

One Drop at a Time:

The Triumph and Tragedy of Polio

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In 1955 history was made when a vaccine was created for the catastrophic disease named poliomyelitis, known more commonly as polio. The fear of this virus disappeared almost instantly when Jonas Salk created the inactivated poliovirus vaccine (IPV).¹ In 1988 the World Health Organization (WHO) made a resolution with over 200 countries to have polio eradicated by 2000. However, when the year 2000 came along the world was anything but close to the herd immunity of 84% vaccinated.² In 1999 infants worldwide were only 78% vaccinated for polio.³ Living in the year 2019 without global eradication, a triumph over tragedy could become a tragedy again.

A Tragedy Unfolds

In 2019, you may not have ever seen polio. Although the death rates may not be very high for poliomyelitis, it can permanently cripple a child in days. So, what is polio? Polio is traced all the way back to 1580 B.C in Ancient Egypt.⁴ It attacks the nervous system and in some cases can cause paralysis which can be fatal. It is most common in children under the age of 5. In 1894 the first major American polio outbreak was recorded in Rutland County, Vermont. A total of 132 cases of permanent paralysis were reported along with eighteen deaths.⁵ Poliovirus is most common in areas with poor sanitation where a person could be exposed to the feces of an infected person. From the feces, it could travel into a water supply or even food. Polio can also

¹ Special to The New, York Times. "The President Congratulates Dr. Salk as 'a Benefactor of Mankind.'" *New York Times (1923-Current file)*, Apr 23, 1955, pp. 1. *ProQuest*,

<https://0-search-proquest-com.nell.flatironslibrary.org/docview/113438007?accountid=48257>.

² *Poliomyelitis Eradication*. *Wikipedia*, en.m.wikipedia.org/wiki/Poliomyelitis_eradication.

³ "Progress Toward Global Poliomyelitis Eradication, 2000." *CDC*, 27 Apr. 2001, www.cdc.gov/mmwr/preview/mmwrhtml/mm5016a5.htm. Accessed 8 Feb. 2019.

⁴ "History of Polio." *Polio Global Eradication Initiative*, polioeradication.org/polio-today/history-of-polio/. Accessed 19 Feb. 2019.

⁵ *The History of Vaccines*. www.historyofvaccines.org/timeline#EVT_100300.

be transmitted by touch.⁶

In 1916 New York City was hit with a polio epidemic. From this epidemic, more than 2,000 people would die from polio. The epidemic spread across the United States and 6,000 people died of poliomyelitis in that same year.⁷ When school ended and summer started you might think the fun would begin. In the time that polio was the strongest, summer meant nothing more than self-imposed quarantine. Pools were closed, amusement parks were quiet, and movie theaters empty. How the disease spread was not understood. Anywhere children would be was an invitation for polio to infect another child within days, or so they thought.⁸ Dr. Giuseppe De Sole, who holds an M.D. and a Ph.D. in Epidemiology, states

Polio is sneaky. We want to eradicate polio as we did smallpox, but it is a very sneaky disease. With smallpox it is obvious- the disease hits everyone in a very clear way and is very contagious. Polio is different. Not everyone has the same symptoms. One child might just get the mild flu, the next child dies because the lungs are paralyzed. So we are not sure where it is. You may think it is eradicated in one area, but it might be there⁹.

The Race for a Cure

Getting to the point the world is now was not easy. A race to create a vaccine was well underway when polio epidemics were happening left and right. By the end of World War II, there was a two-man race between Jonas Salk and Albert Sabin.

On October 28th, 1914 in New York City Dr. Jonas Salk was born. Salk had always been

⁶ CDC. 25 July 2018, www.cdc.gov/polio/about/.

⁷ *The History of Vaccines*. www.historyofvaccines.org/timeline#EVT_100300.

⁸ *Polio an American Story*. New York, Oxford UP, 2005.

⁹ De Sole, Giuseppe, et al. Interview. 28 Dec. 2018.

driven in his education career, but when he was given the opportunity to work at the University of Pittsburgh School of Medicine in 1947 to research polio he knew he was going to do something big.¹⁰ By 1948 his research project was funded by the National Foundation for Infantile Paralysis and the search for the vaccine was the next task at hand. He believed that to create the vaccine you could use a dead virus rather than a live one. Scientists across the world thought he was crazy.¹¹

Albert Sabin was born on August 26, 1906, in Poland. He later emigrated to the United States because of the persecution towards Jews. In 1939 he started working for the Children's Hospital Research Foundation in Cincinnati, Ohio. Here he discovered revolutionary things about polio, such as the fact that polio is also found in the intestines, not just the nervous tissue.¹² In 1941, at the start of World War II, he enlisted in the army as an epidemiologist. During this time Sabin created vaccines for encephalitis (sleeping sickness), sand-fly fever, and dengue fever. After the war, Albert Sabin continued his work with polio and with the help of Russian scientists during the height of the Cold War he developed the live oral polio vaccine (OPV).¹²

