Learning Question 1: *What are the contributions of systems thinking approaches and tools to changes in health system outcomes? How do systems thinking approaches affect health system outcomes?*

Strengthening the Diagnostic Capacity of the National Laboratory System in Liberia

HEALTH SYSTEMS STRENGTHENING ACCELERATOR

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Context

The 1989–2003 civil war severely disrupted Liberia's health system, including the diagnostic network. The Ebola outbreak that followed in 2014–2016 disrupted human resources and supply chains, further stalling progress in strengthening the health system. Today, the country's fragmented laboratory system remains poorly coordinated and scattered across vertical disease-specific control programs and health facility-based management. With the health system in Liberia experiencing challenges at all levels, ranging from basic needs such as supplies, equipment, and commodities to complex systemic problems, and the high burden of disease in the country, the diagnostics, surveillance, and response systems still need to be strengthened to be able to effectively respond. As a result, efforts to improve infectious disease detection and surveillance systems are ongoing, and much still needs to be done.

Laboratories are an essential component of the health system with the goal to improve health outcomes. Reliable and timely results of laboratory investigations are an essential factor in decision-making in almost all aspects of health care and in meeting international obligations such as the International Health Regulations (2005).[1] Under the revised International Health Regulations (IHR 2005), countries are required to develop the capacity to prevent, detect, investigate, and report to the international community, through WHO, potential public health emergencies of international concern. This is achievable through establishment of a credible, reliable, accessible, and sustainable laboratory service that is capable of early detection and characterization of epidemic- and pandemic-prone pathogens, safely containing and handling those pathogens, and producing high-quality results in a timely manner. Developing the laboratory policy and laboratory strategic guidelines documents is an important first step in improving the laboratory system.

[1] WHO Strategic Framework for Strengthening Health Laboratory Services; WHO Document: EM/LAB/390/E

Activity Description

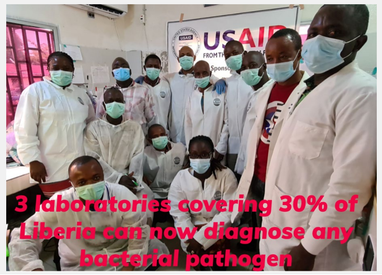
Strengthen leadership and governance of the national laboratory systems

- **Supported the development and finalization of the laboratory policy, strategic plan, and standardization guidelines;** validation; and dissemination to the 15 counties, targeting all county and district laboratories.
- **Strengthen the National Diagnostic Division (NDD) human resource by assisting the recruitment for three vacant positions**: At the time, the USAID Infectious Disease Detection and Surveillance (IDDS) project was launched, only a director and support staff ran the NDD. IDDS assisted the NDD to identify funding to support three technical leads in the division; a national laboratory operations manager; a national laboratory training and supervision officer; a laboratory surveillance coordinator; and a national laboratory supply chain coordinator.
- **Provide technical assistance (TA) to NDD leadership on coordination of laboratory activities and importance of collaborations with NRL, the Central Veterinary Laboratory, and other One Health platform members.** IDDS embedded a diagnostic network advisor in the Ministry of Health (MoH)/NDD central level to advise on laboratory leadership, emphasizing all the laboratory pillars. At the county level, IDDS also embedded diagnostic network advisors to provide TA to the county diagnostic officer and mentorship to laboratory staff in their respective counties. This helped build functional regional diagnostic teams that can rapidly detect threats, respond in a timely manner, and liaise with the central labs.

Address the diagnostic network gap through decentralization of priority pathogen testing services

- Establish three laboratories, two proposed regional reference laboratory, and one county laboratory. This was guided by the **National Laboratory Standardization Guidelines which defines the tests required at each tier level (page 9, and annex 16)** and the **strategic objective 3 in the Five-Year strategic plan for the national laboratory system of Liberia.** IDDS supported the renovation of G.W. Harley Hospital Laboratory to a modern laboratory aligning to international standards as defined in the National Medical Laboratory Infrastructure Guidelines (April 2020). IDDS also upgraded the solar system at Tellewoyan Laboratory so that they can provide 24-hour services.
- **Fully equip** the three laboratories and providing reagents and supplies needed for priority pathogen detection
- **Train laboratory technicians** on basic diagnostic procedures including pathogen detection and antimicrobial sensitivity testing. IDDS trained technicians from the three bacteriology laboratories. One of them became a master trainer and continues diagnostic testing mentorship in the three laboratories.

