Recollection

China-UK Global Health Collaboration Project on Strengthening Public Health Capacity in Sierra Leone

Xiuli Xue[1]; Jiewen Wu[1]; Lili Wang[1]; Idrissa Laybohr Kamara[2]; Mingfan Pang[1]; Xiaopeng Qi[1,#]

ABSTRACT

Since 2016, the Chinese Center for Disease Control and Prevention has continued to conduct project to assist Sierra Leone in improving its public health capacity and building a laboratory for bacteriological and parasitic diseases. Firstly, we can understand the epidemiological characteristics, etiological characteristics and drug resistance of important infectious diseases in Africa through this project, and provide services and guarantees for the construction of the Belt and Road Initiative. Secondly, the project is to carry out scientific research cooperation on the monitoring and detection capacity of major infectious diseases, biosecurity, and prevention and control technologies for important infectious diseases. Thirdly, in order to implement the concept of "building a community with a shared future for mankind", it is important to improve the capacity of Sierra Leone and West Africa to prevent and control infectious diseases, maintain global health security, and participate in global health governance. This article reviews the implementation of the project, and summarizes the experience and shortcomings, in order to help readers achieve better results in future project practice.

RATIONALE

The Ebola epidemic across West African countries severely compromised Sierra Leone's health system (*1*), exposing critical vulnerabilities in its public health infrastructure, particularly in surveillance capabilities, laboratory testing capacity, and the availability of skilled public health professionals (*2*). The Sierra Leone-China Friendship Bio-safety Level 3 Laboratory (hereinafter referred to as "the BSL-3 Laboratory"), constructed with Chinese government assistance, commenced operations in March 2015. This facility was designed to conduct surveillance and detection of Ebola, malaria, and other infectious disease pathogens, while simultaneously serving as a training center for developing highly qualified laboratory personnel in Sierra Leone (*3*). Given the prevalence of emerging infectious diseases and the insufficient viral and bacterial testing capabilities of existing facilities, there was an urgent need for enhanced professional training of local technical staff. Building upon the existing laboratory infrastructure, our objective was to assist Sierra Leone by establishing comprehensive viral, bacterial, and parasitic testing facilities, strengthening the existing laboratory surveillance system and data management network, and fostering new partnerships for cooperation and resource exchange to improve the country's epidemic and pandemic preparedness (*3*).

Building on successful exchange programs with Public Health England (PHE) and the robust foundation of China-Sierra Leone cooperation (*4*), China CDC initiated an exploratory project in 2016 under the China-UK Global Health Support Programme to enhance Sierra Leone's public health capacity (*5*). Through this initiative, PHE provided ongoing support to China CDC for laboratory testing and capacity building at the BSL-3 Laboratory, leveraging UK expertise and resources. The project's management office (PMO), housed within the Centre for Project Supervision and Management, National Health Commission of the People's Republic of China, oversees daily operations and project management.

PROJECT CONTENT AND ACTIVITIES

China provided comprehensive support to Sierra Leone in developing surveillance and detection capabilities for emerging and re-emerging infectious diseases, training essential health management and technical experts, and establishing technical communication mechanisms with key international partners, including the Ministry of Health of Sierra Leone and the UK.

Conducting A Systematic Survey in Sierra Leone

Expert teams conducted comprehensive field

research visits to Sierra Leone to assess the country's infectious disease epidemiological profile, evaluate existing public health infrastructure, and examine the BSL-3 laboratory's operational status. This systematic assessment aimed to identify priority diseases for laboratory testing, evaluate technical and staffing gaps, and determine optimal strategies for integrating the new laboratory within the local public health system.

Sierra Leone's Major Diseases Malaria remains Sierra Leone's predominant vector-borne disease. According to the *World Malaria Report 2023*, the country documented 2,651,760 malaria cases and 8,212 malaria-related deaths in 2022, yielding a case fatality rate of 0.3% (*6*). Additionally, cholera, typhoid, and other enteric diseases constitute significant infectious disease burdens in the nation.

Sierra Leone's Public Health System Chinese experts participated in weekly emergency response meetings coordinated by the Ministry of Health and Sanitation (MoHS), Sierra Leone and conducted field assessments in Makeni. Through these investigations, the experts gained comprehensive insights into Sierra Leone's public health system infrastructure and healthcare operational frameworks. Several critical challenges were identified within the health system, including inadequate epidemic preparedness and response capabilities, insufficient national epidemic surveillance data systems, and unsustainable parasitic disease control programs (*7*).