In the midst of everything, President Roosevelt was suffering from none other than polio. Roosevelt's good friend Basil O'Connor helped him found the March of Dimes (see Appendix A). Back in the day, the March of Dimes was a fundraiser to help find a vaccine for polio. On every street corner, you would see men, women, and children asking for a dime to send to the White House. Hundreds of thousands of dollars were collected to fund the research. Roosevelt even threw fundraising parties and bought a rehabilitation center in Warm Springs, GA to

¹⁰ "Jonas Salk." *Wikipedia*. *Wikipedia*, en.wikipedia.org/wiki/Jonas_Salk. Accessed 15 Nov. 2018.

¹¹ *Vaccine.gov*. www.vaccines.gov/basics/types/index.html. Accessed Dec. 2017.

¹² "The Legacy of Albert B. Sabin." *Sabin Vaccine Institute*, www.sabin.org/legacy-albert-b-sabin. Accessed 14 Apr. 2019.

support polio victims.¹³

The Fear of the Unknown

With all of these efforts to fight polio, you might think it was a leading cause of death. In 1950 heart disease took the lives of 535,705 people in the United States versus in 1952 at the height of the polio epidemic, only 6,000 people died.¹⁴ This leaves us with the question: why was polio the most feared disease? The answer to this question is simple. Watching a child go from running outside and playing to seeing them in a wheelchair and paralyzed from the legs down was something hard for any parent to watch. People were particularly scared of their child being in an iron lung for the rest of their life (see Appendix B).

The Beginning of the End

In 1954 a massive trial was conducted with over 1.3 million children (see Appendix C) to test Jonas Salk's vaccine.¹⁵ After a year of analyzing the results, it was announced in 1955 the vaccine was cleared and licensed for commercial use.¹⁶ Shortly after the vaccine was cleared a doctor from Idaho reported a case of polio in a girl that was recently vaccinated. Similar cases began to pop up.¹⁴ This was called the Cutter Incident. The incident was later found to be caused by a malfunction in the creation of the vaccine at Cutter Laboratories in California.¹⁴ Despite

¹³ Kurlander, Carl Kurlander, producer. *The Polio Story - The Vaccine That Changed the World*.

¹⁴ "NCHS - Top Five Leading Causes of Death: United States, 1990, 1950, 2000." *Centers of Disease Control and Prevention*, data.cdc.gov/NCHS/NCHS-Top-Five-Leading-Causes-of-Death-United-State/mc4y-cbbv. Accessed 19 Feb. 2019. Table.

¹⁵ *The History of Vaccines*. www.historyofvaccines.org/timeline#EVT_100300.

¹⁶ Special to The New, York Times. "The President Congratulates Dr. Salk as 'a Benefactor of Mankind.'" *New York Times (1923-Current file)*, Apr 23, 1955, pp. 1. *ProQuest*, <https://0-search-proquest-com.nell.flatironslibrary.org/docview/113438007?accountid=48257>.

this, parents across the country still vaccinated their children, which shows the contrast of vaccine hesitancy of now and then. Roxana Rogers De Sole holds an MBA and MS in economics and worked for the United States Agency for International Development (USAID) as International Director for HIV/AIDS Prevention. She said “I was part of the polio experiment. I remember the Assistant Principal of our school bringing us into her office for the doses. It was very serious. My mom was very emotional about the trials. She had childhood friends who had polio and she was very worried about it.”¹⁷

In 1959 Albert Sabin did a trial involving 10 million children in the Soviet Union testing his oral polio vaccine. Many countries were interested in Sabin’s vaccine because it was cheaper and easier to administer than Salk’s vaccine. In 1961 Albert Sabin’s live oral vaccine was cleared for commercial use. Today his vaccine is used all around the world to eradicate polio.¹⁸

A Final Triumph Thwarted

With a working vaccine and polio rates dropping things were looking up. In 1988 when the number of reported cases of polio was 35,251, WHO set a goal to have polio eradicated by the year 2000.¹⁹ With the help of over 200 countries, polio dropped to only 719 reported cases in twelve years.¹⁹ Even though eradication of polio was not completed by the year initially planned, progress was still being made. In 2017 only 22 cases were reported worldwide and today

¹⁷ De Sole, Roxana Rogers, et al. Interview. 28 Dec. 2018.

¹⁸ "NCHS - Top Five Leading Causes of Death: United States, 1990, 1950, 2000." *Centers of Disease Control and Prevention*, data.cdc.gov/NCHS/NCHS-Top-Five-Leading-Causes-of-Death-United-State/mc4y-cbbv. Accessed 19 Feb. 2019. Table.

