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Global Vaccination: Trends and U.S. Role

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SUMMARY

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Global Vaccination: Trends and U.S. Role

For more than 50 years, the United States has taken an interest in the eradication of vaccine-preventable diseases (VPDs) in children worldwide, as well as vaccine research and development, particularly since playing a vital role in the global campaign to eradicate smallpox in the 1960s. Since then, vaccinating children against VPDs has been a major U.S. foreign policy effort.

Vaccinations are one of the most cost-effective ways to prevent infectious disease and associated morbidity and mortality. According to UNICEF, immunizations save around 3 million lives per year. As of 2019, VPDs continue to cause high levels of morbidity (illness) and mortality (death), and the World Health Organization (WHO) notes that the adoption of new vaccines by low- and middle-income countries (which often have the highest disease burdens) has been slower than in high-income countries. Receiving a vaccination during childhood can protect the recipient from VPDs, decrease the spread of related diseases, and improve child survival prospects (as children, particularly those under five years old, are more likely than adults to die from VPDs).

Recently, a global resurgence of certain VPDs has caused concern among public health officials and drawn attention to the challenges of vaccine hesitancy and stigma. For example, polio continues to elude global eradication and remains endemic in three countries. In 2019 measles has seen a resurgence in some middle- and high-income countries due to a variety of factors, including reluctance among some individuals and religious communities to vaccinate their children. In April 2019, the WHO reported an increase in global measles cases compared to the same period in 2018, with the greatest surges in cases in the Americas, the Middle East, and Europe. A number of European countries are at risk of or have lost their measles eradication certificate from the WHO, raising questions about global consensus on the use of vaccines, participation in and support for the Global Alliance for Vaccines and Immunization (GAVI, now called GAVI, the Vaccine Alliance) and other global immunization efforts. Prompted in part by this global resurgence, the WHO has listed "vaccine hesitancy" as one of the 10 biggest global public health threats.

The U.S. government is the second-leading government donor to global vaccination campaigns. Through annual appropriations to the Department of Health and Human Services (HHS) and the Department of State, Congress funds global immunization activities through the Centers for Disease Control and Prevention (CDC), the United States Agency for International Development (USAID), and GAVI. In recent years, annual appropriations by Congress for multilateral immunizations campaigns led by GAVI have averaged $290 million and $226 million for bilateral campaigns led by CDC. USAID works to support routine immunization overseas through health systems strengthening, and Global Polio Eradication Initiative Activities. The authorization, appropriation, and oversight of U.S. funding for global child vaccination is thus an ongoing area of concern for many in Congress. Other key issues for Congress include the extent of donor coordination and burden-sharing for such efforts, and the extent to which global child vaccination promotes U.S. foreign policy, development, and domestic health security (i.e., pandemic preparedness) goals.

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Introduction

Beginning with the campaign to eradicate smallpox in the 1960s, the United States has been interested in the eradication of vaccine-preventable diseases (VPDs) in children worldwide, as well as vaccine research and development. The success of the smallpox eradication campaign led to the establishment of the World Health Organization's Expanded Programme on Immunization in 1974.[1] Since then, global vaccination campaigns have been broadened and garnered near universal international support.

Today, the U.S. government is a leading donor to global vaccination campaigns (**Figure 3**).[2] In FY2019, Congress appropriated $290 million in foreign aid for the Global Alliance for Vaccines and Immunization (GAVI, now called GAVI, the Vaccine Alliance) and $226 million for Department of Health and Human Services (HHS) to support child vaccine campaigns abroad. The authorization, appropriation, and oversight of U.S. funding for global child vaccination is thus an ongoing area of concern for many in Congress, as is the extent of donor coordination and burden-sharing for such efforts. Additional potential issues include the extent to which global child vaccination promotes U.S. foreign policy, development, and domestic health security (i.e., pandemic preparedness) goals.

Donor-backed child vaccination campaigns have reduced mortality in poor countries, though occasionally they have faced setbacks. In the early 1990s, U.S. foreign assistance for large-scale vaccination campaigns led by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), and with significant U.S. funding and technical support, contributed to an approximately 80% immunization rate for three doses of the diphtheria, tetanus, and pertussis vaccine (DTP3).[3] Progress, as measured by vaccination rates, stalled on certain vaccines—notably the diphtheria, tetanus, pertussis, and measles vaccines—in the late-1990s for a variety of reasons, including management of vaccine stocks, effective vaccine delivery, and cost of vaccinations.[4]

What Is a Vaccine-Preventable Disease?

A vaccine-preventable disease (VPD) is an infectious disease for which an effective preventive vaccine exists. Examples include measles and polio. If a person acquires a VPD and dies from it, the death is considered a vaccine-preventable death.

A population achieves "herd immunity," whereby a sufficient proportion of the population is immunized in order to prevent disease spread, when 93% to 95% of individuals in a community are vaccinated.

Recommended childhood vaccines are listed in **Figure 3**.

Source: Centers for Disease Control and Prevention (CDC), *Vaccines and Preventable Diseases*, https://www.cdc.gov/vaccines/vpd/index.html.

In 2000, a public-private partnership, the Global Alliance for Vaccines and Immunization (GAVI) was launched to address both declining global momentum for child immunization campaigns and

[1] J.M. Okwo-Bele and T. Cherian, "The expanded programme on immunization: a lasting legacy of smallpox eradication.," *Vaccine*, vol. 29 (December 30, 2011).

[2] See **Figure 3**. Since 2000, the United States has contributed nearly 12% of GAVI's total funding (roughly $2.5 billion), following the United Kingdom (24%), and the Bill and Melinda Gates Foundation (20%).

[3] DTP3 coverage is used as a proxy for vaccination coverage of a population for all recommended vaccines. After smallpox, the pertussis, diphtheria, and tetanus vaccines are the oldest vaccines (developed in 1914, 1926, and 1938 respectively and combined into the DTP vaccine in 1948).

[4] Beth Jarosz and Reshma Naik, *Progress Stalls on Vaccine-Preventable Diseases*, Population Reference Bureau, June 25, 2015, https://www.prb.org/vaccine-preventable-disease-progress/. Beth Jarosz and Reshma Naik, *Solutions to Reducing Vaccine-Preventable Childhood Diseases*, Population Reference Bureau, June 24, 2015, https://www.prb.org/vaccine-preventable-childhood-disease/.

declining funding for these programs. Since its inception, GAVI has supported the immunization of 700 million children.[5] As a founding member of GAVI, the United States holds a rotating seat on GAVI's board and provides it with funding (see "U.S. Role and Funding").

