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**Efficiencies for Clinical
HIV Outcomes (ECHO)**

Viral Load Technical Brief

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Efficiencies for Clinical HIV/AIDS Outcomes (ECHO) aims to support the Government of Mozambique (GRM) in achieving epidemic control by optimizing HIV service delivery, with an emphasis on strengthening local systems and paving the way for future sustainable, government and local organization-led HIV response.

Introduction

Viral load (VL) is the measurement of copies of HIV per milliliter of blood (copies/mL) in someone who has HIV. Taking HIV medicine can reduce one's VL so that they are virally suppressed (<1000 copies/mL) and even so low that it is undetectable (<200 cp/mL). People who maintain viral suppression or an undetectable VL stay healthy for many years and will not transmit HIV to their sexual partners. As part of ECHO's 95-95-95 goal, ECHO aims to have 95% of those on treatment be virally suppressed. In addition to maintaining their antiretroviral therapy (ARV) course, patients must maintain a regular VL testing schedule so that clinicians know that they remain virally suppressed or can be alerted to reach out to a patient with high VL (>1000 cp/mL). High VL means that an individual may not be adhering to their ARV course or has therapeutic failure. Having high VL can make an individual more vulnerable to opportunistic infections (e.g. tuberculosis), which can lead to related cancers (e.g. Kaposi's sarcoma and cervical carcinoma). Additionally, patients with high VL have a higher risk of transmitting HIV to their sexual partners. In its initial phase, ECHO faced challenges with this extremely important indicator.

Technical barriers, such as lack of testing supplies, stockouts of testing equipment, and challenges in sample referencing of VL samples, made it difficult to track patients' VL levels. Additionally, understaffed health facilities were often overwhelmed with patients, resulting in long wait times for VL sample collection. Barriers like lack of understanding of the eligibility criteria for VL tests among health facility staff and lack of understanding of the importance VL testing among patients compounded the problem. This resulted in many lost opportunities for VL collection. Additionally, labs that test VL samples struggled with transportation and equipment failures so even when tests were performed, the samples did not always guarantee results. Additionally, tracking of VL results in patient health records was difficult as the electronic patient tracking system was not properly used. Disalink (a lab monitoring system) requires data entry from the lab, but EPTS also requires printed results to be entered in the medical record system. Sometimes there were no staff to entry data or to print results and a lack of communication between the two systems were not established.

This brief details the strategies that ECHO has developed to increase VL coverage and suppression. The first approach described is the “Multi-level Strategy,” which sought to increase VL literacy among patients, reduce missed opportunities for testing, and ensure that patients who came to clinics for testing could access services in a timely manner. Second, we describe ECHO’s approach to outreach for patients who have defaulted on treatment or have high VL. This approach targets retention of ECHO’s most sick patients and those most vulnerable to discontinuing treatment. In the final two approaches, we describe how ECHO has invested in VL testing and tracking infrastructure. These investments were crucial to overcoming challenges related to lack of testing and transportation infrastructure in Mozambique. Finally, we share key lessons learned for increasing VL coverage, such as prioritizing efficiency in the collection process, which can help future implementing organizations that seek to improve their testing processes.

Multi-level Strategy

In Year 3 of its implementation, ECHO developed and launched a multi-pronged strategy to improve VL coverage and suppression. The strategy aimed to improve patients’ understanding of the importance of VL testing and reduce the number of arduous clinic visits for VL testing. At individual level, ECHO reached out patients through a series of SMS reminders to patients ahead of their VL collection date and to inform those with a VL >1000cp/ml to go to their health unit. Patients also received reminders to test in posters and lectures throughout the community. In Tete, clinics occasionally failed to contact patients due to unclear addresses and inactive phone numbers, which led to a mass updating of contact information.

At the community level, ECHO launched a series of efforts to increase demand for VL testing among patients, focusing on educating patients about the test’s purpose and importance in HIV treatment. This message was included in morning health lectures and posters in the health facilities, as well as community theater, radio talk-shows, faith-based organizations’ activities, and during the community dialogue sessions.

At the institutional level, the multi-level investment strategy made testing more accessible. Previously, long wait times for testing at health clinics could reach up to four hours. Clinic staff addressed this by performing VL sample collection in consultation rooms and performing VL sample collection at the community level outside of health facilities.

