The Polio Vaccine and the Response to Polio in the US: Breaking Medical, Physical, and Social Barriers

Gavin Nazir

Junior Division

Historical Paper

Word Count: 2500

In 1953, the groundbreaking vaccine for the deadly poliovirus was developed at the University of Pittsburgh by Dr. Jonas Salk. The creation of the vaccine was one of the most prominent milestones in medical history, thanks to the hard work and dedication of scientists, medical personnel, volunteers, politicians, and certain organizations. As the United States confronted the challenges posed by the dreaded disease, barrier-breaking medical responses led to valuable innovations in vaccinations and public-health measures. It allowed citizens to resume normal activities and helped establish beneficial healthcare policies. Socioeconomic and racial stereotypes were dispelled, access to and affordability of healthcare improved, and non-profit foundations were formed to fund medical research and treatment.

"The discovery of the Salk vaccine is a story of millions of Americans giving freely of their dimes and dollars in a great cause. It is a story of dedicated and painstaking effort by many thousands of scientists, of a historical and brilliant achievement by one of them, Dr. Jonas Salk" (Oveta Hobby). This expressed the sentiment at the time, when everyone was in it together striving for a common goal and the collective good.

Polio, a viral disease, was one of the most dreaded childhood diseases of twentieth-century America. The virus enters through the mouth and spreads through the body. It is transmitted by contact with the feces of the infected person and less commonly spread by sneezing and coughing. When it reaches the central nervous system, it starts multiplying. From there, the virus targets nerve cells that control the muscles that help with essential functions, such as walking and breathing. When the poliovirus affects the nerve cells, it can cause paralysis. Five to ten percent of those paralyzed die (CDC).

The first known polio outbreak that occurred in the United States was in Vermont in 1894. The first large-scale epidemic of polio occurred in New York City in 1916 with over 9,000 cases and 2,343 deaths (National Museum of American History). In 1952, there were over 57,000 cases of polio. Twenty-one thousand of those cases left the patients disabled, and 3,145 were killed. Each summer during the 1940s and 1950s, parents were terrorized by the thought that polio might cripple or take the lives of their children.

There is no known cure for the poliovirus. Many inventions aimed to eradicate polio; however, many were painful and unpleasant. In the early 1950s, people were desperate to find a remedy. They would try virtually anything that had even the slightest opportunity of working. For instance, immobilization was one of the first methods used. Rigid splints and casts were applied to keep the patients immobilized. Such methods gave rest to the affected muscles to keep the other muscles from constricting. Sometimes children would be kept in a body cast for over a year. This, however, resulted in the degeneration of all the muscles usually causing atrophy (Science Museum).

Before 1928, nothing had been successful in keeping the patients alive. Phillip Drinker, a Harvard medical engineer, invented the modern “iron lung.” It was an airtight tank designed to exert a push and pull motion that moved the diaphragm pulling the air in and out of the patient’s lungs. It was meant to help people in the short run who were expected to breathe again on their own (Oshinsky 61–62). It was very uncomfortable, and few people could afford it. Each iron lung cost 1,600 US dollars, which was the average price of a home at the time (National Museum of American History).

Most families could not afford the expensive equipment that was used for treatment, particularly while trying to recover from the economic Great Depression in the 1930s. Many children had to stay at rehabilitation or isolation hospitals for extended periods of time. Daniel Wilson, a polio survivor, describes his experience of isolation and stigma:

> One of the biggest challenges was the first feeling of abandonment. I was five, and I remember my father carrying me into the isolation hospital and leaving me there alone. My parents were not allowed to visit while I was in isolation. Fortunately, my mother volunteered to give hot packs to the kids in the hospital, so she was able to spend a little time with me each day. My family had to deal with the stigma of having someone in the family with polio. Some of the neighbors shunned my parents and sister. (Wilson)

There were several toddlers and children that did not have any family members to support or comfort them. Some died, while others were confined to a wheelchair or an iron lung for most of their lives. In 1940, an Australian nurse, Sister Kenny, introduced her method to help patients with polio. She believed in stretching and reeducating the muscles into functioning normally again. This was extremely painful, but it became a protocol procedure for the patients (National Museum of American History).

This devastating virus terrified the nation. Polio season, also referred to as the "plague season," usually occurred in the summer. The polio seasons were very unpredictable. The virus targeted random states and cities at arbitrary times and months. There was no clear determination if the disease would spread to a particular town or city. Children in America stopped regular summer activities, such as swimming in public pools. Much like in the current pandemic, the CDC advised that all swimming pools, amusement parks, and other public places shut down due to the fear of contracting and spreading the disease to others. In the movie theaters, they advised people not to sit too close to each other. Parents warned their children not to share toys or food

with their friends (Oshinsky).