Vaccinations are considered one of the most cost-effective ways to prevent infectious disease and associated morbidity and mortality. WHO recommends that all children receive 10 vaccines (**Table 1**).[6] Receiving the recommended childhood vaccinations can protect the recipient from illness and death associated with VPDs, and can reduce infectious disease spread. According to UNICEF, these immunizations save around 3 million lives per year.[7] Globally, coverage of recommended childhood vaccines vary, with VPDs causing high levels of morbidity (illness) and mortality (death), primarily in certain low- and middle-income countries that have had limited success in achieving universal coverage.[8] Recently, some high-income countries, for example France and the United States, have seen exponential increases in cases of VPDs, due primarily to vaccine hesitancy.[9]

Table 1. WHO Recommended Immunizations for Children

Recommended Vaccine	Number of Doses and Disease Protection
Bacilus Calmette Guerin (BCG)	1 dose, protects against tuberculosis.
Diphtheria, Tetanus and Pertussis vaccine (commonly referred to as DTP3, DTPcv3 or DTaP)	3 doses, protects against diphtheria, tetanus, and pertussis (whooping cough)
Hepatitis B vaccine	3-4 doses, protects against hepatitis B disease, which can cause liver failure, and cancer.
Haemophilus Influenzae Type b (Hib) Vaccine	3 doses, protects against Hib disease, which can cause bacterial meningitis, and pneumonia.
Pneumococcal (PCV-3)	3 doses, protects against pneumonia.
Poliomyelitis vaccine (IPV-1)	3 doses, protects against poliovirus, which can cause paralysis and meningitis.
Rotavirus vaccine	3-4 doses, protects against severe diarrhea, vomiting, and stomach pain caused by rotavirus.
Measles vaccine (commonly referred to as MMR, or MCV)	2 doses, protects against measles, often administered in combination with mumps and rubella vaccines.
Rubella (commonly referred to as MMR or MCV)	1 dose, protects against rubella disease.
Human Papillomavirus (HPV) vaccine	2 doses, protects against HPV types 16 and 18, which can cause cervical cancer.

Source: WHO, *Recommended Routine Immunizations for Children*, April 2019. CDC, *Vaccine Information Statements*, 2019.

[5] GAVI, *Facts and Figures*, 2019.

[6] The WHO recommends children receive these vaccinations prior to 23 months of age, with the exception of the HPV vaccine, which is recommended for children by age 12 years.

[7] UNICEF, *Immunization programme*, 2019, https://www.unicef.org/immunization.

[8] F. Bustreo, J-M Okwo-Bele, and L. Kamara, *World Health Organization perspectives on the contribution of GAVI on reducing child mortality*, World Health Organization, October 14, 2014.

[9] "Vaccine hesitancy: a generation at risk," *The Lancet Child & Adolescent Health*, vol. 3, no. 5 (May 2019).

Global Vaccine Coverage

According to GAVI, from 2000 through 2018, more than 760 million children worldwide were immunized against VPDs, including 66 million children in 2018. Approximately 100 million children are immunized each year. At the end of 2018, 20 million infants and children worldwide had not received the full schedule of recommended vaccines.[10] According to GAVI, full vaccination coverage could prevent one in seven deaths in under-5 children.[11] Over 1.5 million children die every year from VPDs.[12] Nearly 60% of these children live in 10 countries: Angola, Brazil, DRC, Ethiopia, India, Indonesia, Nigeria, Pakistan, the Philippines, and Vietnam.[13]

From 1990 to 2017, overall child deaths fell from 12.7 million to 5.8 million, largely due to gains made by global immunization campaigns and expanded national immunization programs.[14] For example, from 2000 to 2017, scaled-up measles vaccination coverage averted an estimated 15.6 million deaths from the disease.[15]

Global coverage for several recommended vaccines has continued to climb over the past decade (see **Figure 1**); however, progress in expanding the number of children vaccinated with DTP3 (a three-dose diphtheria, tetanus and pertussis vaccine) has stagnated in recent years, though its coverage remains higher than coverage for other required vaccinations (see **Figure 2**). GAVI reports recent stagnation in coverage is due to "acute problems that a small number of previously high performing countries have faced."[16]Diphtheria, tetanus and pertussis are particularly fatal to neonates, new mothers, and pregnant women. Maternal and neonatal tetanus (MNTE) has been almost eliminated globally, and since 2000 there has been an 85% reduction in newborn deaths from tetanus.[17] As of March 2019, MNTE remains present in 14 countries.[18] In 2018, 86% of children under the age of one received all three doses of the DTP3 vaccine.

[10] WHO, *Immunization*, July 18, 2019, https://www.who.int/news-room/facts-in-pictures/detail/immunization.

[11] GAVI, *About GAVI, the Vaccine Alliance*, Geneva, Switzerland, 2019, https://www.gavi.org/about/.

[12] UNICEF, *The State of the World's Children 2016: A fair chance for every child*, 2016.

[13] WHO, *Immunization*, July 18, 2019, https://www.who.int/news-room/facts-in-pictures/detail/immunization.

[14] UNICEF, *Under-five mortality*, March 2018.

