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Commentary

Gu Fangzhou and China's polio control: from public health to a global legacy☆

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Poliomyelitis, or polio, is an acute infectious disease caused by poliovirus. Once one of the most severe public health threats of the 20th century, polio can trigger irreversible flaccid paralysis and even death. Starting with the inactivated poliovirus vaccine (IPV) developed by Jonas Salk, followed by the oral attenuated live poliovirus vaccine (OPV) created by Albert Sabin, and then the "Sugar Pills" developed and popularized by Chinese scientists led by Gu Fangzhou (1926–2019) (Fig. 1),[1] polio prevention and control has gradually achieved a leap from individual protection to herd immunity in China.

The year 2026 marks the centenary of the birth of Gu Fangzhou, a renowned Chinese virologist and the founding father of China's polio vaccine program. In December 2025, the 43rd United Nations Educational, Scientific and Cultural Organization (UNESCO) General Conference officially included Gu Fangzhou's centenary in its list of internationally observed anniversaries, in recognition of his extraordinary contributions to global public health. This resolution represents not only international recognition of Gu's outstanding scientific achievements, but also highlights the vital contributions of China's polio elimination efforts to global public health. What Gu built is far more than a small sugar pill vaccine; it stands as an immortal spiritual monument safeguarding the health of hundreds of millions of children across China.

1. The making of a public health scientist

According to the student records of Peking University Health Science Center, Gu was admitted to the Department of Medicine, National Peking University Medical School (six-year program) in 1944. Among all the courses he took, his score in Public Health (Year 4, 3 credits) reached 96, the highest mark he earned throughout his studies, demonstrating his strong interest and remarkable potential in public health. In addition, according to Gu's oral history records, Professor Yan Jingqing (1905–2005) (Fig. 2) exerted an especially profound influence on him during his studies.[2] Yan graduated from Peking Union Medical College and subsequently earned an M.D. from New York University and a master's degree from the Harvard School of Public Health. In his teaching, he emphasized integrating disease prevention and control with social realities, guiding students to focus on major public health issues including infectious disease epidemics, maternal and child health, and occupational health. Influenced by Yan, Gu gradually forged a population-centered public health philosophy. He came to recognize that the value of medicine resides not only in treating individual patients, but more crucially in disease prevention and the promotion of public well-being. As he later remarked: "To practice clinical medicine can undoubtedly save countless individuals, while engaging in public health work stands to benefit millions of people."[3]

In July 1950, following his graduation from the National Peking University Medical School, Gu was assigned to work at the Dalian Institute of Health. Soon afterward, a pivotal turning point arrived in his career path: he was selected as one of China's first cohort of government-sponsored overseas students to pursue advanced studies in the Soviet Union. At the Institute of Virology of the USSR Academy of Medical Sciences, Gu had the privilege of studying under Professor E. N. Levkovich, a preeminent virologist renowned across the Soviet Union and the globe at that time. His dedicated working state was recorded in a 1951 photograph (Fig. 3), in which he carefully operated microscopes and documented experimental observations with extreme concentration.[1]

2. Building China's road to polio elimination

In the early 20th century, polio stood among the most dreaded diseases in industrialized nations, paralyzing hundreds of thousands of children annually.[4] From the late 1950s to the early 1960s, China was also confronted with a severe polio epidemic. At that time, the country suffered from limited domestic vaccine manufacturing capacity and an underdeveloped cold-chain logistics system, which created formidable barriers to the rollout of large-scale immunization programs. Against this backdrop, developing a vaccine tailored to China's national conditions for nationwide mass administration emerged as an urgent public health priority. In 1959, Gu was entrusted with this critical mission to lead a four-member expert panel on poliovirus vaccine, with the other three members including Dong Dexiang, Wen Zhongquan, and Jiang Jingwu. Following their study tour to the Soviet Union, the Ministry of Health

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Fig. 1. Professor Gu Fangzhou (1926–2019).[1]
Source: China Memory Project, National Library of China. The source of this image is cited in compliance with relevant legal requirements.



