

Establishing and expanding molecular HIV diagnostics in Lesotho: A collaboration with Butha-Buthe District Hospital and the Ministry of Health

Final Report to ESTHER Switzerland



Date: June 28, 2019 (Revised Version 4.0)

Author: Niklaus Labhardt

“Over the past 2 years after receiving ESTHER grant, our collaboration with SwissTPH, Dept. Biomedicine University of Basel and SolidarMed have yielded a remarkable progress towards improving access to diagnosis and monitoring of HIV treatment within the district. The turnaround time of getting ... thus improved patient care. We really appreciate the support we are receiving regardless of the technical or non-technical challenges faced with.”

Sister Catherine Lebina, Hospital Management Board of Seboche St Charles Hospital

Content

- 3
- 1. Introduction 3
- 2. The project at a glance 3
 - Topic and context 3
 - Project Goal..... 4
 - Project Partners..... 4
- 3. Overview of major achievements..... 5
 - Achievements in improving monitoring and management of people living with HIV 5
 - Achievements in capacity building..... 6
 - Achievements in the partnership 7
 - Major failure of the project..... 8
- 4. Detailed report of achievements 9
- 5. Evolution of the partnership 15
 - Major problems in the running of the project and how they were managed 15
- 6. Lessons learnt..... 15
- 7. Impact 16
 - Patient-level 16
 - District-level 16
 - National..... 16
- 8. Sustainability..... 17
 - Viral load monitoring 18
 - Resistance testing 18
- 9. Future steps 18

**The ESTHER Switzerland programme (<https://www.esther-switzerland.ch/>)is implemented by the
Institute of Social and Preventive Medicine (ISPM) of the University of Bern, on behalf of the
Swiss Agency for Development and Cooperation SDC**





**SOLIDAR
MED**

Swiss TPH



Departement
Biomedizin
Basel

1. Introduction

In January 2017, our consortium received an 18-months grant from ESTHER to support improvement and expansion of molecular monitoring for people living with HIV in rural Lesotho. Our consortium embraces the Central Laboratory Services of the Ministry of Health of Lesotho, the District Health Management Team of Butha-Buthe, Lesotho, the Dept. of Biomedicine, Petersplatz, Basel, Switzerland, the Swiss Tropical and Public Health Institute, and SolidarMed. The initial project period was extended to 24 months (January 1, 2017 to December 31, 2018).

The initial focus of the project was to improve and expand routine viral load monitoring for people living with HIV in the Districts of Butha-Buthe and Mokhotlong at the Butha-Buthe government hospital Laboratory. The second focus of the project was to establish sustainable HIV drug resistance testing for patients with treatment failure while taking antiretroviral therapy at Seboche St Charles Mission Hospital laboratory, Butha-Buthe District.

2. The project at a glance

Topic and context

Lesotho, a small landlocked country surrounded by South Africa, has the second-highest HIV prevalence worldwide: An estimated 25% of the adult population are infected by HIV. Through joint efforts of the government of Lesotho and international partners, in 2016, when the project started, about two thirds of all persons living with HIV were receiving life-saving antiretroviral therapy. However, provision of antiretroviral therapy must go along with state-of-the-art laboratory monitoring to ensure successful therapy at long-term. The test of choice to determine if a therapy is effective is the quantitative viral load measurement. An undetectable viral load (“suppressed”) means that therapy works well whereas a high viral load hints at treatment failure. Although recommended by the World Health Organization since several years, regular viral load measurement was not accessible for people living with HIV in Lesotho until very recently. This partnership, supported by ESTHER Switzerland, aimed at providing viral load monitoring to all persons receiving antiretroviral therapy in two rural districts in Lesotho. Moreover, the partnership aimed at establishing HIV resistance testing in Lesotho for patients who fail antiretroviral therapy.

The project comprised trainings for laboratory technicians as well as for providers of antiretroviral therapy and provided career opportunities to laboratory technicians and other health care professionals in Lesotho.