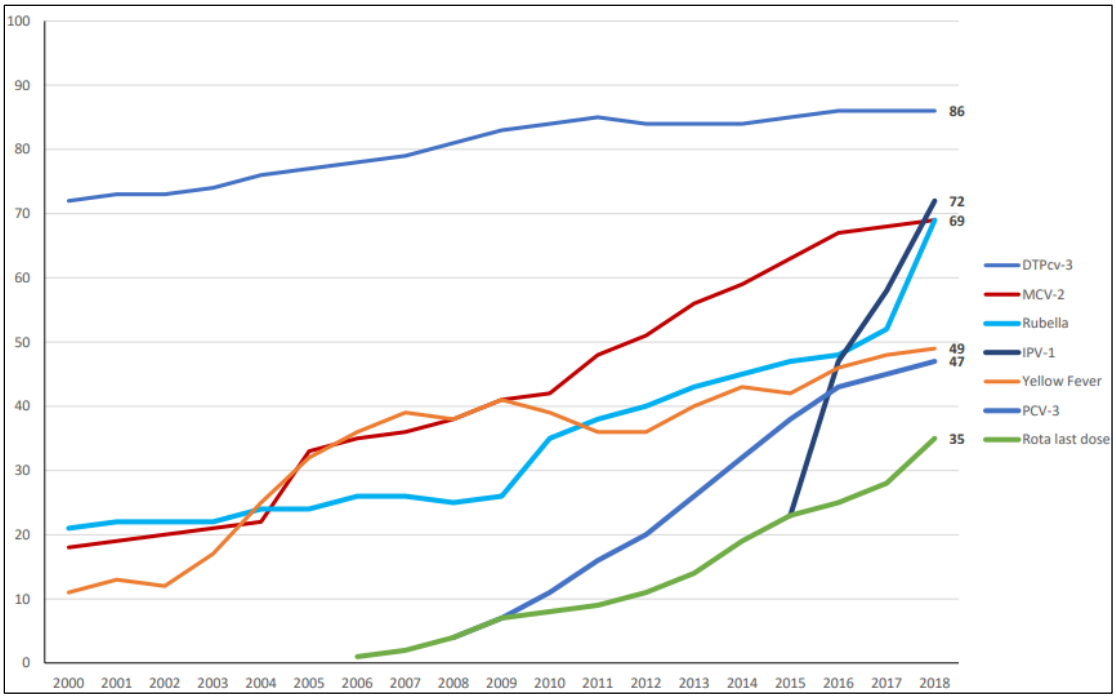
[15] Ibid.

[16] GAVI, *Annual Progress Report: 2018*, 2019.

[17] WHO, *Maternal and Neonatal Tetanus Elimination*, June 2019.

[18] MNTE persists in Afghanistan, Angola, Central African Republic, Chad, Democratic Republic of Congo, Guinea, Mali, Nigeria, Pakistan, Papua New Guinea, Somalia, Sudan, South Sudan and Yemen. Pakistan and Nigeria have partially eliminated MNTE. WHO, *Protecting All Against Tetanus*, January 2019.

Figure 1. Global Coverage for Selected Vaccines, 2000-2018



Source: WHO, *Progress and Challenges with Achieving Universal Immunization Coverage*, July 2019.

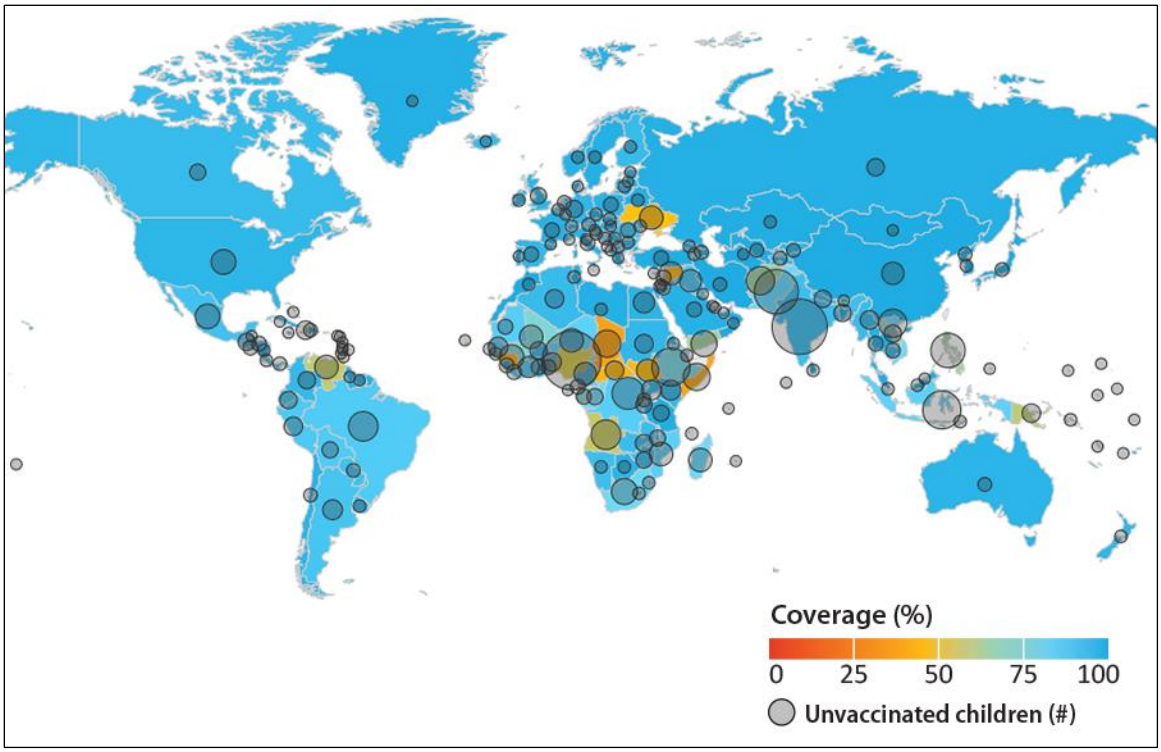
Notes: DTPcv-3 is coverage of the three recommended doses of the diptheria, tetanus, and pertussis vaccine. MCV-2 is coverage of the two recommended doses of the measles-containing vaccine. IPV-1 refers to the inactivated poliovirus vaccine. PCV-3 is the pneumococcal conjugate vaccine used to protect against pneumonia and other diseases caused by the streptococcus pneumoniae bacteria. The rubella vaccine protects against rubella and may be given in combination with other vaccines (i.e., as the MMRV vaccine) to protect against measles, mumps, rubella, and varicella (commonly known as chickenpox).

As global uptake of childhood vaccines improves, an increasing proportion of child deaths are concentrated in sub-Saharan Africa and Southern Asia: four out of every five under-5 child deaths occur in these regions.[19] **Figure 2** displays geographical immunization coverage for three doses of the DTP3 vaccine. DTP3 immunization coverage is used as a proxy indicator to estimate the proportion of children vaccinated within their first year of life.[20]

[19] Ibid.

[20] WHO/UNICEF estimates of national immunization coverage, WUENIC Analytics, https://unicef.shinyapps.io/wuenic_analytics/.

