

# RAGING PANDEMICS AND TAMING EPIDEMICS: THE ROLE OF BEHAVIOUR CHANGE COMMUNICATION IN INDIA'S POLIO ERADICATION<sup>1</sup>

*Arvind Singhal*

*Professor, Department of Communication*

*The University of Texas at El Paso, USA, and*

*Professor 2, Inland University of Applied Sciences, Norway*

*asinghal@utep.edu*

## Abstract

This article, drawing upon the author's past research and scholarly writings on communication strategies to prevent, contain, and mitigate pandemics and epidemics, including HIV/AIDS, analyses India's march towards polio eradication, focusing on the relentless implementation of its macro and micro-level social and behavioural change communication strategies. It discusses the micro-targeting and messaging interventions to achieve large-scale vaccine adherence and behaviour compliance, especially in the states of Uttar Pradesh and Bihar—the last sanctuaries for polio in India. It also analyses how India eradicated polio with relentless social mobilisation, involvement and engagement of local opinion leaders, and an adaptive data-driven strategy. No country, at any time, has utilised the art and science of social and behavioural communication for a greater public good as India did to wipe out polio. This article represents a modest attempt to analyse the communication-centric elements, focusing on the interpersonal and ground-based elements of the polio communication strategy, that contributed to this public health triumph of epic proportions, and represents India's gift to the world.

---

<sup>1</sup> This article draws upon my past research and scholarly writings on communication strategies to prevent, contain, and mitigate pandemics and epidemics, including HIV/AIDS (Singhal & Howard, 2003; Singhal & Rogers, 2003), Methicillin Resistant Staph Aureus (MRSA) (Cohen, Gesser-Edelsburg, Singhal, Benenson, & Moses, 2019; Kim, Singhal, & Kreps, 2014; Singhal, Buscell, & Lindberg 2010, 2014; Singhal & Dura, 2017; Singhal & Greiner, 2011); and Polio (Singhal, 2013). I was privileged to have many encounters with India's polio program, including vivid memories (in the late 1960s) of imbibing the oral polio vaccine, drops straight out of a refrigerator in a doctor's office in Lucknow, Uttar Pradesh (UP) state, and then in Chakradharpur, Jharkhand State. Decades later, I witnessed at close quarters India's polio eradication program in western UP in 2008, under the auspices of UNICEF, the agency that led the on-the-ground social mobilisation and communication actions. My activities included field visits to several blocks and villages of Meerut District and in-depth interactions with officials and community mobilisers of UNICEF's SMNet, local health officials, and polio resistant families. Further, I reviewed archival records (in Delhi and Meerut), both historical and current, of India's march toward polio eradication. Especially golden were in-depth personal interviews in 2008 with Michael Galway and Naysan Sahba, both officials in UNICEF's Programme Communication Unit in New Delhi, and Dr. Hamid Jafari, WHO's project manager for Polio Surveillance in India. Robert Cohen, Ketan Chitnis, Rina Gill, and Neha Kapil of UNICEF's C4D unit and Jeffrey Bates of the Polio Team, New York, helped enhance my understanding of the macro and micro communicative elements in India's polio strategy (see Singhal, 2008). Between 2010 and 2016, I was privileged to serve on the Independent Monitoring Board of the Global Polio Eradication Initiative, which has helped to further sharpen my understanding of the vital role of communication and social mobilisation in the prevention, containment, mitigation and eradication of infectious diseases. I learned quite a bit from participating in on-the-ground polio activities in northern Nigeria (especially in Sokoto and Zamfara states) and in Pakistan (including Lahore and vicinity in Punjab state and areas in and around Peshawar in Khyber Pakhtunkhwa). An important disclaimer: The views that I express here are solely mine – in my capacity as a scholar and sense-maker of communication strategy, and not to be attributed to either UNICEF or the IMB.

**Keywords:** social communication, behavioural communication, micro-targeting, messaging intervention, social mobilisation, data-driven strategy

---

## **Introduction**

In mid-June 2020 as the present article goes to print, the COVID-19 pandemic rages worldwide. In a span of a few months, 7.8 million cases of the infectious novel coronavirus have been detected worldwide, and over 430,000 people have lost their lives. With no cure, therapy, or vaccine in sight, these numbers will rapidly rise in the next year or two. With a botched national response, the United States leads the world in both the number of confirmed cases (2.1 million) and the number of deaths (116,000). India, even with over nine weeks (March 25 to end-May, 2020) of draconian country-wide lockdown measures that caused unprecedented hardship to tens of millions of its most vulnerable population, is catching up fast with 325,000 confirmed cases (fourth highest after the U.S., Brazil, and Russia) and 9,200 deaths. (For current COVID-19 numbers, see the website of the Centers for Disease Control and Prevention at <https://www.cdc.gov/coronavirus/> ).

While the COVID-19 pandemic makes deep inroads on the global landscape, and that too with unprecedented rage, some infectious diseases have been tamed and are close to eradication. Polio is one of them. It has been a long arduous journey to eradicate polio even though a vaccine has been around for 65 years. While it is impossible to predict the short, medium, and long-term impacts of COVID-19, one awaits the time, perhaps several years or decades from now, when we will be writing the epitaph of the novel coronavirus and the disease it causes—COVID-19. Meanwhile, perhaps there are some lessons to be learned from the taming of polio.