Investments through the Multi-level strategy

- On-the job training to health facility staff to increase VL literacy
- Purchasing printers and back-up printers for each province to ensure access to digital VL records.
- Purchasing office supplies, such as telephones (cell phones), so that clinics can reach out to patients eligible for VL testing.
- Tracking of patient needs based on their demographics (e.g., adolescents, key populations, pregnant and lactating women).
- Performing VL tests in consultation rooms and outside of facilities in the community.
- Expediting tests for patients who were visiting the clinic specifically for VL tests.
- Broadening the use of electronic records systems to improve accuracy of medical records.
- Hiring more staff so health facilities could offer extended clinic hours and manage wait-times. This included 7 medical technicians, 3 nurses, and 17 counselors in Manica; 20 medical technicians, 12 nurses, and 17 counselors in Sofala; 2 medical technicians, 2 nurses, and 1 counselor in Tete; and 6 counselors in Niassa.

To avoid long wait times for testing, the facilities prioritized patients who were visiting specifically for VL tests. By the end of 2023, ECHO reached VL testing coverage of 73%; viral suppression was at 93%. This increase from 58% viral suppression in March of 2020 is attributable to ECHO's multi-level strategy aimed at increasing demand for VL testing by identifying and reaching out to all patients eligible for VL testing, as well as improvements in ART optimization, increased viral load and treatment literacy achieved through social behavior change campaigns, and overall improved patient retention and reduced patient attrition.

ECHO's multi-level support strategy also aimed to combat VL procedural knowledge gaps among health clinic staff. After reviewing missed opportunities for VL testing, ECHO's technical staff understood that clinic staff were not properly versed on procedures and eligibility for VL testing. In response to this challenge, ECHO provided on-the-job training on VL coverage for lay staff to improve their understanding of the importance of VL coverage. In 2023, there were 6 trainings in Niassa and 17 trainings in Sofala.

ECHO has struggled with storing medical records in Mozambique, where many clinics use physical books for records-keeping, rather than electronic records systems. This has impacted the accuracy of patient's health records, including VL levels, as patient histories can have discrepancies between physical and electronic records. In the multi-leveled investment strategy for improving VL tracking, ECHO aimed to make patient VL records more accurate, expanding the use of two electronic records systems, Master Cards and the Electronic Patient Tracking System (EPTS), and implementing these platforms at an increasing number of sites supported by ECHO. Particularly important has also been the integration of the Clinical Summary mobile application, which gives providers access to EPTS patient data in real time. This is essential for retrieving viral load and CD4 test results, which may not be readily available in Master Cards due to delays in manual data entry.

At the end of 2023, 118% of VL test results were entered into the OpenMRS electronic record system and 59% were recorded in the OpenMRS Master Card. This represents a significant improvement in the flow of physical records to digital records. However, there is an ongoing need to improve flows between the OpenMRS lab module and Master Card.

Success Story: Bottle Strategy for VL Literacy

For children who are HIV-positive, one challenge for providers is building VL literacy among the patient and their caregiver. To explain the importance of VL to a younger audience, health providers demonstrate with bottles filled with colored beads. The bottles are filled with different colors to visually show the differences between high VL (red), a patient in treatment (mixed red and black), and a patient with undetectable VL levels (mostly black). Children that are having their diagnosis disclosed receive this explanation method. Additionally, adults with low literacy can benefit from this demonstration. "I think the bottles do a good job of facilitating VL information sharing with patients," reflected Saide Mustafa, a staff member at CS Moatize in Tete. In the pediatric sector, where Mustafa works, they had roughly 60% VL coverage when ECHO began. As per the facility's most recent reporting, they are up to 98% coverage. Mustafa has developed activities, such as the bottle demonstration, to improve indicators in the facility. Additionally, when he finishes his appointments with patients, he works in the archives, checking the files of patients eligible for VL collection and assigning follow-up to patients needing outreach. As a result of ECHO support with capacity building for VL testing, Saide believes that the facility can continue its HIV activities independently, without ECHO support.



In February of 2023, ECHO implemented a second phase of multi-level investment. This involved hiring additional medical technicians, nurses, and counselors in each province to collect VL in the community and help health facilities create demand for VL testing. With more staff, health facilities could offer extended clinic hours and manage wait-times. This included 7 medical technicians, 3 nurses, and 17 counselors in Manica; 20 medical technicians, 12 nurses, and 17 counselors in Sofala; 2 medical technicians, 2 nurses, and 1 counselor in Tete; and 6 counselors in Niassa. ECHO also implemented continuous intensive monitoring of patients eligible for VL and reinforced the importance of printing and updating results in EPTS to improve performance.

