

## NUMAT TECHNICAL BRIEFS

### Improving TB Laboratory Diagnosis through Support Supervision & Proficiency Testing

NORTHERN  
UGANDA  
MALARIA,  
AIDS &  
TUBERCULOSIS  
PROGRAMME  
(NUMAT)

#### INTRODUCTION

In low-income countries with high tuberculosis (TB) prevalence, like Uganda, sputum smear microscopy using the Ziehl-Neelsen (ZN) technique remains the most cost-effective tool for diagnosing patients with pulmonary tuberculosis. This technique also monitors patient progress during treatment and assesses its successful completion. The ZN technique remains a simple, inexpensive, and relatively easy laboratory methodology that does not require complex skills and can be scaled up to low-level health facilities.

Although the method has a high specificity (meaning that its positive results have a very high likelihood to be truly positive), its sensitivity—the technique’s capacity to detect truly negative results—is not optimal, depending on the ability and diligence of the laboratory staff on appropriate application of the method. Maintaining a high standard of sputum smear microscopy technique is therefore an indispensable component to attaining an effective TB control program.

Quality assurance is a means to improve the efficiency and reliability of smear microscopy so that tests are performed and interpreted correctly, thus fulfilling its basic function of detecting cases and providing clinicians with consistent laboratory findings. Proficiency testing is a process of quality assurance that assesses the capabilities of laboratories by comparing their results with those obtained with the same specimens by either the national reference laboratories or the direct supervisors.

Among the various methods for testing proficiency, using supervision field visits for monitoring the quality of sputum smear microscopy is particularly effective because it allows for quality checks in all stages of the ZN technique and provides prompt feedback to the peripheral laboratory staff.

#### NUMAT INTERVENTION

Northern Uganda has experienced more than 20 years of war, destruction, and population displacement. Although security has improved considerably in the last two years, the long period of instability has severely affected the entire health care system, including laboratory services. Additionally, the chronic lack of adequate human resources still represents a serious challenge for the delivery of quality health services.

The Northern Uganda Malaria, AIDS, & Tuberculosis Programme (NUMAT) is a six-year USAID/PEPFAR-funded program implemented in the 15 districts of the Central North Region. Under its objective of increasing access to and utilization of health services, one of the areas of intervention is supporting laboratory services. This is accomplished by renovating and re-equipping lab infrastructure, building the capacity of lab personnel through training and supervision, quality assurance through provision of reference text materials, development of standard operating procedures (SOPs), and other quality control measures, equipment provision, maintenance, and repair.



Ongoing proficiency testing during support supervision.

### Supportive Supervision

NUMAT contracted supervisors from the local Ministry of Health (MOH) together with the district laboratory focal persons (DLFPs) to conduct technical support supervision in all of the laboratory units that the NUMAT program assists within the fifteen districts. Nine supervision rounds were conducted in the last three years. The laboratory personnel supervised during this activity included both qualified and non-qualified health workers deployed in various levels of health facilities ranging from Health Centre III (HCIIIs) to referral hospitals.

### Proficiency Testing

Prior to the supervisory visits, district officials were notified about the planned activity and the DLFPs were requested to take part with a role of mentoring. The supervisors together with the DLFP also met the district health officer to discuss in detail the purpose of the activity. During supervision visits, blinded re-checking and proficiency tests were performed, their results assessed on the spot, and immediate feedback provided. Proficiency samples were prepared following national SOPs and their reading ranged from “no Acid-Fast Bacillus (AFB) seen,” corresponding to a negative result to “AFBs + + +,” which correspond to a highly-positive result, according to the international reporting format. Sera for HIV and syphilis testing and blood smears for malaria parasites were also provided as part of the proficiency testing.

The supervision team first re-examined stored slides and compared their results with those recorded in the laboratory register. Subsequently, the supervisors provided the laboratory staff with unstained smears to perform the ZN technique. Using a standard checklist, each step of the process was followed to evaluate the competency of the supervisees in staining, identifying, quantifying, and reporting AFBs and detect any performance gaps. This also enabled evaluation of the quality of the stains and the microscopes. The supervisors provided immediate feedback, held discussions, and conducted on-the-job training whenever necessary. At the end of the supervision round, general feedback and recommendations were also given to the respective district health teams (DHTs) to keep them abreast of achievements and challenges.