Operation and Management of the Current Laboratory

The BSL-3 Laboratory, established by the Ministry of Commerce, People's Republic of China, operated under Chinese expert management with local Sierra Leonean staff participating in daily operations. While the facility conducted passive surveillance for Ebola pathogens, it lacked comprehensive bacterial and parasitological testing capabilities. Additionally, a limited number of Sierra Leonean personnel possessed only basic testing skills and were unable to work independently or participate in project management activities.

Carry Out Laboratory Cooperation and Collaboration

Chinese experts facilitated collaborative site visits with PHE representatives Dr. Marcus and Dr. Bausch to the BSL-3 Laboratory and Makeni Regional Hospital Molecular Laboratory. These visits enabled comprehensive knowledge exchange regarding laboratory scale, operational scope, biosafety protocols, staffing structures, and training programs.

Establishment of Bacteriology and Parasitology Testing Laboratories

The Sierra Leone-China Friendship Hospital provided space for establishing bacteriology and parasitology testing laboratories. Chinese experts led the comprehensive laboratory development, implementing a design that incorporated distinct zones with clear signage and separated pathways for personnel, specimens, and laboratory waste to ensure compliance with infection control and prevention protocols. The experts assessed existing bacterial testing reagent inventory, equipped the laboratory with testing apparatus scaled to anticipated specimen volumes, and established robust systems for laboratory storage and waste management. These systems supported the cultivation, storage, and safe disposal of bacterial strains, enabling comprehensive bacterial and parasitic testing capabilities.

Establishing Laboratory Standard Operating Procedures (SOPs)

Chinese experts developed standardized testing procedures for *Vibrio cholerae* and *Salmonella typhi* pathogens, focusing on stool sample analysis from diarrheal patients. They completed procedural documentation and laboratory operation manuals for parasitic disease testing, with particular emphasis on the *Plasmodium* parasite responsible for malaria, incorporating the World Health Organization (WHO) SOPs for *Plasmodium* microscopy detection. These measures ensured consistent laboratory operations and project continuity.

Training and Practice for Laboratory Personnel

Laboratory personnel training was strategically organized by work specialization, with customized theoretical and practical training programs developed for each area. The curriculum encompassed pathogen monitoring and detection in bacteriological laboratories, standardized laboratory operations, sentinel hospital sample collection methodologies, and data collection and statistical analysis. In response to public health emergencies in Sierra Leone, additional practical training sessions focused on environmental sample collection in affected areas, disease surveillance protocols, and environmental decontamination

procedures.

PROJECT IMPACTS AND DELIVERABLES

Through rigorous quantification of project outcomes and comprehensive feedback from both UK and Sierra Leone stakeholders, this initiative has achieved its intended impacts. The project successfully trained laboratory professionals to operate BSL-3 facilities, establishing sustainable and efficient operations that exemplify the mutual benefits of China and UK's collaborative health assistance to Sierra Leone.

Chinese Perspective

From China's perspective, the multi-stakeholder collaboration enhanced the nation's capacity to coordinate international health cooperation resources. The China-UK partnership optimized resource sharing and joint laboratory capacity building, maximizing the advantages of their collaborative program. Additionally, the diversification of China's foreign aid activities in Sierra Leone accelerated the development of China's global health workforce, strengthening the country's capacity for international engagement.

Sierra Leone's Perspective

From Sierra Leone's perspective, the establishment of bacteriological and parasitological testing laboratories markedly enhanced the nation's diagnostic capabilities. The successful training of 19 local laboratory technicians has been instrumental in building sustainable operations (*8*). This comprehensive capacity-building initiative improved Sierra Leone's ability to design testing protocols, manage biosafety programs, and maintain a skilled surveillance and testing workforce. The trained laboratory personnel are now central to strengthening the country's emerging infectious disease surveillance systems.

UK's Perspective

The United Kingdom's involvement optimized resource allocation by preventing redundant laboratory investments, thereby enhancing funding efficiency. This tripartite cooperation model improved the effectiveness of UK aid programs while strengthening their capacity to deliver health assistance. Furthermore, the project enabled the UK to leverage its healthcare expertise by transforming technical knowledge, resources, and governmental influence into tangible improvements in socioeconomic outcomes and health security, ultimately advancing their strategic objectives.

The laboratory has achieved significant recognition, being designated as Sierra Leone's "National Reference Laboratory for Viral Hemorrhagic Fever" and "National Training Centre for Virus Detection and Biosafety." During the COVID-19 pandemic, it served as the primary testing facility not only for Sierra Leone but also for the entire West African region.

SUCCESS FACTORS

The United Kingdom's financial support served as the primary catalyst for the project's success. Their comprehensive involvement extended beyond funding to include laboratory capacity-building initiatives and collaborative exchanges. The UK's extensive experience in international project management significantly enhanced the implementation strategy. Their established global health network provided crucial support in developing technical communication mechanisms between China CDC and key stakeholders, including Sierra Leone MoHS, PHE, and other international partners (*9*).

