engaging community leaders to address religious and cultural barriers.



A Rohingya gathering. Credit: Mohamed Jalloh.

Innovations in Fractional Dose of Yellow Fever Vaccine

Because of the increased use of and demand for yellow fever (YF) vaccine, global stockpiles have been depleted. Therefore, in 2016, WHO issued a new recommendation that a fractional (1/5) YF vaccine (fYF) dose could be used for outbreak response when there is a shortage of vaccine, based on limited evidence available from clinical trials in adults. However, WHO identified an urgent need

This study is critical to inform global yellow fever vaccination policy.



to compile immunogenicity data for fYF in children and infants. In response to this request, CDC initiated two fYF immunogenicity studies; the findings of one of these studies conducted in the Democratic Republic of the Congo was published in 2018. The fractional dose was shown to be highly effective at providing protective immunity for at least 1 year in people at least 2 years old and was particularly effective in generating an immune response in those with low levels of or no preexisting antibodies. This was the first study of fYF vaccination to include children and is critical to informing global yellow fever vaccination policy. Planning and training has been completed for a second study to evaluate fYF immunogenicity in children under 2 years old in Uganda, and enrollment began in March 2019.

The Promise of an Experimental Malaria Vaccine

In 2017, 219 million cases of malaria and 435,000 related deaths occurred worldwide, many of them in children under 5 years of age in sub-Saharan Africa. Working to help expand available interventions, CDC has continued to evaluate promising new vaccines and, in 2018, collaborated with the National Institutes of Health, Sanaria, and other partners to evaluate the safety of and response to an experimental malaria vaccine (PfSPZ) in young children.

Data collection and analysis were completed, and reporting is underway. In addition, in 2018 CDC and a consortium of partners were selected to lead an evaluation of pilot implementation of another malaria vaccine (RTS,S/AS01) in western Kenya. This activity provides additional critical information about feasibility, impact, and safety of this vaccine.

Malaria and Parasitic Disease Control in the United States

Preventing and Treating Malaria and Parasitic Diseases

The expertise CDC brings to its global work in malaria and parasitic diseases is also critically important to protecting the United States. CDC's parasitic diseases diagnostic reference laboratory provides consultations to clinicians or public health laboratories in the United States and around the world, often for the most difficult to diagnose cases.

In 2018, across the United States and globally, CDC conducted over 6,400 diagnostic tests for parasitic diseases. CDC also responded to over 5,100 hotline inquiries, providing advice on diagnosis and treatment to health care providers, blood banks, and other essential health care facilities, as well as advice on preventing malaria among travelers. This service is essential to improve prevention, diagnosis, and treatment of parasitic diseases in the United States. CDC also managed the release of otherwise unavailable life-saving medications for 97 patients with parasitic infections in the United States.



In 2018, CDC conducted **6400+** diagnostic tests for parasitic diseases and responded to



5100+ hotline inquiries



A CDC scientist examines a slide via microscopy to identify parasites.

Controlling Cyclosporiasis in the United States

Cyclosporiasis has been the cause of multiple food-related outbreaks in the United States, with over 2,300 confirmed cases reported from 33 states between May and August 2018. To improve control efforts, tools to identify parasites that are related (and may have come from the same source) are needed. CDC staff have developed a method for genotyping these complex organisms that appears to accurately identify parasite linkages and may be useful to identify and investigate outbreaks. As no validated molecular typing tools have previously been available, this new typing method could help reduce the spread of parasitic diseases such as cyclosporiasis by stopping them at their source.



Technology and Innovation

Smartphones Connect Disease Data Faster

Across the globe, CDC experts are using smartphones to find and stop outbreaks at their source.

In Thailand, a CDC developed smartphone app allows people who work with poultry and swine to report human and animal sicknesses or deaths with the click of a few buttons. In Kenya, CDC helped roll out a new mobile app that enables veterinary practitioners to enter, transmit, and analyze surveillance data from the palm of their hand. Health workers in Sierra Leone are using a smartphone app to report critical health information to the country's CDC-supported surveillance network. With technical assistance from CDC, Zambia was the first country to conduct a new mobile phone survey to track noncommunicable diseases and related risk factors using adaptable, open source technology. In Guatemala, smartphones are being used to track potential outbreaks

of flu by having users report influenza like symptoms using a smartphone app created by CDC.

The real time use of data collected through these apps has led to several successful outbreak investigations, helping to contain diseases before they spiral into epidemics. The successes in these countries can serve as a model for other countries on how to harness the power of technology to detect disease outbreaks faster.



Credit: David Snyder, CDC Foundation.

Innovation in the Field: The Measles-Rubella Box

Since 2016, CDC has been testing an innovative new technology, the Measles-Rubella Box (MR Box).



Dr. Aimee Summers preparing whole blood samples for DMF-ELISA at a Health Center in Biyela, Kinshasa Province, DRC. Credit: Alaine Knipes.

