2016 2020

CDC's STRATEGIC FRAMEWORK *for* GLOBAL IMMUNIZATION

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

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Cover
A child in Benin holds a stamped vaccination card, ensuring she has been vaccinated and that the dose is registered. She was one of more than 3 million children vaccinated during a measles vaccination campaign supported by the Measles & Rubella Initiative in Benin in November 2014. At just $1 per shot, the measles vaccination is one of the most cost effective global health interventions available.

Photo credit: Courtesy of Red Cross*/Javier Acebal*

Global Immunization at CDC

*The **Global Immunization Division**, through the **Center for Global Health**, has overall coordination and responsibility for global immunization activities implemented across the agency. CDC divisions, offices, and programs with subject matter and disease-specific areas of expertise related to global immunization activities include:*

Center for Global Health

Division of Parasitic Diseases and Malaria
Division of Global Health Protection
Division of Global HIV and TB
Global Immunization Division

National Center for Chronic Disease Prevention and Health Promotion

Office of International Cancer Control, Division of Cancer Prevention and Control

National Center for Emerging and Zoonotic Infectious Diseases

Division of Foodborne, Waterborne, and Environmental Diseases
Division of High Consequence Pathogens and Pathology
Division of Vector Borne Diseases
Immunization Safety Office, Division of Healthcare Quality Promotion

National Center for Hepatitis, HIV, and STD Prevention

Division of Adolescent and School Health
Division of HIV/AIDS Prevention
Division of Viral Hepatitis

National Center for Health Statistics

Global Program for Civil Registration and Vital Statistics Improvement

National Center for Immunization and Respiratory Diseases

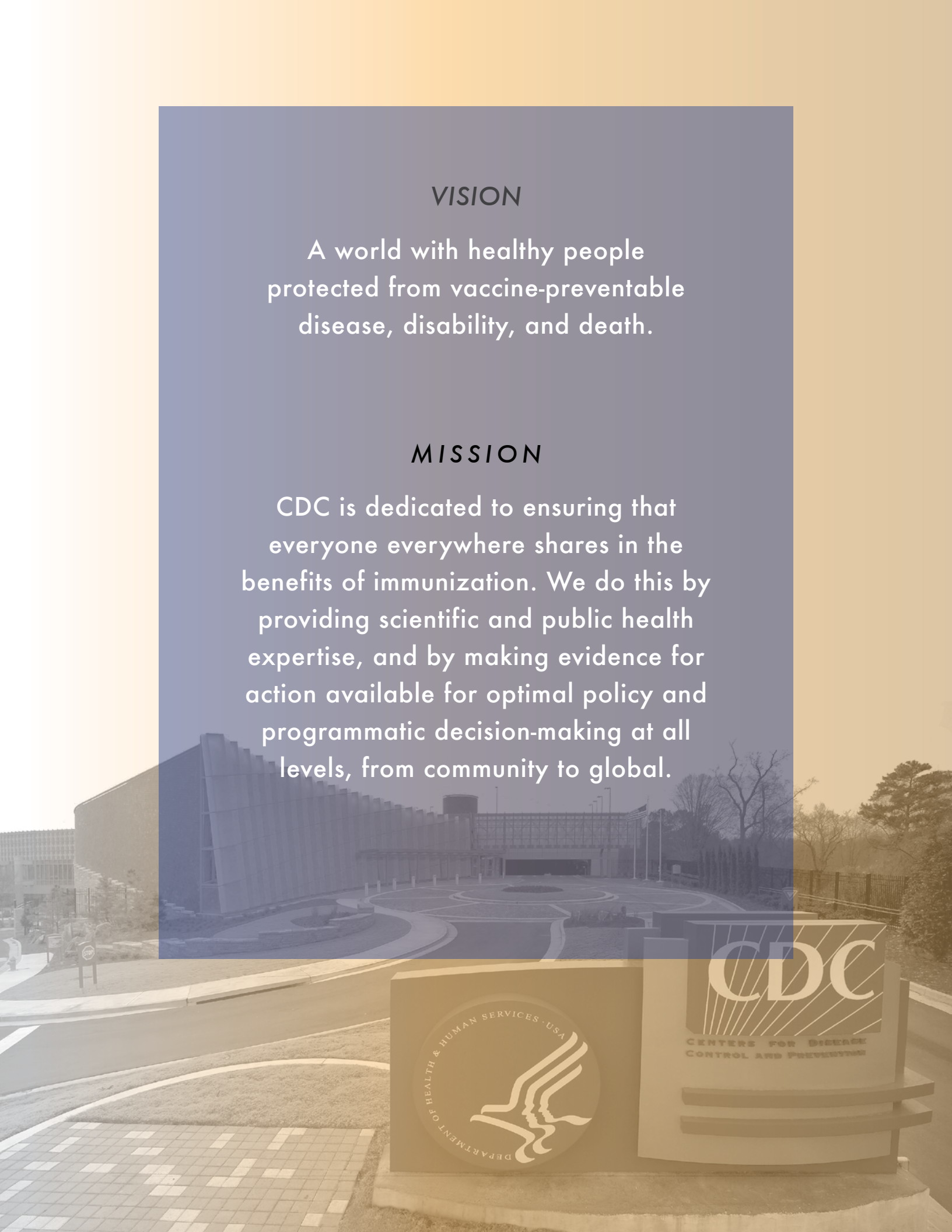
Division of Bacterial Diseases
Division of Viral Diseases
Immunization Services Division
Influenza Division

VISION

A world with healthy people protected from vaccine-preventable disease, disability, and death.

MISSION

CDC is dedicated to ensuring that everyone everywhere shares in the benefits of immunization. We do this by providing scientific and public health expertise, and by making evidence for action available for optimal policy and programmatic decision-making at all levels, from community to global.



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Foreword

Due to the strength of federal and state government-funded immunization programs, the burden of **vaccine-preventable diseases (VPDs)** in the United States has been greatly reduced.[1]

Children in the United States no longer suffer from diseases such as polio and congenital rubella syndrome. In addition, deaths from once common infections such as measles, diphtheria, tetanus, pertussis (whooping cough), meningococcus, pneumococcus, *Haemophilus influenzae* type b, and rotavirus no longer occur or are rare.

> "To achieve a polio-free world we need to continue to advance peak programmatic performance."

Vaccines are also preventing infections caused by human papillomavirus and hepatitis B virus, thereby saving lives and millions of dollars related to cancer and chronic diseases.

Americans at home and the millions working and traveling abroad, including those serving in the military, however, remain vulnerable to VPDs as long as these diseases exist elsewhere in the world. Mass air travel and increased mobility spread disease not just from community to community, but from continent to continent.

CDC's Strategic Framework for Global Immunization, 2016-2020 builds on 50 years of the Centers for Disease Control and Prevention's public health leadership and global immunization expertise since we established the **CDC Smallpox Eradication Program** in January 1966.

Since then, CDC's global immunization efforts to control, eliminate, and eradicate VPDs and strengthen worldwide immunization programs protect Americans from VPDs that have been eliminated or no longer circulate in the United States.

As long as VPDs persist in other nations, they can cause outbreaks in the United States. CDC's global immunization work provides an umbrella of protection to keep Americans safe and secure at home and abroad.

This strategic framework also lays out CDC's continuing role in fulfilling the U.S. government's broader commitment to improve global health. Vaccines are among the most cost-effective ways to improve health,[2] and healthy people improve the economic well-being of communities and nations,[3] cascading into a myriad of benefits necessary for a stable society.

Vaccines also provide a powerful tool to achieve equity globally by protecting every child against VPDs so he or she can survive and reach his or her full potential.

CDC leverages its core assets to collaborate with other country governments to strengthen or enhance their immunization programs by:

- Providing scientific expertise in infectious disease epidemiology, surveillance, and laboratory science;
- Implementing and evaluating evidence-based VPD prevention strategies and practices;
- Providing quality-assured public health laboratory systems; and
- Building public health institutional and workforce capacity.

CDC's scientific leadership and evidence-based strategic guidance has brought the world to the cusp of eradicating polio. To achieve a polio-free world on every continent, we will continue

to advance peak program performance, as well as devise and adopt new methods to address programmatic challenges so that the global health community can find and stop the very last chains of poliovirus transmission.