Engage government agencies: MoH National Diagnostic Division, National Public Health Institute of Liberia (NPHIL) National Reference Laboratory, County Health Teams, and other laboratory stakeholders such as the U.S. Centers for Disease Control, World Health Organization, GIZ, PIH, Integrated Quality Laboratory Services, Riders International Liberia, and FAO (One Health platform). IDDS engaged MoH and NPHIL during a planning phase and assisted in setting up meetings for the laboratory technical working group (TWG) to discuss materials development. For renovation work, IDDS worked with the MoH infrastructure Department and used specifications from the National Medical Laboratory Infrastructure Guidelines (April 2020). For equipment installation, IDDS worked with county health teams and county biomedical technicians to ensure they own the equipment and are trained by IDDS vendors.



Activity Impact

How did this activity strengthen the health system? Which components of the health system did you act on (for example, did you support improvements in financing, cross-sectoral coordination, governance, local ownership, information, human resources, behavior of health system actors, service delivery, or medical products, vaccines, or technologies)?

- IDDS activities strengthen the laboratory governance component and service delivery to improve detection of pathogens. IDDS activities emphasize local ownership by building capacity of the local teams to provide services and the national level to monitor and improve the quality of the system. It was necessary to empower both the national-level and county-level laboratory leadership to start monitoring the pillars of the laboratory system in their areas.

How did the pieces of your activity come together to impact equity, quality, and/or resource optimization in the health system?

- The national-level stakeholders increased their collaboration with other government departments such as the supply chain management unit, the human resources unit, the Health Monitoring, Evaluation and Research (HMER) unit, and parallel programs for improved coordination of laboratory activities and effective use of resources. The central unit was able to tap into funding from other partners to provide integrated laboratory supervision; staff now visit the counties not for only one disease component but to use the opportunity to address any other challenge they encounter at the facilities. The embedded IDDS diagnostic network advisor enabled them to coordinate their partners and mobilize resources for the laboratory system, which does not have a designated budget line from the treasury.

How did these improvements in equity, quality, and/or resource optimization lead to better health outcomes?

- A critical pillar in strengthening the diagnostic network is providing quality health services. Liberia scored low on quality in the 2016 Joint External Evaluation (JEE). IDDS provided support in strengthening the quality management system (QMS) in the laboratories through introduction of the Strengthening Laboratory Management Toward Accreditation (SLMTA) QMS, which involves diagnostic specialists providing mentorship to the laboratories. Using the WHO-AFRO Stepwise Laboratory Improvement Process Towards Accreditation (SLIPTA) checklist, the three county laboratories providing diagnostic testing services have a score of at least one star, while the district laboratories have shown an increase in their SLIPTA score, indicating an improvement in quality of services provided by these laboratories.

How does this activity contribute to health system resiliency and/or sustainability?

- IDDS is empowering local technicians to build the systems and ensuring they lead in the implementation of the systems. The master trainer for bacteriology, a technician at Phebe Hospital, has been providing mentorship to his peers in Tellewoyan and GW Harley, who are becoming more confident in pathogen identification. IDDS worked with local biomedical technicians on issues pertaining to equipment maintenance and repair, empowering them to become the custodians of these equipment in their facilities. This was a sustainable approach to servicing and maintenance of equipment. Engagement of the different partners ensured that the NDD maximized partner funding to build a sustainable laboratory system. Decentralization of diagnostic testing services improved community access, enabling faster diagnosis and patient management, improving patient outcomes, and ensuring equitable provision of laboratory services.

Evidence

What evidence do you have of your activity's impact on health system or health outcomes?

The NRL was the only public health laboratory providing diagnostic services in the country and they mainly focused on diarrheal pathogens. IDDS introduced diagnostic testing services at three clinical laboratories (serving 30 percent of the country's population), which are now capable of informing public health authorities as they do diagnostic surveillance by reporting any priority pathogen they detect and reporting any cases of antimicrobial resistance. In short, IDDS added three functional laboratories to the diagnostic network.