¹⁹ *Number of Poliovirus Cases by Year*. *Wikipedia*, commons.wikimedia.org/wiki/File:Number_of_poliovirus_cases_by_year.png#mw-jump-to-license.

reported cases of polio has gone down 99% since 1955 (see Appendix D).²⁰

It has recently been discovered that a new form of polio has developed called Circulating Vaccine-Derived Poliovirus. This new poliovirus is “very rare and genetically changed from the weakened virus originally contained in OPV, which can only emerge in under-immunized populations.”²¹ The only way to stop it is to vaccinate all children under five with the oral polio vaccine. With Vaccine-Derived Poliovirus now circulating it is making it harder and harder to get polio eradicated.

An Uncertain Future

Today vaccine hesitancy is more common than ever. One of the many reasons why eradicating polio has been such a challenge is due to its location and to culture. Polio is endemic in only three countries: Afghanistan, Nigeria, and Pakistan. Cultural influences discourage vaccinating in these countries.

Militant organizations such as Tehreek-e-Taliban, Al-Qaeda and Boko Haram movement of northern Nigeria are a major hurdle in the eradication of polio from these countries.

The misconception of people about the polio vaccine, insecurity within the country and poor health system are the reasons for the failure of polio eradication campaigns in these regions.²²

²⁰ *Number of Poliovirus Cases by Year*. Wikipedia, commons.wikimedia.org/wiki/File:Number_of_poliovirus_cases_by_year.png#mw-jump-to-license.

²¹ *Polio Global Eradication Initiative*. polioeradication.org/wp-content/uploads/2017/09/GPEI-cVDPV-factsheet_September-2017.pdf. Accessed 19 Feb. 2019.

²² Jegede, Ayodele Samuel. "What Led to the Nigerian Boycott of the Polio Vaccination Campaign?" *PLoS Med*, 4 Mar. 2007, www.ncbi.nlm.nih.gov/pmc/articles/PMC1831725/. Accessed 18 Feb. 2019.

In 2003 political and religious leaders in Northern Nigeria brought vaccinating polio to a halt when they claimed the OPV had been altered by the Americans and caused HIV and AIDS.²³ Another reason why it has been hard to eradicate polio is because of the countless rural villages in these countries. Many of these villages are hard to reach making it even harder to eradicate. In Pakistan and Afghanistan, it has not been any easier. Many terrorist groups such as the Taliban and Al-Qaeda have made a significant disruption in vaccinating for polio. The fear of these groups has made many people turn down the chance to vaccinate their child.

Cultural barriers are an issue in the United States as well. In 2005 five Amish children in Minnesota contracted polio and caused a scare among world health officials.²⁴ Dr. Hull who was featured in the article that shared the event said: "It's a model of what might happen if we stop vaccinating too soon."²⁵

There are several factors that continue to make polio a health threat to children. This first is said by Dr. Giuseppe De Sole who states "The nature of the disease is not obvious where it is endemic because not everyone has the same symptoms."²⁵ Secondly, vaccine hesitancy is a problem both in developing and developed countries. Low herd immunity leaves children exposed to both WPV (wild poliovirus) and rare cases of cVDPV (Circulating Vaccine-Derived Poliovirus).²⁶ Vaccine hesitancy remains an unsolved issue. In addition to these biological and cultural issues, the eradication of polio is a two-step process.²⁷ After endemic polio is eradicated

²³ Jegede, Ayodele Samuel. "What Led to the Nigerian Boycott of the Polio Vaccination Campaign?" *PLoS Med*, 4 Mar. 2007, www.ncbi.nlm.nih.gov/pmc/articles/PMC1831725/. Accessed 18 Feb. 2019.

²⁴ Harris, Gardiner. "5 Cases of Polio in Amish Group Raise New Fears." *The New York Times*, 5 Nov. 2005, www.nytimes.com/2005/11/08/us/5-cases-of-polio-in-amish-group-raise-new-fears.html. Accessed 19 Feb. 2019.

²⁵ De Sole, Giuseppe, et al. Interview. 28 Dec. 2018.

²⁶ *Polio Global Eradication Initiative*.

polioeradication.org/wp-content/uploads/2017/09/GPEI-cVDPV-factsheet_September-2017.pdf. Accessed 19 Feb. 2019.

²⁷ *Vaccine.gov*. www.vaccines.gov/basics/types/index.html. Accessed Dec. 2017.

the dead-virus vaccine developed by Jonas Salk will be used to contain and forever eradicate polio.