The next five years are crucial to build on and leverage the successful achievement of polio eradication and advance additional public health targets, including:

- A world free of measles and rubella;
- Ending VPD deaths among children under five years of age; and
- Reducing chronic disease and cancer deaths from VPDs.

CDC is strengthening our collaborations with countries to develop the ability to detect, respond to, and prevent VPD outbreaks under the **Global Health Security Agenda**.[4] Public health infrastructure and capacity in these areas are vital to protecting Americans and all people around the world during regional or global public health emergencies. In addition,

"A key focus during 2016–2020 is building on and leveraging polio eradication successes to assist countries achieve targets for national and subnational vaccine coverage and measles elimination."

CDC supports development and introduction of new vaccines to protect against leading causes of morbidity and mortality and emerging infectious disease threats, such as those from the Ebola and Zika viruses.

CDC supports global and regional immunization partnerships that provide capacity and coordination needed to maximize the health impact of vaccines.

To achieve lasting health impact, CDC is also increasing its collaboration with countries that have a high burden of VPDs, helping these countries build capacity to sustain their own immunization programs. This requires using the strengths and complementarity of disease-specific (vertical) and health-systems (horizontal) approaches. CDC is providing scientific leadership and evidence-based guidance to:

- Improve vaccination delivery to achieve high and equitable coverage;
- Implement integrated laboratory and epidemiologic surveillance with capability to detect and respond to VPD outbreaks; and
- Ensure availability of high-quality immunization information to monitor, evaluate, and improve immunization program implementation.

The foundation of CDC's global immunization work is conducting and promoting research and innovating and evaluating programs. Therefore, we will continue to enhance regional and country capacity in these areas. Results from these efforts translate into evidence-based immunization strategies, policies, and practices to strengthen sustainable, global immunization programs, which are measured by deaths averted due to VPDs.

CDC is implementing its *Strategic Framework for Global Immunization, 2016-2020* in collaboration with other U.S. government agencies; **WHO**; **UNICEF**; **Gavi**, the Vaccine

alliance; and other stakeholders. Our priorities are aligned with the **U.S. Department of Health and Human Services National Vaccine Plan 2010**[5,6], the Global Health Security Agenda, and the **Global Vaccine Action Plan 2011-2020**[7]. The strategic framework is designed to advance the **United Nations 2030 Sustainable Development Goals**.[8]

Unity of purpose and strong collaborations with government ministries of health and finance, multilateral organizations, non-government organizations, and communities are critical for the successful implementation of this strategic framework.

Through these collaborations, we look forward to achieving further successes in preventing death and suffering from VPDs around the world while protecting and securing the United States from imported vaccine-preventable diseases.

Dr. Thomas Frieden, MD, MPH
Director, CDC

A group of children eagerly hold up their newly updated vaccination cards in the Indian state of Uttar Pradesh during monitoring of measles and polio vaccination activities.
Photo credit: Alan Janssen, CDC, 2012

Overview

CDC's *Strategic Framework for Global Immunization, 2016-2020* is built around five interconnected goals: an overarching goal for improving health **impact** of vaccines on disease-specific outcomes; three goals for increasing **reach** by strengthening country-owned immunization programs; and a foundational goal for providing **evidence** for effective policy and program implementation.

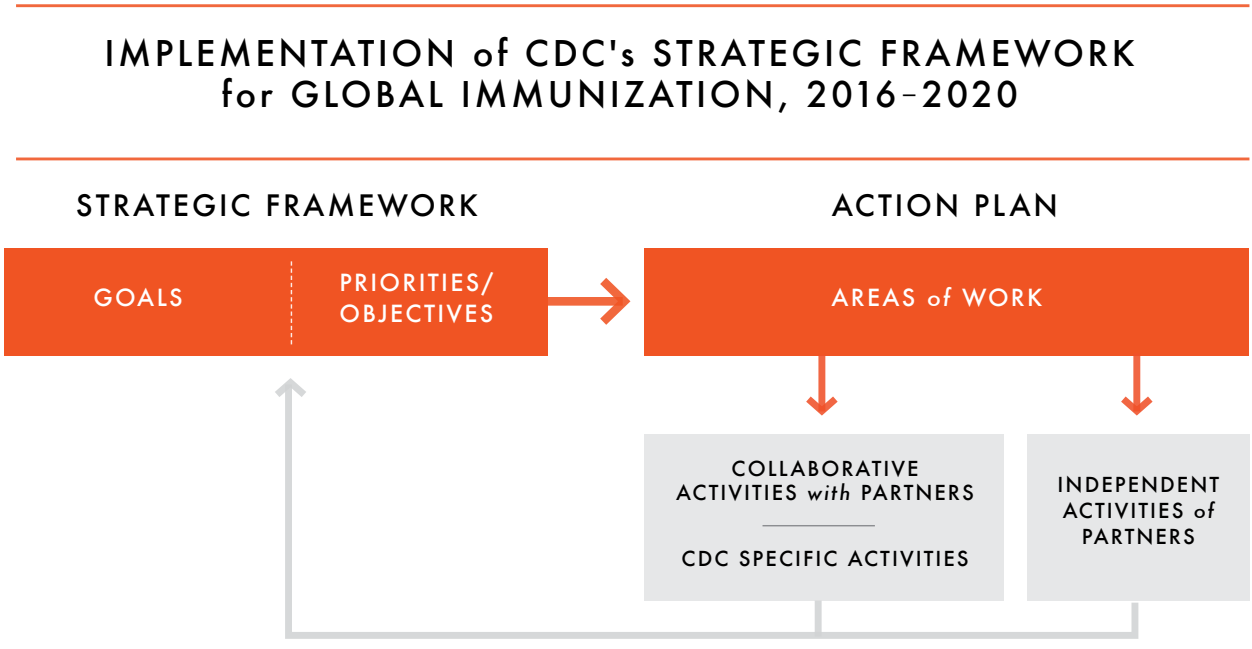
As we enter into this next five years, CDC's work with global and regional partners, and with national governments to achieve and sustain polio eradication will continue to be of upmost importance.

CDC is also engaged in planning for the transition of polio eradication assets and knowledge to advance additional health impact targets while sustaining essential polio functions still needed for a polio-free world.

A key focus of these efforts is to use elements of both the health impact goal and the immunization program strengthening goals to develop and implement a diagonal approach to reach both the national and subnational vaccination targets,[9] as well as measles and rubella elimination targets, as committed to in the Global Vaccine Action Plan, 2011-2020[7] and endorsed by the World Health Assembly.

This framework charts the road ahead and guides development of our action plan. (See Figure 1)

Figure 1



IMPACT

GOAL 1

Vaccine-preventable diseases (VPDs) can be controlled*, eliminated†, or eradicated‡ through the development and introduction of vaccines, and implementation of targeted disease-specific initiatives.[10]

Prevention of VPDs can be seen as a continuum, beginning with generating disease burden evidence and rationale for vaccine development, followed by vaccine introduction, and then implementation of VPD control initiatives, which for some VPDs, can lead to control, elimination, or eradication goals. Although some VPDs can be controlled largely through vaccination, others require a multi-faceted approach that includes additional prevention and control measures and strategies.

REACH

GOALS 2/3/4

The success and sustainability of VPD control, elimination, and eradication initiatives depends on the strength of sustainable, country-owned immunization programs as an integral component of a well-functioning health system. Immunization programs, in turn, can be strengthened by political commitment to and visibility of VPD-specific initiatives.

Successful targeted VPD-specific initiatives and strong immunization programs can therefore be mutually reinforcing. Strong country-owned immunization programs rely on institutional and workforce capacity. In addition, strategic partnerships provide support to ministries of health to achieve immunization goals.