Fig. 2. Professor Yan Jingqing (1905–2005).
Source: Peking University Health Science Center Archive. The source of this image is cited in compliance with relevant legal requirements.

initiated and established the Poliovirus Vaccine Collaborative Group, which took charge of the research, development, and large-scale manufacturing of OPV in China, with Gu serving as the group leader. In addition, Gu led his team to collect thousands of serum samples in Beijing, Shanghai, and other cities for population-based detection of neutralizing antibody levels. Though this work may appear routine by modern standards, the newly reconstructed China lacked mature epidemiological protocols and computer-assisted data analysis, all data were processed with abacuses and hand-cranked calculators, and every statistical table was worked out manually by public health practitioners.

Building upon the imported Sabin attenuated virus strains obtained in 1959, the team systematically performed virological characterization, domestic adaptability verification, establishment of quality control systems, and formulation of standardized production workflows, ultimately achieving domestic manufacture of liquid-form OPV in 1960. Their most innovative achievement lay in transforming liquid vaccine into sugar pill formulations in 1962 to address two practical bottlenecks: inadequate cold-chain infrastructure and low vaccination adherence among children. This breakthrough extended far beyond a simple dosage-form modification. It substantially enhanced the vaccine's thermal stability, accessibility and public acceptability, while cutting logistics and storage costs and lowering operational barriers for vaccination delivery. Such advancement delivered core technical underpinnings for the smooth implementation of nationwide mass immunization campaigns. The development of the sugar pill vaccine represents both a pivotal technological innovation and a tangible embodiment of the "appropriate technology" principle in public health practice, marking a landmark contribution to China's journey toward poliomyelitis elimination. Furthermore, Gu proposed a herd-immunity-oriented immunization strategy and suggested universal oral vaccination for susceptible children during winter. Centered on calculating critical immunization coverage to determine the vaccination scale required to interrupt transmission chains, this was virtually the earliest application of operations research in China's large-scale vaccination planning.

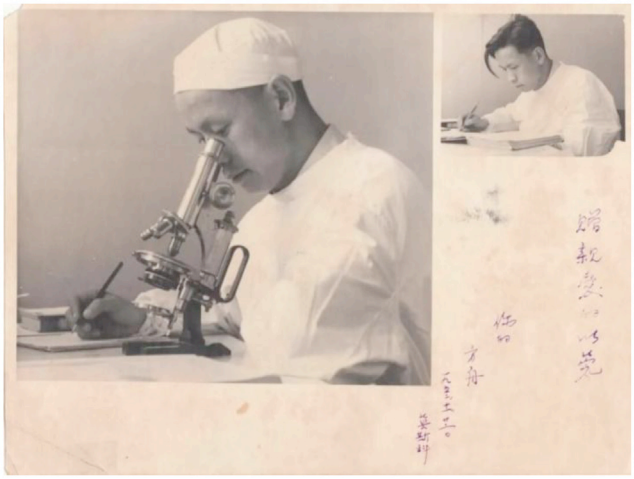


Fig. 3. Gu Fangzhou at work during his studies in the Soviet Union, 1951.
Source: China Memory Project, National Library of China. The source of this image is cited in compliance with relevant legal requirements.



Fig. 4. In 2000, Gu Fangzhou (fourth from the left in the front row) attended the signing ceremony for the *Certification Report on the Elimination of Poliomyelitis in China*.
Source: China Memory Project, National Library of China. The source of this image is cited in compliance with relevant legal requirements.

The eradication of poliomyelitis represents a global undertaking built upon decades of joint international efforts. In 1994, China successfully interrupted the indigenous transmission of wild poliovirus within its territory. In 2000, the World Health Organization (WHO) officially declared the Western Pacific Region, where China is located, polio-free.[5] This historic milestone is largely attributable to the nationwide large-scale rollout of the oral attenuated poliovirus vaccine developed by scientists led by Gu. In 2000, 74-year-old Gu signed the official certification report of polio elimination in China as a representative (Fig. 4) ,[1] bearing witness to the fruition of his decades-long devotion to this cause.

