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African institutions will lead on the road to end neglected tropical diseases

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Globally, more than one billion people suffer from one or more neglected tropical diseases (NTDs). These diseases create enormous suffering, rob individuals of social and economic opportunities, and set-back countries' development efforts. It is now clear that transmission and elimination of many NTDs is attainable in our lifetime. The elimination of NTDs will not happen without a concerted effort and plan to ensure that the most affected countries have a robust clinical, public health, laboratory, pharmaceutical, and research capacity to ensure that the last mile towards reaching elimination is not only reached, but sustained. This means increasing strategic investments to develop and strengthen the NTD health workforce, develop and integrate innovative diagnostic approaches, effective treatments, and responsive surveillance systems. Equally important is ensuring that people living with lifelong disabilities resulting from NTDs receive the care and support they need to live healthy, productive, and fulfilling lives. African-based national non-governmental organizations, the private sector, research institutions, and governments play a vital role as they work to attain ambitious NTD elimination and control goals put forward by the global health community. The recent elimination of onchocerciasis in Niger, trachoma in Burundi and Malawi as well as ongoing progress to eliminate lymphatic filariasis in Kenya and other sub-Saharan Africa countries demonstrate the capacity of African leadership in NTD control and elimination efforts.

KEYWORDS

NTDs, African ownership, sustainability, philanthropy, NTD elimination

1 Introduction

We are at a watershed moment in the fight against neglected tropical diseases (NTDs)- a group of at least 20 health conditions prevalent in tropical areas (1). NTDs can be generally classified into two major groups based on the public health strategies used to address them—I) those treated through clinical interventions at the individual level e.g. leishmaniasis, African Trypanosomiasis, Chagas disease and Buruli ulcer; and 2) those treated through mass drug administration e.g. onchocerciasis, lymphatic filariasis, schistosomiasis, soil transmitted helminths and trachoma (2). The World Health Organization has laid out an ambitious roadmap that outlines a clear path towards the elimination and control of many of these

diseases that have primarily affected persons living in abject poverty in sub-Saharan Africa (1, 3). While the sector is abounding with optimism, we must ensure that institutions closest to the persons living at risk of NTDs have the resources and skills to be able to reach the last mile. If these African based institutions are equipped in this way, we will ensure a sustained, healthier future for those who have long been living with the threat of infection with these diseases looming over their heads. At the END Fund, we are committed to seeing the ambitious targets of the World Health Organization reach fruition. 2022 marks our 10-year anniversary, and in collaboration with generous investments from the private sector, government representatives across Africa, national implementing partners, and health workers, we have been able to provide over one billion NTD treatments since our inception. Additionally, we have supported over 68,000 surgeries to prevent blindness and disabilities, and train nearly 3.7 million health workers. We are committed to seeing these efforts through to the end as we ensure that our investments lead to at least 500 million persons no longer living at risk of NTDs by 2030 (4).

As we progress towards our control and elimination targets and NTD disease burdens diminish, inevitably global health attention and funding streams for NTDs will dwindle and be diverted towards emergent health crises as seen with the recent example of the re-purposing of funding from other global health programs for COVID-19 prevention and response efforts. In this context, it will be imperative that African institutions be increasingly engaged in these last pushes to ensure elimination. This means that countries will need to be equipped with advocates and subject matter experts to ensure effective surveillance and prevention of the re-emergence of these devastating diseases. Knowing how dangerous it can be to forget history in the field of public health, we have to ensure that NTDs are integrated into broader public health systems so that they are not completely forgotten. We also need to sustain research on NTDs to keep it on our radar. This includes ensuring adequate surveillance detection in cases of re-emergence, and the efficacy of post-elimination and control programs.

2 Ownership and integration as key components to elimination and sustainability

2.1 Developing an NTD health workforce and technical expertise

The NTD health infrastructure can only function with qualified, accessible, and available health workers. The World Health Organization estimates a 10-million-person shortfall in health workers by 2030, mostly in low- and middle-income countries (LMICs). There are many reasons for this shortage, including an underinvestment in developing a health workforce and the migration of trained and qualified personnel from developing countries (5).