Project Goal

The project had two goals

1. To improve HIV-care through sustainable access to viral load testing for all persons living with HIV in two districts in Lesotho (Mokhotlong and Butha-Buthe)
2. To set up the first laboratory for quality-controlled HIV resistance testing in Lesotho

Project Partners

Institutions in Lesotho

- District Health Management Team of Butha-Buthe
- Central Laboratory Services of Lesotho (Ministry of Health)

Institutions in Switzerland

- Swiss Tropical and Public Health Institute (SwissTPH)
- Molecular Virology, Department of Biomedicine, University of Basel
- SolidarMed, Swiss Organization for Health in Africa

The “Towards 90-90-90” consortium

The partners listed above build the “Towards 90-90-90“-consortium. This consortium received an Open Call R4D Grant (IZ07Z0_160876/1) in February 2016.

Timeframe

February 2017 to Dec 2018

3. Overview of major achievements

From January 2017 to December 2018, this partnership has registered the following major achievements:

Achievements in improving monitoring and management of people living with HIV

- In total, the project performed 25,686 viral load tests for 15,548 patients living with HIV, who thereby benefitted directly from the project through the new state-of-the-art molecular diagnostics, enabling clinicians to monitor the effectiveness of their treatment;
- During the project period, 1,510 patients had at least one viral load test done, where treatment did not control the HIV (i.e. >1000 copies/mL), indicating treatment failure. Among these, 271 patients were switched to a second-line regimen of antiretroviral therapy according to the national guidelines;
- Butha-Buthe government hospital molecular lab has been recognized by the Ministry of Health as the laboratory with the best performance of the HIV viral load monitoring based of shortest testing turnaround times. The following data support the good quality performance of the viral load monitoring in the district: Median time from blood sample-registration at laboratory to processing was 5 days (in settings where this can take many weeks), overall median turn-around time from blood-draw to result being sent back to the clinic was 9 days (inter-quartile range 2-21), while other African settings often struggle with the challenges of often more than a month;
- Based on the estimated 11,000 persons living with HIV on treatment in the district of Butha-Buthe, more than 90% of them received at least one viral load test during the project period (January 2016-December 2018), a goal which is truly a major step towards reaching the international 90-90-90 goals set by UNAIDS for 2020;
- In December 2017, our consortium extended viral load monitoring to the neighbouring district Mokhotlong, the country's district with the currently poorest HIV indicators (high HIV prevalence, low ART coverage and low viral load suppression rates), and by December 2018, more than 5,000 patients from Mokhotlong had received a viral load test at the project supported Butha Buthe Molecular laboratory; Based on an estimated 6000 patients engaged in ART in Mokhotlong, VL coverage was above 80% Mokhotlong.
- An online database that had been established right from onset of the project was the platform where all viral load determinations of the Butha-Buthe laboratory are imported.

This system is now also capable of generating customized automatic SMS messages to patients, i.e. communicating to them directly the viral load result.

Achievements in capacity building

- Three cadre positions, 2 at the Ministry of Health institution and one at Seboche Missionary Hospital, were enrolled in our advanced studies;
- One Master's student in Cell Biology from Switzerland with the relevant expertise travelled to Lesotho for 8 months in 2017 to mentor Butha-Buthe and Seboche laboratory teams;
- During the project period, Prof Thomas Klimkait provided technical assistance and support for laboratory processes and quality assurance through 3 one-week on site visits and remotely, through regular contacts via email/skype;
- Over 120 health care providers in the two districts were trained and re-trained on the clinical implications of regular viral load monitoring and in the management of treatment failure;
- 6 Laboratory technologists from Butha-Buthe and Seboche received a 5-day onsite advanced viral load testing training at the state of the art Laboratory of Roche Diagnostics in Johannesburg in South Africa; This training included advanced techniques for regular machine maintenance to improve efficiency.
- The head of the Seboche laboratory attended an HIV Drug Resistance Training Workshop provided by the African Society for Laboratory Medicine (ASLM) in Addis Ababa, Ethiopia, from August 20 to August 31, 2018;
- Prior to this project, the Swiss partners had provided all essential instrumentation for HIV genotypic resistance testing. During this Esther-supported project, the Seboche laboratory team developed and received training in all skills for virus isolation of HIV and resistance-characterization with the respective clinical interpretation (i.e. linking viral mutations with corresponding drugs threatened to fail). This sophisticated and technically challenging process has been validated by the analysis of first clinical specimens. The Seboche laboratory has been renovated and is currently, in its clinical translation phase towards becoming the first laboratory in Lesotho to provide HIV drug resistance testing.
- National staff has co-authored two scientific manuscripts that are currently in preparation for submission early 2019. A first manuscript entitled "*The viral load monitoring cascade in a*