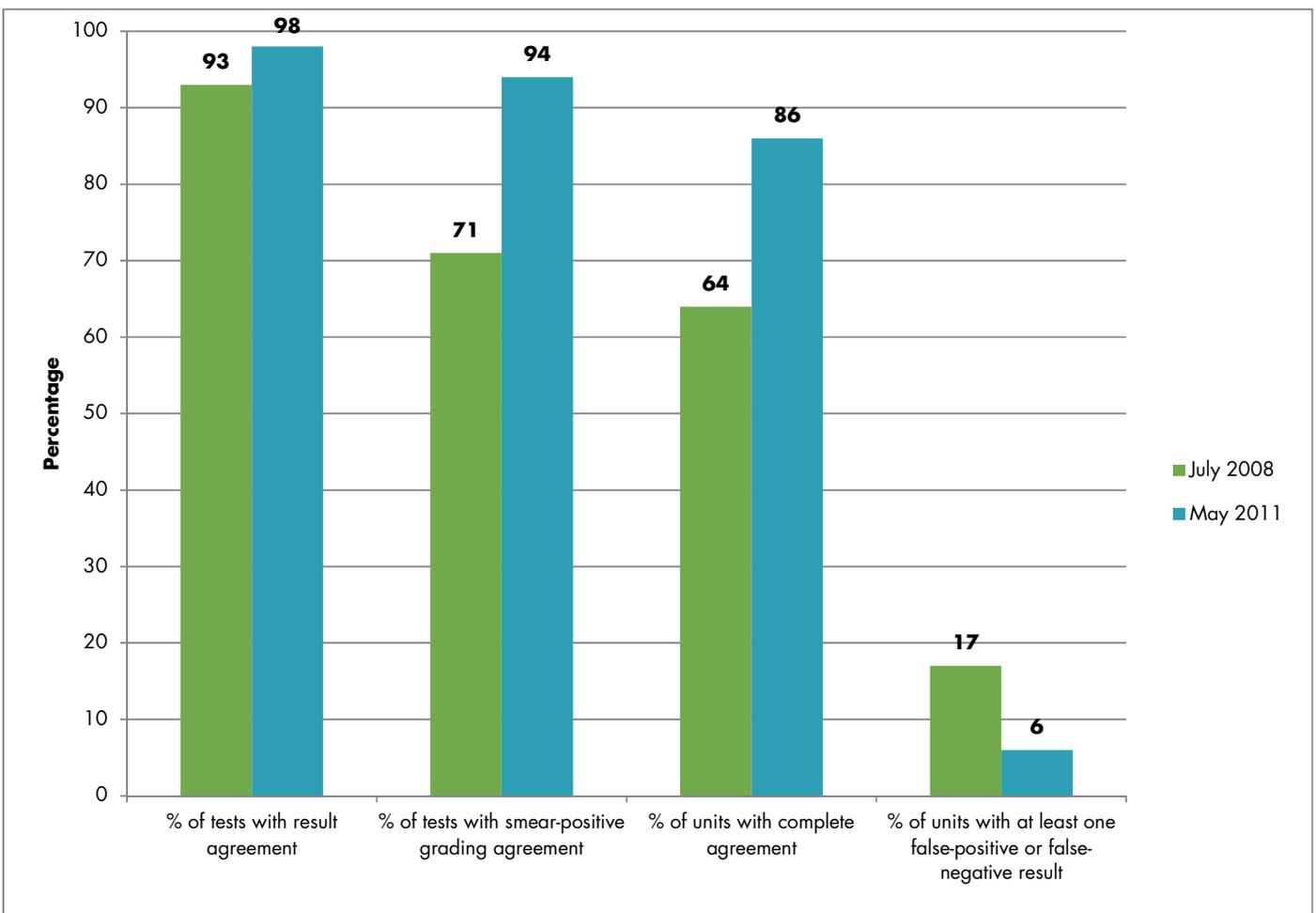
### RESULTS

From July 2008 to May 2011, nine rounds of laboratory supervision were conducted throughout the region. The number of participating laboratory units increased from 36 to 85, of which lower level facilities—specifically HCIIIs—represented 61% of all units supervised in July 2008 and 75% in May 2011.

