Antimicrobial resistance (AMR) is of increasing international concern. It threatens the effectiveness of existing treatments against many infectious diseases. Low- and middle-income countries are most at risk, particularly as local and national healthcare approaches are often not set up to tackle the problem. Makeda Semret, Cédric Yansouni, and colleagues at McGill University, Canada, partnered with Addis Ababa University, Ethiopia, to develop a sustainable clinical bacteriology sector at the Tikur Anbessa Specialised Hospital in Addis Ababa. The project’s success demonstrates that local interventions can lead to sustainable improvements in approaches to AMR.

AMR threatens the effectiveness of existing treatments against very common infectious illnesses like urinary tract infections, appendicitis, or infected wounds. Treatments then become costly or even impossible for previously curable diseases, leading to prolonged illness or death in susceptible patients. Without effective antimicrobials, medical procedures, such as surgeries and cancer chemotherapy become risky, as the risk of infections increases.

Even though there are innovative antimicrobials in clinical development, their development is not fast enough to combat the exponentially growing threat of AMR. If no significant measures are taken to curb the rising threat of AMR, it is estimated that the burden of AMR will increase to 10 million deaths per year by 2050. This dwarfs the number of fatalities associated with HIV combined.

Currently, the highest rates of AMR are reported from low- and middle-income countries (LMICs). Of those, sub-Saharan African countries are the least prepared to face the socioeconomic costs of AMR due to a lack of health infrastructure in place, particularly diagnostic testing capacity. Among other factors, the focus on single- disease control programmes instead of overall health systems has led to many aspects of patient care being neglected.

The WHO’s Global Strategy for Containment of Antimicrobial Resistance recognises that clinical microbiology diagnosis is essential to combat AMR. This is because identifying the exact cause of infections and identifying only the patient populations that require antimicrobials ensure the appropriate use of antimicrobials, which then prevents overuse. The committee addresses three strategies: data for surveillance, appropriate use of antibiotics (antibiotic stewardship), and infection control. Sub-Saharan Africa, however, has almost no clinical hospital laboratories that provide bacteriology diagnostics services to international standards.

The project at work in Ethiopia. The team undertaking blood culture testing in Ethiopia.
and with the attitudes and experience of individual healthcare providers in LMICs. Malaka Semret, Cédric Yansouni, and a team from McGill University worked with researchers from Addis Ababa University to understand the factors needed to ensure sustainable change.

They established the Addis Ababa–McGill Partnership for Infectious Disease to address training gaps, provide opportunities for innovative research and, importantly, focus on measures that would improve the quality of care and safety of patients in LMICs. They conducted a project to strengthen the clinical bacteriology service at the Tikur Anbesa Specialised Hospital (TASH), the largest referral hospital in Ethiopia with approximately 20,000 admissions annually.

Before this project, TASH had few quality measures in place, communication between clinicians and laboratory staff members as well as credibility of the laboratory results were weak. Protocols from the McGill University Health Centre (MUHC) were adapted for healthcare professionals at TASH, with local realities including available reagents and equipment in Ethiopia, level of training and language proficiency of personnel in mind. Three microbiologists from MUHC (Semret, Yansouni, and Michael Libman) visited TASH on a regular basis to provide direct supervision and formal training sessions with local technologists, instilling a SOP culture in TASH healthcare professionals. The Ethiopian Public Health Institute assisted in TASH healthcare professionals. The technologists, instilling a SOP culture and formal training sessions with local basis to provide direct supervision and language proficiency of personnel in mind.

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SCALING-UP BACTERIOLOGY AS THE CORNERSTONE OF AMR CONTAINMENT

The team’s short-term success at TASH demonstrates that local interventions to strengthen clinical bacteriology laboratories are feasible in low-income countries. However, it also highlights the pertinence of taking a holistic approach and gaining support from organisational leadership to ensure the changes in culture and practice are sustainable.

Quality-assured laboratory results made it possible to safely discontinue 50% of the antibiotics prescribed to admitted patients, because the team could determine they were not needed. For example, providing the clinical and financial impact of this work to policymakers yields the information they need to provide the appropriate budget and support to diagnostic bacteriology laboratories, so they can adapt routine quality-assured bacteriology testing as essential to AMR containment. If clinical microbiology is recognised as a specialty in sub-Saharan Africa, expertise in this area can be fostered to produce a new generation of skilled microbiologists.

The major factors that contribute to widespread AMR still remain in Ethiopia and across sub-Saharan Africa. Weak supply chains for bacteriology reagents, lack of comprehensive policies that address regulatory and fiscal obstacles for the diagnostic sector outside the laboratory, and a perennial lack of quality-assured bacteriology testing as part of the Global Antimicrobial Surveillance System. Following the success at TASH, efforts are underway to scale-up versions of this intervention in other large hospitals in Ethiopia.

As well as strengthening the laboratory, the team implemented a number of new initiatives, such as antimicrobial stewardship to steer clinicians towards evidence-based prescribing of antimicrobials. Taken together, all these measures resulted in a 50% reduction in antibiotic use in hospitalized patients. Strikingly, the savings resulting from lower antimicrobial use were slightly greater than the annual cost of laboratory reagents, making the intervention financially feasible in addition to being clinically beneficial.

Our research programme aims to support global efforts towards better strategies for implementing bacteriology laboratories, in order to contain antimicrobial resistance (AMR) in low- and middle-income countries (LMIC). Our work evaluates specific laboratory tools or larger intervention bundles. Examples include assessing rationalised “AMR toolkit” that can be scaled-up in LMIC, studying the diagnostic accuracy and clinical impact of new tools for AMR diagnostics as they become available, or evaluating electronic decision support tools to help clinicians interpret key information at the point of antibiotic prescription. We believe this work fills a current vacuum between high-level recommendations and the reality of large parts of the LMIC healthcare landscape.