

Vaccinating a Nation: Lessons from the Polio Epidemic

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The SARS-CoV-2 (COVID-19) pandemic has all but brought the Global Polio Eradication Initiative to a halt. Nonetheless, the global quest to stamp out the polio scourge provides a uniquely salient point of comparison for the ongoing battle against SARS-CoV-2. At the time of this writing, two of the three wild poliovirus (WPV) serotypes (WPV2 and WPV3) have been eliminated, and WPV1 remains endemic in only Afghanistan and Pakistan.¹ Though the near-elimination of endemic polio marks the successes of more than 85 years of eradication efforts, the race towards development, testing, and distribution of vaccines against poliovirus – most notably exemplified by the 1950s’ competition between American researchers Jonas Salk and Albert Sabin – stands in striking parallel to that ongoing in the United States’ fight against COVID-19. The lessons learned through this odyssey can and must inform the gargantuan task of vaccinating the American populace against SARS-CoV-2. Herein we lay out the successes and failures of the polio vaccination campaign with an eye toward informing policymakers entrusted with securing, distributing, and administering a safe and effective SARS-CoV-2 vaccine. Special emphasis will be placed on the principles of national unity, racial and ethnic equity, as well as vaccine safety and efficacy.

Research efforts aimed at elucidating the biology of the poliovirus family date back to the early 20th century. However, it took the 1932 election of President Franklin Delano Roosevelt (FDR), a polio survivor himself, to align the requisite political and scientific forces against the deadly disease. It was not until 1938, and the establishment of the National Foundation for Infantile Paralysis (NFIP), later renamed the March of Dimes Foundation, that the national quest for a polio vaccine was launched. What followed was a 17-year race for the development of a safe and effective polio vaccine. Jonas E. Salk, MD, of the University of Pittsburgh, sought to develop an inactivated poliovirus vaccine (IPV).² Albert B. Sabin, MD, of the University of Cincinnati, in turn, pursued a live attenuated poliovirus vaccine (OPV) option.² By 1952, preliminary trials of the Salk vaccine were deemed

promising enough to warrant an unprecedented, nationwide, year-long field trial involving nearly 2 million children who were to be known as the “polio pioneers.”² The success of this trial and the widespread dissemination of the Salk vaccine that followed – bringing American polio cases down by half each year from 1955 to 1959 – would serve as a foundation for future mass vaccination efforts of the modern era.³

In stark contrast to the political dynamics surrounding the SARS-CoV-2 pandemic, FDR and the NFIP were able to insulate the polio eradication efforts from the politics of the day by calling for individual participation in a national cause. Hollywood executives and A-list stars were recruited to churn out films and radio broadcasts emphasizing the dangers of polio.² Simultaneously, grassroots fundraising programs, from the FDR Birthday Balls and March of Dimes fundraising drives (wherein millions of Americans sent dimes to the White House towards the eradication of polio), to the Mothers’ Marches of the 1950s, enabled millions of Americans to find a sense of personal affiliation with the cause of polio eradication.⁴ Slogans such as “Polio Wears No Party Label” stood as unity cries amidst the political strife engendered, for example, by the attack on Pearl Harbor, amongst many other points of stark political division.² After years of personal involvement in the fight against polio, Americans saw the vaccination effort not only as a means to protect themselves but also as a means of fulfilling their national duty. Though such rally-round-the-flag dynamics may be difficult to muster in the current political climate, depoliticization of the fight against SARS-CoV-2 stands as a crucial step to counter the spread of vaccine hesitancy and related anti-vaccination sentiments. Ongoing vaccine distribution efforts can only be successful if local authorities, regardless of party affiliation, continue to promote the uptake of available vaccines.