After researching this topic for months I have come to the conclusion that eradicating polio is similar to the arcade game Whack-A-Mole. Each time you contain a region another country is announced to be in an epidemic. As of 2019, we celebrate the creation of Jonas Salk's vaccine 64 years ago. However, at the same time, health experts worldwide are alarmed by the threat of the return of the disease. The triumph of the polio vaccine is yet to be realized.

Appendix A



Basil O'Connor with Franklin D. Roosevelt, White House, 1944; Courtesy of the March of Dimes. Polio Place, www.polioplace.org/people/basil-oconnor. Accessed 19 Feb. 2019.

This photo shows Basil O'Connor (right) and Franklin D. Roosevelt (left) at the White House together. Basil O'Connor and President Roosevelt worked together to form the March of

Dimes.

Appendix B



Iron Lungs In a Polio Ward. NPR,

www.npr.org/sections/npr-history-dept/2015/04/10/398515228/defeating-the-disease-that-paralyzed-america.

This photo shows iron lungs in a polio ward. Iron lungs were used to help people that were paralyzed. When a person contracts polio there is a chance they could get paralyzed. If this happens the person could not be able to breathe and iron lungs were invented to help with that case.

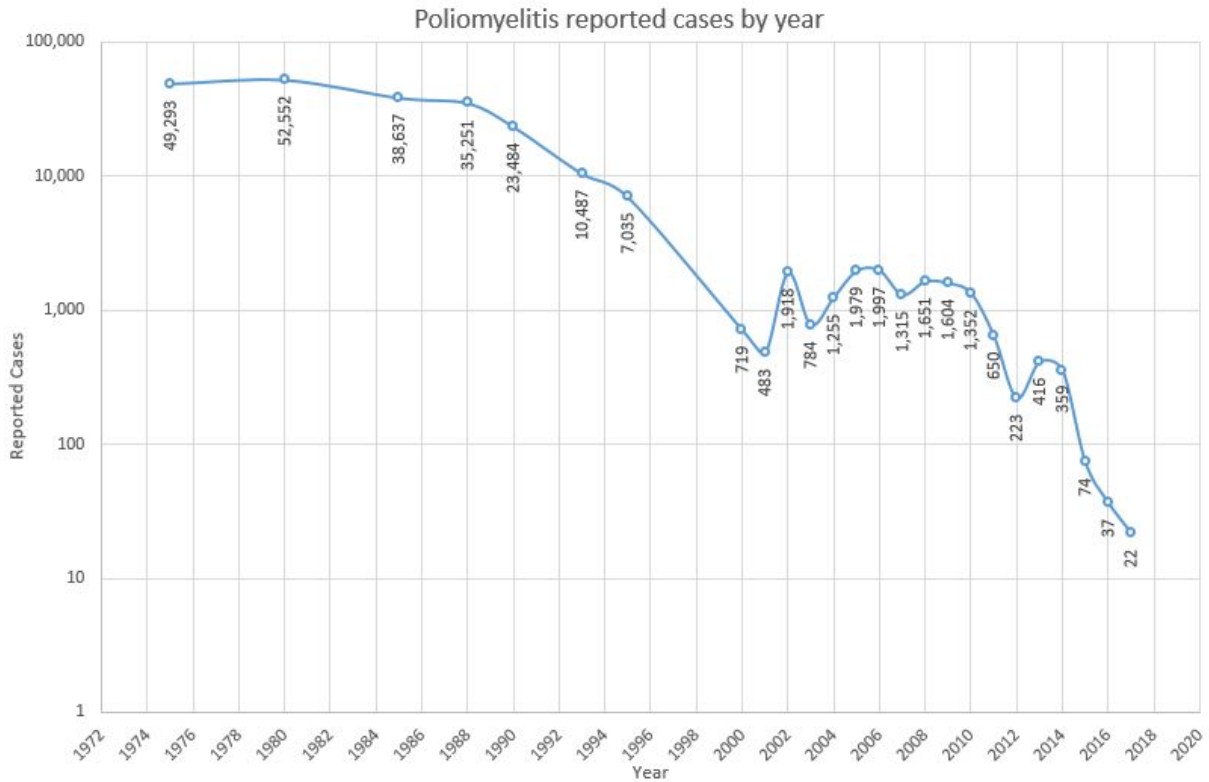
Appendix C



A photo of children that participated in the 1954 polio vaccine trial. *March of Dimes*, www.marchofdimes.org/mission/history-tour.aspx.

This is a photo of a group of children that participated in the 1954 polio vaccine trial that determined if Jonas Salk's vaccine was safe.

Appendix D



Number of Poliovirus Cases by Year. Wikipedia,

commons.wikimedia.org/wiki/File:Number_of_poliovirus_cases_by_year.png#mw-jump

-to-license.

This image shows the number of polio cases across the world by year. In the image, it is clear that polio cases have dropped dramatically.

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