resource-limited setting: a prospective multicentre cohort study after introduction of routine viral load monitoring in rural Lesotho” is in press at PLoS One. A second manuscript focusing on virologic outcomes of children/adolescents is currently in preparation and will be submitted to the *Pediatric Infectious Disease Journal*. The support through ESTHER will be acknowledged in both publications.

“Without doubt, it was an honor to receive the scholarship that helped me achieve my dreams of obtaining a Master’s. I had more time to concentrate on my studies and work without worrying about school fees. Thank you for the generous support I received.”

Molisana Cheleboi, Head of Laboratory of Seboche

Achievements in the partnership

- Prior to the grant period, a very close partnership had been established between the implementation partners (laboratory Butha-Buthe, laboratory Seboche) and the Swiss partners (SwissTPH, SolidarMed, Molecular Virology University of Basel).
- As a new component in this partnership, during the project period, the exchange between the Ministry of Health of Lesotho at central level, the two laboratories in the district, and the Swiss partners was further developed. Concretely, the Director of Laboratory Services visited both laboratories at several instances; the direct communication channel was appreciated as uncomplicated and swift. Secondly, the Laboratory Information System (LIS) manager of the ministry of health became closely involved in the viral load database of the project towards importing all laboratory results; the manager visited the laboratories several times providing support in IT management at both sites.
- As a sign of its commitment to this partnership, Seboche Hospital used own funds to build a dedicated laboratory extension as is standard for modern molecular diagnostics laboratories performing PCR-based services. As such, the new facility provides separate rooms to accommodate the individual steps of state-of-the-art genotyping and resistance testing. This setup is key to guaranteeing a contamination-free process and high-quality results.
- In the last phase, the Director of Laboratory Services outlined the accreditation process for resistance testing in the Seboche Laboratory. The steps will be as follows: National Laboratory Assessment (1); Assessment through ASLM (African Society for Laboratory Medicine) (2), Accreditation through SANAS (South African National Accreditation System)

(3). The project has been in contact with all three bodies and accreditation may start as soon as the infrastructural problems in the resistance laboratory have been solved (see below).

Major failure of the project

- Whereas viral load monitoring now works routinely and independently, the goal of a functional and financially independent genotyping laboratory for HIV drug resistance testing in Seboche has not yet been achieved.

The major reason for this shortfall during this period was the need for further support to invest in critical hard-ware and maintenance had been underestimated before: While the entire laboratory infrastructure was built and became operative, with all instruments fully functional by September 2018, the instability of the supplied electrical power led to a sudden interruption, electrical failure and breakdown of the sequencing machine. Furthermore, unanticipated excessive power-spikes upon re-introduction of power led to damage and necessitated repair cost of > 10,000 USD. We are currently evaluating the best options of either repairing and maintaining the current (old and refurbished) sequencer or of buying a new sequencer of the next instrument generation including a maintenance contract.

Despite the above-mentioned serious reason why, at the time of writing this report, the resistance laboratory is not yet fully functional and, although financial sustainability through the routine-provision of resistance testing to other organisations and hospitals in Lesotho (testing is reimbursed by several NGOs and on the agenda of government institution) has not yet been implemented, we are confident the project is on track. The training of laboratory personnel and having control measures in place will lead to the successful establishment of a laboratory dedicated to and certified for state-of-the-art HIV resistance diagnostics.

Another important draw-back of the project is that analysis of the database revealed that VL results are not always met by an action. I.e. that there are delays between an elevated VL and a follow-up VL or delays in case of confirmed virologic failure and switch to second-line. This important implementation gap will now be addressed by a follow-up project using electronic notifications of patients and health care providers.

4. Detailed report of achievements

As outlined in chapter 4 of our proposal the project had 4 goals with 3 to 5 specific objectives per goal. The following table reports achievements and failures for each objective according to the indicators listed in chapter 9 of our proposal.