Figure 2. Estimated Immunization Coverage and Number of Unvaccinated Children (DTP3), 2018



Source: WHO/UNICEF estimates of national immunization coverage (WUENIC), as of 2019, available at https://unicef.shinyapps.io/wuenic_analytics/; and UNDP World Population Prospects, 2019.

Notes: Estimates of immunization coverage stem from UNICEF/WHO member states, survey reports, and data from academic literature. Values may not sum to total due to rounding. Regional estimates of the number of unvaccinated children reflect the entire target population, whether or not a country has introduced the vaccination of interest.

Global Efforts to Decrease VPDs Among Children

In 2015, U.N. member states adopted the Sustainable Development Goals (SDG) as a common agenda to help alleviate global poverty, improve health and education, reduce inequality, and spur economic growth by 2030.[21] SDG Goal 3 is to end preventable deaths of newborns and under-5 children by 2030, with a targeted reduction of under-5 mortality to 25 per 1,000 live births in every country.[22] (According to 2018 figures, 80 countries worldwide have under-5 mortality rates that are higher than 25 per 1,000 live births.)[23] International efforts to decrease vaccine-preventable deaths among children younger than five years are led by international organizations such as WHO, UNICEF, and GAVI, with significant U.S. support (detailed in the section on U.S. role and funding). Several multilateral initiatives and commitments frame these efforts.

[21] See U.N. Sustainable Development Goals, at https://sustainabledevelopment.un.org/?menu=1300.

[22] United Nations, *Goal 3: Ensure healthy lives and promote well-being for all at all ages*, Sustainable Development Goals, 2015, https://www.un.org/sustainabledevelopment/health/.

[23] The World Bank, *Data: Mortality rate, under-5 (per 1,000 live births)*, 2018.

UNICEF. UNICEF supports immunization programs globally and is the biggest single global purchaser of vaccines. The organization focuses on providing vaccinations, monitoring and improving vaccine supply and quality (e.g., ensuring that vaccines are consistently stored at an appropriate temperature, known as "the cold chain"), vaccine innovation (e.g., research and development), and disease eradication and elimination programs. UNICEF has a permanent seat on GAVI's board and procures all vaccines for GAVI-supported programs to ensure a reliable supply of high-quality and affordable vaccines.[24] UNICEF's immunization goals align with WHO targets outlined in the Global Vaccine Action Plan (GVAP) 2011-2020; to reach 90% of children under the age of one with routine immunization, and achieve 80% immunization coverage for every country district by 2020.[25]

WHO. The WHO launched its first 10-year strategic framework on vaccines in 2005. The Global Immunization Vision and Strategy Immunization was intended to extend immunization achievements and to continue encouraging governments to maintain a commitment to protect their populations from VPDs. The GVAP for 2011-2020 was released in 2010 to build on the 2005 strategic framework. The GVAP aligns with the WHO's 2015-2030 strategic goals, which include promoting the development of new vaccines and vaccine delivery technologies to meet public health priorities, establishing norms and standards for vaccines and vaccine delivery technology, and ensuring quality.[26]

The WHO also develops evidence-based immunization policy recommendations for member states through an independent advisory group, the Strategic Advisory Group of Experts on Immunization (SAGE).[27] SAGE meets biannually to develop recommendations based on available evidence on immunization and vaccines. It also convenes on an emergency basis to discuss disease outbreaks and vaccine-related concerns (e.g., experimental Ebola vaccines).

GAVI, the Vaccine Alliance. GAVI is a multilaterally funded public-private partnership. It was founded in 2000 by the United States, the WHO, the United Nations, the World Bank, and the Bill and Melinda Gates Foundation to expand global access to vaccines and prevent deaths from VPDs. GAVI is guided by five year strategic plans, the Phase IV strategy for 2015-2020 aligns with the goals outlined in the GVAP. In 2019, GAVI set the overall goal to immunize 300 million children by 2025, and save 5-6 million lives in the long term.[28] For more information on GAVI, see the section under U.S. Funding for Multilateral Initiatives.

Factors Affecting Immunization Coverage

Various factors affect global immunization coverage, including vaccine hesitancy and stigma, geographic location, inadequate country capacity, and poverty and socioeconomic status.

Vaccine hesitancy and stigma. Recently, a resurgence of certain VPDs has caused concern among public health officials and drawn attention to the challenges of vaccine hesitancy and stigma. For example, polio continues to elude global eradication, and in 2019 some middle- and

[24] GAVI, *Gavi's partnership model: UNICEF*, 2019, https://www.gavi.org/about/partners/unicef/.

[25] A goal of 80% immunization coverage for every country district differs from a national 80% coverage rate because it does not mask differences in districts within a country (e.g., rural and urban gaps or gaps between poor and rich districts).

[26] WHO, *From Vaccine Development to Policy: A Brief Review of WHO Vaccine-Related Activities and Advisory Processes*, 2017.

[27] WHO, *Strategic Advisory Group of Experts on Immunization*, March 2019.

[28] GAVI, *Gavi's Strategy*, 2019.

high-income countries experienced a resurgence of measles, due to a variety of factors, including reluctance among some individuals and religious communities to vaccinate their children. In April 2019, the WHO reported a 300% increase in global measles cases compared to the same period in 2018, with the greatest surges in cases in the Americas, the Middle East, and Europe.[29]

Prompted in part by this resurgence, the WHO listed "vaccine hesitancy" as one of the 10 biggest global public health threats.[30] Corruption, authoritarian governance, and social or political discrimination can fuel vaccine hesitancy by undermining citizens' trust in authority figures (including government officials and health workers involved in vaccine campaigns). For example, Nigeria was close to eliminating polio for many years but did not do so until recently. Vaccination campaign efforts were hampered in part by conspiracy theories, "vaccine stigma," as well as by ethical concerns about government regulations and pharmaceutical industry practices. Vaccine stigma, for its part, arises when a community normalizes vaccine denial.[31]

VPD Eradication Campaigns and U.S. National Security Actions[32]