EVIDENCE

GOAL 5

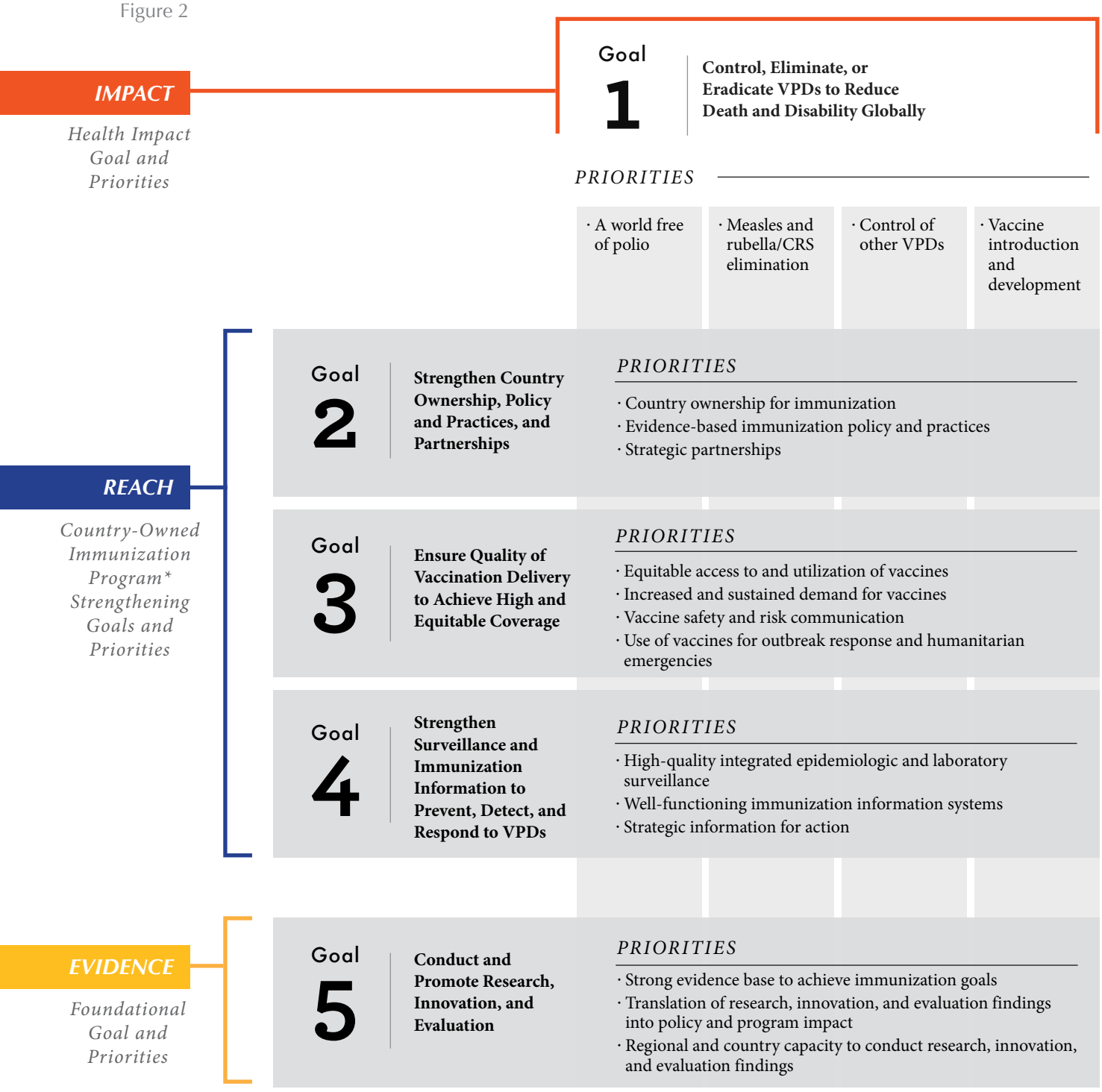
Research, innovation, and evaluation that increase the evidence base for effective immunization policies and program improvements are critical for achieving increased VPD impact and immunization program strengthening goals.

*Control is defined as reduction of disease morbidity and mortality to a locally acceptable level.

†Elimination is defined as the absence of a disease or infection caused by a specific agent in a defined geographic area as a result of deliberate control efforts that must be continued in perpetuity to prevent reemergence of disease.

‡Global eradication is defined as the worldwide absence of a specific disease agent in nature as a result of deliberate control efforts that may be discontinued where the agent is judged no longer to present a significant risk from extrinsic sources.

Figure 2



*Essential components of immunization programs include:

1. vaccination delivery (supported by social mobilization, planning and supervision, and cold chain logistics) to achieve high and equitable coverage;
2. integrated epidemiologic and laboratory surveillance to detect and respond to VPD outbreaks and other public health emergencies; and
3. immunization information systems to collect, analyze, and report data to monitor, evaluate, and improve immunization program implementation.

The global health community has nearly eradicated polio. As of 2016, endemic WPV1 remains only in Afghanistan and Pakistan.

India Epidemic Intelligence Services Officer conducting a vaccination coverage survey in Alwar District, Rajasthan, India.

Photo credit: Kayla Laserson, 2012

Immunization programs have contributed substantially to reductions in childhood morbidity and mortality.[11]

Global diphtheria, pertussis (whooping cough), and tetanus burden has declined by >90% since 1980.[12] Since the **World Health Assembly** of the **World Health Organization (WHO)** resolved to interrupt wild poliovirus (WPV) transmission worldwide in 1988, the annual number of cases has decreased by >99%.[13] (See Figure 3)

Global measles deaths decreased by 79% from 2000 to 2014,[14] primarily attributed to measles supplemental immunization activities (SIAs)* designed to close immunity gaps. (See Figure 4)

Along with decreases in pneumonia and diarrhea, the decline in measles deaths is among the three main contributors to the decline in overall child mortality during this time period.[15]

Vaccines protect the future health of all populations. The sustainable and equitable introduction of new vaccines and increasing coverage with underutilized vaccines can greatly reduce VPD morbidity and mortality. Using new and underutilized vaccines alongside the continued use of measles vaccine is estimated to save 23.3 million lives overall from 2011 to 2020 in low-income countries.[16] (See Figure 5)

POLIO ERADICATION IS WITHIN REACH

The WHO Executive Board and World Health Assembly declared achieving **polio eradication** a public health emergency in 2012. With the certification of the Southeast Asia Region in March 2014, four out of six WHO regions are certified as polio-free.

Of the three WPV serotypes, WPV2 has not been detected since October 1999; WHO certified its eradication in September 2015. WPV3 has not been detected since November 2012, leaving WPV1 as the only serotype still known to be circulating.

*SIAs are mass campaigns that aim to administer vaccine doses to a target age group in a defined period of time, regardless of prior vaccination history.

Africa has been free of all wild poliovirus since August 2014, and endemic WPV1 circulation is now only in Afghanistan and Pakistan. Planning is underway among the global health community to transition polio assets and knowledge to ensure that capabilities of the **Global Polio Eradication Initiative** are repurposed to support other immunization priorities while sustaining polio functions necessary for a polio-free world.

MEASLES AND RUBELLA/CRS ELIMINATION

The importance of eliminating measles, rubella, and congenital rubella syndrome (CRS) is now recognized by leaders and governments across the globe. With the establishment of a measles elimination goal in the WHO Africa Region in 2011 and in the Southeast Asia Region in 2013, all six WHO regions have goals to eliminate measles by no later than 2020. The **Global Vaccine Action Plan (GVAP)** also has a target for five of six WHO regions to achieve measles elimination by 2020.

"Leaders around the world now recognize the importance of eliminating measles and rubella."

However, progress toward reducing measles mortality and achieving measles elimination targets has slowed since 2007, particularly in sub-Saharan Africa and the Indian subcontinent. This was due to both gaps in coverage of measles vaccine typically administered as part of countries' routine immunization service delivery and a failure to close immunity gaps by implementing timely, high-quality, supplemental immunization activities.

Rubella and CRS elimination efforts are closely linked with measles elimination through the use of measles-rubella vaccine and integrated measles and rubella surveillance. Introduction of rubella vaccine has accelerated during the past five years and it is now used in 147 of 194 (76%) WHO member countries.

A GVAP target is for five regions to achieve rubella and CRS elimination by 2020; by the end of 2015, three WHO regions had rubella and CRS elimination goals — the Americas, Europe, and Western Pacific. The success of rubella elimination in the Americas Region, verified in 2015, provides evidence that rubella and CRS elimination can be achieved.

CONTROL OF OTHER VPDs

During the past five years the global health community has made progress setting or reaching other vaccine-preventable disease (VPD) control or elimination goals.