The laboratory capacity training led by Chinese experts constituted another critical success factor. This foundation enabled China and the UK to jointly develop and share laboratory capacity-building resources, leading to optimized resource utilization through mutual exchange of outcomes and experiences.

Sierra Leone's receptive approach toward public health cooperation with China and the UK proved instrumental to the project's success.

LESSONS AND EXPERIENCES

The establishment of an effective communication and coordination mechanism provided a robust foundation for project implementation. Throughout both the application and execution phases, the Center for Global Public Health, China CDC, maintained consistent communication with the Project Management Office through regular progress reports, prompt problem identification, and collaborative solution development guided by the PMO-designated project manual, ensuring smooth project progression.

A strategic focus on innovation and collaboration

enabled project expansion beyond its initial scope. Building upon previously established international partnerships, China CDC effectively engaged with PHE, CDC, WHO, UN, and other international organizations to develop new collaborative opportunities (*10*).

Complex logistical challenges and force majeure events, including a devastating mudslide in Freetown in August 2017, impacted expert secondments to international organization offices in third countries. Based on these experiences, researchers recommend earlier planning for secondments to accommodate administrative procedures and enhanced communication with international organization offices in host countries to secure necessary approvals and support.

NEXT STEPS

The China-UK Global Health Programme should expand its multilateral health technical cooperation initiatives in global health, with particular emphasis on tailoring interventions for African nations and other developing countries. By combining China's extensive expertise in infectious disease prevention with the UK's established global health network, this collaboration has the potential to achieve significant innovations and breakthroughs in international public health capacity building.

doi: 10.46234/ccdcw2025.006

[#] Corresponding author: Qi Xiaopeng, qixp@chinacdc.cn.

[1] Center for Global Public Health, Chinese Center for Disease Control and Prevention, Beijing, China; [2] Sierra Leone-China Friendship Biological Safety Laboratory, Ministry of Health and Sanitation, Freetown, Sierra Leone.

Submitted: July 10, 2024
Accepted: December 20, 2024
Issued: January 03, 2025

REFERENCES

1. Huang Y. Current situation and needs of pest control in Sierra Leone. Chin J Hyg Insect Equip 2020;26(3):281 – 3. https://doi.org/10.19821/j.1671-2781.2020.03.025.
2. Ansumana R, Bonwitt J, Stenger DA, Jacobsen KH. Ebola in Sierra Leone: a call for action. Lancet 2014;384(9940):303. https://doi.org/10.1016/S0140-6736(14)61119-3.
3. Wang Q, Zhou WM, Zhang Y, Wang HY, Du HJ, Nie K, et al. Good laboratory practices guarantee biosafety in the Sierra Leone-China friendship biosafety laboratory. Infect Dis Poverty 2016;5(1):62. https://doi.org/10.1186/s40249-016-0154-5.
4. Zhang Y, Gong Y, Wang CY, Liu WS, Wang ZY, Xia ZP, et al. Rapid deployment of a mobile biosafety level-3 laboratory in Sierra Leone during the 2014 Ebola virus epidemic. PLoS Negl Trop Dis 2017;11(5):e0005622. https://doi.org/10.1371/journal.pntd.0005622.
5. Zhou H. Studies on British health diplomacy a case study of China-UK global health support program [dissertation]. Shanghai, China: Shanghai International Studies University, 2020. http://dx.doi.org/10.27316/d.cnki.gswyu.2020.000932. (In Chinese)
6. World Health Organization. World malaria report 2023. Geneva: World Health Organization; 2023. https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023.
7. Duan L, Wang LL, Lu SN, Wang B, Li YB, Xu QL, et al. Development and impacts of the sierra Leone-China laboratory for parasitic diseases testing and surveillance. China CDC Wkly 2021;3(15):327 – 30. https://doi.org/10.46234/ccdcw2021.088.
8. Wang LL, Tia AB, Xu B, Qi XP, Harding D. Sustainable laboratory capacity building in Sierra Leone: from Ebola to COVID-19. China CDC Wkly 2023;5(28):632 – 6. https://doi.org/10.46234/ccdcw2023.120.
9. Zhang GR. Aid to Africa by UK: performance, characteristics and influences. Int Econ Coop 2011(5):38-42. https://d.wanfangdata.com.cn/periodical/gjjjhz201105009. (In Chinese).
10. Chen ZL, Chang GH, Zhang WY, Chen Y, Wang XS, Yang RF, et al. Mobile laboratory in Sierra Leone during outbreak of Ebola: practices and implications. Sci China Life Sci 2015;58:918 – 21. https://doi.org/10.1007/s11427-015-4912-6.