Retaining at-risk patients in care

ECHO has also taken measures to make VL testing accessible so that patients' VL can be continuously monitored. The "One-Stop model," where patients can fulfill multiple steps of their treatment including medicine pickup, counseling, and VL testing during one visit to a health facility has also made VL testing easier for patients. In mid-2023, the Mozambican Ministry of Health introduced a new process for patients with viral loads above 1,000 copies that specifically moved them to the One-Stop model. This essentially prioritized the most vulnerable patients to benefit from more efficient, back-to-back appointments on the same day.

ECHO also improved retention of patients who were not adhering to VL testing through follow-up from community actors, psychosocial support staff, and integrated teams. Integrated teams are ECHO employed mentors that work out of provincial offices and assist with site-level problem solving and supervision. For example, when health facilities in Sofala were lacking VL test data among pregnant and lactating women, their integrated teams monitored lists of pregnant and lactating women and identified those needing VL tests. The teams then disaggregated the patients who needed to be tested into groups (e.g., pregnant women, breastfeeding women, adults, pediatric patients) so the appropriate counselors could follow up with these patients and encourage them to come to health units for tests.

Additionally, the integrated teams noticed that mentor mothers were bringing in more women for VL tests, but nurses weren't always following up with them correctly. In response to the issue of health facility staff being insufficiently trained on VL collection, both the integrated teams, lab officers, and psychosocial support officers gave trainings to all health facility staff on the procedures for VL sample collection and follow-up with identified patients showing high VL counts.

Integrated teams assist with monitoring the health units, asking what support they need, and analyzing databases together. ECHO's integrated teams also identify all patients with a VL count >1000cp, contact them via phone call or home visit, and return them to the health facility to begin AMA (adherence improvement counselor sessions). After high VL patients return to treatment, they receive an elevated level of assistance, with members of the integrated teams personally referring and introducing them to psychosocial support staff and clinical consultations. However, ECHO has faced barriers reaching sufficient numbers of high-VL patients through this approach, ranging from caregiver resistance in pediatric cases to enrollment in multi-month ARV distribution, which limits a patient's interaction with their local health facility. Coordination with orphans and vulnerable children (OVC) program partners as well as campaigns to find patients at their home addresses are ongoing and seek to break down the factors limiting this approach. In 2023, ECHO also prepared a viral load follow-up checklist, which is used to monitor patients with high VL, identify gaps in testing and result turnaround, and prepare a follow-up plan for each patient.

Stocking VL testing supplies and equipment

Another challenge to testing and achieving suppressed VL levels has been recurring stockouts of VLC supplies. At the end of 2022, there was a national stockout of reagents that impacted ECHO's ability to scale up VL testing. This issue reappeared in Manica early in 2023. A lack of reagents for testing and laboratory machine failure lasted for 10 days and led to 3,617 unprocessed samples in March of 2023.

Success Story: Demand Creation of Health Center #2 in Tete

In October 2022, Health Center Number 2 in Tete reached stability in VL coverage, but this wasn't always the case. After assessing indicators among the health facilities in Tete, ECHO's program manager, Oreana Canhanga, and the HIV Treatment Specialist & EL Lead Diogo Sambo found that CS Number 2 wasn't hitting its targets in VL coverage. Canhanga and Sambo went to the health facilities for an intensive visit to find gaps and develop a plan for addressing them. After arriving at the facility before standard work hours, they divided the staff between providers, patient care, and a remaining group, who were to provide patient care and later collaborate with Oreana and Diogo to review folders. They took this folder review approach after realizing that reviewing lists of eligible patients alone was not enough to improve VL coverage, because the lists did not always have complete patient data. Without addresses and contacts, these patients were being left out, as providers had no way to reach patients. This system wasn't presenting a list of patients with samples collected – only those with results. The strategy of reviewing folders contributed to solving this problem. While some staff reviewed folders, others made calls to patients to arrange for them to come and take a viral load test. During these calls, patients committed to and followed through with a visit to the health facilities. Following this new approach, the health facility broke its record for VL test collection. At the end of the day, ECHO recommended that the health facility continue these activities following the same approach, and it continues to date. With the inclusion of this approach, the health facilities had its best monthly VL performance yet and continues to be a referral for VL in the province and one of the largest-volume facilities in the province.

