



# A tale of two global emergencies: tuberculosis control efforts can learn from the Ebola outbreak

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**International TB control efforts can learn valuable lessons from the recent Ebola outbreak**

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In 1993, the World Health Organization (WHO) issued a press release announcing that tuberculosis (TB) was a global emergency, making it the first infectious disease to be declared as such. Although progress has been made, no country has eliminated TB and there are 3 million missed TB diagnoses each year [1]. The term global health emergency has since evolved and most recently, the term “Public Health Emergency of International Concern” (as defined by the International Health Regulations in 2005) was applied to the Ebola epidemic in West Africa, which has caused over 11 000 deaths [2]. Ebola control efforts are now focussed on getting to zero cases. Yet, while huge public interest has focussed on Ebola, TB is bereft of public attention despite causing 1.5 million deaths since the Ebola epidemic began a year ago.

The WHO End TB strategy boldly aims to end the global TB epidemic by 2035 and envisions zero deaths, disease and suffering [3]. TB elimination is not a new concept but national preparedness plans are currently inadequate [4]. Although the epidemic trajectory of an emerging disease such as Ebola differs from that of a chronic pandemic such as TB, the implications of delayed recognition, poor infection control and pressing diagnostic and therapeutic challenges provide many parallels between the two infections. Thus, TB control efforts could learn valuable lessons from the recent experiences gained during response to the Ebola outbreak.

## Appropriateness of local and global health response

The magnitude of the Ebola outbreak in West Africa highlights the challenges that countries with fragile health systems and volatile political situations face in mounting an appropriate local response to health crises. The absence of early warning systems for disease surveillance perpetuated the delay of WHO and others to recognise the scale of the disaster, resulting in a fragmented global response [5]. The TB epidemic in New York City in the 1990s is another example of the influence of socioeconomic policies on disease emergence and the importance of political commitment to control efforts. Overcrowding and social marginalisation in inner city areas resulted in a dramatic rise in TB incidence, but control efforts were not enhanced until the disease extended to middle-class suburbs [6]. TB funding in New York has since been cut by over 50% and 2013 statistics revealed the first increase in TB cases since the 1990s [7].

However, although inadequate funding and delays in routing resources have impacted both disease epidemics, existing resource allocation must be optimised. Nigeria’s success in curtailing Ebola offers lessons to TB control efforts. Within days of the Liberian index patient being diagnosed with Ebola in Lagos, Nigeria’s Ministry of Health activated an Ebola incident management centre (using facilities

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originally funded by the Gates Foundation to combat polio). There was rapid identification and follow up of the 894 contacts of the 20 Ebola cases, along with attention to infection control measures [8]. Nonetheless, since one potential unintended consequence of focussing health resources on a single disease is that other disease control efforts are compromised, if instead groups interested in different diseases including TB came together to use existing funding to improve health systems in developing countries, we would be better equipped to address both acute and chronic epidemics.

### **Addressing urbanisation and migration by healthcare system strengthening**

Widespread urbanisation has had profound effects on the scale of the Ebola epidemic and the resurgence of TB. Previous Ebola outbreaks were confined to geographically restricted rural areas, allowing for disease containment by basic public health measures [9]. Although the current outbreak began in a remote area of Guinea [10], its proximity to borders with Sierra Leone and Liberia led to rapid disease spread, making contact tracing more challenging [11]. Border issues also remain a pressing concern for TB control efforts and the importance of integrating migrants into healthcare systems has frequently been overlooked [12, 13]. The global framework for TB elimination in low-incidence countries lists the special needs of migrants and cross-border issues as one of eight priority actions [14]. The Ebola epidemic provides a poignant reminder that infections do not respect borders. TB control efforts must direct resources towards improving disease surveillance, ensuring integrated primary care services for all and providing social protection mechanisms for those who become ill [15].