This has been further exacerbated by a larger proportion of financial and technical support to strengthen Africa's health workforce's capacity to respond to HIV/AIDS, TB and Malaria due to their high morbidity and mortality rates (6). Investments in HIV/AIDS and TB has led to a robust and effective collaboration between clinicians and public health practitioners, and an abundance of clinical and operations research to inform treatment and program delivery quality. This collaboration between clinicians and public health programs needs to be reinforced in the NTD sector. Furthermore, we need to find ways to invest in Africa's growing cadre of clinical and public health researchers to garner their interest and build their capacity to respond to NTDs as begun in commitments made during the 2022 Kigali Summit on Malaria and Neglected Tropical Diseases (7). In the absence of clinicians able to diagnose and treat NTDs, and research on how to effectively deliver programs as we reach the last mile, countries will be unable to effectively eliminate NTDs. The establishment of the WHO led Global Health Workforce Network in 2016 recognized the urgency of supporting an intersectoral collaboration to develop a responsive health workforce (8). Consequently, investing in developing a health workforce, inclusive of disease experts, researchers within African institutions and clinicians, and reflective of a health system's needs and contexts is urgent for countries to eliminate NTDs. Concerted efforts should engage all NTD health system stakeholders which include government agencies at national and sub-national levels, health care providers (public, private and other professional entities), and populations (individuals, formal and informal organizations) (9).

2.2 Diagnostics and treatment

The WHO Roadmap to eliminate NTDs by 2030 calls for diagnostics that can detect and inform treatment needs (1). Measuring the impact of mass drug administration for preventive chemotherapy neglected tropical diseases (PC-NTDs) is crucial to informing treatment strategies including changing the frequency of treatment, drug procurement and inventory, health system needs, validating or verifying elimination of a disease, and post-elimination surveillance (10, 11).

A recent NTD diagnostics landscape study identified 125 diagnostic tests for the detection of the13 most common NTDs (African Trypanosomiasis, Buruli Ulcer, Visceral Leishmaniasis (VL), Cutaneous Leishmaniasis, Loiasis, Chagas disease, Echinococcosis, Onchocerciasis, Schistosomiasis, Soil Transmitted Helminths, Yaws, Lymphatic Filariasis and Dengue). Among these, no rapid diagnostic tests (RDTs) are available for onchocerciasis while 27 are available to detect schistosomiasis (12). Few of these diagnostics have been cleared for use by a stringent regulatory authority unlike the majority (19 of 23) of diagnostics used to detect malaria, and all 49 diagnostics for HIV that have also been prequalified by WHO (11).

Findings from a study analyzing the availability, costs and manufacture of schistosomiasis diagnostics indicated that only one of the seven rapid diagnostic tests used in sub-Sahara Africa– the Point of Care Circulating Cathodic Antigen (POC-CCA)—was manufactured on the continent, in South Africa. The remaining RDTs, six microscopy and three molecular diagnostics are manufactured in Europe and the USA (13). The development of diagnostics in the settings in which they are could identify cross-

reactivity and guide clinicians on the need for confirmatory tests. Accurate diagnosis is critical for delivery of effective treatment in diseases such as VL whose symptoms partly mimic malaria. As such combining immunodiagnostic tests (direct agglutination test (DAT) and DNA-based tests such as polymerase chain reaction (PCR) confirms diagnosis (14). Local development could also improve usability and eliminate barriers to access due to costs.

The underinvestment in NTD diagnostics is recognized by WHO as a major gap in achieving the global targets to eliminate NTDs by 2030. For this reason, WHO's Diagnostic Technical Advisory Group (DTAG- NTD) was established in 2019 to advise on the development of NTD diagnostic tools for this sector (15).

Marginal returns on NTD diagnostics due to low demand and the low financial disposition of those affected by NTDs deter investors from the sector. The recent decline in the availability of and production of RK 39 diagnostics used for VL is a jarring example of the lack of interest in NTD diagnostics (16). However, production of NTD diagnostics can be shifted to Africa where lower labor costs could offset the marginal profitability of investing in NTD diagnostics. Lessons from the HIV/AIDS sector and the availability of testing kits demonstrate how this significantly improved HIV/AIDS testing, treatment and the consequent control of HIV as a public health hazard (17). Additionally, global support through UNAIDS 2020 (now 2030) targets and the Global Access Program enabled countries to build their HIV/AIDS diagnostic capacity and access to treatment, an indispensable step in reducing the risk and burden of HIV/AIDS globally (18). Similar efforts are needed to support the elimination of NTDs.

Point of Care (POC) NTD diagnostics for the most common NTDs–schistosomiasis, soil transmitted helminths and Lymphatic Filariasis are available for use without highly specialized health care personnel. Non-invasive and WHO approved RDTs include the Kato Katz for soil transmitted helminths. Their use in mapping disease has informed national NTD strategic plans. Other diagnostic tests such as the enzyme linked immunosorbent assay (ELISA) OV16 ELSA or rapid diagnostic tests such as OV16 RDT (19) for Oncho can be easily administered. In combination with entomological mapping, these tests can enable countries to measure progress towards eliminating Oncho and or revamping efforts in endemic areas as they work on attaining national elimination.