One of the most famous people to contract polio was former US President Franklin D. Roosevelt. The people were shocked when they found out through a *New York Times* magazine. Before this, there was a theory that polio only targeted poor people or immigrants. This dispelled those stereotypes and brought awareness that anyone could be susceptible to the virus. Fortunately, Roosevelt survived, although he became disabled for life. In the 1920s, disability was frowned upon. Disabled people were not employable and were often removed from society. F.D.R.'s illness threw him into a category that faced discrimination by most of the American population. The way he viewed himself as a person, father, and politician despite his limitations changed the way people viewed others crippled by disease or disability (Berish). The impact of having someone as prominent as the US president suffering from the disease inadvertently benefited those with paralysis or other physical disability as they faced less stigma than they had previously.

After what F.D.R. experienced, he decided to start a foundation called the National Foundation of Infantile Paralysis, also known as the March of Dimes. “Once you’ve spent two years trying to wiggle one toe, everything is in proportion” (Franklin D. Roosevelt). He raised millions of dollars by inspiring charity balls across the nation in an effort to raise awareness and combat this illness (FDR Presidential Library & Museum). This signified the importance of having the president mobilizing resources based on his personal experience with the illness. Thanks to Roosevelt’s and many others' efforts, the Foundation, from 1938 to 1962, raised over $630M for purchasing iron lungs, hot packs, wheelchairs, and researching a vaccine or treatment, and much more (Kohn). Some of the money was also used to help parents that had children with

polio. It was very expensive to care and provide everything needed to keep their children healthy and safe. Peg Kehret, a polio survivor said:

> I was hospitalized for nine months, which had a profound effect on me and my family. Besides the worry and trauma of a serious illness and separation, there was a financial hardship. To pay my medical bills, my parents used all their savings, mortgaged their house, and eventually got help from the March of Dimes. (Peg Kehret)

According to the Jonas Salk Center, it was one of the largest private fund-raising efforts ever. Without the Foundation, parents would be in debt, patients would not get the proper treatment, and a vaccine would not have been produced.

There were two types of polio vaccines developed. The first polio vaccine was discovered by Jonas Salk in 1953. The second vaccine was an oral vaccine created by Albert Sabin in 1961. The initial vaccine that broke barriers was the one conceived by Dr. Salk, who was born on October 28, 1914, in New York City. He was very bright and graduated high school at the age of 12. In 1947, Salk was offered a position directing the University of Pittsburgh's virus laboratory (Llanas 10-19). He made the vaccine out of noninfectious poliovirus (in other words, the dead virus). He killed the virus for the vaccine using formaldehyde. Many medical researchers disagreed with Salk, but he continued despite their protests. "I did not doubt it. I just questioned the logic of it, the reasonableness of it, when other people accepted it" (Jonas Salk). Salk and his team worked on creating the controversial vaccine. He had to make sure he put the right amount of the virus so that it would make the immune system produce antibodies. If he miscalculated it, he could give the person polio. He believed it would be safer than live vaccines. The live vaccines had a chance of creating the disease or mutating into an even deadlier version of it.

Salk's vaccine is safer and is recommended by the US Public Health Service today, 75 years later.

Even though Salk was the most famous for the development of the vaccine, he could not have done this without the help of many others. In 1949, three Harvard students, John Enders, Thomas Weller, and Frederick Robbins, discovered that they could grow the poliovirus in laboratory tissue cultures (Thomas Weller). This meant that they did not have to grow the vaccine in animals, as before they had to use monkeys. Most of the time the monkeys would contract the virus and die. Due to the discovery by the three Harvard students, they could produce more of the vaccine than before and save innocent animals. They won the Nobel Prize in 1954 for their discovery. Salk tried to work quickly but safely. After Salk composed his vaccine, he injected it into the monkeys, thereby exposing the animals to the virus. Not a single monkey got polio (*Journal of the American Medical Association*).

Salk then tested it on humans. He performed a minor test of 4,000 children in Philadelphia. The results were everything he was hoping for. The vaccine worked. He needed to prepare for an even larger-scale test. Salk asked the National Foundation of Infantile Paralysis for funding. The foundation started fundraising and many ordinary people also helped fundraise in hopes of ending polio. To prove how sure he was of the vaccine, he gave it to himself and his family, including his children. The field test took five months to plan. The problem was that Salk could only make a small amount of the vaccine. If they wanted to distribute it to many people, they would need other labs to manufacture more. The National Foundation of Infantile Paralysis paid several other labs and drug companies to mass-produce the vaccine.