In the long roster of documented polio cases in India, Rukhsar Khatoon of Howrah District in West Bengal has a coveted place: she is the last entry, dated January 13, 2011. Two years later, on January 13, 2013, with no other polio cases reported, the World Health Organization declared India as being free of the wild poliovirus. India's Rukhsar Khatoon is one among many "lasts" in the annals of global polio eradication: In 1991, a child in Peru represented the last case in the Americas; in 1997, a child in Cambodia was the last case in the Pacific region; and in 1998, a child in Turkey was the last case in Europe (Ferris, 2013).

With India's name off the list of polio-endemic countries in 2013, and Nigeria being certified as having eradicated polio in 2019, only two countries remain that have yet not eliminated the stranglehold of the wild poliovirus – Pakistan and Afghanistan. India's triumph over the wild poliovirus demonstrates that it is possible to wipe out polio from this world. Not since 1979, when the smallpox virus was completely eradicated from nature, has the world come so close to eradicating another infectious disease -- no small feat for a disease whose recorded history goes back several thousands of years. An Egyptian stele, a tablet employed as a tombstone, from about 1500 B.C, for instance, depicts an individual with an atrophied leg, signifying polio's long-stand in history.

The purpose of the present article is to analyse India's march toward polio eradication, focusing on the relentless implementation of its macro and micro-level social and behavioural change communication strategies. In the present article, we discuss the micro-targeting and messaging interventions to achieve large-scale vaccine adherence and behaviour compliance, especially in the states of UP and Bihar — the last sanctuaries for polio in India. We analyse how India eradicated polio with relentless social mobilisation, involvement and engagement of local opinion leaders, and an adaptive data-driven strategy. No country, at any time, has utilised the art and science of social and behavioural communication for a greater public good as India did to wipe out polio. This article represents a modest attempt to analyse the communication-centric elements that contributed to this public health triumph of epic proportions, and represents, truly, India's gift to the world.

In this article, however, we focus more on the interpersonal and ground-based elements of the polio communication strategy (see also Obregon et al. 2009), while acknowledging the important role of mass-media

polio campaigns, include the long-running one featuring Bollywood superstars, Amitabh Bachchan and Shah Rukh Khan, promoting the two miracle drops.

## **Towards a Polio - Free World**

It may come as a surprise to many that prior to 1955, until a vaccine for polio became available, the worst outbreaks of the disease were reported in Western Europe, Canada, Australia, and the United States (Oshinsky, 2005). Prior to, and post-World War II, polio was deeply feared globally and second only to the atomic bomb in the US because it hit indiscriminately, causing panic akin to present-day terror attacks. Polio spared no one, not even American President, Franklin Delano Roosevelt, and worse, it was insidiously partial to children, especially boys. One of the worst polio epidemics in the U.S. occurred in 1952 when 58,000 healthy people in the U.S. contracted polio, of which 3,200 died, and 22,000 were left with deformed limbs, braces, crutches, and wheelchairs (Gould, 1995). An all too familiar sight in US hospitals were polio wards with endless rows of patients hooked to iron lungs, ungodly mechanical ventilators that breathed for people who lost muscular control (Black, 1996).

The tide against the scourge of polio began to turn when Jonas Salk announced the development of a safe and effective injectable vaccine on April 12, 1955. It was immediately put to use for the greater public good. When famed television reporter Edward R. Murrow asked Salk about who owned the patent to the vaccine, his response was: "The people I would say. There is no patent. Could you patent the sun?" While the Salk polio injectable vaccine has been available since the mid-1950s and the Sabin oral polio vaccine (OPV) since 1962, polio still has no cure. Vaccine-based prevention is the only cure!

Some 20 million people are living today who have been crippled by the poliovirus. Polio is spread through the oral-fecal route from one person to another. The virus enters the body orally, multiplies in the intestine, and then spreads through feces in places besieged by poor hygiene and sanitation, high population density, and inadequate health services. The virus usually strikes children under the age of five and can cause death and permanent, irreversible disability through paralysis of limbs. For every one case of paralysis that is reported, roughly 200 people carry the virus, 90 percent of them without symptoms. (Polio Global eradication Initiatives, n.d., at [polioeradication.org/Polioandprevention.aspx#sthash.4TMsKhbV.dpuf](http://polioeradication.org/Polioandprevention.aspx#sthash.4TMsKhbV.dpuf)). Once a substantial number of children in a community (80 to 85 percent) are fully immunised against polio, the virus finds it difficult to find a host and dies out.

In 1988, some nine years after the world had eradicated the scourge of smallpox, the World Health Assembly established the Global Polio Eradication Initiative (GPEI). It should be noted that the only other infectious disease that has been eradicated is rinderpest (a German word meaning "cow plague"), a viral, highly contagious, and deadly disease afflicting cows. In June of 2011, the United Nations FAO confirmed the disease was eradicated.