The search for a polio vaccine is often portrayed as a fierce battle between the Salk and Sabin vaccines. The evident competition notwithstanding, the two vaccines played complementary roles in the long-term journey towards polio

eradication. IPV, for its part, served to reduce the risks of vaccine-associated paralytic polio inherent to the live if attenuated option¹. OPV, on the other hand, afforded a low-cost means of mass vaccination intent on establishing herd immunity by means of spreading attenuated-but-still-infectious forms of poliovirus to unvaccinated individuals through stool or respiratory secretions.³ The variety of vaccines being developed against SARS-CoV-2 should be seen as a boon for a fight that will inevitably outlive the current pandemic. It is beyond cavil that the U.S. must continue to invest in vaccine research and development while searching for therapeutics that can eliminate SARS-CoV-2 safely, efficiently, and reliably.

Though the Salk and Sabin vaccines often dominate discussions of polio vaccine development, earlier efforts trace back to the 1930s. In 1935, John A. Kolmer, MD, of Temple University pushed for large-scale trials of his attenuated poliovirus vaccine. Nine deaths and at least twelve cases of paralysis followed.² A similar fate befell trials of the inactivated poliovirus option developed by Maurice Brodie, MD, of New York University Medical College.² Not unexpectedly, any and all efforts to develop a polio vaccine came to a temporary, but costly halt. Nearly 13,000 children would become permanently paralyzed each year vaccines remained unavailable and thousands more would vow to avoid potentially dangerous vaccines to come.⁴ Similar failures plagued the Salk vaccine which was declared “safe and effective” on April 12, 1955.⁵ Mass inoculation followed a day later.⁵ Reports of post-vaccine paralysis followed within days.⁵ Even so, vaccination efforts continued for three additional weeks only to be belatedly halted by the U.S. Surgeon General on May 6, 1955.⁵ The culprit, improper inactivation of the poliovirus by the Cutter Laboratories, resulted in over 40,000 cases of vaccine-induced polio, 200 cases of paralysis, and 10 deaths nationwide.⁵ Avoiding more of the same with the COVID-19 vaccines will require that the FDA thoroughly oversee the manufacturing processes. Equally important will be the monitoring and reporting of any and all adverse effects by the National Vaccine Program Office. The latter, dismantled under the Trump administration by the Department of Health and Human Services, should, if possible, be prioritized for reinstatement.⁶ Putting speed ahead of safety should not be tolerated. In an era of heightened vaccine hesitancy, avoiding rollout errors – most notably, infection-via-vaccination – likely stands out as the single

most crucial step in the successful dissemination of a SARS-CoV-2 vaccine.

Though many regard SARS-COV-2 as a great equalizer, infecting any and all who come in its path, the disproportionate burden the pandemic has placed on the Black and Latinx communities recapitulates lamentable disparities not unlike those noted during the polio era.⁷ Although the Salk vaccine was made available to all, deference to local authorities in the process of vaccine distribution rendered racial equity a focus which would only be realized in certain parts of the country. In many Southern states, the requisite presence of parents during the vaccination of their children posed a greater challenge to communities of color wherein the attendant financial strain often required both parents to work.⁷ Additionally, mandates of some state and city health departments relegated much of the vaccinations effort to then-segregated white public school districts.² Though Rhode Island’s current efforts to prioritize vaccine access in Central Falls highlights a local understanding of the degree to which communities of color have been disproportionately burdened by the ongoing pandemic, such local attempts to counter the stark racial discrepancies in pandemic burden fail to protect those whose own local authorities have failed to make racial justice a priority in their vaccine distribution plans. Racial inequities in pandemic burden reflect national disparities in health outcomes and therefore require national responses to cement the prioritization of racial justice in vaccine distribution.

The import of the aforementioned lessons of the polio epidemic to its SARS-CoV-2 counterpart notwithstanding, success of the national vaccination effort may well flounder on the rocks of reality. National unity may well prove unattainable in the current political climate. However, vaccine safety and efficacy can and must be assured during the development, production, and distribution of SARS-CoV-2 vaccines. Ensuring that all Americans, regardless of race, color, or creed, are afforded equal access to the vaccine must be a top priority. Vaccines serve their purpose only when and if welcomed by the public and guided by intentional and swift plans for distribution. Further erosion of the public trust must be guarded against at all costs. As we look, yet again, at vaccinating a nation, we must take stock of the lessons of the past. The polio epidemic is one notably informative place to look. ❖

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