The number of countries remaining to validate maternal and neonatal tetanus elimination has fallen from 36 in 2011[17] to 21 in 2015.[18]

WHO's Western Pacific Region, the region with the highest prevalence of chronic hepatitis B virus (HBV) infection in the world (>8% pre-vaccine), adopted a resolution in 2005 to reduce chronic HBV infection prevalence to <2% among children by 2012 as an interim milestone towards achieving a regional goal of <1% prevalence. Reaching the interim milestone in 2012 has prevented more than an estimated one million chronic HBV infections and 300,000 HBV-related deaths per birth cohort.[19]

Since 2009, WHO **Africa**, **Eastern Mediterranean**, and **Europe** regions have set hepatitis B control goals. A remaining challenge is increasing hepatitis B vaccine birth dose coverage, which was only 38% globally as of 2014.

A regional control goal has been established for meningitis A in African meningitis belt countries, and the introduction of wide age range, meningococcal group A conjugate vaccination campaigns in these countries has been highly effective in eliminating meningococcal meningitis.

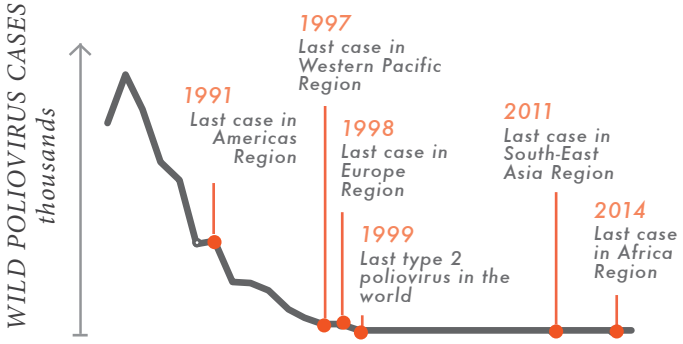
The WHO Western Pacific Region set a Japanese encephalitis control goal, but targets and time

The Global Impact of Vaccines in Reducing Vaccine-Preventable Disease Morbidity and Mortality

1988-2015

AFGHANISTAN
PAKISTAN

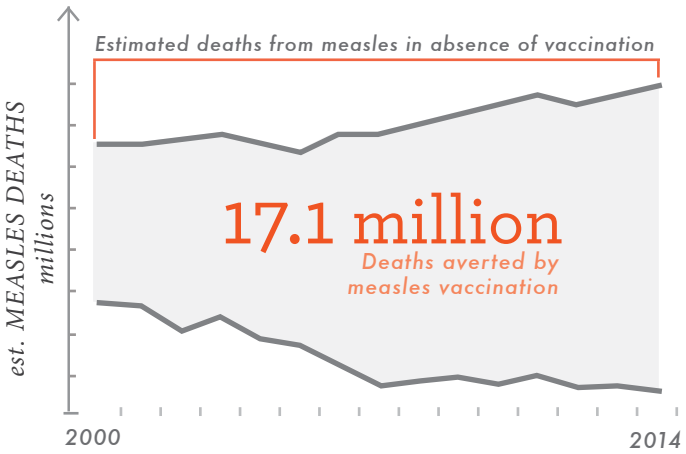
Only remaining polio endemic countries in the world, 2015



Region = WHO regions
Source: ***Global Polio Eradication Initiative***
Figure: 3

2000-2014

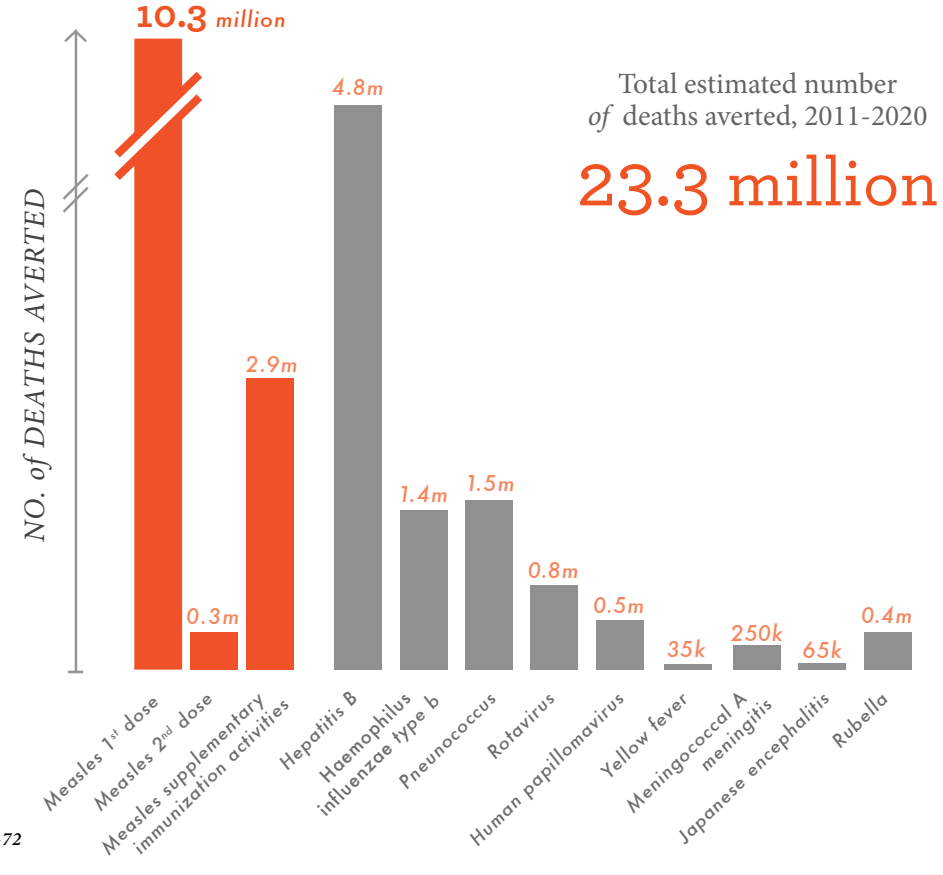
Annual estimated measles deaths declined 79%, from 546,800 to 114,900.



Source: ***MMWR 2015; 64:1246-51***
Figure: 4

2011-2020

Estimated deaths averted with vaccines in low-income countries



Total estimated number *of* deaths averted, 2011-2020

23.3 million

Source: ***Vaccine 2013; 18;31 (Suppl 2): B61-72***
Figure: 5

frames remain to be established as of the end of 2015. In 2015 the **World Organization for Animal Health**, WHO, and the **United Nations Food and Agriculture Organization** established a goal of eliminating human rabies of canine origin globally by 2030.

NEW AND UNDERUTILIZED VACCINES

With support from Gavi, the global health community is facilitating equitable access to vaccines and the uptake of vaccines recommended for global or regional use, as well as developing new vaccines.

For example, during 2010 – 2015, the number of WHO member countries using *Haemophilus influenzae* type b vaccine rose from 168 to 192 out of 194 (87% and 99% respectively). By 2015, 33 low-income countries had introduced rotavirus vaccine, up from 3 countries in 2009. Use of pneumococcal conjugate vaccine also expanded, from 54 countries (28%) in 2010 to 120 countries (62%) in 2015.

"Sixty-five countries had not met the Global Vaccine Action Plan target of 90% DTP3 coverage nationally as of 2014."

The 2014-2016 **Ebola virus outbreak** in West Africa led to rapid development of four candidate Ebola vaccines, and there is substantial progress on malaria and dengue vaccines. In addition, new, more easily deployable vaccine delivery approaches such as microneedle devices are actively being pursued by multiple developers to facilitate more effective vaccination delivery.

VACCINATION DELIVERY

CDC partners with WHO, UNICEF, Gavi, and other stakeholders to support the **Expanded Program on Immunization**, which was established in 1974 to ensure equitable access to immunization service delivery.

The number of children who did *not* receive a third dose of diphtheria-tetanus-pertussis vaccine reached an all-time low of 18.7 million in 2014[20]; however, 65 (34%) countries had not met the Global Vaccine Action Plan target of 90% coverage nationally.* For nearly two decades, six countries (India, Nigeria, Pakistan, Indonesia, Ethiopia, and Democratic Republic of Congo) have remained home to more than half of the global population of unvaccinated children.

CDC helped develop the ***Global Routine Immunization Strategies and Practices*** companion document to the Global Vaccine Action Plan,[21] which highlights routine immunization service delivery as the foundation for sustained decreases in morbidity and mortality from VPDs across the lifecycle of all individuals.