Goal/Objective	Indicator	Achievement	Comment
Goal 1			
To expand routine viral load monitoring from Butha-Buthe to Mokhotlong district	≥ 80% of patients on ART will have had at least one viral load measurement by June 2018	VL coverage end of June 2018 Butha-Buthe: >90% VL coverage Mokhotlong end of Dec 2018: > 80% Expansion of viral monitoring to Mokhotlong started in December 2017 and by June 2018 all clinics in Mokhotlong district were sending viral load samples on a weekly basis to Butha-Buthe laboratory. Overall, from January 1, 2017 to November 30, 2018, 15,548 patients benefitted from viral load monitoring, 25,686 viral load measurements were conducted during this time period.	
Specific objectives			
1. To employ and train two additional laboratory technicians in viral load quantification on Cobas Ampliprep Taqman (Roche Diagnostics) to cover the expected doubling of the work-load	2 additional laboratory technical staff employed and trained by February 2017	2 additional laboratory technicians were recruited and trained (1 in Butha-Buthe Laboratory, 1 in Seboche Laboratory).	For 2019, salaries of these 2 laboratory technicians could not yet be absorbed by the Ministry of Health. A grant obtained by SwissTPH will be used to cover salaries in 2019.

2. To run a well-organised, monitored and regularly updated plasma-bank for further retrospective molecular analyses where indicated, and for enabling new local research projects on the cohort	From ≥ 80% of blood specimens for viral load samples are correctly stored, labelled and registered in the database	> 90% of samples stored. The viral load database has been modified and improved to import not only the viral load results but also the respective positions of the corresponding vials in the plasma-bank. Currently samples from >15,000 patients have been stored and all position linked to the database.	Currently the standard operating procedures for the database are under revision as continuous storage of all samples will rapidly exceed the limited storage room (-80°C freezer).
3. To train, mentor and supervise health care providers in both districts on management of ART failure	≥ 80% of patients with one unsuppressed viral load receive a follow-up viral load within <6 months ≥ 80% of patients with sustained unsuppressed viral load are either switched to second-line ART or receive resistance testing within < 3months	Only 40% of those with VL≥1000c/mL had a follow-up VL within 180 days Only 55% of those with sustained unsuppressed VL were switched to second-line within 90 days.	The two papers that are currently prepared/submitted address the problem of the weaknesses in the viral load cascade. As a response, we are currently developing a large follow-up project that uses direct electronic notification of patients and providers in case of unsuppressed VL to ensure timely management
Goal 2 To improve HIV-related molecular diagnostics in Lesotho	≥ 80% of patients on ART will have had at least one viral load measurement by June 2018; ≥ 50% of patients failing on 2 nd -line ART will have received resistance testing by June 2018	VL coverage end of June 2018 Butha-Buthe: >90% VL coverage Mokhotlong end of Dec 2018: > 80% Out of 33 with treatment failure on second-line, 11 received resistance testing (33%)	While implementation of all activities for viral load measurement was as planned, setting up the resistance laboratory proved difficult and experienced several setbacks.
Specific objectives			
1. To successfully run countrywide the first laboratory that provides genotypic HIV resistance testing in Lesotho	≥ 4 laboratory technicians trained by June 2017	3 Laboratory technicians were trained by June 2017. An additional 2 were trained in 2018. The head of laboratory of Seboche is currently pursuing an MTech program at the Central University of Technology of Free State, South Africa and attended a 2-week resistance workshop of the	Construction of the laboratory extension was fully financed by own funds of Seboche Hospital. Electricity spikes with high voltage fluctuation destroyed the laser of the sequencer At the time off writing this report, resistance testing is not functional. Repair/replacement is

