

## A History of Vaccines

Vaccines are one of the most successful and cost-effective public health tools for saving lives and preventing debilitating illness, particularly among the world's children. Over the last half of the 20th century, diseases that were once all too common became rare in the developed world, due primarily to widespread immunization. Routine vaccination programs have prevented the deaths of hundreds of millions of people and saved billions of dollars in public health expenditures. Yet the role of vaccines in public health is often overlooked today.

### THEN AND NOW...

**Smallpox:** In the 20th century alone, smallpox was responsible for an estimated 300 to 500 million deaths, more than double the number of people killed during the wars of that same period. As recently as 1967, the World Health Organization (WHO) estimates that 15 million people contracted the disease, and 2 million died that year. Smallpox has since been eradicated, through the effective use of vaccines.

**Polio:** In the years following World War II, polio was the most feared disease among parents in the United States. In 1952, it is estimated to have permanently paralyzed 21,000 people in the United States alone. Since

then, immunization campaigns have reduced polio rates by more than 99 percent, down to just over 400 annual cases. The fight to fully eradicate polio worldwide continues.

**Measles:** Measles is far more contagious than smallpox, and in some children can be just as dangerous. Measles can cause deafness, blindness, encephalitis, and death. Between 2000 and 2013, measles deaths dropped by 75 percent worldwide. However, more than 20 million people continue to be infected by measles each year, resulting in 145,700 deaths in 2013, primarily among children.

**Rubella:** Although rubella is a mild childhood illness, it can cause severe birth defects in children born to mothers who contracted the disease in the early stages of pregnancy. The introduction of a rubella vaccine in 1969 has greatly reduced the incidence of congenital rubella syndrome in the developed world, but the disease still causes approximately 110,000 cases each year, and causes blindness, deafness, and mental retardation in thousands more.

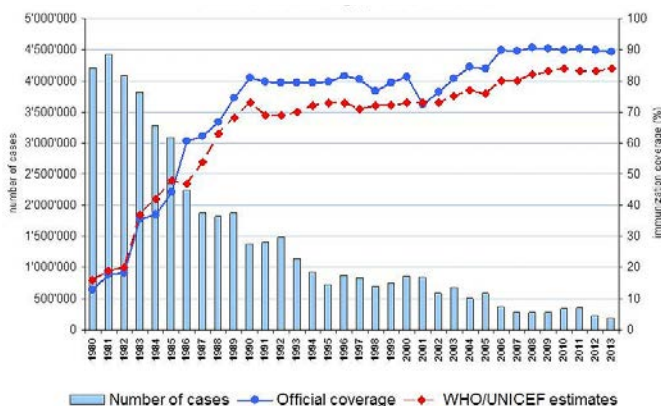
**Diphtheria:** Diphtheria was once one of the most common causes of death in children. As recently as the 1920s, diphtheria infected an estimated 100,000 to 200,000 people per year in the United States and killed 13,000 to 15,000. While it is now rare in the US, diphtheria is re-emerging in some areas of the world and is responsible for about 2,500 deaths each year in developing countries, primarily among children.

**Pertussis:** Pertussis, or whooping cough, causes spasmodic, uncontrollable coughing that persists for weeks. Before the arrival of the vaccine, pertussis infected an average of 200,000 people a year in the United States



CDC

### Global Annual Reported Measles Cases and Measles Vaccine Coverage, 1980 to 2013



Source: WHO/IVB database, 2014. 194 WHO Member States. Date as of July 2014.

alone. Although global rates have fallen significantly since the arrival of the vaccine, pertussis still kills almost 195,000 children every year.

### THE ARRIVAL OF VACCINES

Although the earliest smallpox vaccine was developed in 1796, vaccination of large groups of people remained sporadic until the 20th century. The golden age of vaccine development did not come until after World War II, when several new vaccines were developed in a relatively short period. Their success in preventing diseases such as polio and measles was nothing short of revolutionary, and large-scale vaccination campaigns soon followed.