Sound immunization programs depend on the assurance of vaccine safety, and CDC has supported development of global and country capacity to monitor and respond promptly and with scientific rigor to vaccine safety issues.

ESSENTIAL ROLE OF TRAINED WORKFORCES

Effective immunization programs include a high-functioning workforce. In order to develop immunization program workforce capacity, CDC has expanded its **Stop Transmission of Polio Program** (STOP) to support more countries and to provide a broader range of technical support for immunization programs beyond polio. Areas include surveillance, data management, planning, and implementation of **SIAs**, program management, and communications.

STOP trains public health professionals from around the world and sends them to the places with the greatest need. CDC increased the average number of public health professionals participating from 70 per year in 2009 to more than 200 per year since 2014, and the average number of countries supported yearly from 20 to 40.

CDC collaborates with ministries of health and national **Field Epidemiology Training Programs**[22] to

*Most recent year data was available as of the publishing date of the Strategic Framework.

assist governments establish national STOP programs. These train nations' public health professionals to provide management and technical support for immunization programs at the most critical operational levels.[23] In addition, CDC has established the **Strengthening Technical Assistance for Routine Immunization Training (START) Program**, which builds management and technical capacity of district-level immunization staff.

VPD SURVEILLANCE AND IMMUNIZATION INFORMATION SYSTEMS

A key area of CDC support for immunization program strengthening is high-quality VPD laboratory networks, which are crucial for effective integrated epidemiologic and laboratory VPD surveillance.

Building on the polio laboratory network, CDC has supported WHO to establish and maintain a global laboratory network for measles and rubella. Many of these laboratories also perform testing for yellow fever and Japanese encephalitis.

CDC provides technical guidance and supports surveillance networks for other viral VPDs, including influenza and rotavirus disease; and for bacterial VPDs including meningococcal disease, Haemophilus influenza type b disease, pertussis, pneumococcal disease, and tetanus. CDC has helped develop guidance to implement and strengthen registries for cervical and hepatic cancer caused by VPDs.

CDC recognizes the vital role played by immunization information systems: since 2010 it has dedicated a team to strengthening information systems through collaborations to improve data quality and workforce capacity. CDC also works to strengthen immunization registries and establish linkages to civil registries and vital statistics systems.

GLOBAL IMMUNIZATION IN THE GLOBAL HEALTH SECURITY AGENDA

As a leader for the **Global Health Security Agenda** (GHSA), to which CDC and the U.S. government committed in 2014, CDC focuses on effective protection through immunization against measles and other epidemic-prone VPDs, including cholera, diphtheria, influenza, Japanese encephalitis, meningococcal disease, pertussis, typhoid fever, and yellow fever.

Immunization is 1 of 11 **GHSA "Action Packages"** designed to support countries to develop sustainable immunization program capacity to prevent, detect, and respond to emerging disease threats.

CDC's Samra Ashenafi (2nd from left) engaging an Ethiopian family in a community mapping exercise in the Afar region.
Photo Credit: Dr. Rebecca Martin, CDC, 2013

IMPACT

1

CONTROL, ELIMINATE, or ERADICATE VPDs to REDUCE DEATH and DISABILITY GLOBALLY

Grandfather holds granddaughter during a polio vaccination campaign in the Sindh province of Pakistan as her finger is marked to indicate she's been vaccinated.
Photo credit: Courtesy of ***UNICEF****/Irfan Ali, 2012*

1 CONTROL, ELIMINATE or ERADICATE VPDs to REDUCE DEATH and DISABILITY GLOBALLY

Priorities	Objectives
A world free of polio	• Interrupt wild poliovirus and vaccine-derived poliovirus transmission globally • Contain poliovirus in safe and secure facilities; certify polio eradication • Plan and implement the transition of assets and knowledge from polio eradication efforts to post-eradication activities
Measles and rubella/ congenital rubella syndrome (CRS) elimination	• Eliminate measles and rubella virus transmission • Develop strategies to verify measles and rubella/CRS elimination; monitor progress • Use measles elimination strategies to strengthen immunization programs
Control of other VPDs	• Develop and implement VPD control goals; document progress • Implement control strategies; detect, prevent, and respond to outbreaks
Vaccine introduction and development	• Introduce globally and regionally recommended vaccines • Conduct post-licensure and post-introduction monitoring; assess vaccine impact • Use vaccine introduction to strengthen immunization programs and health systems • Generate rationale and disease burden evidence for vaccine development • Support development and licensure of candidate vaccines

A world free of polio

CDC is a founding partner of the **Global Polio Eradication Initiative (GPEI)**, a public-private partnership supporting efforts to achieve **polio eradication** since 1988. Interrupting wild poliovirus transmission in the two remaining polio endemic countries – Afghanistan and Pakistan; maintaining a polio-free Africa; and preventing, detecting, and responding to poliovirus importations in polio-free countries are critical to achieve polio eradication.

GPEI's plan for **oral polio vaccine (OPV)** withdrawal to eliminate the risk of vaccine-derived polioviruses includes introduction of at least one inactivated poliovirus vaccine dose into national infant immunization schedules; a **switch** from trivalent OPV (types 1, 2 and 3) to bivalent OPV (types 1 and 2) in April 2016; and withdrawal of all OPV use by 2019-2020.

CDC will continue work on a containment plan to minimize the risk of poliovirus reintroduction from laboratories and vaccine production facilities, and to achieve certification-standard **AFP surveillance** globally.

CDC is engaged in planning for the transition of assets and knowledge from polio eradication efforts, ensuring that the capabilities of GPEI are repurposed to support other global immunization priorities while sustaining basic polio functions still needed in a post-polio eradication world. CDC will build on and leverage polio eradication assets to enhance capabilities of country-owned immunization programs to prevent VPD importations, respond to public health emergencies, and improve maternal and child health.

Measles and rubella/congenital rubella syndrome elimination

CDC is a founding partner of the **Measles & Rubella Initiative**, a public-private partnership supporting measles and rubella (MR) elimination since 2001. MRI is calling for renewed efforts to accelerate progress towards achieving regional measles and rubella elimination targets.

WHO member states in all six regions have adopted measles elimination goals, however, rubella elimination goals are needed in three WHO regions as of 2016: **Africa**, **Eastern Mediterranean**, **Southeast Asia**.

Achieving MR elimination requires implementing strategies to attain high two-dose MR vaccine coverage at routine immunization visits in all countries, introducing rubella vaccine in remaining countries, and conducting risk assessments to implement high-quality supplemental immunization activities (SIAs) in order to close immunity gaps.

Strong surveillance capacity is also needed to detect and rapidly respond to measles and rubella outbreaks and to document CRS burden. MR elimination verification requires developing guidelines, generating data for verification commissions, and political commitment to sustain efforts.

CDC intends to develop and implement a diagonal approach using MR elimination strategies to strengthen immunization programs generally, for example:

- Using introduction of the second dose of measles-containing vaccine to develop and implement second-year-of-life immunization platforms, which can increase coverage for other vaccines and preventive services;
- Maximizing MR SIA planning, training, and implementation to enhance the capability of routine immunization service delivery to equitably reach children;
- Using measles surveillance and risk assessments to focus efforts to strengthen routine immunization service delivery; and
- Using MR surveillance to strengthen surveillance for other epidemic-prone VPDs.

Control of other VPDs

CDC will continue to develop and monitor progress towards hepatitis B control goals in all regions; maternal, and neonatal tetanus elimination goals globally; meningitis A elimination goals in the African meningitis belt countries; and a Japanese encephalitis control goal in the **Western Pacific Region**.

CDC will work with partners to develop and support control goals for other VPDs, including regional control goals for rabies. For VPDs without control goals, CDC will work to implement control strategies to lower VPD incidence, and to prevent, detect, and respond to outbreaks.

Vaccine introduction and development

CDC supports introduction of globally and regionally recommended vaccines which have the potential to greatly reduce VPD morbidity and mortality. It also actively supports research to develop new vaccines to protect against leading causes of VPD morbidity and mortality, including disease burden studies and clinical trials. In addition, CDC supports research to develop new vaccine delivery approaches.

