Responding to Health System Failure on Tuberculosis in Southern Africa

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Abstract

The characteristics of tuberculosis—such as links to poverty, importance of patient actions, and prevalence of multi-sectoral drivers—require more from health systems than traditional, medically oriented interventions. To combat TB successfully health systems must also address social risk factors and behavior change in a multi-sector response. In this, many health systems are failing. To explore why, and how they can do better, we apply the Flagship Framework and its five "control knobs" (*financing*, *payment*, *organization*, *regulation*, and *behavior*) to the literature on TB control programs, focusing on the mining population of Southern Africa, among whom the incidence of TB is highest in the world. We conclude by recommending a patient-centered approach that broadens a system's engagement to a whole-of-health-sector, whole-of-government response.

Keywords: tuberculosis, health systems, multi-sector, mining, Southern Africa

Introduction

If treated immediately and effectively, tuberculosis (TB) has a cure rate of over 90%.[1] In spite of this, it remains the number two killer in the world—just barely outpaced by HIV/AIDS.[2] After TB was classified as a disease by Robert Koch in 1882, its first control programs focused on improved housing, ventilation, and nutrition. These programs were successful in lowering TB prevalence, but gave way to medically oriented interventions following the discovery of the bacillus Calmette-Guérin (BCG) vaccine in 1921, and treatments streptomycin in 1949 and isoniazid in 1951.[3] Over decades, prevalence declined steadily in middle- and high-income countries, where improved socioeconomic conditions had the dual benefit of supporting large-scale immunizations and improving living conditions. In lower-income countries, where poverty, overcrowding, and malnutrition continue, TB remains a large problem. Moreover, recent spikes in TB prevalence—catalyzed by HIV/AIDS—have remained largely impervious to control efforts.

With a high cure rate, a relatively inexpensive treatment, and decades to refine treatment protocols, why has tuberculosis been so persistent in these countries?

A look into the experience of the Southern African region helps illuminate the factors that contribute to explain this puzzle. In a region already fraught with poverty and high levels of HIV, miners have the highest incidence of TB in the world, at well over 2000% the global average.[a,4] They fall victim to the heavy burden to complete lengthy treatment regimens, the strong link to social determinants such as housing conditions and poverty, and the occupational risks that make them simultaneously more likely to be infected with TB and less likely to receive adequate care.

These barriers to effective treatment occur across the continuum of care, and thus TB control programs must touch every aspect of a nation's health system to properly combat them. For the purposes of this paper we use the World Health Organization's definition of health systems as a system that "delivers quality services to all people, when and where they need them" and does so through "a robust financing mechanism; a well-trained and adequately paid workforce; reliable information on which to base decisions and policies; well-maintained facilities and logistics to deliver quality medicines and technologies."[5]

Of course, it is natural for diseases of all types to proliferate more successfully in areas where health systems are inadequate—this is the rationale underpinning most advocacy for health systems strengthening.[6] The purpose of our paper, however, is not to emphasize the connection between health systems and better disease outcomes. Rather, it is to encourage health systems to grow and adapt beyond their traditional approach to deliver a whole-of-health-sector, whole-of-government, even whole-of-region response.

Methods

To explore why health systems are failing to combat TB in Southern Africa, and how they can do better, we synthesized the large body of published literature on TB and health systems in a systematic way. We structured the literature review around the Flagship Framework,[7] The Framework revolves around five actionable and interrelated health sector policy areas, termed "control knobs." These knobs—*financing, payment, organization, regulation,* and *behavior*—can be used in combination to influence intermediate outcomes such as efficiency, quality, and access, in order to impact health system outputs. [Figure 1]

In the literature search, we used keywords such as *tuberculosis, TB, Southern Africa,* in conjunction with each of the five control knobs, as search terms to retrieve relevant articles. Only articles published in the last 20 years, and in English, were included in the review.