To address stockouts of reagents, ECHO analyzes stocks weekly and shared information with provincial medical storage facilities and facilitated to sharing of reagents between the provinces of Sofala, Manica, and Tete to ensure no province fell severely behind in analyzing testing samples. Moving forward, ECHO closely monitors stocks of reagents and consumables for tests of other HIV-associated diseases. To make up for the backlogs caused by stockouts and machine breakdown, Manica implemented 24/7 business hours (3 shifts in total per day) including weekends and holidays and conducted weekly monitoring of testing and backlogs, provided VL mentoring, and updated the Siglab system daily. When laboratories in Sofala experienced a similar equipment breakdown in early 2023, assistance was provided by the Mozambican Ministry of Health to fix the machine.

Support for Laboratories

Due to recurring struggles with the transportation and testing of VL samples, ECHO also supports all stages of transportation to and from laboratories that test VL samples. In the past, ECHO-supported facilities struggled with transportation of VL samples, leading to samples expiring before arrival. From 2019 to 2021, ECHO led the sample referral process, though this later transitioned to the USAID Adapting and Modifying Optimized Sample Transport Routes for Achieving Impact (AMOSTRA) project. When this outsourcing began in 2022, ECHO took on the role of monitoring AMOSTRA performance and working at the health facility level to ensure referral and transportation processes are seamless. ECHO monitors turnaround times, reviews health facility transport routes, monitors sample quality, and addresses equipment breakdown where it occurs. In many cases, samples are now tested in laboratories located within large health facilities, resolving the need to test samples before they arrive at these health units and improving efficiencies. In ECHO-supported provinces, sample rejection rates have been reduced to 0-3%, depending on the province.

In cases where samples are rejected, ECHO has improved follow-up procedures. In 2021, ECHO created a rejected sample tracking form that is used in all laboratories or equivalent sectors (for health facilities without labs). A communication form is filled in by the rejection site (molecular biology laboratory and district headquarters

laboratories) and sent to health facilities for follow-up. These steps ensure that the patient with a rejected sample is called and has their sample taken again. ECHO also conducted weekly monitoring of sample rejections by reason and by health facility to implement specific measures by site level to improve the quality of samples.

ECHO has also improved procedures in case of testing backlogs by scaling up use and synchronization of lab monitoring systems (DisaLink and DisaLab), which enable improved information flows between labs and facilities and reduce inefficiencies and laboratory response time. As previously described, ECHO's system for monitoring and adapting to backlogs is thorough.

In future years, ECHO plans to improve data interoperability at numerous sites, continue mentorship for VL testing at molecular biology laboratories, and continue on-the-job trainings for new data entry clerks, providing laboratory governance and oversight through staffing and training. ECHO also ensures adherence to national laboratory biosafety guidelines including the provision of biosafety supplies.

To reduce turnaround time (TAT), ECHO is providing VL mentoring at the biomolecular laboratory, monitoring TAT per health facility and per testing time implementing specific strategies for each challenge identified, participating in provincial technical groups, monitoring Disalink connections, monitoring SIGLAB updates, and expanding hours for testing at labs. However, ECHO's ability to increase VL coverage has been restricted due to equipment breakdowns and reagent stock outages, resulting in a backlog where many VL samples collected were not tested.

Problem-Solving

ECHO's Innovating, Learning, and Adapting (ILA) team, comprising dedicated M&E analyst staff who observe and analyze trends and communicate with health workers to scale up good performance, has been important in identifying recurring challenges. In response to the issue of patients defaulting on treatment and returning with a high VL load, the ILA team prepares quarterly reports that monitor the profiles of reintegrated patients and their VL levels, leading to the adaptation of interventions as needed.



Apart from long distances to facilities and loss of follow-up, irregular drug pick-up and stigma have negatively impacted ART adherence, thereby affecting viral suppression rates. As previously mentioned, the One-Stop model for patients with high viral loads, which includes clinical and adherence follow-up, has also been a helpful response.