Although vaccination is now a routine medical intervention, supplying vaccines to the general public required a massive mobilization of resources and human endeavor, from the scientists who developed and tested vaccines, the manufacturers that produced them, the public health officials who advocated for them, to the governments that paid for them, and finally to the millions of people who rolled up their sleeves to participate. It was a remarkable achievement, requiring tremendous effort from all concerned.

These efforts paid off in a dramatic fashion. In 1967, the WHO spearheaded a massive immunization campaign against smallpox. Within ten years, this disease that had plagued human civilization for thousands of years had been vaccinated out of existence. Wild-virus polio, which once circulated widely in nearly every region of the world, is now present in only a handful of countries, without a case diagnosed in the United States since 1979. Measles, mumps, rubella, diphtheria, and pertussis were reduced from frightening epidemics to rare outbreaks within a few decades.

### THE PARADOX OF SUCCESS

As the prevalence of once-terrifying diseases decreased, so did the fear. Vaccines began to lose some of their luster. Only 50 years after vaccination became a standard rite of passage for children, it was taken for granted that a child born in the developed world would grow up without fear from the paralysis, brain damage, blindness, and death that plagued previous generations.

In addition, as years passed and infectious disease rates fell, concerns began to grow over vaccine risks and side effects, which led some to question the wisdom of mass

vaccination. This scrutiny of vaccines had many positive effects; besides sparking a national movement to improve oversight of vaccine manufacture, it also led to better vaccine technology. Vaccines became safer than ever before.

However, the criticism has had some negative consequences as well. Because people do not fear the diseases anymore, vaccine coverage is falling in some areas, and diseases once thought beaten are making new inroads. The incidence of pertussis has increased in the United States in the last 20 years, with 28,660 cases reported in 2014. In 2014, 644 cases of measles were reported in the U.S., the highest in any year since 1996. In addition, fear of litigation and market uncertainties have driven many drug companies out of the vaccine business, inhibiting innovation and occasionally creating shortfalls in vaccine supply.

### LOOKING INTO THE FUTURE

Despite several years of neglect, vaccines are once again gaining attention as vital solutions in the fight against infectious disease. Major efforts are under way to develop new vaccines against pneumonia, AIDS, tuberculosis, malaria, and diarrheal diseases like rotavirus. Introduction of these vaccines into the developing world has the potential to save millions of lives.

*PATH is working to close gaps in access to lifesaving vaccines. By strengthening health systems, expanding access to new vaccines, accelerating research and development, and creating innovative technology solutions, PATH is working to make safe and effective vaccines affordable and available to those most in need.*

### RESOURCES

WHO: [www.who.int/mediacentre/factsheets/fs114/en/](http://www.who.int/mediacentre/factsheets/fs114/en/)

WHO: <http://web.archive.org/web/20070921235036/http://www.who.int/mediacentre/factsheets/smallpox/en/>

US Centers for Disease Control and Prevention (CDC) Pink Book: [www.cdc.gov/vaccines/pubs/pinkbook/index.html](http://www.cdc.gov/vaccines/pubs/pinkbook/index.html)

WHO: [www.who.int/mediacentre/factsheets/fs286/en/](http://www.who.int/mediacentre/factsheets/fs286/en/)

WHO: <http://www.who.int/immunization/topics/pertussis/en/>

CDC: <http://www.cdc.gov/pertussis/outbreaks/trends.html>

WHO: <http://www.who.int/mediacentre/factsheets/fs367/en/>

Allen, Arthur. *Vaccine: The Controversial Story of Medicine's Greatest Lifesaver*. New York: W.W. Norton & Company; 2007.

WHO: [http://www.who.int/immunization/monitoring\\_surveillance/burden/diphtheria/en/](http://www.who.int/immunization/monitoring_surveillance/burden/diphtheria/en/)

CDC: <http://www.cdc.gov/measles/cases-outbreaks.html>



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