Efforts to use vaccine introduction to strengthen other disease prevention and control initiatives includes linking rotavirus and pneumococcal conjugate vaccine introductions with implementing the **Global Action Plan for Prevention of Pneumonia and Diarrhea**,[24] human papillomavirus vaccine with cervical cancer prevention, and malaria vaccine with other malaria control and elimination strategies.

CDC also links vaccine introductions with development of service delivery across the life-span.

REACH

2

STRENGTHEN COUNTRY OWNERSHIP, POLICY and PRACTICES, and PARTNERSHIP INITIATIVES

Children wait outside a vaccination site to get vaccinated in Indonesia.
Photo credit: Margie Watkins, CDC, 2013

2 STRENGTHEN COUNTRY OWNERSHIP, POLICY and PRACTICES, and PARTNERSHIP INITIATIVES

Priorities	Objectives
Country ownership for immunization	• Develop and strengthen institutional capacity for effective immunization programs • Build workforce capacity to monitor, evaluate, and improve quality of immunization programs • Develop and implement strategies to increase workforce performance and accountability • Develop and strengthen sustainable immunization financing mechanisms
Evidence-based immunization policy and practices	• Guide and strengthen global and regional vaccine technical advisory groups • Foster development and strengthening of national immunization technical advisory groups
Strategic partnerships	Sustain and strengthen: i. Global immunization and VPD-specific partnership initiatives ii. CDC's global and regional immunization partnerships iii. CDC's country-level partnerships

Country ownership for immunization

CDC supports country ownership for immunization by working with countries to strengthen institutional capacity for sustainable and effective immunization programs in ministries of health, national public health institutes, and national regulatory authorities. CDC will also help countries develop a supportive environment for immunization through legislation.

CDC partners with ministries of health and other stakeholders to build workforce capacity to plan, implement, monitor, evaluate, and improve the quality of immunization programs. Quality improvements are made by increasing the technical capacity of and developing core competency standards for the immunization workforce through **STOP (Stop Transmission of Polio Program)**, national STOP, and **START (Strengthening Technical Assistance for Routine Immunization Training)** programs.

CDC also develops interventions to increase immunization workforce performance and accountability, and to strengthen public health management and leadership for immunization services. In addition, CDC works with existing workforce development programs (e.g., **Field Epidemiology Training Programs**) to develop and improve immunization workforce technical capacity, performance, and accountability.

Additional areas of CDC support for country ownership include development and implementation of sustainable immunization financing mechanisms, vaccine pricing, and procurement mechanisms.

Nigerian Field Epidemiology Training Program resident, Dr. Wada Imam Bello, vaccinates a nomadic child during a polio vaccination campaign, where Fulani is the dominant nomadic tribe in northern Nigeria. Health workers located nomads using a GPS device. Seated next to Dr. Bello is Kore Miyetti Allah, chair of the Faskari Local Government Area.
Photo credit: CDC, 2012

Evidence-based immunization policy and practices

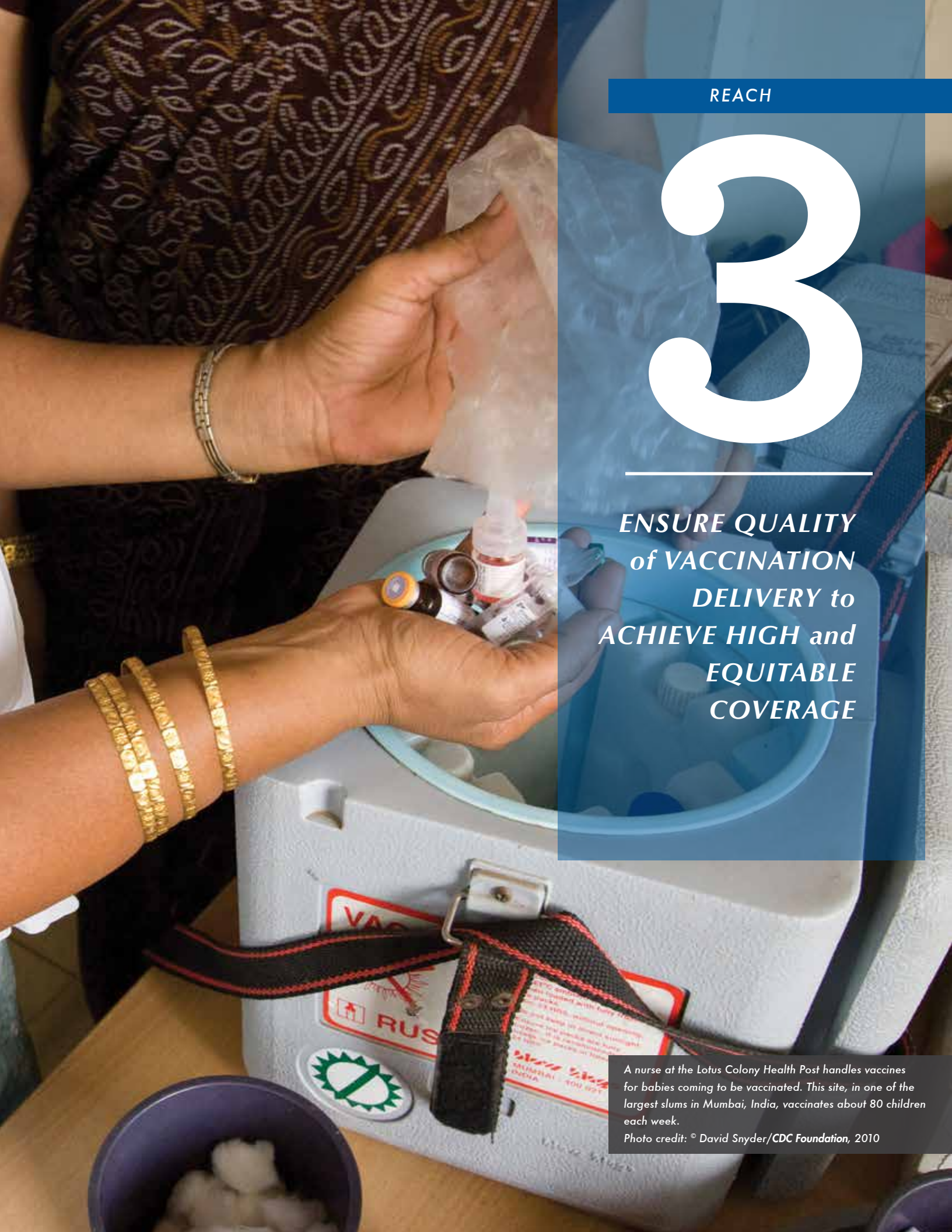
CDC works to strengthen global and regional immunization policy bodies, which play important roles in reviewing technical, operational, and programmatic evidence, and in developing immunization goals, policies, and guidelines. CDC provides information, tools, and briefing materials to improve evidence-based decision-making for vaccine and immunization policy at regional and global levels. In addition, CDC fosters development and strengthening of national immunization technical advisory groups as a resource for evidence-based immunization policy and program decision making.

Strategic partnerships

CDC has been a founder and a leader in promoting and supporting strategic partnership initiatives at global and regional levels to support countries to achieve immunization goals.*† These partnerships capitalize on the strengths of each partner and promote a harmonized approach under national government leadership. CDC will sustain and strengthen its partnerships with country governments through CDC's country offices and by enhancing country-led partner coordination mechanisms, for example, health sector and inter-agency coordination committees.

*Global immunization and VPD-specific partnership initiatives include: **Global Polio Eradication Initiative**; **Measles & Rubella Initiative**; **Global Alliance for Rabies Control**; **Meningococcal Vaccine Partnership**; **Pink Ribbon Red Ribbon Initiative (HPV vaccine)**; and **Partnership for Influenza Vaccine Introduction**.

†CDC's global immunization partnerships include: multilateral organizations (**WHO**, **UNICEF**, **UN Food and Agricultural Organization**, **World Bank**, **World Organization for Animal Health**); global non-governmental organizations (**American Academy of Pediatrics**, **American Red Cross**, **Bill and Melinda Gates Foundation**, **Gavi**, **International Pediatric Association**, **PATH**, **Rotary International**, **Sabin Vaccine Institute**, and **Task Force for Global Health**). CDC's regional immunization partnerships include **WHO** and **UNICEF regional offices**, and regional immunization technical advisory groups.