Health practitioners can face a range of obstacles in administering vaccines, including security conditions in or near conflict zones and resistance from local populations rooted in cultural, religious, or political views. Real or perceived associations between vaccination efforts and foreign government interests may further limit the willingness of populations to participate and may contribute to security risks for health workers. In Pakistan, for example, some observers attribute a backlash against polio vaccination efforts to revelations that U.S. government entities used a hepatitis B vaccination program to covertly gather information confirming the whereabouts of Osama bin Laden in 2011.[33] A Pakistani doctor, Shakil Afridi, had been engaged in hepatitis B vaccination efforts that were indirectly used to confirm Bin Laden's whereabouts in 2011. Following Afridi's imprisonment and revelations from his trial, the expulsion of some foreign health workers from Pakistan, the assassination of several U.N. polio vaccine workers, and the suspension of U.N.-supported polio eradication efforts in Pakistan, the deans of several prominent U.S. schools of public health wrote to the Obama Administration stating that "public health programs should not be used as cover for covert operations" and requesting public assurance that cases such as Afridi's would not be repeated.[34] In 2014, the Administration confirmed that "the Director of the Central Intelligence Agency (CIA) directed in August 2013 that the Agency make no operational use of vaccination programs, which includes vaccination workers. Similarly, the Agency will not seek to obtain or exploit DNA or other genetic material acquired through such programs. This CIA policy applies worldwide and to U.S. and non-U.S. persons alike."[35]

Geographic location. Geographical distance from health centers negatively impacts vaccination coverage.[36] Underserved populations within any given country often shoulder a heavier burden of

[29] WHO, *Global Measles and Rubella Update*, August 2019.

[30] The WHO defines "vaccine hesitancy" as "a delay in acceptance or refusal of vaccines despite availability of vaccine services." WHO, *Ten Threats to Global Health in 2019*, 2019, https://www.who.int/emergencies/ten-threats-to-global-health-in-2019.

[31] "Vaccine denial" is defined as refusal to vaccinate, or rejection of recommended vaccinations, usually by the parent or guardian of an eligible child.

[32] Christopher Blanchard, Specialist in Middle Eastern Affairs, contributed to this text box.

[33] Saeed Shah, "U.S. defense chief confirms Pakistan holds doctor with role in bin Laden raid," *McClatchy Newspapers*, January 29, 2012; Shah, "Pakistani who helped CIA gets 33 years," *McClatchy Newspapers*, May 24, 2012; and, Alexander Mullaney and Syeda Amna Hassan, "He Led the CIA to bin Laden—and Unwittingly Fueled a Vaccine Backlash," *National Geographic*, February 27, 2015.

[34] Letter from Pierre M. Buekens, M.D., M.P.H., Ph.D. Dean, Tulane University School of Public Health and Tropical Medicine et al to President Barack Obama, January 6, 2013.

[35] Letter from Assistant to the President for Homeland Security and Counterterrorism Lisa Monaco, May 16, 2014; and Johns Hopkins School of Public Health, "White House Responds to Public Health Deans: the Central Intelligence Agency Makes No Use of Operational Vaccination Programs," press release, May 20, 2014.

[36] C. Edson Utazi, Julia Thorley, Victor A. Alegana, et al., "Mapping vaccination coverage to explore the effects of

disease, and they may lack access to basic medical care. Notably, vaccine coverage disparities between children in urban and rural areas persist throughout the world, and commonly exacerbate disease spread within a certain geographical area. For example, according to the WHO, in some countries (e.g., Nigeria and Indonesia), coverage of the measles vaccine in rural areas is 33% lower than in urban areas.[37]

Poverty, socioeconomic status, and social determinants of health. Vaccination coverage in low-income countries (41%) lags behind coverage in high-income countries (90%).[38] Medical systems in many low-income countries are often underfunded and unable to vaccinate enough children to stop a virus's spread even with donor aid. In addition, researchers have found that inequities in vaccination coverage are associated with individual socioeconomic determinants, such as a family's income level and the educational status of a child's mother.[39] Children born into poverty are almost twice as likely to die before the age of five as those from wealthier families, and researchers suggest that unequal access to vaccines is a key factor.[40] Vaccine coverage for the richest fifth of the population in some countries is up to 58% higher than for the poorest fifth.[41]

Fragile and conflict settings. UNICEF reports that 40% of unvaccinated children live in countries affected by armed conflict or other humanitarian challenges.[42] Often, already fragile health care infrastructure is further crippled by armed conflict, which can hinder health workers in carrying out vaccinations and interfere with proper disease treatment and containment. Humanitarian settings such as refugee and internal displacement camps can also foster conditions (e.g., poor nutrition, overcrowding, and unsanitary conditions) conducive to the rapid spread of infectious diseases.[43] According to UNICEF estimates, as of 2015, half of the 10 countries that had under 50% diphtheria, tetanus, and pertussis vaccine coverage—the Central African Republic, Somalia, South Sudan, Syria, and Ukraine—had experienced conflicts or other humanitarian emergencies.[44] Other conflict-affected countries have seen spikes in VPD cases, such as a 2019 surge in measles cases in the Democratic Republic of Congo (DRC), which has killed more people than the ongoing Ebola outbreak in that country.[45]

U.S. Role and Funding

Congress has historically supported global child vaccination programs, both as a component of U.S. foreign assistance and as part of efforts to eradicate infectious diseases that might affect Americans at home or abroad. Through annual appropriations for the Department of Health and Human Services and the Department of State and Foreign Operations (SFOPS), Congress funds

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delivery mechanisms and inform vaccination strategies," *Nature Communications*, vol. 10, no. 1633 (April 19, 2019).

[37] Ibid.

[38] Rebecca Casey, Laure Dumolard, and Carolina Danovaro-Holliday, *Global Routine Vaccination Coverage, 2015*, CDC, November 18, 2016, https://www.cdc.gov/mmwr/volumes/65/wr/mm6545a5.htm.

[39] WHO, Global Vaccine Action Plan 2011-2020, op. cit.

[40] UNICEF, *Sustainable Development Goals: Goal 3 Good Health and Well-Being*, 2017.

[41] Ibid.

[42] UNICEF, *Infographic: Fast Facts on Immunization*, April 2019.

[43] Chimeremma Nnadi, Andrew Etsano, aBelinda Uba, et al., "Approaches to Vaccination Among Populations in Areas of Conflict," *The Journal of Infectious Diseases*, vol. 216 (July 1, 2017).