In addition, two of the authors drew from direct experience between 2013 and 2016, when the World Bank worked with the Government of South Africa, the WHO, USAID, and other partners to better understand the challenges faced by the government in tackling TB in the mining industry. This included two meetings bringing together local and international experts: February 8-9, 2015, in Cape Town, and October 1-4, 2014, in Pretoria. Participants included representatives of the Global Fund to Fight AIDS, Tuberculosis, and Malaria; the World Health Organization; USAID's Office of Infectious Disease, within the Bureau for Global Health; the World Bank Southern Africa team; and the Stop TB Partnership. From within the region, experts included Ministry of Health officials from South Africa, university professors from Cape Town University and the University of Witswatersrand, private-sector members for service delivery and health insurance,[b] former mine workers, and labor recruitment for the mining sector.

Results

In the following section we review the results of our research, first reviewing the challenges that TB presents to health systems, honing in on the challenges most prevalent for Southern African miners, and finally highlighting each "control knob." Where evidence allows, we present examples of how these knobs affect TB control programs, and recommend ways to turn the knobs toward a more effective, patient-centered approach.

Tuberculosis and Health Systems

Tuberculosis requires a proactive and targeted approach to finding cases, yet those most vulnerable to exposure can also be the hardest to reach. Once diagnosed, they face lengthy treatment of Direct Observation Treatment–Short course (DOTS) therapy, which lasts between six and nine months, and must be observed for the first two months (or more). Patients frequently discontinue this because taking time off work or making long trips to the nearest TB provider is difficult.[3] Still others are not educated about the importance of completing their entire regimen, and so stop treatment when their symptoms cease because they believe they are cured.

These factors can propagate multiple drug resistant (MDR) tuberculosis, a deadly strain that only 52% of patients overcome.[8] Treatment for MDR-TB can easily overwhelm health budgets of middle- and low-income countries, where 95% of cases occur.[9] In these instances, what might have started as a relatively manageable case of TB can quickly grow into a widespread epidemic, exacerbating the health system failures that allowed TB to thrive in the first place.

The struggle certain countries face in effectively combatting TB illustrates how TB links to the capabilities of health systems. However, this is not a lens through which TB is historically viewed. WHO's strategy has traditionally focused on how TB presents in the population.[10,11] While this approach effectively highlights countries that have the highest estimated numbers of TB cases, and highlights the similarities TB can have across the globe, it does not capture the underlying drivers that cause TB to surface in the first place and persist so doggedly. Socioeconomic factors such as occupation, poor housing conditions, and existing comorbidities are stronger predictors of TB case notification trends than is national TB program

performance.[12,11] In fact, empirical analysis has demonstrated that WHO's TB control interventions alone have not helped bend the curve of TB incidence.[13]

More recently, attention has been given to the importance of underlying social and economic structures in the last decade. In the transition from the Millennium Development Goals (2005–2015) to the Sustainable Development Goals (launched in 2015), WHO asserted Goal Three is to "ensure healthy lives"; but almost all of its eight goals affect health outcomes.[14] Studies have similarly broadened to examine social factors such as cultural norms. For example, treatment default on DOTS was revealed to be directly linked to conflicting cultural norms in the state of Gujarat in India in 2014, where dietary recommendations challenged patients' vegetarian traditions.[15] WHO has also begun emphasizing the importance of social factors: 2017 marks the second year of a new Unite to End TB campaign, espousing "a whole-of-society and multidisciplinary approach."[16]

Examining the Case of Miners in Southern Africa

The Southern African region—consisting of Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe—has the highest TB incidence in the world. Ranging from 10% in Malawi to 27% in Lesotho and Botswana, these countries consistently top global rankings of TB in both absolute numbers and in cases per capita.[17,18] While some progress has been made, with increased numbers of patients receiving treatment and higher case detection rates, overall incidence remains stagnant. There are many reasons for this, but few are as influential as pervasive poverty, high rates of HIV/AIDS, and occupational risks of the mining industry.