		African Society for Laboratory Medicine (ASLM) in Addis Ababa, Ethiopia in August 2018 Two doctors received advanced clinical training on management of HIV/AIDS at a course held in South Africa	planned for early 2019 (Offers have been obtained).
2. To establish in both districts a team with expertise in HIV therapy resistance and second- and third-line therapy	≥ 50 genotypes conducted by June 2017 ≥ 200 genotypes conducted by June 2018	Only 11 genotypes were successfully run in Seboche Laboratory.	
3. To develop a business plan for national long-term sustainable genotypic resistance testing for HIV (and possibly other for pathogens that will become treatable with targeting drugs)	Business plan by December 2017	This plan has not been finalized yet, mainly because as of now, resistance testing is not yet routine .	The Directorate of Laboratory Services of the Ministry of Health has issued a firm declaration stating that once resistance testing is established and accredited, ministry of health will send samples to Seboche laboratory for analysis. These analyses are to be financially compensated through the funding available for resistance testing in South Africa.
4. Laboratory technicians in Lesotho are enrolled in advanced studies, for example in South Africa (MTech, M.Sc.)	≥ 2 technicians enrolled by end of 2017	Head of laboratory of Seboche enrolled for MTech Studies at Free State University of South Africa Head of laboratory Butha-Buthe enrolled in a Master of Science in Public Health Management (MPH) by International Telematic University, UNINETTUNO, Rome, Italy (UTIU)	
Goal 3			
To improve clinical management by making viral load and		The viral load database has been improved and includes now several features that made it to	As outlined under Goal 2, no routine resistance testing is currently

genotypic testing data accessible for care providers and programme-managers at facility, district and central level (Ministry Of Health)		become a valuable tool at patient, district and national level (see specific objective 1, just below)	available. Yet, analyses have been successfully conducted for nine patients at Seboche laboratory. In these cases. The results were discussed between the doctor in charge and the partners from Switzerland.
Specific objectives			
1. To improve the existing visible impact database by adding new critical features (different access-levels, SMS-authentication, link to plasma-bank freezer, integration of resistance information (gene mutations of HIV))	Additional database development stage completed by February 2017	<p>Implemented features:</p> <ul style="list-style-type: none"> - Partners received different levels of access to database (individual data for health care providers, aggregated data for Ministry of Health) - Those accessing the database can automatically generate reports they need, stratifying by viral load results, clinic, age-group, etc. - SMS viral load result notification directly to the patient - Customized adherence reminders to patients who wish to receive SMS reminders - Plasma-bank location has been integrated into the database 	Resistance testing information has not yet been integrated into the database as resistance testing is not yet routine .
2. Additional data-clerks maintain an updated database	Average time between running the sample on the machine and result-availability in the database < 7 days	<p>Median turn-around time of VL results from blood-draw back to clinic:</p> <p>Butha-Buthe Hospital: 5 days (IQR: 0-9)</p> <p>Rural clinics: 9 days (2-21)</p>	200 percent additional data-clerk positions have been created. Additional funds from partners was used to finance these positions.
3. To include the feature of automated SMS notifications of viral load	Feature available by 05/17	This feature is now integrated into the database and will become part of a larger research project starting in 2019	

results to patients who have a cell phone and who agree to receive SMS			
4. To use the database for better clinical management of patients with unsuppressed viral load		Using the feature of automatically generated reports and lists, the database is now used to highlight and follow-up patients with unsuppressed viral load. The SolidarMed project physician in close collaboration with 2 senior mentors contact clinics to follow up patients with unsuppressed viral loads and mentor nurses in the management of treatment failure.	
5. To use the database at district and central level for monitoring and reporting	Quarterly submission of comprehensive and coherent reports on viral load monitoring	Reports from the database are shared on bi-annual basis with partners in both districts stakeholders at the Ministry of Health have access to the database	

Goal 4			
To foster the exchange of know-how, laboratory and clinical experience between the partners			
Specific objectives			
1. To provide to Basotho and Swiss laboratory staff an opportunity for exchange with mutual learning	≥ 2 students assisted for ≥ 1 month in the laboratory of Butha-Buthe	A MSc student and a PhD student from Switzerland, both spent several months in Lesotho. This dynamic “mixed group” worked jointly on common implementation and research projects.	
2. To provide to Basotho and Swiss master’s or PhD students a new additional setting for completion of their thesis	≥ 2 technicians received advanced training	Both head of laboratory (Butha-Buthe and Seboche) have enrolled in advanced studies and will conduct their thesis within the viral load monitoring/resistance testing project. The person from Ministry of Health who is responsible for the Laboratory Information System did post-graduate diploma in Public Health with funds from ESTHER and will now enrol for Master studies where he will do a thesis on the SMS results notification function.	Head of laboratory Seboche: MTech Head of laboratory Butha-Buthe: MPH Head Laboratory Information System: MSc Epidemiology
3. To share project experience and lessons learnt at district, national and international levels	≥ 2 symposia held by June 2018	Data from viral load monitoring and lessons learnt are regularly shared at district meetings and have been presented in 2017 and 2018 at the Ministry of Health Research Symposium Moreover, data from viral load monitoring were presented at international conferences and currently two manuscripts are in preparation for submission	