ECHO has also faced ongoing discrepancies between results recorded in the laboratory book (books that are used to physically record results in Mozambique) and those recorded in the online OpenMRS laboratory module. The problem was noted when ECHO staff found discrepancies above 20% (with fewer results entered in lab module than registered in the laboratory book) in multiple health facilities. In response, ECHO conducted analyses of the result flows in health facilities with elevated challenges, identified constraints, and implemented next steps for improvement. ECHO then reinforced the implementation of the results delivery protocol, provided technical assistance for printing results, and monitored the implementation of the standard operating procedure for printing results. By mid-2023, ECHO reached nearly the similar levels of VL results being recorded in laboratory logbooks (83,367 results) and the OpenMRS lab module (98,156 results), which indicates improvements in flows between both modules, though there is room for continued progress.

Mozambique has also been impacted by a national stockout of reagents, which has restricted ECHO's ability to scale-up VL testing, especially in the Manica and Sofala provinces. ECHO-supported laboratories have shared reagents to prevent testing backlogs from increasing. Additionally, ECHO closely monitors stocks of reagents and consumables for tests of other HIV-associated diseases to predict issues with stockouts and advocates for accumulating backup stocks of testing supplies.

Difficulties managing overcrowded health facilities have also created issues with VL testing. Because of such a high demand from patients and low comparative staff capacity, physicians have felt drained, and patients have had to wait in long lines for VL collection. Hiring more staff and extending health clinic hours has improved this issue.

Results

During the reporting period following the implementation of the multi-level investment strategy, ECHO observed an improvement in VL coverage and VL suppression. In early 2020, VL coverage across ECHO patients was at 58%, but has since risen to 73% by December 2023, even with the VL testing backlog. In the same period viral suppression rose from 91% to 93%. Additionally, by the end of 2023, annual rejection rates of VL samples in all provinces remained below 3.5%, with Tete maintaining rates below 1%. This shows strong performance in the handling and transportation of VL samples.

ECHO had previously determined that it was critical to limit VL turnaround times to 28 days, so the result would be available for the medical provider at a client's next clinic visit. Since the implementation of the multi-level investment strategy, average TAT have been limited to below 28 days in all provinces.

Sustainability

In early 2023, ECHO reinforced its multi-level investment strategy for increasing VL testing, achieving increased testing in all provinces except Manica. The project is phasing out parts of the multi-level investment strategy and developing new strategies in provinces where it is not effective, while sustaining it where it is producing results.

Efforts are ongoing to improve viral suppression rates through various activities. These include home visits by case managers and mentor mothers, personalized psychosocial support, and active review of all cases with viral loads over 1000 cp/ml. Therapeutic failure cases are identified and addressed, while addressing social problems that may interfere with viral suppression.



Lessons Learned

- **Individual demand.** Effective engagement strategies, including health lectures, posters in health facilities, community theater, and radio talk-shows, can be instrumental in increasing patient demand for viral load (VL) tests. Training nurses on eligibility criteria also empowered them to initiate VL testing, highlighting the importance of patient education and healthcare provider training in promoting testing uptake.
- **Patient-centered care.** Adopting patient-centered approaches, like the use of the One-Stop model for vulnerable patients and the Family Approach for families with multiple members needing services at once, help decrease barriers to testing. These strategies have been proven to be effective through rigorous analysis of approaches and patient outcomes and demonstrate the importance of tailoring testing services to meet the diverse needs of patients and their families.
- **Institutionalizing facility-level change.** To address access barriers and reduce strain on healthcare systems, innovative and tested approaches such as extending clinic hours, deploying additional staff for VL testing, and offering testing in consultation rooms and community settings were implemented. The introduction of mobile clinics have further shown to improve access to testing in remote areas, underscoring the value of flexible testing delivery models.
- **Community actors.** Community engagement initiatives, including targeted outreach efforts and the involvement of community actors such as counselors and mentor mothers, significantly contribute to increasing VL testing uptake and adherence. However, ECHO's regular assessments found that the success of these efforts hinges on community actors being trained in accurate, up to date testing methods. The ECHO project worked through its Integrated Teams to facilitate the capacity-strengthening of these community stakeholders, enhancing their effectiveness in supporting patients through the VL testing process and ultimately improving HIV/AIDS management at the community level.
- **Multi-level strategies and investments.** Proactive inventory monitoring, robust supply chain management, and collaborative stock management among laboratories are essential for mitigating the impacts of recurrent stockouts on viral load testing services. Seamless coordination across clinical, administrative, and laboratory functions, with support from partners like ECHO, ensures effective sample prioritization, backlog monitoring, and timely results delivery. Collaborating with partners and utilizing laboratory networks during equipment failures or reagent shortages further enhances testing efficiency and maintains service reliability.