For countries with limited resources, reaching vulnerable populations is exceedingly difficult: in Mozambique, the case detection rate hovers around a mere 38% of the population.[10,19] For the region, TB/HIV coinfections are higher than anywhere else in the world: in Botswana, between 60% and 86% of TB patients also live with HIV; in Lesotho this hovers around 64%.[20,21,10] As a result, the majority of TB diagnoses and treatment services in the region are viewed through an HIV lens.[22] When done properly, HIV/TB program integration is a positive and essential part of effectively treating TB—however, fatalities remain unacceptably high.[23] Additionally, such programming can be imbalanced: for every $100 that the Global Fund spends in sub-Saharan Africa, for example, only $6 goes to TB programming.[4]

These factors converge in the case of miners. Botswana, South Africa, Zambia, and Zimbabwe all rely economically on the vitality of their mines, as do Lesotho and Malawi indirectly due to their status as labor-exporting countries.[17] Unfortunately, a combination of occupational and demographic traits, including poor ventilation, indoor pollution, and high population density, increases the miners' risks of being exposed to TB. Once exposed, several characteristics of this population compound their chances of being actively infected: poverty, malnourishment, active smoking, and/or frequent use of alcohol. These risk factors are worsened by the high prevalence of TB already present in the mining community.[12]

It is estimated that in South Africa alone, implementing activities to tackle TB would result in increased mining productivity worth $783 million per year.[4] That the country has not acted to mitigate risks to miners in spite of such potential gains speaks to the challenges of implementing an adaptable, multi-sectoral response. Where exactly these challenges lie and how a system can change them are described in the next section.

What Can Be Done Differently

When a health system does grow and adapt to include social, multi-sectoral responses, TB control programs struggle to work effectively. In illustrating this, we organize our results in this section using the Flagship Framework's five control knobs. When applicable, we highlight the broader social determinants or drivers that remain unaddressed, and the need to turn the knobs in a way that increases the multi-sectoral nature and adaptability of the health sector in tackling TB.

Financing

There is overwhelming evidence of the links between poverty and limited access to TB services, including the impact of financial barriers to access.[24,25,26,27] These barriers manifest directly in the costs of goods and services. They also include the opportunity costs that patients must incur in the time they take to seek screening and treatment, which can result in lost income both immediately and potentially in the future if they miss too much work and lose their job.

Financial barriers to accessing care can be eliminated in various ways. Most countries in Southern Africa attempt to eliminate fees for TB services, or alternatively, implement targeted exemption mechanisms for poor or highly vulnerable populations.[28] In spite of free treatment, many TB patients still face catastrophic costs that limit their access to care: in spite of having free TB treatment in South Africa, the average time between experiencing symptoms and receiving a TB test jumps from 33 days to 90 when comparing the poorest group to the less-poor group.[29] In addition to delaying treatment—which gives the disease in the larger population more time to develop drug resistance—the extra days also triple the time that families, coworkers, and others in the community are exposed.

Additional financing policy interventions, such as conditional cash transfers or voucher mechanisms, must be considered. These work through demand-side financing and also relate to other control knobs such as payment (to providers) and behavior changes. There is increasing evidence of the success of cash transfers in tackling inequality in access to care by allowing households to break the cycle of poverty through addressing many of these indirect costs head-on, such as improving ventilation in their homes, or using public transportation to cover long distances to facilities more quickly.[28,12,30] Research conducted in Malawi with HIV/AIDS, for example, revealed that even relatively small monetary incentives encouraged uptake of interventions and changed people's health-seeking behaviors by compensating for economic and psychological costs of HIV testing.[31]

Payment

Incentives, or disincentives, created by paying providers through various mechanisms