2.3 Data quality and use

As this group of diseases are neglected, their related data are also largely neglected in routine government health information systems. The WHO NTD data repository under the Expanded Special Project for the Elimination of Neglected Tropical Diseases (ESPEN) houses this information. This results in a significant time lag that affects governments' and decision makers' timely access to this data. Ministries of Health in Africa need to integrate NTDs in their routine data collection and reporting to enhance opportunities for institutional data access, and evidence-based decision making towards their elimination goals. This will further inculcate the culture of reviewing, owning, and using NTD data at all decision and implementing levels.

While data availability forms one piece of the puzzle, the capacity to analyze and effectively use the data in a timely manner is lacking in some of the countries with the highest burden of NTDs. This role is often outsourced to international partners and consultants. Local research institutions and universities need to build the capacity and resources available to ensure a well-equipped cadre of statisticians and mathematicians to build predictive models that enable countries to monitor their progress towards attaining their 2030 NTD elimination goals. Furthermore, countries need to ensure this robust statistical capacity and systems are in place to support post elimination surveillance.

Supporting greater domestic government ownership to promote systems-change has been one of the END Fund's priorities since its establishment in 2012. This is especially important as we work to achieve the ambitious 2030 goals. Our aspiration of enabling 500 million people to live lives free from the burden of NTDs represents a third of the global goal for the next decade, as laid out in WHO's 2030 Roadmap. In the mid-term, 261.4 million people will benefit from END Fund operations between 2020-2025 whereas 37.5 million people will no longer need treatment for at least one NTD, and by 2025 at least 223.9 million people will no longer suffer from lack of NTD treatments as a result of the END Fund's operations (4).

3 Leaving no one behind

Even as countries continue to reach the inspirational point of developing and submitting elimination dossiers for key NTDs, elimination should not mean forgetting about these diseases. The long history of endemicity in many of these countries means that many persons will continue living with disabilities because of NTDs, including lymphedema in the case of lymphatic filariasis, and blindness in the cases of trachoma and onchocerciasis. Furthermore, women living with female genital schistosomiasis are often misdiagnosed, left untreated, and bear the pain and stigma of the infection. The psychological and social repercussions of the disabilities caused by NTDs can be devastating. They lead to discrimination and stigma that leads to inability to ensure a sustained income and social isolation (20). While it is an enormous achievement to halt transmission of these diseases, we have a moral responsibility as public health practitioners committed to NTDs to ensure that we leave behind community-based institutions that are adequately equipped to continue to support persons living with disabilities because of the history of NTDs in their communities. For this to happen, we need to ensure that African-based institutions are involved now, as they should have been a long time ago. Their involvement in current efforts will allow these institutions to continue to advocate for the social and economic inclusion of these persons in their communities. This, in turn, will allow these persons to receive care for the chronic conditions they are living with while continuing to be integral members of their communities.

4 Discussion

The sustainability of our joint global efforts to eliminate and control NTDs requires African-based institutions with the resources and

capacity to ensure that once we meet our NTD elimination and control goals, NTDs are not forgotten completely. Recent commitments to support African Leadership to end Malaria and NTDs indicate a recognition of the need for an Africa led approach to end these diseases. The risk of re-emergence is real without measures to prevent, detect, and rapidly react to any re-appearance of these diseases. However, funding in the public health sector is already strained, and NTD programs are often the first to be cut when new and emerging epidemics emerge. A key example of this was observed with the large cuts to programs by the UK government's Foreign, Commonwealth and Development Office (FCDO) in 2020 (21). As funding is diverted towards other new and emerging public health priorities after countries reach their ambitious, yet feasible, elimination and control goals, the role of local institutions in spearheading research and programs to implement the elimination agenda is critical. Investing in diagnostic devices that have high sensitivity and specify capacity, rapid turnaround times, and the ability to detect multiple NTDs is paramount to reducing both equipment and personnel costs. This includes ensuring that local institutions take the lead in the development and implementation of post elimination surveillance, and developing in-country pharmaceutical and diagnostic capacity. It will also be important to continue generating operational research to ensure NTDs are integrated into existing public health programs including One Health initiatives, malaria programs, sexual and reproductive health programs, and community advocacy initiatives.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.

Author contributions

LM-B contributed to the study design, analysis, writing. KY contributed to the study design, analysis, writing. NO contributed to the study design, analysis, writing. CK contributed to the study design, analysis, writing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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