Laboratory testing is essential for diagnosis and effective treatment of HIV/AIDS. Viral load monitoring has complex technical and logistical requirements, and needs continual expert guidance, sustained country and stakeholder support and quality management systems to function reliably. APHL assistance has been key to efforts in several countries in sub-Saharan Africa to implement quality testing services to monitor antiretroviral treatment effectiveness.
Implementation Framework
APHL’s viral load scale-up work in Zimbabwe began with creating a comprehensive implementation framework for the program.

Testing Path of Work Flow for Viral Load Testing
This process starts with request for a viral load test by clinicians, collection of a venous blood specimen from the patient, packaging and transport to a hub laboratory, specimen preparation (centrifugation), transport to a viral load lab, testing, results verification and interpretations, test result report to the clinician, data management and post-test storage or disposal of specimens.

Accurate, reliable and timely viral load test results are essential to patient care. The UNAIDS goal of providing access for 90% of HIV infected persons is one of the essential steps in ending the HIV epidemic.

Monitoring and Evaluation System
At every stage in the testing process, quality indicators or measures are used to monitor the achievement of process requirements and targets. These indicators are very important in monitoring progress and evaluating the impact of the program.

Collaboration
There have been efforts for collaboration, coordination and leveraging amongst all stakeholders including PEPFAR partners, Ministry of Health, Global Fund, civil society and other interest groups. This has brought harmonization of partner efforts as partners are fully aware of all activities. Collaboration and leveraging are done in areas of demand creation, sample transport, sensitization of clinicians, community involvement, procurements and data management. Coordination occurs at national to provincial and district levels. Establishing viral load committees within the Ministry of Health has helped to keep everyone focused on the scale-up agenda.

Personnel
Full-time laboratory mentors were assigned to coordinate implementation of the Viral Load Program at six hospital laboratories supporting their provinces and districts.

Equipment, Reagents, and Consumables
APHL assisted in the procurement of Ministry of Health-approved equipment to support viral load scale-up. Since the system for viral load testing was enabled in September 2016, machines have

Laboratorian Yavonne Mbaura prepares viral load samples for testing at Masvingo Laboratory in Zimbabwe
been utilized above 100% resulting in immediate and abrupt improvement in the test numbers. Bundling comprehensive equipment services with reagent price was an effective strategy to assure reliable maintenance support that included pre-positioning of key repair parts. Additionally, all ancillary equipment, consumables and reagents usable with the proprietary viral load equipment that were not already available were procured just ahead of the arrival of the viral load machines. This ensured rapid startup of fully-functional testing facilities. APHL also supports the labs and the 585 PEPFAR-supported clinics with specimen collection tubes, viral load request forms, specimen preparation materials, test reagents and required office supplies (e.g. printer cartridges, printer paper and barcode stickers).

Sample Referral System
A hub-and-spoke model coupled with clustering of clinics and efficient managing of specimen collection for riders was implemented. 36 PEPFAR priority sites received a motorbike supported by the program to enable collection of samples from “spokes” and delivery to the “hubs.”

Quality System
Each viral load testing laboratory received technical assistance from their mentor to establish a quality management system and ensure accurate, timely and reliable testing. The mentors also visit hubs that manage samples to ensure they have the capacity to sort, record in referral registers, determine accept/reject and proper storage prior to shipment handling of samples for shipment to the viral load laboratory.

Information Systems
When the program started, a paper-based system was in place, which was insufficient to manage the increasing specimen receipts and patient data. The program registers and office supplies used to capture data are being replaced at five of the six supported labs by an electronic laboratory information system (LIS), which is being configured to suit the needs of the laboratories.
Laboratory Information System (LIS) Viral Load Workflow Used in Mozambique

1. Laboratorian uses a software application to order viral load tests and print sample barcodes.

2. Each referral specimen receives a unique barcode.

3. A barcode is affixed to each patient form.

4. Dried blood sample is packaged with patient form and barcode to be sent to referral lab.

5. Samples are registered in the lab information system at viral load referral laboratories using a barcode scanner.

6. Once samples are registered in the system, viral load testing can begin.
In conjunction with CDC-Mozambique and other PEPFAR partners, APHL-Mozambique is increasing the number of viral load reference laboratories with LIS capabilities. Currently, six viral load labs have LIS capability and three additional viral load labs will receive LIS installations this year. This system allows viral load reference laboratories to track specimens through the workflow, and interface with equipment so that results are uploaded into the system automatically, in addition to storing the results and sending them to LIS-equipped referral sites.

APHL will aid clinical partners with the installation of a LIS for approximately 80 viral load referring facilities. This software application allows referring labs to enter patient demographic information and create a unique barcode for each sample. Samples are then transported to a viral load lab which can scan the barcode, populating all patient information into the LIS via the server connection between the system and the application.

In Zambia, APHL is supporting a National Viral Load Scale-Up Program through strengthening the Specimen Referral Transport Systems and providing backup power solutions at viral load sites. Backup power ensures that viral load testing can be done continuously, even if other power sources at laboratories are not functional. APHL has begun work on nine sites to provide solar backup power or an uninterruptible power supply, and will begin working at an additional 10 sites this year. APHL is also providing LIS support to manage the data needs of viral load testing, and is also in the process of hiring four medical laboratory mentors. The mentors will be stationed at four key laboratories across the country and will provide technical expertise and oversite of the viral load program.

APHL has also provided technical support to the Zambian Ministry of Health in drafting and finalizing the National Laboratory Strategic Plan, as well as the National Laboratory Operational Plan. These plans were developed by hosting two week long meetings with stakeholders from APHL, Ministry of Health and other implementing partners in Zambia.

APHL has supported the development of the Ghana Laboratory Viral Load Testing Extension Plan in coordination with CDC-Ghana, the Ghanaian Ministry of Health, Ghana Health Service, and the National AIDS Control Programme. In order to garner support for Ministry of Health approval and implementation, APHL and CDC-Ghana hosted a Viral Load Stakeholder Meeting with 69 stakeholders from all 10 regions in Ghana.

To determine current capacities, APHL supported a baseline viral load assessment using the Viral Load Scorecard. Based on this assessment, implementation of viral load testing scale-up activities will occur in a phased approach from 2017-2020 and will include program management, test equipment, supply chain management and logistics, human resources and training, specimen referral and result transmission, quality assurance programs, laboratory information management and monitoring and evaluation.

APHL is working with CDC to implement viral load remote log-in of samples through a web interface of the LIS installed at the National HIV Reference Laboratory (NHRL). Remote log-in allows remote sites to log samples in the viral load testing laboratory, monitor progress, view results and retrieve results. The system enables data entry from the referring facility to reduce transcription errors and ensures faster delivery of data to NHRL and reduced turnaround times.
Association of Public Health Laboratories

The Association of Public Health Laboratories (APHL) works to strengthen laboratory systems serving the public’s health in the US and globally. APHL’s member laboratories protect the public’s health by monitoring and detecting infectious and foodborne diseases, environmental contaminants, terrorist agents, genetic disorders in newborns and other diverse health threats.

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