The technology, developed by scientists from the University of Toronto, has the potential to confirm active measles and rubella infections in the field to help stop outbreaks faster.

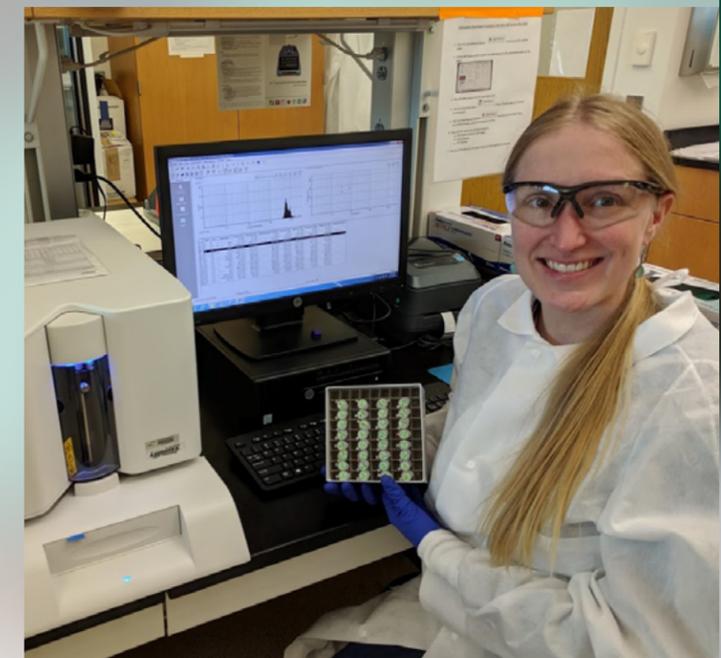
In the Democratic Republic of the Congo (DRC), measles and rubella tests have to be sent to the national laboratory in the capital of Kinshasa. DRC is a large country, and transporting blood samples can be difficult. Even the fastest results take a minimum of a week to get back.

The MR Box has the potential to solve this issue. It is portable, easy to use, and—at less than a dollar per chip—affordable. It is also compact, weighing less than 11 pounds. The technology inside each box, called digital microfluidics-enzyme-linked immunosorbent assay (DMF-ELISA), or “ELISA on a chip,” has some distinct advantages over other technologies used to detect measles and rubella. It can test samples from up to four people at the same time and yields results in less than an hour—much more efficient than transporting blood samples to the national lab and waiting several days for laboratory results. Since measles spreads rapidly, having technology that can provide immediate results in the field is a game changer.

Technology and Innovation

Multiplex Immunoassay: A Cost-Effective Way to Conduct Surveillance

CDC has developed and validated a multiplex immunoassay that detects antibodies for more than 35 viral, bacterial, and parasitic diseases and provides an assessment of vaccination coverage levels, using a single small blood sample. This test provides a more cost-effective approach to obtain critical public health information, as most surveillance costs are related to sample collection. Since late 2017, CDC has used the multiplex immunoassay to conduct integrated serosurveillance for infectious diseases in large-scale pilots in Brazil, Mexico, Paraguay, Thailand, and the United States. To respond to increasing requests, CDC has identified establishing a multiplex reference laboratory to assist country partners as a priority.



CDC microbiologists work with laboratory scientists around the world on a tool that can detect more than 35 pathogens with a single drop of blood.

Leading Innovations in HIV Testing

CDC has developed an HIV rapid test that can diagnose HIV in minutes and distinguish recent (i.e., likely occurring within the past year) from long-standing HIV infection. This test, now commercialized by two manufacturers, is being integrated into routine HIV testing services in 17 PEPFAR-supported countries to establish a real-time HIV surveillance and response system. A main objective of the system is to identify clusters of recent transmission. It provides an opportunity to prevent onward transmission and link HIV services to those who require them. CDC continues to lead innovations in testing for recent HIV infection to ensure wider accessibility and use of the tool.

Understanding Insecticide-Resistant Mosquitoes

Mosquitoes can transmit a wide range of diseases, including malaria, dengue fever, chikungunya, and West Nile virus. Using insecticides is one way to control mosquitoes and the diseases they spread. However, mosquitoes have become increasingly resistant to insecticides, thus compromising mosquito control efforts. In 2018, CDC research demonstrated that insecticide exposure impacts bacteria that colonize mosquitoes (the mosquito microbiota). The presence of insecticide-metabolizing bacteria in resistant mosquitoes could potentially be used to predict insecticide resistance in the field. More research is needed to fully understand insecticide resistance in mosquitoes.



The CDC Bottle Bioassay determines if particular ingredients are able to kill an insect vector, such as a mosquito, at a specific location at a given time. Credit: David Snyder, CDC Foundation.

For more information, visit us at
www.cdc.gov/globalhealth

Connect with us on social media:



CDCGlobal



@CDCGlobal



@DrMartinCDC



@CDCGlobal



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

Photo credit: Visa Tyakaray