In 1953, the children who participated in the field trials prepared for testing. These children were called Polio Pioneers. 1.8 million children participated from 217 areas in the US, Canada, and Finland. Around 300,000 people volunteered from the community. It was the largest field trial ever conducted (Bentley Historical Library). The work was done by clerical staff who entered the data using paper and pencil (Monto, S Arnold). Their ability to keep track of so many children with limited technology was truly astonishing.

Dr. Thomas Francis Jr., Salk's former teacher, was asked to design, supervise, and evaluate the field trial with the help of the March of Dimes. Four hundred thousand children received the vaccine while the others were given a placebo to assess the difference between the two (Llanas 66-69). Two years later on April 12, 1955, at the University of Michigan, Dr. Francis Jr. announced that the vaccine was safe and effective. Salk's team rejoiced. The vaccine was a huge success as only 0.4 percent of the vaccinated children suffered minor reactions, and 0.005 percent suffered from major reactions. Out of 1,800,000 subjects, only 1,013 cases of polio were developed during the study. No one that received the vaccine died, and only fifteen others died during the trial (University of Michigan). Even though Salk demonstrated the efficacy of the vaccine, many scientists still disapproved of his work. In the eyes of the public, however, Salk was their savior.

> Dr. Jonas Salk was a national hero! The polio vaccine changed the world forever. Parents no longer needed to fear that their children would get this deadly disease; instead, they took them to be vaccinated. The whole nation rejoiced when the vaccine was declared safe and effective. (Peg Kehret)

Once the vaccines became available, US polio cases dropped by 85 to 95 percent in 1957 (CDC). It took 25 years for the US to become polio-free in 1979. "I had polio when I was five. The

vaccine was available in 1955, but there was a shortage in northern Wisconsin so they were giving it only to kids going to school. I was one year short of going to school so I did not get the vaccine" (Wilson). Even though the vaccine became available, there was still a period of time where new cases occurred until everyone could access the vaccination.

Experience with the polio vaccine encouraged public health officers to think in broader terms. It led to the Vaccination Assistance Act of 1962, a landmark in public health legislation. It provided the states with $36M to give free vaccines for polio and other childhood diseases. Coordinated by the Centers for Disease Control, the national effort eventually became the focus of an annual infant immunization week, launched in 1977 (National Museum of American History). Due to the efforts of healthcare, governments, and partners of the Global Polio Eradication Initiative, polio cases have been reduced by 99.9 percent since 1988 worldwide (CDC).

In an era characterized by global unrest due to a viral pandemic, the development of the polio vaccine in 1953 has gained renewed importance. The elimination of this frightening disease would not have been possible without so many people who dedicated hours, years, or a whole lifetime, to fighting polio. They overcame the barriers of producing and distributing the vaccines, the social stigma of disabilities, and the stereotype against low-income immigrant communities. Even today, scientists and medical researchers continue to use the inactive vaccine method for influenza, hepatitis A, and rabies. The development of the polio vaccine and the response to polio was a watershed moment that transformed the landscape of medical and social life in the US.

Annotated Bibliography

Primary Sources

"Battle Report." *Time* 30 Aug 2020, pp. 45.

In this article, there was a map of the US. On the map, they were trying to show how much polio has increased or decreased in the US. It compared the average number of cases from 1949 to 1953 versus the average for the first 32 weeks of 1954. Over half of the states' polio cases have increased with Nevada and Florida being the highest. In the article, it stated that there was no telling where and when the disease would hit. This helped me understand that there was no pattern to polio. The fact that there was no pattern frightened everyone. The next victim could be your child or your cousin's child across the country.

Eisenhower, Dwight D. "White House Press Release With Text of Citations." White House, Washington, DDE's Records as President, Official File, Box 511, 22 April 1955.

I used this website to get information on the significance of the polio vaccine. It showed a citation written by President Eisenhower which was addressed to Jonas Salk and the March of Dimes for their contributions to ending polio. This helped me understand the extraordinary significance of both the vaccine and the March of Dimes.

Hobby, Oveta. “Remarks by Oveta Culp Hobby, Secretary of Health, Education, and Welfare, given at a conference on the Salk polio vaccine.” Oveta Culp Hobby Papers, Box 44, April 22, 1955.