The triumph over smallpox was a phenomenal global public health feat, given the highly virulent disease killed an estimated half-a-million Europeans annually in the early 19<sup>th</sup> century (Hays, 1995). A killer without comparison, smallpox took 300 to 500 million lives during the 20th century, rendering tens of millions blind all over the world, and leaving hundreds of millions of pock-marked survivors (Hays, 2005; Koplow, 2003; Henderson, 2009).

After eradicating smallpox, the global public health community turned its attention to polio eradication. When GPEI was established in 1988, polio was endemic in 125 countries and some 350,000 cases of infant paralysis occurred each year. In 2019, the number of countries with endemic polio dropped from 125 to two (Figure 1).

## The polio endgame

Since 1988, when the WHO resolved to eradicate polio, its footprint has shrunk dramatically. It is only considered endemic in Afghanistan, Pakistan and Nigeria (which hasn't seen a case since 2016). Last year there were only 22 new cases reported.

	1988	2017
Endemic countries	125	3

SOURCE: World Health Organization  
TORONTO STAR GRAPHIC



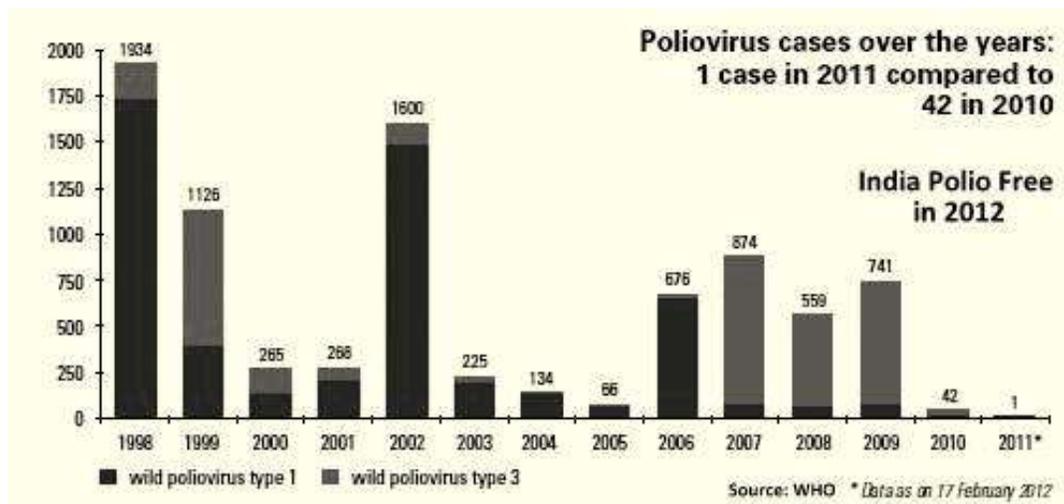
Source: WHO (Public Domain)

Figure 1: The Tremendous Progress Made in Polio Eradication in the Past Three Decades. Nigeria Was Declared Polio-Free in 2019.

The GPEI, spearheaded by national governments, WHO, Rotary International, UNICEF, the Centers for Disease Control and Prevention (CDC), and more recently the Bill and Melinda Gates Foundation is the largest public health initiative the world has known. Since 1988, some two billion children have been immunised against polio in more than 200 countries involving over 20 million vaccinators and volunteers. The number of polio cases has spiraled downward – by 99.9 percent -- from 350,000 in 1988, to less than a hundred in 2019. An estimated 10 million children have been spared paralysis (see <http://www.gatesfoundation.org/What-We-Do/Global-Development/Polio>). Of the 3 types of wild polioviruses, the last recorded wild case of type 2 was in 1999, and of type 3 in November 2012. Only type 1 wild poliovirus persists.

## Towards a Polio - Free India

With its billion-plus people, squalid urban slums and remote rural communities, India was expected to be the last sanctuary for the wild poliovirus (Paul, 2007). However, backed by strong political will, a country as huge and diverse and poor as India managed to stop polio in its tracks (Chaturvedi, 2008). Completing the “last mile” called for every ounce of human effort, ingenuity, and data-driven macro and micro strategy (Obregon et al., 2009) (Figure 2).



Source: UNICEF

Figure 2: India's Long Road to Polio Eradication

Beginning in the mid-1990s, the polio eradication efforts in India were intensified around National Immunisation Days (NIDs) and “pulse polio” campaigns to reach every child under the age of five in every round. A National Polio Surveillance Project was established in 1997 to closely track the evolving epidemiology of the disease, and target efforts accordingly. The NIDs yielded good results in many states as immunity increased over time and the number of polio cases declined. The strategy changed accordingly, moving from a focus on a general population to more intensive engagement in localised geographic areas with particular communities where the children were at the highest risk.

Despite this focused targeting, in the two most populous and poorest states in north India -- Uttar Pradesh (UP) and Bihar – the poliovirus was resilient and relentless, finding new hosts amidst poverty, high population density, and poor hygiene and sanitation (Cheng, 2004). Especially troubling were some 107 Blocks (an administrative unit within a district) of western UP and the Bihar States which represented “polio factories” (endemic reservoirs). In 2003, an estimated 80 percent of the world’s new polio cases originated in these locations (Figure 3). To rid these two states of polio would require sustained and highly coordinated social mobilisation campaigns.