Effective TB prevention and treatment is dependent upon expansive case finding for both drug-sensitive and drug-resistant strains, and high patient adherence for both drug-sensitive TB and MDR-TB treatments. For both of these important objectives, provider-payment-based incentives can increase the likelihood of success. Instruments such as results-based financing can be used to improve performance of both public and private providers for diagnosis and treatment of TB. Diagnosis-related group (DRG) payment mechanisms, for example, did this for hospitals in the former Soviet Union.[32]

The limited nature of evidence directly linking results-based payments to health outcomes prevents us from making full-fledged recommendations in this area.[33] However, the experiences of other countries when challenged by payments may offer lessons to Southern Africa on what to avoid. In China, provider payment mechanisms are having unintended consequences, derailing the effectiveness of a recently instituted policy of free treatment for TB. Because facilities cannot charge for TB services directly, but can charge for repeated and/or ancillary tests, they frequently will provide additional, unnecessary services for which they can be paid. Primary clinics there also will delay patient referrals to hospitals that provide TB services. As a result, patients receive delayed diagnoses and experience gaps between diagnosis and treatment, as well as incur costs for possibly inappropriate testing.[34]

Organization

Historical inequities in South Africa's public health system, coupled with the extent of the combined TB and HIV epidemics within the region, have created enormous operational challenges for integrated health service delivery. [4,35,36,37] A decades-long legacy of disease-specific vertical programming, particularly for TB and HIV, resulted in fragmented, poorly coordinated care. Prior to the country's integrated response to TB and HIV in 2010, services were delivered by different staff and often located in separate clinics, hindering communication between managers and exacerbating inefficiencies in joint planning.[38] Furthermore, weak communication among the national, provincial, and district levels in the South African health system resulted in poor integration of program management at provincial and district levels. Such challenges can be insurmountable for mineworkers with TB, where limited access to

primary care doctors, a deficient referral system, and gaps in follow-up have led many to discontinue treatment.[39]

This fragmentation is exacerbated by high volumes of migrants: almost half of the workers in South African mines are migrants from Lesotho, Mozambique, and Swaziland.[40] Migrants are not unique to Southern Africa, but circumstances are particularly challenging in this region, where no common language is spoken across countries. In Zambia, Namibia, and Mozambique, Namibia, and Zambia alone, more than a hundred languages are spoken (32, 28, and 41, respectively).[17]

A step in the right direction is efforts to harmonize TB treatment protocols across the Southern Africa region and to evolve a regional response through the political structure of SADC, the Southern Africa Development Cooperation mechanism.[4] In South Africa specifically, there have been promising efforts to strengthen the health system and ensure affordable, effective, and quality health services—most notably through primary health care re-engineering and phased implementation of national health insurance.[41] Most recently, the World Bank has launched a $122-million program aimed at controlling TB in Southern Africa by focusing on mining communities, regions with high HIV/AIDS comorbidities, transport corridors, and cross-border areas of Lesotho, Malawi, Mozambique, and Zambia.[18]

Regulation

Setting the rules of the health care game and ensuring that somebody is accountable for enforcing them is a critical function of government. Mechanisms include *control regulation*

(using the mandating instruments of government), *incentive regulation* (using payment systems to create incentives for provider behavior), or *self-regulation* (building and strengthening professional organizations and empowering them to influence provider behavior). Fragmentation in the service delivery for TB complicates regulatory functions.

Lax regulation contributes to the proliferation of TB in Zambia. Mines there have an average total of respirable dust concentrations that is well above the limit recommended by safety authorities, yet can operate because levels are still below the legal limit enforced by the Zambian government.[42] Another example is easily found in South Africa, whose mining sector is regulated by its Department of Minerals rather than its Department of Health. As a result, in spite of TB's sky-high prevalence among miners, regular screenings of TB are not implemented widely, and there are few programs in place to educate miners about the occupational risks they are taking and their vulnerability to acquiring TB. In 2010, the South African National Institute for Occupational Health surveyed 63 mines and found that only 40% provided TB services on site.[40]