3. Enlightenments for future infectious disease governance

Against the continuing threat of emerging and re-emerging infectious diseases, China's experience in polio control offers enduring lessons

for contemporary public health governance. Effective infectious disease control requires integrated governance linking innovation with surveillance, immunization, policy, and implementation. China successfully interrupted indigenous poliovirus transmission through such coordinated efforts across vaccine development, national immunization, surveillance, health-system mobilization, and industrial support. This governance capacity remains relevant to contemporary infectious disease threats. The COVID-19 pandemic, for example, demonstrated that rapid response to a novel pathogen requires not only scientific and technological innovation but also coordinated surveillance, risk communication, resource mobilization, and implementation across different levels of the health system. Similarly, the detection and management of imported polio cases underscore the continuing importance of sensitive surveillance and rapid immunization response even in settings that have interrupted indigenous transmission. Thus, the experience accumulated through China's polio control provides a useful reference for strengthening integrated and resilient infectious disease governance.

Second, public health innovation must be guided by population needs, contextual adaptability, and equitable access. Gu's team adapted the OPV to China's public health context, addressing challenges including limited cold-chain capacity, underdeveloped healthcare infrastructure, and huge number of children to be vaccinated. The development and large-scale application of the sugar-pill formulation reduced operational barriers to mass immunization and exemplified the principle of context-sensitive technological innovation. This principle remains pertinent to the introduction and scale-up of vaccines and other public health interventions for emerging infections, including mpox, particularly where disparities in vaccine availability, delivery capacity, and health-system resources affect access to prevention. Public health technologies should therefore be evaluated not only by their scientific performance but also by their feasibility, accessibility, and capacity to reach populations in need. Such people-centered and context-sensitive innovation remains relevant to strengthening equitable infectious disease preparedness and response globally.

4. Beyond polio: a legacy for global public health

Gu once delivered a message to young scientific researchers: "Grow up quickly and serve the motherland." Today, this aspiration bears profound implications far beyond polio prevention and control. Gu's legacy encompasses not only the self-developed sugar pill vaccine that facilitated China's polio elimination, but also a distinctive public health scientific spirit rooted in national strategic needs, people-centered health governance, independent innovation, and global vision. Amid the evolving landscape of global infectious disease risks, upholding Gu's legacy enables the sustained transformation of China's technological innovation capacity, public health governance experience, and institutional advantages accumulated through polio elimination into systematic capabilities and enduring resources for addressing future global health challenges.

Yet the world remains far from the complete eradication of poliomyelitis. As of 19 August 2026, confirmed new polioviruses cases persist in the Central African Republic, Afghaniatan, Democratic Republic of the Congo, Niger, Sudan, and Nigeria.[6] Furthermore, global public health systems continue to grapple with persistent threats from emerging and re-emerging infectious diseases. Recent disease outbreaks and resurgences—such as Ebola disease caused by Bundibugyo virus in Democratic Republic of the Congo & Uganda, Hantavirus outbreak linked to cruise ship travel, Nipah virus disease in India, and yellow fever globally in 2026[7]—underscore a persistent reality: infectious disease control remains an unfinished global agenda.

These persistent challenges reaffirm the enduring relevance of Gu's legacy. In a world where epidemic risks remain unevenly distributed and rapidly evolving, the principles embedded in his work—equitable access to vaccines, context-sensitive technological adaptation, and system-level coordination—continue to serve as essential foundations for global health security.

Authors' contributions

Song QF: Writing – original draft, Investigation. Shi JY and Liang YF: Writing – review & editing. Wang Y: Conception, Writing – review & editing. All authors reviewed and approved the final version of the manuscript.

Declaration of generative AI and AI assisted technologies use

During the preparation of this work, the authors used large language models to assist with language editing, translation, and figure formatting. After using this tool/service, the authors closely reviewed and edited the content as needed and take full responsibility for the final content of the publication.

Conflict of interest disclosure

The authors declare no potential conflict of interest.

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