Source: UNICEF

Figure 3: The Dark Areas Represent the 107 Polio Reservoirs in Western UP and Bihar State.

### **Data-Driven Macro and Micro Communication Strategies**

By any measure, the scale of the polio eradication effort in India was staggering. In the last decade leading up to eradication, more than 170 million Indian children under the age of five were being vaccinated in two national immunisation campaigns, involving the mobilisation of 2.5 million vaccinators (UNICEF, 2012). Additionally, up to 70 million children in the highest-risk areas were vaccinated multiple times during Subnational Immunisation Days (SNIDs). The on-the-ground mobilisation was of epic proportions.

UNICEF, in cooperation with various international, national and state-level partners, led the implementation of intense social mobilisation and behaviour change communication campaigns (Chaturvedi, 2008; Mittal & Matthew, 2007). While UP and Bihar were the last bastions of the poliovirus in India, West Bengal, Karnataka, Andhra Pradesh, Maharashtra, and Delhi were always at risk, because of migration (of labourers and their families) from UP and Bihar to work on construction projects and in agricultural fields. What made the polio communication activities extraordinary, especially in UP and Bihar state, were the mapping and record-keeping associated with the macro-plan (at the state, district, and block level) and a relentless drive to reach each child as per the micro-plan (at the village, locality, and household level). Mapping and monitoring of



Source: Arvind Singhal

Figure 4: A Micro-Plan Detailing Households within a Locality in a Polio-Endemic Village.

each household was developed into a precise art (or “German engineering”), where the room for error was minimal given the goal was complete eradication (Singhal, 2008).

More importantly, these macro and micro-plans for reaching every child under the age of five were continually refined, strengthened and benchmarked to measure their efficacy and effectiveness (Singhal, 2008). Michael Galway, Chief of Programme Communication at UNICEF in New Delhi, who guided UNICEF’s communication and social mobilisation efforts during these crucial years in India, emphasised: “The polio communication effort on the ground came with tremendous accountability to both donors and clients. Therefore, the communication strategy had to be evidence-based, data-driven, epidemiologically-guided, adaptive, and localised” (Michael Galway, personal interview, January 9, 2008).

## Achieving Compliance, Overcoming Resistances and Rumors

The organisation of NIDs and SNIDs would mean little if caregivers did not know *when* and *where* these polio rounds would take place, and if they were not convinced that these drops were essential to protect their children (Athar, Khan, & Khan, 2007). While it may seem that the central communication message is simple (immunise your child) and needs to be reinforced repeatedly without variation, challenges existed in reaching isolated communities, migratory populations, and every child during every round, as also in countering rumors about vaccine safety.

Tracking the immunisation status of every child under the age of five was crucial in the NIDs and SNIDs, especially in the high-risk areas. If a child went unvaccinated during polio round – at the neighborhood immunisation booth or during the door-to-door visit, the reasons for missing the child (e.g., a child was sick, in school or the playground, or out of town) were noted, and at least three additional attempts were made within the following week to make sure the child was immunised.

Another challenge involved continued compliance by families in each round, spaced once every five to six weeks in the 107 high-risk blocks of western UP and Bihar state. How to convince families that polio can still cripple children who have been immunised several times? Michael Galway noted in a personal interview: “People live difficult lives in this part of the world and they, understandably, get angry when we are back in their house every six weeks with a polio vaccine. What they want is electricity, water, schools for their children, sanitation, and better health care” (Michael Galway, personal interview, January 9, 2008).

An even tougher challenge was convincing those who were misinformed and resisted vaccinations for reasons that were personal, local, cultural, and frequently changing. To do so, frontline workers developed new tools to engage with families, to record the reasons for refusal, to better understand the complexities of multiple community identities even within the same village or urban slum, and to overcome deeply-rooted social and cultural barriers, such as the practice in UP and Bihar of not allowing newborns to be immunised. When questions were raised or resistances detected, answers were researched, messages pre-tested in the field, and the social mobilisation team, composed of local health workers and volunteers, would rope in key influencers – whether imams, school teachers, community leaders or medical doctors – to engage and convince the families.

Efforts to eradicate polio globally and in India, received a big setback when a 2003 *fatwa* issued by influential Muslim clerics in the West African nation of Nigeria warned their communities to avoid polio

vaccination for it would, they said, make children sterile (Sulaiman, K. 2014). Heeding the *fatwa*, members of some Muslim communities in northern Nigeria stopped vaccinations. A minority of Muslim leaders in India also supported the *fatwa*. UNICEF and other partners joined hands with premier Muslim institutions (e.g. Aligarh Muslim University, Jamia Milia Islamia University, and others) to address and overcome misguided *fatwas* or other ostensibly faith-based opposition. In addition, local religious leaders were engaged in mosques and madrasas (religious Islamic schools) to support polio eradication. Many of them signed appeals and provided printed testimonials during prayers, festivals, and community events. Countering rumors without delay, and that too in close partnership with credible and influential religious and local leaders, help put the Polio program back on tracks.