Results from the TB laboratory diagnosis proficiency indicators are showed in Figure 1.

The number of sputum smears available for blinded re-checking and proficiency testing was 118 in the first round of supervision and 329

Figure 1: Comparison of proficiency indicators at first and last round of supervision



in the last one. The proportion of proficiency tests whose results were in agreement with the supervisors' findings increased from 93% to 98%. Of the specimens that were read incorrectly, 72% were false-negative and 28% false-positive results.

For smear-positive specimens, the proportion of grading agreement increased from 71% in 2008 to 94% in 2011. Despite the increased number of sputum smears examined and number of facilities participating in the exercise, the proportion of laboratories achieving a complete 100% specimen agreement rose from 64% to 86% over the time period.

On all indicators of adherence to the mandatory steps of quality TB microscopy, improvements were found between 2008 and 2011, as shown in the chart below. Overall, most laboratories performed well in the quality of their ZN staining and the technique employed in staining. A marked improvement was shown in the smear preparation, the reporting of smear positive results and in using internal quality assurance measures.

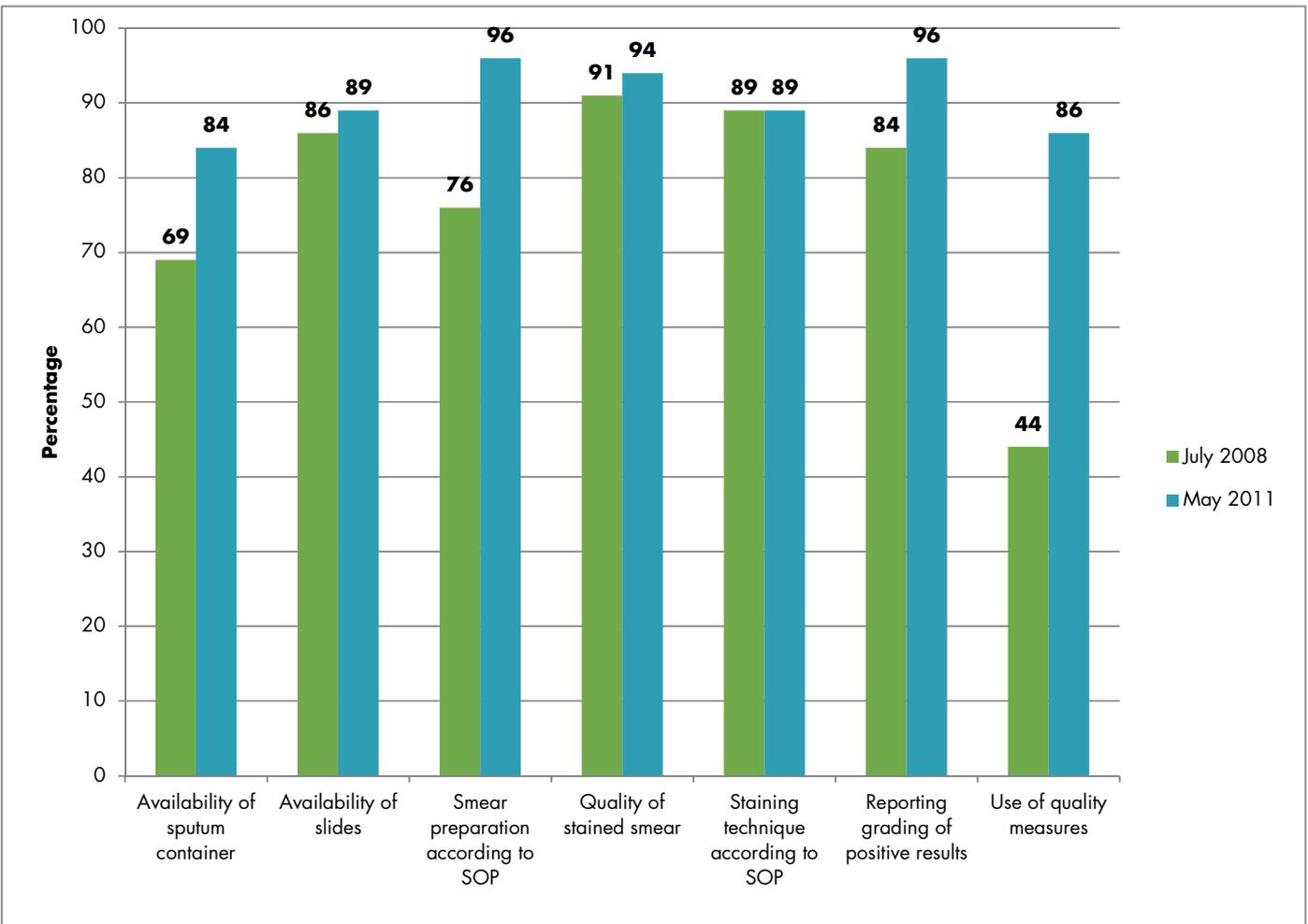
In initial 2008 supervision visits, only 48% of supervised facilities adhered to all of the sequential steps for a quality TB smear technique; this percentage increased to 67% in 2011 during the last round of supervision. All laboratories were found to have a functional microscope at both assessment visits, and 79% had a centrifuge in 2011 compared with 67% in 2008. As shown in Figure 2, slides