[44] Eric E. Mast, Stephen L. Cochi, Olen M. Kew, et al., "Fifty Years of Global Immunization at CDC, 166-2015," *Public Health Reports*, vol. 132, no. 1 (January-Febrary 2017), pp. 18-26.

[45] University of Minnesota Center for Infectious Disease Research and Policy, "DRC declares measles outbreak after 1,500 deaths," June 11, 2019.

global immunization activities through the Centers for Disease Control (CDC), the United States Agency for International Development (USAID), and the Global Alliance for Vaccines and Immunization (GAVI, now called GAVI, the Vaccine Alliance).

The U.S. Agency for International Development (USAID) and the Centers for Disease Control and Prevention (CDC) are the primary U.S. federal agencies involved in international vaccination provision and immunization campaigns. These campaigns support the 2016-2020 Strategic Framework for Global Immunization and the WHO's 2011-2020 Global Vaccine Action Plan, the agencies work with country governments to strengthen immunization programs by bolstering infectious disease surveillance, increasing laboratory capacity, and strengthening public health workforce capacity. The efforts of both agencies align with the 2010 HHS National Vaccine Plan, the Global Health Security Agenda, and the U.N.'s 2030 Sustainable Development Goals.

CDC and USAID also support routine immunizations worldwide through enhanced supply chain management and product procurement assistance. Related efforts are implemented bilaterally and through international partnerships with the WHO, UNICEF, the World Bank, and others. In addition, CDC, along with the Department of Defense, finances the research and development of new vaccines.

Centers for Disease Control and Prevention (CDC)

The CDC has played a central role in controlling vaccine-preventable diseases since it established the CDC Smallpox Eradication Program in January 1966.[46] The Global Immunization Division of the CDC's Center for Global Health is responsible for coordinating CDC's global immunization activities.[47] To support these activities, the CDC provides scientific and public health expertise in infectious disease epidemiology and surveillance by building laboratory capacity and helping to implement evidence-based prevention strategies. CDC also carries out clinical trials and epidemiologic studies.

Funding for the CDC's Global Immunization Program is detailed in **Table 2**. The majority of CDC's efforts are focused on polio, with smaller funding allocations for measles and other VPDs. Global vaccination campaigns against polio have lowered the worldwide incidence of polio by 99% compared with that of 1988, and in 2018 only two countries recorded wild polio cases: Afghanistan and Pakistan.[48] Vaccine-derived poliovirus continues to be detected in Nigeria, but as of August 21, 2019, no cases had been confirmed there in three years.[49]

The CDC's programming is based on its 2016-2020 *Strategic Framework for Global Immunization,* which builds on three previous strategic frameworks and outlines five goals:

1. Control, eliminate, or eradicate vaccine-preventable diseases to reduce death and disability globally.
2. Strengthen country ownership, policy and practices, and partnerships.

[46] CDC, *CDC's 2016-2020 Strategic Framework for Global Immunization*, May 2016.

[47] Ibid.

[48] UNICEF, *Infographic: Fast Facts on Immunization*, April 2019.

[49] In under-immunized populations vaccine-derived polio remains a challenge. An excreted vaccine-virus can continue to circulate for extended periods of time, the longer the virus survives the more genetic changes it undergoes (in rare occurs vaccine-derived poliovirus can mutate into a version that can paralyze an afflicted person). According to the WHO, this occurs when immunization campaigns are poorly conducted, and populations are left susceptible to vaccine-derived or wild poliovirus. WHO experts note the issue is not the vaccine, but low vaccination coverage. WHO, *What is vaccine-derived polio?* April 2017.

3. Ensure quality of vaccination delivery to achieve high and equitable coverage.
4. Strengthen surveillance and immunization information to prevent, detect, and respond to vaccine-preventable diseases.
5. Conduct and promote research, innovation, and evaluation.[50]

To implement the strategic framework, the CDC works with USAID, UNICEF, GAVI, and other stakeholders. The strategy is aligned with the HHS National Vaccine Plan 2010, the Global Health Security Agenda, and the WHO Global Vaccine Action Plan 2011-2020.

In FY2019, Congress appropriated more funding for CDC global immunization programs than the Trump Administration sought and more than was appropriated in prior years (**Table 2**). The Administration's FY2019 and FY2020 budget requests would have reduced funding for global immunization activities and proposed that the CDC "focus its global immunization activities to continue progress towards polio eradication, as well as measles and rubella elimination in countries with the highest disease burden."[51]

Table 2. CDC Center for Global Health Global Immunization Program Funding, FY2015-FY2019

(current U.S. $ millions)

Year		Polio Eradication	Measles and other VPDs	Total
FY2015	Requested	162	50	211
	Enacted	159	50	209
	% Change Requested to Enacted	-1.85%	0%	-1.08%
FY2016	Requested	169	50	219
	Enacted	169	50	219
	% Change Requested to Enacted	0%	0%	0%
FY2017	Requested	174	50	224
	Enacted	174	50	223
	% Change Requested to Enacted	0%	0%	0%
FY2018	Requested	165	N/A	206
	Enacted	176	50	226
	% Change Requested to Enacted	+6.67%	N/A	+9.71%
FY2019	Requested	165	N/A	206
	Enacted	176	50	226
	% Change Requested to Enacted	+6.67%	N/A	+9.71%
FY2020	Requested	NA	NA	206

[50] Ibid., and CDC, *2016-2020 Strategic Framework for Global Immunization*, May 2016.

[51] CDC, *FY2020 Congressional Justification*, March 2019.

Source: CDC Congressional Justifications, 2015-2020; Statements of Conferees, Joint Explanatory Statements accompanying omnibus appropriations measures, 2015-2020, FY2015-2020, appropriations legislation (P.L. 114-113, 115-31, 115-41, and P.L. 116-6); and CRS correspondence with CDC, July 2019. USAID

To strengthen routine immunization campaigns and community-based disease surveillance, USAID works with foreign countries' ministries of health and provides funding to GAVI. These actions are part of the agency's strategy to prevent child and maternal deaths, which it also supports through capacity building for foreign health systems.[52] For example, in Ethiopia, the agency works with Ethiopia's Ministry of Health to train community volunteers to identify symptoms of vaccine-preventable diseases (e.g., paralysis due to polio) and track "vaccine defaulters" (individuals who do not receive the full schedule of immunizations) to keep them on schedule.