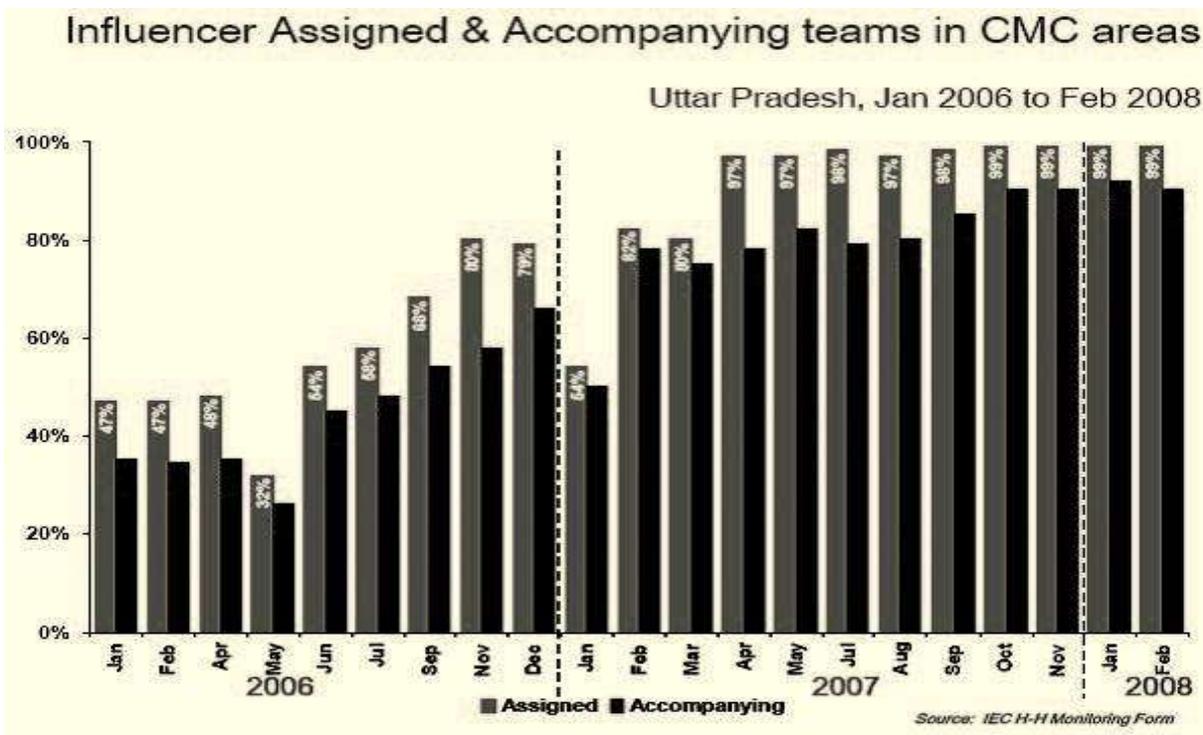
## **Influence of Social Mobilisers and Local Opinion Leaders**

In 2008, during one of the SNIDs, I spent several days in western UP to witness the social mobilisation activities first-hand. I met dozens of community mobilisers belonging to the Social Mobilisation Network (SMNet), which UNICEF helped launch in 2001. At the time of my visit, some 4,300 community mobilisation coordinators (CMCs) actively worked in 44 districts in UP, supported by an umbrella of block, district, and sub-region coordinators, who continuously liaison with local administration, public health officials, stakeholders, and partner agencies to utilise resources optimally. The CMCs were strategically placed in high-risk areas (HRAs) concentrated around western UP and select eastern and central pockets of the state, forming the link with the underserved community most at risk. On average, each CMC tracked 440 households and about 375 under-5 children, covering about 1.85 million households and 1.6 million children during each of pulse polio rounds (once every 5-6 weeks), in addition to routine immunisation of children (Singhal, 2008).

In western UP, the frontline social mobilisers that I met were mostly women, who lived and worked in communities that are at high-risk for ongoing transmission of the poliovirus. With some training, these mobilisers maintained and updated extremely complicated data and records of children in their area, which is consolidated upward during each round through multiple levels (community, locality, block, district, and State), analysed, and fed back with amazing alacrity.

What made these on-the-ground social mobilisers tick was the personal rapport, credibility, and trust they brought to an interpersonal encounter. As Chaturvedi (2008, p. 5) noted: “Nothing beats the familiar face, the lilt of the local dialect and the genuine concern of the friendly neighbourhood aunt who may say: ‘He looks a little pale today, have you taken him to the doctor? Don’t neglect your health while looking after the babies and don’t forget to come to the polio booth on Sunday’”. Such personalised, localised interaction with a locally-respected woman, backed by a network of local influencers and opinion leaders, provided an opportunity for iterative dialogue, discussion, and decision-making, leading to the imbibing of the two miracle drops of the oral polio vaccine.