REACH

3

ENSURE QUALITY of VACCINATION DELIVERY to ACHIEVE HIGH and EQUITABLE COVERAGE

A nurse at the Lotus Colony Health Post handles vaccines for babies coming to be vaccinated. This site, in one of the largest slums in Mumbai, India, vaccinates about 80 children each week.
*Photo credit: © David Snyder/**CDC Foundation**, 2010*

3 ENSURE QUALITY of VACCINATION DELIVERY to ACHIEVE HIGH and EQUITABLE COVERAGE

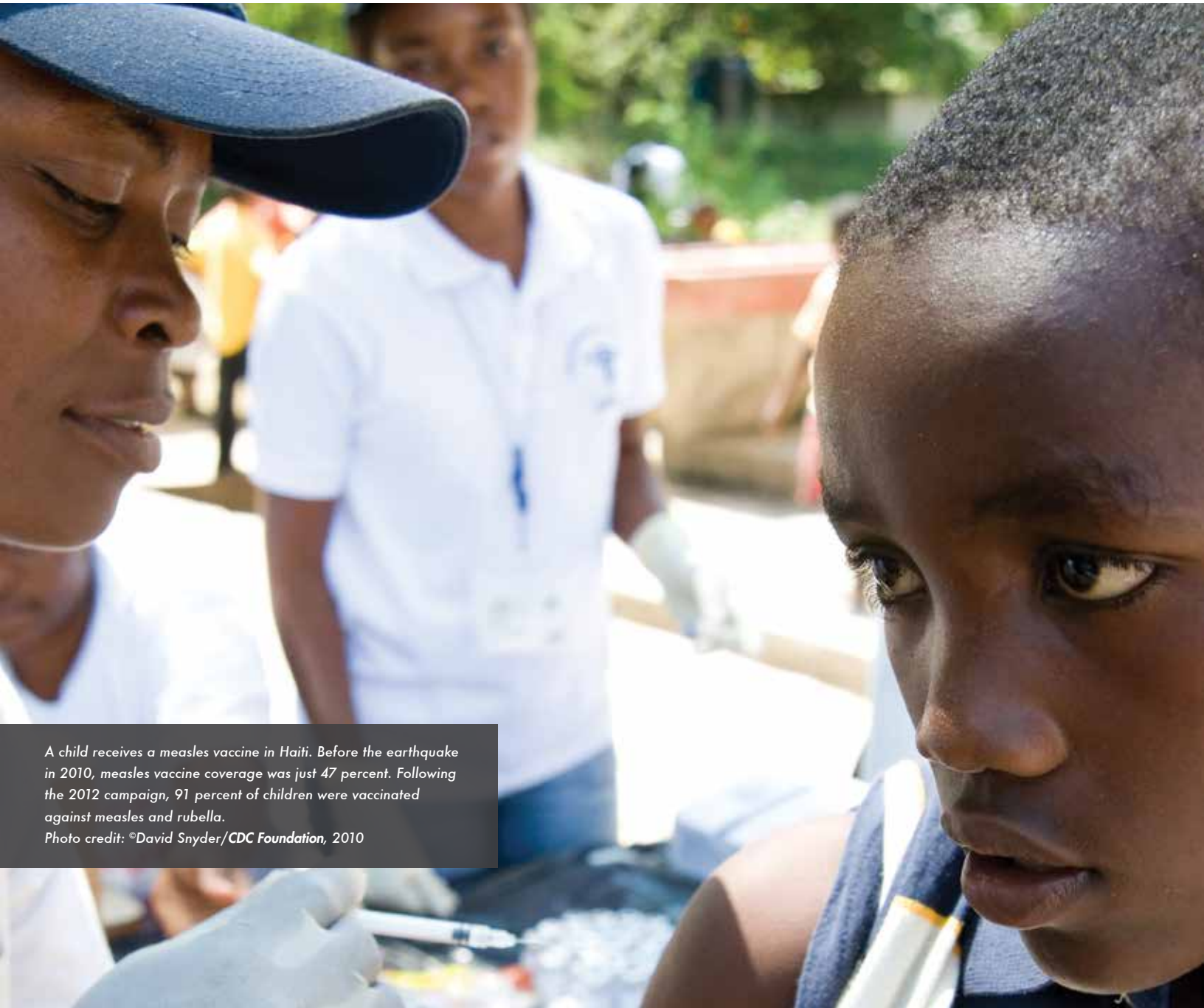
Priorities	Objectives
Equitable access to and utilization of vaccines	• Strengthen service delivery platforms to increase access and utilization of vaccines for all populations across the lifespan • Strengthen immunization service delivery as an integral part of a well-functioning health system
Increased and sustained demand for vaccines	• Develop and implement strategies to generate and sustain national, subnational, and community-based demand for vaccination
Vaccine safety and risk communication	• Strengthen capacity to monitor, investigate, characterize, and communicate emerging vaccine safety data, and to appropriately adapt vaccine policy
Use of vaccines for outbreak response and humanitarian emergencies	• Support timely use of vaccine in response to outbreaks and humanitarian emergencies

Equitable access to and utilization of vaccines

CDC strengthens national vaccination delivery platforms for populations across the life-span, including pregnant women, children in the first and second years of life, children at school-entry, and older children and adolescents.

CDC supports country efforts to increase vaccination coverage through routine immunization services by developing and advocating for the scale up of interventions to:

- address community- and health sector-based barriers to vaccine access and utilization;
- minimize missed opportunities for vaccination; and
- provide catch-up vaccination (e.g., school-entry record checks and follow-up vaccination).



A child receives a measles vaccine in Haiti. Before the earthquake in 2010, measles vaccine coverage was just 47 percent. Following the 2012 campaign, 91 percent of children were vaccinated against measles and rubella.
*Photo credit: ©David Snyder/**CDC Foundation**, 2010*

CDC also supports SIA planning and implementation to increase equity and coverage by identifying under-vaccinated children for referral to routine immunization services. CDC strives to monitor and evaluate equity, access, and utilization of routine immunization services, and to develop and implement new technologies and approaches to deliver safe and high-quality vaccines.

CDC strengthens vaccination delivery as an integral part of a well-functioning health system by developing and supporting implementation of strategies to link planning, delivery, and vaccination monitoring of vaccination with other related health interventions administered across the life span (e.g., Second Year of Life project piloted in Ghana).

Increased and sustained demand for vaccines

Underpinning expanded vaccine utilization and access are the development and implementation of strategies to generate and sustain national, subnational, and community demand for vaccination. CDC will:

- foster partnerships (e.g., with civil society organizations) supporting initiatives that increase demand for vaccination;
- address vaccine hesitancy and increase community demand for vaccines through innovations in communication strategies and other relevant initiatives; and
- promote policies, regulations, and laws that facilitate vaccine demand and utilization.

Vaccine safety and risk communication

Vaccine safety and a scientifically rigorous response to **adverse events following immunization (AEFI)** are critical to ensure public confidence in immunization. CDC partners with the **Global Vaccine Safety Initiative**[25] and ministries of health to build capacity for vaccine safety assessment and response in low- and middle-income countries. This includes developing technical documentation to monitor and characterize AEFIs, and developing risk management and communication strategies for rapid response to emerging vaccine safety data.

Use of vaccines for outbreak response and humanitarian emergencies

CDC supports development of guidelines and policies for use of vaccine stockpiles to respond to outbreaks, pandemic threats, and other emerging diseases. In addition, CDC supports development of guidelines and policies for vaccine use in outbreaks and humanitarian emergencies.

CDC will continue to support maintaining and rebuilding of vaccination delivery in humanitarian emergencies, and to conduct risk assessments and immunization to identify and close immunity gaps.

REACH

4

STRENGTHEN SURVEILLANCE and IMMUNIZATION INFORMATION to PREVENT, DETECT, and RESPOND to VPDs

A Nepalese vaccinator uses a chair seat as a tabletop to update a vaccination registry during a vaccination campaign monitored by an EIS officer on assignment to the Stop Transmission of Polio Program in Nepal.
Photo credit: Adam Bjork, Ph.D., CDC, 2011

4 STRENGTHEN SURVEILLANCE and IMMUNIZATION INFORMATION to PREVENT, DETECT, and RESPOND to VPDs

Priorities	Objectives
High-quality integrated epidemiologic and laboratory surveillance*	• Maintain and strengthen global VPD laboratory networks • Assess and enhance the performance of integrated epidemiologic and laboratory surveillance • Strategically link VPD surveillance with surveillance for other diseases
Well-functioning immunization information systems (IIS)†	• Develop and enhance **IIS policies**, guidelines, and performance standards • Assess and enhance IIS performance to ensure high-quality collection, management, and use of data • Develop and implement strategic linkages of IIS with other health information systems
Strategic information for action‡	• Assess VPD burden and risk • Assess vaccination coverage • Assess vaccination delivery improvements

*Integrated epidemiologic and laboratory-based VPD surveillance systems are able to collect and analyze VPD data using one identification number for case and specimen data, and to measure the impact of immunization.