### **Improving the clinical impact of diagnostic tests**

Despite the rollout of serology and PCR-based tests to diagnose Ebola in West Africa, rural areas often lack the infrastructure requiring electricity needed to run them. The expedited WHO approval of the finger-prick whole-blood ReEBOV Antigen Rapid Test (Corgenix, Broomfield, CO, USA) potentially represents a significant breakthrough. Although ReEBOV's sensitivity of 92% is lower than that of PCR, it does not require electricity and has a 15-min turnaround time [16, 17]. The development, scale up and roll out of Xpert MTB/RIF (Cepheid, Sunnyvale, CA, USA) has revolutionised the field of TB diagnostics [18] but demonstrates that the clinical impact of rapid molecular diagnostic tests is limited by infrastructure requirements and cost considerations in many countries [19, 20]. The rapid development of affordable, point-of-care tests, ideally with high sensitivity and specificity, remains a key objective for the End TB 2035 targets to be feasible. However, translating this into early diagnosis and improved patient outcomes requires an understanding of the current barriers to effective TB care [21]. A sustained commitment is needed to expand access to services and improve the quality of care, which will also rely on involving the informal and private health sectors in high-burden settings.

### **Development and evaluation of therapeutics**

The urgent need for specific treatments for Ebola parallels the need for better therapeutic options for TB. The search for Ebola drugs has intensified and there is an understandable tendency to rush drugs to market for this disease given its high mortality rate but this may have unintended consequences. Although bedaquiline, the first anti-TB drug to be approved since rifapentine in 1998, has demonstrated promising results, its accelerated FDA approval raised questions regarding the appropriateness of approving a drug based on small phase 2 trials that used a surrogate endpoint [22]. Heated debate surrounds the best approach to evaluating treatments for Ebola and many questions posed also apply to TB therapy trials. Despite evidence demonstrating the cost-effectiveness of TB therapy [23], the lack of financial incentives compromises the development of TB products. Many new TB drugs are thus being developed as part of collaborative risk-sharing initiatives between pharmaceutical companies and product developers. Particular challenges for TB therapeutics development include developing effective short-course regimens while managing drug resistance, interactions and toxicities [24].

### **Addressing infection control and healthcare worker infections**

This Ebola epidemic has served as a chilling reminder of the effect that inadequate infection control practices can have on infectious disease transmission. The high rate of Ebola infections in frontline healthcare workers has also been of particular concern [25], since they already represent an extremely limited resource in West Africa. Greater efforts were made as the Ebola epidemic developed to implement adequate infection control measures including using personal protective equipment for healthcare workers. There are persistent reports in TB that this basic lesson has yet to be learnt. A higher incidence of active TB has been demonstrated in healthcare workers [26], along with a lack of TB-specific infection control programmes and poor compliance with personal protective equipment in healthcare facilities in high-TB burden settings [27, 28]. Nosocomial TB transmission is a particular additional threat to hospitalised HIV patients. Despite a very different disease trajectory, the Ebola epidemic highlights the importance of stringent contact tracing and developing rapid triage tests to facilitate appropriate use of limited isolation facilities.

### Community engagement and decreasing stigma

Finally, engaging local communities in disease control efforts is critical. Successful efforts to reduce transmission in the densely populated Montserrado County slums, which accounted for 50% of Liberia's Ebola cases, relied on dedicated local teams using basic mobile health technology to actively identify each case and quarantine their contacts [29]. These efforts were backed by the commitment of political and local community leaders. The importance of building trust and decreasing stigma within disenfranchised communities cannot be under-emphasised. Although the panic regarding an acute infection such as Ebola differs from the stigma and apathy surrounding a chronic disease like TB [30, 31], the Ebola epidemic is a reminder of the importance of community-based approaches to managing these infectious diseases.

### Conclusions

Other additional challenges for TB control that cannot be compared to Ebola include HIV–TB co-infection and drug-resistant TB [32, 33]. Both of these require improved case detection, linkage to care and early initiation of appropriate therapy to improve individual outcomes and decrease transmission. The push towards TB elimination as stated in the End TB strategy must also address the reservoir of latently infected TB patients, which requires improving diagnosis and uptake of preventive therapy [34]. However, the Ebola outbreak has reminded us that rapid strides can be made in diagnostics and therapeutics development but also that sustained political commitment and community engagement must occur earlier and not waver if preventable deaths are to be averted. Examining aspects of these two epidemics in tandem demonstrates that infections impact the whole health economy and it is vital to invest in the system infrastructure rather than any one disease. This is of paramount importance if we are to address acute newsworthy epidemics such as Ebola but also a chronic pandemic that has become a global yet underappreciated issue such as TB.

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