were widely available, while the availability of sputum containers also increased from 69% in 2008 to 84% in 2011.

**LESSONS LEARNED**

- Regular laboratory-specific support supervision visits are a useful way to assess laboratory functionality, monitor the presence and functionality of equipment, the availability and supply of reagents, and review collected and submitted data.
- Utilizing the same group of supervisors helped in standardizing the approach, monitoring the progress of individual laboratory staff, and ensuring the continuity needed to build a meaningful rapport with them.
- During the last NUMAT program year, activities were organized to promote greater district ownership and involvement in strengthening laboratory services. More time and resources were invested to enhance the supervisory role of the DLFPs, who conducted the supervision by themselves. The DLFPs were very motivated to take on a prominent role in promoting laboratory services in their districts and exhibited greater confidence in preparing proficiency testing materials, reporting, and providing recommendations to their DHTs.

Figure 2: Facilities adhering to the mandatory steps for quality TB microscopy



## CHALLENGES

- The schedule of the visits was not shared with facility staff beforehand, to prevent artificial situations and provide a real-life supervision context. However, this generated some disadvantages, particularly when laboratory staff were not present at their workstation on the visit's scheduled day and the supervision could not take place for a facility until the following quarter.
- Despite the recommendations made to all laboratory staff who perform TB microscopy, some facilities still failed to store enough samples to be cross-examined by supervisors, thus limiting the practical benefits of the exercise.
- Over the time between supervisory visits, the proportion of stored slides with positive results decreased, leaving fewer opportunities for the supervisors to properly assess the supervisees' ability to grade smear-positive results.



**Review of stored slides at a NUMAT-supported laboratory.**

## CONCLUSIONS

Smear microscopy remains the most cost-effective method of diagnosing pulmonary TB suspects in a resource-constrained setting. Given that many of the lab workers in Northern Uganda have been trained on-the job to perform smear microscopy, quality assurance of their work is essential. Conducting proficiency tests is a feasible and effective method to monitor and improve their technical ability in proper identification of sputum-positive TB-infected individuals. Our findings showed that the degree of agreement in smear reading between the peripheral laboratory staff and the supervisors has been considerably high and that the SOPs were followed more consistently after subsequent rounds of support supervision and coaching. Sustainability and ownership of quality assurance activities for the laboratory can also be ensured through greater involvement of local resource persons under the guidance of policies, principles, and methodology recommended by the MOH.

**NUMAT** is a six-year, USAID-funded project designed to expand access to and utilization of HIV, tuberculosis, and malaria prevention, treatment, and care, and support activities in conflict-affected districts of Northern Uganda.

Over the course of the project, NUMAT has expanded the geographic coverage and populations served through strengthening local government responses, expanding the role of communities in planning implementation and monitoring activities, and building upon existing networks.

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