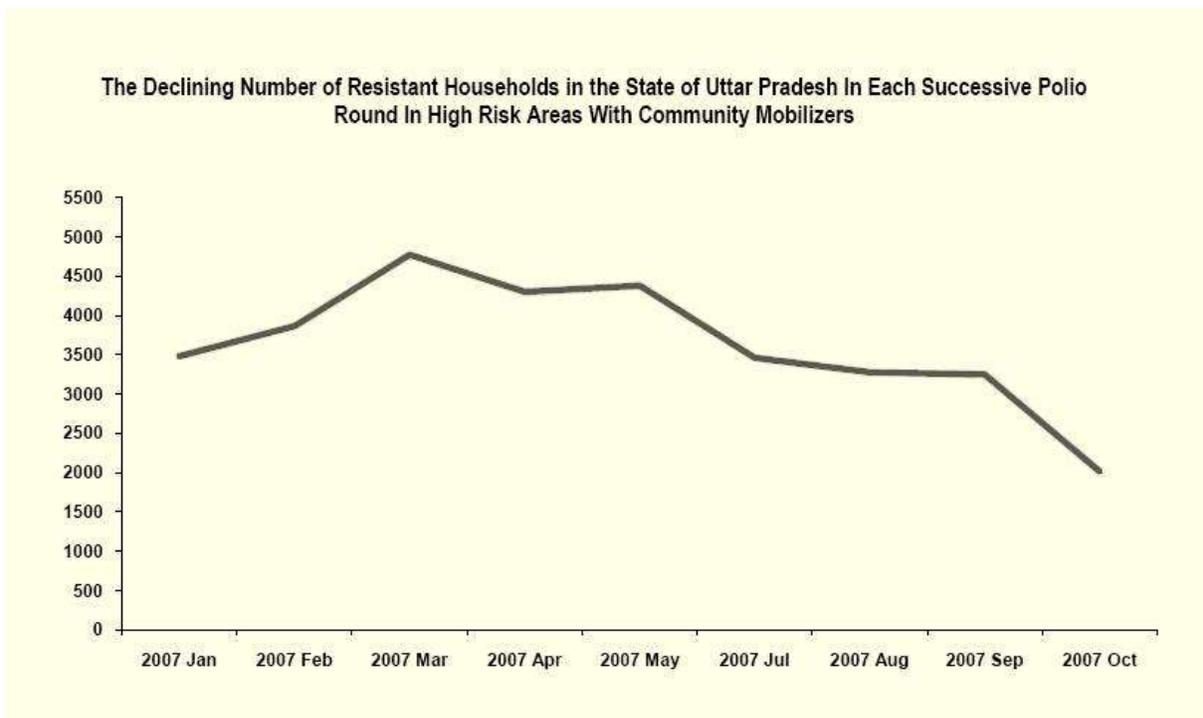
*Opinion leadership* is the degree to which an individual is able to influence informally others’ behaviour in a desired direction (Rogers, 2005; Singhal & Dearing, 2006). SMNet’s social mobilisers worked very closely with local “influencers” (religious, occupational, and societal) to actively engage them in convincing resistant households. Between January 2006 and April 2007, the percentage of local influencers who accompanied vaccination teams during house-to-house activities doubled in high-risk pockets of UP, significantly boosting immunity in the community (Figure 5). Further, the presence of local *pradhans* (chiefs of local government), medical practitioners, imams, and shop keepers, visibly demonstrated that polio eradication was not an imposition from the outside, but a goal that the community-owned.



Source: UNICEF

Figure 5: The Rising Engagement, Over Time, of Local Influencers in UP State.

The cumulative effect of community influencers working shoulder-to-shoulder with community mobilisers is evident in Figure 6, showing the number of households resistant to immunising their children in Uttar Pradesh dropped by half in within six months.



Source: UNICEF

Figure 6: The Declining Number of Resistant Households as Community Influencers Work Shoulder-to-Shoulder with Community Mobilisers.

## Adaptive Communication Strategy

The on-the-ground mobilisation and vaccination strategy in western UP and Bihar was dynamic and nimble, guided by emerging data, and responding to the evolving epidemiology of the poliovirus. For instance, as immunity levels began to rise in communities for children under the age of five, it was imperative to increase the vaccine coverage of newborns. Newborns were especially at risk for polio, given the established social norm in rural and semi-urban households in UP and Bihar to shield the newly-arrived from “evil outside eyes,” – a cultural response to cope with high infant mortality. Immunising newborns was critical in UP and Bihar, the two most populous Indian states with a combined population of 300 million, where some 18,000 babies were delivered each day. No newborn could be missed.

This shift to target newborn households is evidence of how the communication strategy was continually adapted to keep pace with the epidemiological data. As polio in north India became more clustered in the youngest children, getting to these newborns before the poliovirus was imperative. Community mobilisers were on location with alacrity, convincing mothers of newborns and their husbands and in-laws to immunise their child within hours (or days) of their birth (Figure 7).