I used excerpts from the remarks given by Oveta Hobby. She was the first secretary of the US Department of Health, Education, and Welfare. These remarks were regarding the production and distribution of the vaccine once it was found to be safe and efficacious. I found this source on the Eisenhower Presidential Library website which has given me great resources and data about polio and the time period.

Kehret, Peg. “Re: Questions.” Received by Gavin Nazir, 6 Feb 2020.

I conducted this interview with Peg Kehret over email. She talked about what it was like to contract and suffer from polio and how it was perceived. She is a polio survivor and I used some of her words in this paper. It was amazing hearing about her life experiences and how she adapted and persevered even through something as dreadful as polio. Despite her hardships, she has become an amazing author.

Oshinsky, David M. *Polio: An American Story*. Oxford University Press, 2005. Print.

This book was written by a polio survivor. His book won the 2006 Pulitzer prize in history for his phenomenal work in portraying the story of polio. It showed me what the culture was like at that time. The book gave me a good source of knowledge that helped me determine what I wanted to do with my paper. I also used some words from the book in my research.

"Polio Epidemic." *Time* 14 Aug. 1944, pp. 56. Print.

The article stated that the week of August 14, 1944, had the worst polio outbreak since 1916. It also listed the states that were affected the most. This was important because it showed me the widespread dangers of the disease.

Salk, Darell MD. *Selected Questions from Student Interview.* 16 May 1991. Web. 7 Feb 2020.

On this website, there was an interview, answered by Darell Salk. He is one of Jonas Salk's sons. I used some of his responses as quotes and got information on the vaccine. He talked about things his father has told him and taught him throughout his life.

"Salk, Jonas, MD. Interview, Developer of Polio Vaccine." *Academy of Achievement.* American Academy of Achievement, 16 May 1991. Web. 6 Feb 2020.

I used some words from Jonas Salk in the interview conducted by the Academy of Achievement in my paper. This source provided me with an idea about what Jonas Salk's goals and challenges were while creating the vaccine. Since he was a lot older in the interview, he spoke about the present and the future which gave it an unusual contrast that was very beneficial.

Salk, Jonas E. "Studies in Human Subjects on Active ImmunizationAgainst Poliomyelitis." *Journal of the American Medical Association*, 28 Mar 1953. Web. 8 May 2020. Link: jamanetwork.com/journals/jama/article-abstract/2728267.

I found this source to be very interesting because this was published around the time when Salk discovered the vaccine before anyone knew if it was effective or not. I found the article in the *Journal of the American Medical Association*. The article stated that the experiment trials on monkeys were successful. They then started preparing and researching to introduce it to humans.

Thomas H. Weller. *Nobel Lecture.* 11 Dec 1954. Web. 10 May 2020. Link: https://www.nobelprize.org/uploads/2018/06/enders-robbins-weller-lecture-1.pdf

This site showed me Thomas Weller's Nobel Lecture for his work, along with two other students, was displayed. I found their work quite captivating. They showed great research and graphs explaining their discoveries about tissue cultures. I explained some of their research in my paper.

Wilson, Daniel J. "Re: Questions." Received by Gavin Nazir, 5 Feb 2020.

I conducted the interview over email with Professor Daniel Wilson, to get knowledge from someone who is a polio survivor. I was surprised that there was so much hate towards disabled people back then. Most people today sympathize for those who are disabled and their families. Talking to him definitely gave me a good idea of the time period and his perspective of polio and the vaccine. I also learned about some of his personal experiences and how dreadful it was to endure. Nevertheless, he did not quit and that was really inspiring to me.

Secondary Sources

"About Jonas Salk." *Salk.* Web. 29 January 2020. Link:

https://www.salk.edu/about/history-of-salk/jonas-salk/

It helped me get information about Jonas Salk and how he got inspired to take on the challenging task of creating a vaccine. I found some basic information on him that I use to introduce him.

Berish, Amy "FDR and Polio." *FDR Presidential Library & Museum*. Web. 7 Feb 2020. Link:

www.fdrlibrary.org/polio.

This source taught me about FDR's life and how contracting polio-affected himself, his family, and his career. The source provided me with information for my sections about FDR. It gave me information on how one of the greatest presidents coped with such an awful disease.

"Details - Public Health Image Library(PHIL)." CDC, Web. 17 Feb 2020. Link

phil.cdc.gov/Details.aspx?pid=12009.