U.S. Funding for Multilateral Initiatives

The United States, through contributions to international organizations and GAVI, provides significant support for multilateral immunization and vaccination programs (**Figure 3**).[53] Such support is intended to complement U.S. bilateral efforts in this arena while enabling the United States to expand its reach and provide opportunities for collaboration and burden sharing.

GAVI, the Vaccine Alliance

GAVI is a multilaterally funded public-private partnership. It was founded in 2000 by the United States, the WHO, the United Nations, the World Bank, and the Bill and Melinda Gates Foundation to expand global access to vaccines and prevent deaths from VPDs. The United States played a central role in the creation of GAVI and continues to be involved in GAVI's governance, strategic planning, and funding. U.S. support of GAVI is intended to accelerate access to vaccines, strengthen vaccine delivery platforms, and work with country governments to sustain immunization programs.[54]

Which Countries Are Eligible for GAVI Support?[55]

GAVI supports the lowest-income countries. Eligibility for GAVI funds is determined by World Bank data on per capita Gross National Income (GNI). Recipients of GAVI funds must co-finance vaccination campaigns. As GNI grows, governments must finance increasing proportions of vaccine costs. When countries pass GAVI's "eligibility threshold," they phase out of GAVI support and enter a five-year "accelerated transition phase," during which GAVI works with transitioning countries to progressively assume full financial responsibility for their immunization programs. As of 2019, fifteen countries have "graduated" from GAVI support, including Angola, Bhutan, Bolivia, Guyana, Honduras, Indonesia, Kiribati, Mongolia, and Sri Lanka.[56]

[52] USAID, *Acting on the Call: A Focus on the Journey to Self-Reliance for Preventing Child and Maternal deaths*, June 2019.

[53] From 2000 to present, the United States has provided approximately 12% of GAVI's total funding. See https://www.gavi.org/investing/funding/donor-contributions-pledges/ for more information.

[54] GAVI, *Annual Progress Report: 2017*, 2018, https://www.gavi.org/results/gavi-progress-reports/.

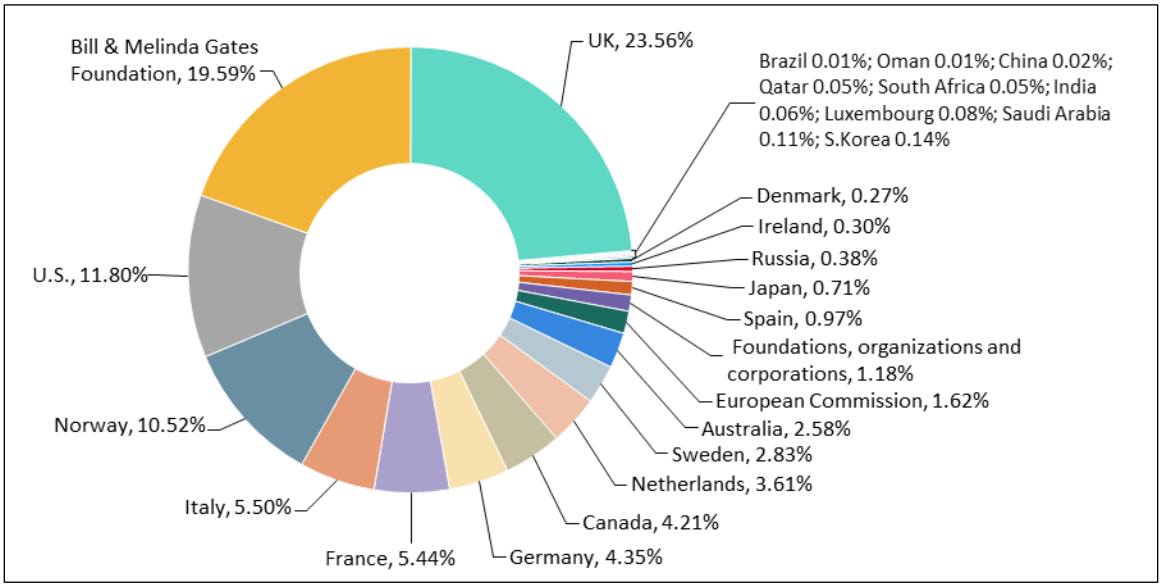
[55] GAVI, *Eligibility and transition policy*: June 11, 2015, https://www.gavi.org/about/programme-policies/eligibility-and-transition/.

[56] For a full list of countries that have graduated, see GAVI. *Transitioning out of GAVI support*: 2019, https://www.gavi.org/support/sustainability/transition/.

U.S. Contributions to GAVI

The United States is GAVI's third largest donor, having provided nearly $2 billion of the $21 billion donated to GAVI since its founding (**Figure 3**).[57]

Figure 3. Donor Contributions to GAVI, 2000-2020



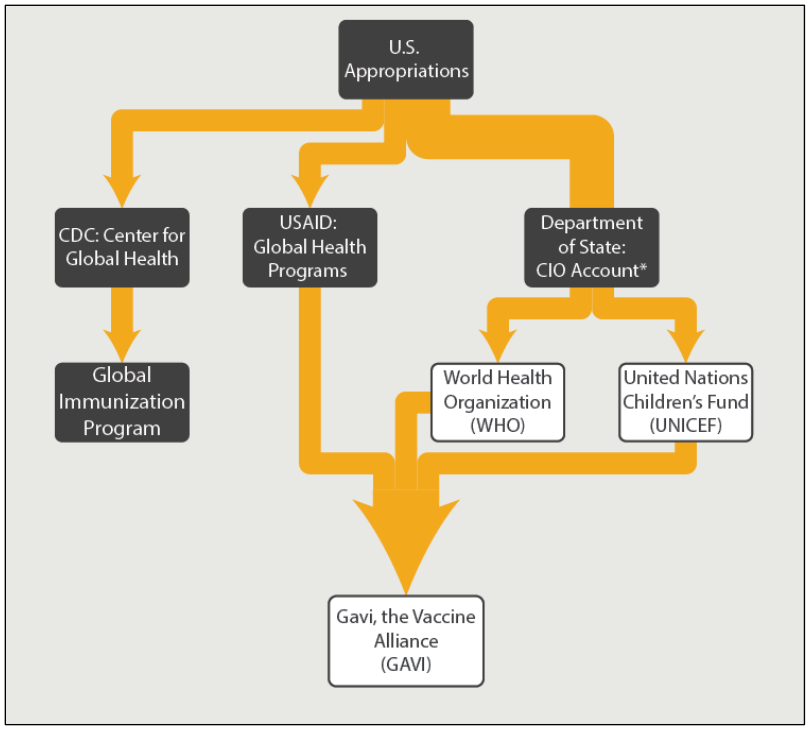
Source: GAVI, *Key figures: donor contributions & pledges*, Geneva, Switzerland, 2019.