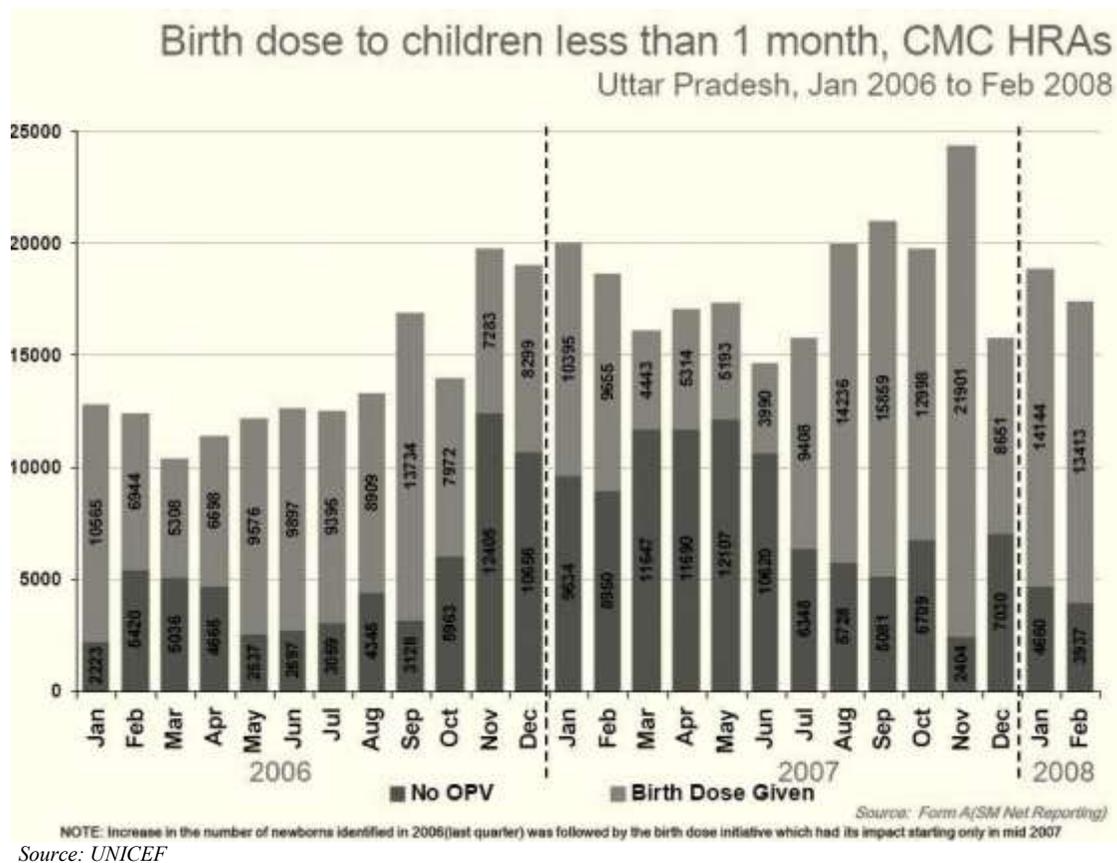


Figure 7: The Rising Coverage of Newborns to Keep Pace with the Evolving Epidemiology of the Poliovirus.

## Discussion and Conclusions

While there exist important differences in transmission patterns and risk profiles, COVID-19 and polio have important commonalities (McRobbie, 2020). Both are infectious diseases, can be transmitted by silent and asymptomatic carriers, and can be deadly. While a vaccine exists for polio, the transmission of COVID-19 at this time can only be prevented through a cocktail of behavioral practices: regular handwashing, wearing a mask, physical distancing between people, and avoiding crowded indoor settings. Adoption of this cocktail of

behavioural practices is the only vaccine available. Hard to believe but up until the mid-1950s when the polio vaccine became available, families sheltered in fear of polio at home, public gathering places were closed or had restricted hours, and normal life was on hold for many. The present-day lockdowns and shelter-at-home policies for COVID-19 are reminiscent of those bygone polio times. Hope is pinned on the discovery of an efficacious vaccine.

While the story of COVID-19 pandemic is just getting underway, there is much for the world to learn about the role of behaviour change communication in eradicating polio. The lessons include:

- the relentless implementation of macro and micro communication strategies.
- the micro-targeting and micro-messaging to achieve compliance, overcome resistance, and counter rumors.
- large-scale and intensive on-the-ground social mobilisation and active and purposive involvement of local religious and opinion leaders.
- an evidence-based, data-driven, epidemiologically guided, adaptive communication strategy.

The room for error with polio eradication or even COVID-19 is next to zero, given that it takes only one individual to transmit the virus. India's journey toward remaining polio-free needs is equally relentless until Pakistan and Afghanistan eradicate the wild poliovirus.

It has been nearly a decade since Rukhsar Khatoon's name was recorded on India's polio roster. That is an epic triumph in the annals of global public health. It has brought the world a step closer to eradicating polio. We all await the day when the final entry will be made in the global roster of polio eradication. Meanwhile, the roster of COVID-19 is growing by leaps and bounds.