†Immunization information systems are able to collect, analyze, and report high-quality, immunization-related data to support vaccination delivery. At the point of vaccine administration, IIS include vaccination records for individual children that can be used to determine vaccine needs. IIS can also be used to implement strategies to improve vaccination coverage (e.g., reminder-recall) and manage immunization programs (e.g., assess vaccination coverage and missed opportunities for vaccination).

‡Strategic information is "evidence for action" for optimal policy and programmatic decisions to enhance immunization system performance, and includes information from VPD surveillance systems, IIS, and other sources (e.g., vaccine coverage surveys, serosurveys, risk assessments).

High-quality integrated epidemiologic and laboratory surveillance

CDC has multiple global VPD reference laboratories and plays an important role in establishing and building high-quality VPD laboratory networks globally. CDC enhances VPD diagnostic capacity in regional and national public health laboratories by providing diagnostic reference resources and global and regional coordination.

CDC also enhances VPD laboratory network capacity by developing appropriate technologies to meet evolving VPD surveillance needs, including new laboratory methods, reagents, analytic tools, diagnostic tests, training materials, quality control, data management, and improvements to specimen handling and transport.

CDC assesses and enhances performance of integrated epidemiologic and laboratory VPD surveillance at global, regional, national, and community levels. It works to develop capacity to generate, interpret, and use surveillance data to detect and respond to VPD outbreaks, and to investigate the causes of outbreaks (e.g., vaccine failure; failure to vaccinate).

CDC also supports surveillance reviews and follow-up actions, including developing and enhancing VPD surveillance policies, guidelines, and quality standards. CDC works to develop and implement strategic linkages of VPD surveillance to surveillance for other diseases, including through CDC's activities to implement the Global Health Security Agenda.

Well-functioning immunization information systems

CDC has expertise in developing immunization information systems (IIS) which are able to collect, analyze, and report high-quality, immunization-related data to support management of immunization programs. It supports development of:

- standards to improve the quality of IIS practices and increase interoperability between systems;
- standards for electronic immunization registries; and
- guidelines to monitor and evaluate data quality and use.

CDC assesses and enhances the ability of IIS to ensure high-quality collection, management, and use of data by developing interventions to improve the quality and use of data and IIS at regional and country levels. These interventions include appropriate technologies to track and improve vaccine delivery across the life course, and approaches to improve target population estimates.

CDC also works to develop and implement strategic linkages of IIS with other health information systems, including linking immunization registries with civil registration and vital statistics systems, and assessing the feasibility and value of linkages between IIS and other health information systems. IIS can improve vaccination management and the use of reminders for vaccination and other child health interventions.

Strategic information for action

Strategic information is evidence for action supporting policy and programmatic decisions which lead to enhanced performance of immunization programs. CDC conducts assessments of VPD burden and risk, detects and responds to VPD outbreaks, conducts risk assessments, and monitors risk mitigation activities.

CDC also supports accurate estimates of vaccine coverage by developing new tools and approaches to increase accuracy as well as by developing guidelines for interpretation and use of vaccination coverage surveys.

Under the scorching sun, a Nigeria Field Epidemiology and Laboratory Training Program resident and two data collectors hike down difficult terrain to conduct a vaccination coverage survey in under-served settlements at Hirgizan Duste in Sokoto, Nigeria. The survey was organized by Nigeria's National Stop Transmission of Polio program.
Photo credit: Mariam Florence Ogo, 2014

EVIDENCE

5

CONDUCT and PROMOTE RESEARCH, INNOVATION, and EVALUATION

A healthcare worker administers oral polio vaccine during a 2011 campaign in Chad.
Photo credit: Katrina Kretsinger, M.D., CDC

5 CONDUCT and PROMOTE RESEARCH, INNOVATION, and EVALUATION

Priorities	Objectives
Strong evidence base to achieve global immunization goals	• Identify, prioritize, and implement research, innovation, and evaluation
Translation of research, innovation, and evaluation findings into policy and program impact	• Disseminate and communicate research, innovation, and evaluation findings
Regional and country capacity to conduct research, innovation, and evaluation	• Increase regional and country capacity to conduct research, innovation, and evaluation

Strong evidence base to achieve global immunization goals

CDC collaborates with external scientists to conduct and support research, innovation, and evaluation to increase the evidence base needed to address immunization program challenges. CDC's global immunization research, innovation, and evaluation agendas are developed in the context of the global landscape related to achieving immunization goals, and local contexts and priorities.

Translation of research, innovation, and evaluation findings into policy and program impact

CDC bridges the gap between knowledge and action by disseminating and communicating research, innovation, and evaluation results, and by working with countries to use these results to catalyze improvements in immunization policy and practices. These in turn impact control, elimination, and eradication of VPDs.[26]

Regional and country capacity to conduct research, innovation, and evaluation

A core principle of CDC's approach to increasing the global immunization evidence base is to strengthen research, innovation, and evaluation capacity and quality within low- and middle-income countries. Scientists in these settings are best positioned to identify immunization system challenges and provide local immunization policy-makers and program managers with high-quality evidence to inform decisionmaking.[27]

CDC will collaborate with ministries of health, national public health institutes, Field Epidemiology Training Programs, and universities to ensure local ownership, and to expand capacity to implement immunization research, innovation, and evaluation. Key factors for national capacity building include:

- fostering governance structures;
- promoting effective leadership, communication, and collaboration; and
- providing support, supervision, and mentorship for research and evaluation projects.

CDC also collaborates with WHO regional offices and other partners to foster development of national research capacity, as well as to develop and implement immunization research, innovation, and evaluation agendas in countries.

Preparing supplies for polio vaccination campaign, Central African Republic.
Photo Credit: Benjamin Dahl, CDC, 2012

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A vaccinator in Jalalabad, in eastern Afghanistan, administers bivalent oral polio vaccine (OPV) to a child on December 16, 2009, the first day this vaccine was ever used for a vaccination campaign. Bivalent OPV targets wild poliovirus types 1 and 3, inducing a stronger immune response than trivalent OPV. Wild poliovirus type 2 has not been detected since October 1999; WHO certified its eradication in September 2015. The global switch from trivalent to bivalent OPV began in April 2016.

*Photo credit: Courtesy of **UNICEF**/Cornelia Walther*

*The **Global Immunization Division**, through the Center for Global Health, has overall coordination and responsibility for global immunization activities implemented across the agency. CDC divisions, offices, and programs with subject matter and disease-specific areas of expertise related to global immunization activities include:*

Center for Global Health
Division of Parasitic Diseases and Malaria
Division of Global Health Protection
Division of Global HIV and TB
Global Immunization Division

National Center for Chronic Disease Prevention and Health Promotion
Office of International Cancer Control, Division of Cancer Prevention and Control

National Center for Emerging and Zoonotic Infectious Diseases
Division of Foodborne, Waterborne, and Environmental Diseases
Division of High Consequence Pathogens and Pathology
Division of Vector Borne Diseases
Immunization Safety Office, Division of Healthcare Quality Promotion

National Center for Hepatitis, HIV, and STD Prevention
Division of Adolescent and School Health
Division of HIV/AIDS Prevention
Division of Viral Hepatitis

National Center for Health Statistics
Global Program for Civil Registration and Vital Statistics Improvement

National Center for Immunization and Respiratory Diseases
Division of Bacterial Diseases
Division of Viral Diseases
Immunization Services Division
Influenza Division

While monitoring polio vaccination teams during a 2014 vaccination campaign, Kenya Field Epidemiology and Laboratory Training Program resident Samuel Juma searches for a mobile phone signal by climbing on an anthill in Wajir Bor.
Photo credit: CDC

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