Note: Total amount represents U.S. $21 billion donated to GAVI since 2000.

Congress appropriates U.S. funding for GAVI via USAID's Global Health Programs (GHP) account in annual SFOPS appropriations measures. In turn, the United States holds a seat on GAVI's board, as do the WHO and UNICEF, which also receive U.S. funding (**Figure 4**).

[57] GAVI, *Investing in GAVI: Cash Receipts 2000-2019*, 2019, https://www.gavi.org/investing/funding/donor-contributions-pledges/cash-receipts/.

Figure 4. U.S. Funding for GAVI



Source: CRS graphic, created by Edward Collins-Chase from information available at https://www.gavi.org/investing/funding/.

Note: *Department of State Contributions to International Organizations Account.

Table 3 details U.S. budget requests and enacted appropriations for GAVI from FY2015 to FY2020.

Table 3. U.S. Funding for GAVI, Global Health Programs Account (FY2015-FY2020)

(appropriations, current U.S. $ millions)

Fiscal Year	Administration Request	Enacted
FY2015	200	200
FY2016	235	235
FY2017	275	275
FY2018	290	290
FY2019	250	290
FY2020	250	TBD

Source: GAVI, *Investing in GAVI: Cash Receipts 2000-2019*, 2019. Department of State and Foreign Operations Congressional Budget Justifications, FY2015-2020, appropriations legislation (P.L. 114-113, 115-31, 115-41, and P.L. 116-6), and CRS correspondence with USAID, July 2019.

Note: TBD = to be determined.

During the Obama Administration, congressional appropriators met the Administration's requests to increase funding for GAVI year on year. In line with the Trump Administration's broad calls for cuts to foreign assistance, the Administration proposed $250 million for GAVI in FY2019 and

in FY2020, a $40 million decrease from the FY2018-enacted level. In FY2019, Congress appropriated $290 million for GAVI, the same level as in FY2018.

Outlook and Issues for Congress

Congress has continued to demonstrate interest in supporting child vaccinations for VPDs overseas—for example, by appropriating increasing levels of funding for related programs. However, numerous global outbreaks of VPDs have raised concerns about whether the progress made in preventing and eradicating communicable diseases can be maintained. In light of recent events, and in the context of the FY2020 appropriations process (and beyond), Congress may examine a few additional issues.

One area that could be explored is the effectiveness of global vaccination campaigns as a tool of domestic pandemic preparedness. U.S. government public health officials have argued that the global resurgence of certain vaccine-preventable diseases, particularly measles and mumps, may threaten U.S. public health.[58] Recent outbreaks of vaccine-preventable diseases in the United States have been traced to travelers from Europe and abroad, and the CDC reports that these travelers, coupled with domestic vaccine hesitancy, are the main cause of outbreaks in the United States.[59]

In March 2019, the full Senate Committee on Health, Education, Labor and Pensions (HELP) held a hearing to discuss the reasons behind preventable disease outbreaks, including imported cases of vaccine-preventable diseases linked to international travelers.[60] As these outbreaks continue, Congress may continue to consider its oversight of, and federal government involvement in, issues surrounding vaccines, such as misinformation campaigns and their role in vaccine hesitancy.[61]

Another core area of interest relates to U.S. funding, foreign policy objectives, and foreign aid programs supporting immunization. The U.S. government has long-included vaccination as a core component of foreign policy, and as a foreign aid priority. Recently, the Trump Administration requested cuts to global health funding, including for U.S. agencies involved in global vaccination campaigns.[62] The Administration contends that the funding requests will not affect programs and that "the reduction reflects the Administration's intent to further focus funds on countries, populations, and programs where resources will have the greatest public health impact ... [and] CDC will focus its global immunization activities to continue progress towards polio eradication, as well as measles and rubella elimination in the countries with the highest disease

[58] Department of Health and Human Services, "HHS Secretary Azar Statement on National Infant Immunization Week," press release, April 29, 2019. CDC, "CDC Media Statement from Dr. Redfield on National Infant Immunization Week, Safety and Effectiveness of Vaccines," press release, April 29, 2019. Food and Drug Administration, "FDA In Brief: During National Infant Immunization week, FDA reinforces continued confidence in the safety and effectiveness of vaccines, stresses the importance of immunization to prevent diseases," press release, April 29, 2019.

[59] Centers for Disease Control and Prevention, *Measles Cases and Outbreaks*, August 15, 2019.

[60] U.S. Congress, Senate Committee on Health, Education, Labor, and Pensions, *Vaccines Save Lives: What Is Driving Preventable Disease Outbreaks?*, 116th Cong., 2nd sess., March 5, 2019.

[61] James Hohmann, "Growing bipartisan alarm in Congress over measles outbreaks amid falling vaccination rates," *The Washington Post*, March 5, 2019.

[62] See **Table 2** and **Table 3** for detailed figures on Administration requests and congressional appropriations for U.S. foreign assistance for global immunization coverage.

burden."[63] Some experts argue that stagnation in vaccination coverage and the resurgence of some vaccine-preventable diseases are "alarm bells," and have expressed concern about flat support for global vaccine campaigns leading to a continued resurgence of vaccine-preventable diseases.[64] These issues raise questions about burden sharing and the role of other high-income country donors in global immunization funding, as well as factors affecting the efficacy of global campaigns to increase vaccination rates.

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[63] CDC Congressional Budget Justification p.13, 2018.

[64] Helen Branswell, "Could the world see a resurgence of polio? Experts fear a cautionary tale in measles," *STAT*, August 19, 2019. WHO, *Wild poliovirus type 1—Islamic Republic of Iran*, Disease outbreak news, May 2019. Kimberly Thompson, "Eradication versus control for poliomyelitis: an economic analysis," *The Lancet*, April 2007.