5. Evolution of the partnership

As outlined, the project team has been able to strengthen the partnership during the project period, and two new large research projects that build on the established viral load monitoring and on the resistance testing are expected to start in 2019.

Major problems in the running of the project and how they were managed

One major challenge experienced in the project was human conflicts between the laboratory teams of Seboche and Butha-Buthe. These conflicts were not entirely new but had existed before the project start. In assessment, we identified the possible causes related to pre-existing tensions arising from fundamental structural differences between the missionary led health care system and the governmental led health care system. But the essential close collaboration on the joint project, however, brought old tensions back to the surface, which at certain moments endangered the project as a whole. Regular meetings, facilitated by the other partners (SolidarMed, SwissTPH, MoH at central level) were successful in solving most of the conflicts and at the time writing of this report, collaboration between both laboratories is good. The individuals from both teams recognize the need for effective collaboration and opportunities offered by the project towards capacity building and career development. As such, the project has instead fostered better collaboration between these two important laboratories the district of Butha-Buthe.

Other challenges were mainly of technical nature, i.e. regarding the setup for resistance testing in Seboche. As outlined above, the sudden breakdown of the sequencing instrument due to imbalances in power supply was a major set-back for this project. In the spirit of true partnership, we have now defined the steps for the way forward, where each partner contributes a share. Seboche Hospital has improved power-supply for its laboratory, including the installation of APCs and power supply spike protectors to prevent unexpected power-spikes, hence mitigating the risk to breakdown of essential equipment. Using funds recently acquired, SwissTPH will fund a new or repair the current sequencer and will provide a maintenance contract, SolidarMed and Virology Dept Biomedicine contributed and will provide manpower and expertise to set up the new laboratory as state-of-the-art facility. We expect to have the sequencing facility running by Feb 2019.

6. Lessons learnt

- For both sides, work in the pluri-disciplinary and pluri-national environment was and still is enriching and motivating.
- Constant exchange and joint work on projects contributed more to capacity building than sole trainings.

- Providing nationally employed staff in Lesotho the opportunity to enrol in advanced studies where they will use data/experience from the common project for their thesis is an excellent incentive for the staff and at the same time a good driver for the project
- New essential technologies (i.e. sequencing) can only be introduced in a setting if the infrastructure in place is strong enough to host the new technology. In our project, a careful assessment of power-supply before installation of the sequencer would have saved time and money.

“For the past 10 years working in the medical industry, I have been privileged to work with SolidarMed, with University of Basel and Swiss Tropical and Public Health Institute. Through the collaboration, I have learnt that communication is the key for success. We were having frequent communication to share the achievement and challenges, thus helped us to achieve the goal of giving our patients the quality service”

Molisana Cheleboi, Head of Laboratory of Seboche

7. Impact

Patient-level

- As outlined above, until today > 15,000 patients benefitted from state-of-the-art viral load monitoring with short turn-around times during the project period
- The viral load database with its messaging system and customized reports improves follow-up of patients with unsuppressed viral load

District-level

- All 28 clinics (public, missionary and private) in the districts of Butha-Buthe and Mokhotlong have now access to routine viral load monitoring
- The laboratories of Butha-Buthe Hospital and Seboche Hospital are supported by one additional laboratory technician each
- Both head of laboratory enrolled in advanced studies (MTech and MPH)
- Health care providers in both districts are now familiar with viral load monitoring and management of treatment failure

National

- The successful roll-out of viral load monitoring through Butha-Buthe laboratory was taken as example for other districts within Lesotho
- Given the successful implementation of viral load monitoring in Butha-Buthe, members of our consortium are frequently consulted by the Ministry of Health for providing input on national guidelines and policies