## References

- Ansari, M. A., Khan, Z., & Khan, I. M. (2007). Reducing resistance against polio drops. *Perspectives in Public Health*, 127(6), 276-279. <https://doi.org/10.1177/1466424007083705>.
- Black, K. (1996). *In the shadow of polio: A personal and social history*. Perseus Books.
- Chaturvedi, G. (2008). *The vital drop: Communication for polio eradicate in India*. Sage Publications.
- Cheng W. (2004). *Polio eradication India: reaching the last child*. United Nations Children's Fund Regional Office for South Asia.
- Cohen, R., Gesser-Edelsburg, A., Singhal, A., Benenson, S., & Moses, A. E. (2019). Deconstruction of central line insertion guidelines based on the positive deviance approach—Reducing gaps between guidelines and implementation: A qualitative ethnographic research. *PLOS ONE*, 14(9). <https://doi.org/10.1371/journal.pone.0222608>.
- Ferris, R. (2013, January 13). *One polio survivor to another: Meeting India's last case of polio*. Rotary Voices. <https://blog.rotary.org/2013/01/28/khatoon/>.
- Global Polio Eradication Initiative. (n.d.). *Polio + prevention*. <http://polioeradication.org/polio-today/>.
- Gould, T. (1995). *A summer plague: Polio and its survivors*. Yale University Press.
- Hays, J. N. (2005). *Epidemics and pandemics: Their impacts on human history*. ABC-CLIO.
- Henderson, D. A. (2009). *Smallpox: The death of a disease: The inside story of eradicating a worldwide*. Prometheus Books.
- Kim, D. K., Singhal, A., & Kreps, G. L. (Eds.). (2014). *Strategies for developing global health programs*. Peter Lang.
- Koplow, D. A. (2003). *Smallpox: The fight to eradicate a global scourge*. University of California Press.
- McRobbie, L. R. (2020, May 26). *The man in the iron lung*. The Guardian. [https://www.theguardian.com/society/2020/may/26/last-iron-lung-paul-alexander-polio-coronavirus?CMP=oth\\_b-aplnews\\_d-1](https://www.theguardian.com/society/2020/may/26/last-iron-lung-paul-alexander-polio-coronavirus?CMP=oth_b-aplnews_d-1).
- Mittal, S. K., & Mathew, J. L. (2007). Polio eradication in India: The way forward. *The Indian Journal of Pediatrics*, 74(2), 153-160.
- Obregón, R., Chitnis, K., Morry, C., Feek, W., Bates, J., Galway, M., & Ogden, E. (2009). Achieving polio eradication: A review of health communication evidence and lessons learned in India and Pakistan. *Bulletin of World Health Organization*, 87, 624–630. <https://doi.org/10.2471/blt.08.060863>
- Oshinsky, D. M. (2005). *Polio: An American story*. Oxford University Press.
- Paul, Y. (2007). What needs to be done for polio eradication in India?. *Vaccine*, 25(35), 6431-6436. <https://doi.org/10.1016/j.vaccine.2007.05.059>
- Rogers, E. M. (2005). *Diffusion of innovations* (5th ed.). Free Press.
- Singhal, A. (2008). *Where practice has led theory: UNICEF's contributions to the field of communication for development*. UNICEF, C4D Unit.
- Singhal, A. (2013). Adaptive macro and micro communication strategies to eradicate polio in India: Social mobilization, opinion leadership, and interpersonal influence at unprecedented scale. *International Journal of Communication and Social Research*, 1(1), 1-14.
- Singhal, A., & Dearing, J. W. (Eds.). (2006). *Communication of innovations: A journey with Ev Rogers*. Sage Publications.
- Singhal, A., & Dura, L. (2017). Positive deviance: A non-normative approach to health and risk messaging. *Oxford Research Encyclopedia of Communication: Communication Theory, Health and Risk Communication*. <https://doi.org/10.1093/acrefore/9780190228613.013.248>
- Singhal, A., & Greiner, K. (2011). Using the positive deviance approach to reduce MRSA at the Veterans Administration Healthcare System in Pittsburgh. In A. Suchman, D. Sluyter & P. Williamson (Eds.), *Leading change in healthcare: Transforming organizations using complexity, positive psychology, and relationship centered-care* (pp. 177-209). Radcliffe Publishing.
- Singhal, A., & Howard, W. S. (Eds.). (2003). *The children of Africa confront AIDS: From vulnerability to possibility*. Ohio University Press.
- Singhal, A., & Rogers, E. M. (2003). *Combating AIDS: Communication strategies in action*. Sage Publications.
- Singhal, A., Buscell, P., & Lindberg, C. (2010). *Inviting everyone: Healing healthcare through positive deviance*. Plexus Press.
- Singhal, A., Buscell, P., & Lindberg, C. (2014). *Inspiring change and saving lives: The positive deviance way*. Plexus Press.
- Sulaiman, K. O. (2014). An assessment of Muslims' reactions to the immunization of children in Northern Nigeria. *Medical Journal of Islamic World Academy of Sciences*, 22(3), 123-132.
- United Nations Children's Fund. (2012). *From 200,000 to zero: The journey to a polio-free India*. India Environment Portal. [http://www.indiaenvironmentportal.org.in/files/file/Polio\\_Booklet-final\\_\(22-02-2012\)V3.pdf](http://www.indiaenvironmentportal.org.in/files/file/Polio_Booklet-final_(22-02-2012)V3.pdf).