This image showed me what an iron lung looked like and how it was used to keep patients breathing. This was important because it gave me an understanding of what it was like to be in an iron lung and how dreadful it was. Children had to lie down in one of these machines for months, maybe years. Very rarely they allowed the patients to take five to ten-minute breaks

"FDR's Birthday." *FDR Presidential Library & Museum.* Web. 8 May 2020. Link: https://www.fdrlibrary.org/fdr-birthday

I got this source off of FDR's Digital Library. I learned about his birthday balls, which raised awareness and money to support the cause of ending polio. I was amazed that the balls raised over one million dollars a year. FDR certainly did a lot to advocate for people with polio and to raise money to find a cure or vaccine.

Hays, J. N. *Epidemics and Pandemics*. Santa Barbara, ABC-CLIO, 2005.

I used this book to find out theories of polio before it was identified as a virus. It gave me a good perception of the stereotypes, whether it was race or socioeconomic status. It also compared the effect of polio to other diseases at that time.

"Jonas Salk and Albert Bruce Sabin." *Science History Institute.* Web. 30 January 2020. Link: https://www.sciencehistory.org/historical-profile/jonas-salk-and-albert-bruce-sabin

This source gave me facts about the two types that were created and how they tested it. It also showed the difference between Sabin and Salk's vaccine.

Kohn, George Childs. *Encyclopedia of Plague and Pestilence.* New York City, Facts on File, 2008.

This book gave me information about the National Foundation of Infantile Paralysis. It also gave information about major outbreaks across the US and some perspectives of the virus at the time.

Llanas, Sheila Griffin, and Daniel J. Wilson. *Jonas Salk: Medical Innovator and Polio Vaccine Developer*. ABDO Publishing Company, 2014.

This book gave me information about Jonas Salk's early life, accomplishments, and how he created the vaccine.

Monto, Arnold S. "Francis Field Trial of Inactivated Poliomyelitis Vaccine: Background and Lessons for Today." *OUP Academic*, Oxford University Press, 1 Mar. 1999, Web. May 9 2020 Link: 10.1093/oxfordjournals.epirev.a017989

The Oxford University Press is the largest university press in the world. This source provided me information about data management in the 1950s for such a large scale field trial.

"Polio: a 20th Century Epidemic." *Science Museum* Web. 17 Jan 2020. Link: www.sciencemuseum.org.uk/objects-and-stories/polio-20th-century-epidemic.

This website gave me very broad information which was great for my background knowledge. It also helped me figure out what direction to point my research towards.

"Poliomyelitis." *World Health Organization.* Web. 30 January 2020. Link: https://www.who.int/biologicals/areas/vaccines/polio/en/

It gave me trustworthy statistics about polio and its effects in the US and throughout the world. The WHO is still trying to combat this disease all over the world to officially eradicate it for good.

"Poliomyelitis and the Salk Vaccine." *Bentley Historical Library.* Sep 2014 Web. 14 May 2020. https://bentley.umich.edu/wp-content/uploads/2014/09/Poliomyelitis_and_the_Salk_Vaccine_Subject_Guide.pdf

This site gave me informative and precise information about the field trials and almost everything related to it. It gave a large source of data that I incorporated into my paper.

"Vaccine Testing and Vulnerable Human Subjects." *History of Vaccines.* Web. 17 Feb 2020. Link: www.historyofvaccines.org/content/articlesvaccine-testing-and-vulnerable-human-subjects

This website showed a timeline of vaccines which helped me understand the history of vaccines chronologically. It gave me an idea of how new vaccines were at the time and important discoveries that made the vaccine possible.

"Whatever happened to polio?" *NMAH.* 1 February 2005 Web. 29 January 2020. Link: https://amhistory.si.edu/polio/index.htm

I used this site to get background information about polio and information about what they used to treat polio before the vaccine. This website was extremely useful and talked

about almost everything you could think about polio. I also got some quotes from this website.

"What is polio?" *CDC.* 24 October 2019. Web. 25 January 2020. Link: https://www.cdc.gov/polio/what-is-polio/index.htm

I used this site to get statistics and information about polio and how it is transmitted. The CDC is part of the Global Polio Eradication Initiative which is helping eradicate polio worldwide. I used a lot of facts and data throughout my paper from the CDC

"1955 Polio Vaccine Trial Announcement." *University of Michigan.* Web. 11 Feb 2020. Link: https://sph.umich.edu/polio/

This website gave me information about Dr. Thomas Francis Jr. and data of the largest field trial ever conducted. I use the information in the paragraph about the field trial that was conducted in 1955.