- If, based on this project, Seboche Laboratory manages to implement genotypic resistance testing early 2019, Lesotho, a country with >300,000 persons living with HIV/AIDS, will finally have its first in-country laboratory to run resistance tests for patients with complex treatment histories
- The person responsible for the Laboratory Information System at Ministry of Health received a Diploma in Epidemiology and now enrolls in a MSc. His thesis will build on the project realized through the ESTHER collaboration

International

Data from viral load monitoring have been presented at several international congresses:

21st AIDS conference 2016 in Durban, South Africa:

- *Leaks in the HIV treatment failure cascade: the reality in rural Lesotho. TUPEB077*
- *The treatment cascade of children with unsuppressed viral load - a reality check in rural Lesotho, Southern Africa. TUPEB111*

16 European AIDS Conference 2017 in Milan Oct 25-27, 2017:

- *The Cascade from a High Viral Load to Switch to Second-line Therapy among Adults: Implementation of Routine Viral Load Monitoring in Rural Lesotho. PE9/32*
- *High Rates of Paediatric Treatment Failure and Poor Management of Children with Unsuppressed Viral Load: A Reality-Check in a Cohort in Rural Lesotho. PE20/4*

Data from viral load monitoring are being published in peer-reviewed journals:

In press at PLoS One:

“The viral load monitoring cascade in a resource-limited setting: a prospective multicentre cohort study after introduction of routine viral load monitoring in rural Lesotho

In preparation:

A second manuscript focusing on virologic outcomes of children/adolescents is currently in preparation and will be submitted to the *Pediatric Infectious Disease Journal*. The support through ESTHER will be acknowledged in both publications.

8. Sustainability

Viral load monitoring

Currently, viral load monitoring within both districts has been sustainable for more than 2 years and will continue to do so, the platform is under regular maintenance, there are at least seven laboratory technicians who are familiar in operating the platform, and the ministry of health covers all supplies and running cost. However, to date the two laboratory technicians who were employed for the additional work-load for viral load monitoring are not funded by the ministry of health yet. Additional funding through SwissTPH and SolidarMed will help to cover their salaries in 2019 and 2020.

Resistance testing

Once the resistance testing is fully operational, it has the potential to become financially self-sustaining or even income-generating for Seboche Hospital. This is, because for a long time the Ministry of Health of Lesotho has a dedicated funding to pay for resistance testing in patients with the indication for it. Currently, all samples are analysed by a private for profit laboratory in South Africa and this is costly to the government. It is therefore at the best interest of the ministry to have an in country cost effective solution for drug resistance. The Ministry has thus made a firm statement indicating that it will send its samples to Seboche laboratory as soon as accredited resistance testing is available.. However, as outlined in previous sections, due to technical set-backs, we expect resistance testing only to be working in 2019, and, due to the lack of back-up options, it may remain technically vulnerable for the years to come. The consortium is currently setting up a follow-up project to accompany Seboche Laboratory in the process until resistance testing is technically and financially on solid grounds.

9. Future steps

The partnership will continue, and we are in the process of setting up a new agreement for collaborations from 2019 to 2023. The ESTHER project laid the foundation to two large future projects:

- Project 1: Assessment of clinical utility and cost-effectiveness of resistance testing in children and adolescents who have treatment failure while taking antiretroviral therapy. This study will be conducted in 3-4 districts in Lesotho as well as in the Chronic Diseases Clinic of Ifakara, Tanzania. Nationally employed staff, who were part of the ESTHER collaboration, will have a leading role in planning and implementation of this project. Resistance testing for patients in Lesotho will be conducted at Seboche laboratory.

- Project 2: Assessment of viral load results guided differentiated care in Lesotho and Kwa Zulu Natal, South Africa. This project builds on the viral load database and monitoring system that was set up through ESTHER project. In two settings, the project will assess if direct communication of results to patients together with information on action to be taken, improves clinical follow-up and if it is cost-effective. The lead of this project will be with the person responsible for the Laboratory Information System who could accomplish his Masters in Epidemiology through the ESTHER grant.