How can you best show what your activity accomplished? How do you know that you met your goals? Is the evidence able to be measured?

Availability and functionality of the laboratories in Bong, Lofa, and Nimba is evidence that the activity was accomplished. The laboratories are fully equipped and have reagents and consumables to provide presumptive diagnosis of any bacterial pathogen. Laboratory reports of results sent to the clinicians demonstrate the success of the intervention. IDDS has also assisted the laboratories to develop handbooks that include turnaround times for testing. The table below shows the capacity built by IDDS in the three laboratories compared to the capacity at baseline. The baseline assessment was conducted in 2019 when IDDS was launched. IDDS used the Liberia Laboratory Assessment Tool adapted from the global standard for Laboratory Assessment of Antibiotic Resistance Testing Capacity Tool (LAARC).

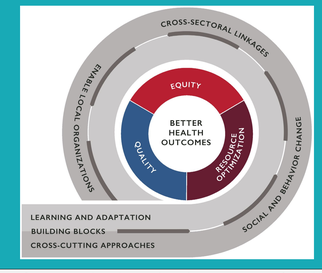
	Tellewoyan		G.W. Harley		Phebe	
	Baseline (2019)	2022	Baseline (2019)	2022	Baseline (2019)	2022
Specimen collection	67%	100%	60%	95%	70%	100%
General Microbiology	17%	86%	24%	86%	50%	90%
Bacterial Disease Detection	13%	81%	0%	75%	45%	92%
Equipment	44%	83%	5%	85%	79%	88%

Facilitators

What aspects of the health system, context, or external partner support helped make this successful? For example, were there existing working groups in place that enabled efficient coordination between stakeholders on this activity? Did you use a tool or knowledge resource from a global partner like WHO or UNICEF to help inform your activity?

- The laboratory TWG was key in the finalization and validation of strategic documents. IDDS engages NDD and communicates with other laboratory stakeholders in their implementation of activities. This approach was used so as to enable partners to learn from each other.
- The Liberia Laboratory Assessment Tool was adapted and is now used to facilitate diagnostic checklists and supervisions at the regional level.
- The WHO-AFRO SLIPTA checklist is used to measure progress of QMS implementation in the laboratories enrolled in the SLMTA program.

USAID's vision for Health Systems Strengthening guided these facilitation activities.



U.S. Agency for International Development (USAID). 2021. *USAID Vision for Health Systems Strengthening 2030.* Retrieved from: https://www.usaid.gov/sites/default/files/documents/USAID_OHS_VISION_Report_FINAL_single_5082.pdf.

Challenges

- The COVID-19 pandemic was an unexpected challenge that slowed down implementation progress due to travel restrictions within country.
- Staff attrition (in excess of IDDS-anticipated levels) led to repeat trainings. IDDS engaged the NDD and the USAID Mission, alerting them of the challenge. The NDD made efforts to engage the HR department and the Assistant Minister of Health on this issue.
- Data management was an anticipated challenge, with a paper-based system still in use. The system is prone to errors in both entry and reporting. IDDS procured computers to assist in updating the data management system, but there is a need to extensively train the teams on the ground.
- Given the skills and knowledge gap in Liberia, more contact time with technicians is needed to ensure they understand the principles around laboratory testing. In addition to bench training, IDDS provides mentorship and supportive supervision to address skills and knowledge gaps.
- There is a need for the country to build an integrated specimen referral system (another anticipated challenge).

Lessons Learned

- Capacity building should be locally owned. Building capacity of local technicians at all levels ensures ownership. Training local technicians as master trainers empowers them to build the capacity of their peers.
- Empower local people to own the system that you are building by engaging them as the key implementers of your activities.
- Capacity building is a continuous process. The implementing partner and MoH should identify indicators that help them to monitor and evaluate the success of any capacity building effort.
- Engaging the MoH staff at all levels and laboratory stakeholders helps to build a strong system.
- Implementing partners should listen to the needs of the local government and adapt methods and approaches that are applicable to the settings. Partners should use strategies that are tailored to the situation (there is no one size fits all).

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