For the many miners who are not permanent employees but contracted or completely informal workers, these opportunities are even fewer. Moreover, absence of job security and/or occupational disease compensation creates strong disincentives for workers to take advantage of screenings in the few places they are offered for fear of losing needed income. The growing number of undocumented migrant workers across the region, are even more vulnerable to being abused in this environment of lax regulation.[40] A successful regulatory response to TB requires a health system to be flexible in bringing other sectors on board for preventive and care services, but also requires national leadership to facilitate multi-sector responsibilities and actions.[43]

Behavior

In the context of TB in Southern Africa, central issues relate to on-the-job-related prevention activities for miners, reporting illness despite the risk of losing their job, and compliance with the full medication regimen once diagnosed. Disincentives to health-seeking behavior are alive and well. In Zambia, for example, not only are miners infected with TB removed from the mines, but prospective miners found to test positive for TB prior to employment may not work.[42] This can create distrust between the mining institution and the miners. The social and historic context of poverty, low education, and a legacy of racism in the mining sector make changing this policy especially difficult.[22]

Interventions should revolve around finding and strengthening community-based information and support mechanisms that respond to distrust of institutions, as well as using incentive-targeted mechanisms such as conditional cash transfers and vouchers. Utilizing trusted channels, such as ex-mineworkers and ex-mineworker associations, as part of community outreach or as community health workers has the potential to improve health-seeking behaviors and adherence to TB treatment protocols.[39]

Conclusion/Discussion

TB in Southern Africa continues to be an unfortunate fact of life and death for its 65 million inhabitants. The nature of the disease, the link to poverty and vulnerability connected to a history of racism around mining and civil rights, and the complications of multi-sectorality and

cross-country migration and coordination are among the reasons for this failure of the health sector. Clearly, business as usual is not solving this challenge. Here we identify needs and propose certain concrete steps, some already under way, in recognition of the need for the health sector be more resilient and to expand its toolkit beyond funding and service delivery to include influence, empowerment, and broad stewardship.

A central dimension of addressing TB in Southern Africa is the need to explore and address population-based and population-focused issues and challenges. The disproportionate prevalence of TB among socio-economically vulnerable populations such as migrant miners makes it critical to take a community-based response and to ensure that services are patient-centered and take into account how the population receives and acts on life-saving information. Some of that work in already beginning in the region, with authorities reaching out to miners through trusted channels (e.g., by employing non-governmental groups such as ex-mineworkers from the same labor-sending regions and speaking the same language).

Second, TB control efforts in Southern Africa should continue to acknowledge the multi-sectoral drivers of the disease highlighted by the mining industry, and advocate more strongly with non-health-sector actors. The dominant sectors that can regulate economic activities that in turn influence the drivers of TB are the Departments of Minerals, Labor, and Migration, and not Health. This means that a successful response to TB in Southern Africa has to be a whole-of-government approach, in which the health sector plays a coordinating and empowering role.

Finally, a regional approach is necessary to account for the Southern Africa cross-border challenge linked largely to migration of mining workers. The implication is that an effective response to TB in Southern Africa requires a regional approach. An excellent example is a recent

effort to harmonize TB treatment protocols across the region and to evolve a regional response through the political structure of SADC.[4]

It is heartening to see that recent efforts to tackle TB in Southern Africa have gone beyond the basic medical approach. While clear cost-effective medical approaches exist, the challenge is beyond basic delivery and financing of services. New efforts have begun to put the population first and pay attention to what motivates them to change their behavior. These efforts are also focused on strengthening collaboration across the different parts of the health sector (whole-of-sector approach), across sectors to work more closely with Minerals and Labor (whole-of-government approach), and across national borders (whole-of-region approach).

To reverse centuries of system failure, however, collective efforts need to be sustained and even expanded, and the health sector needs to show a higher level of resilience than it has to date.

Disclosure of interest

The authors report no conflict of interest.

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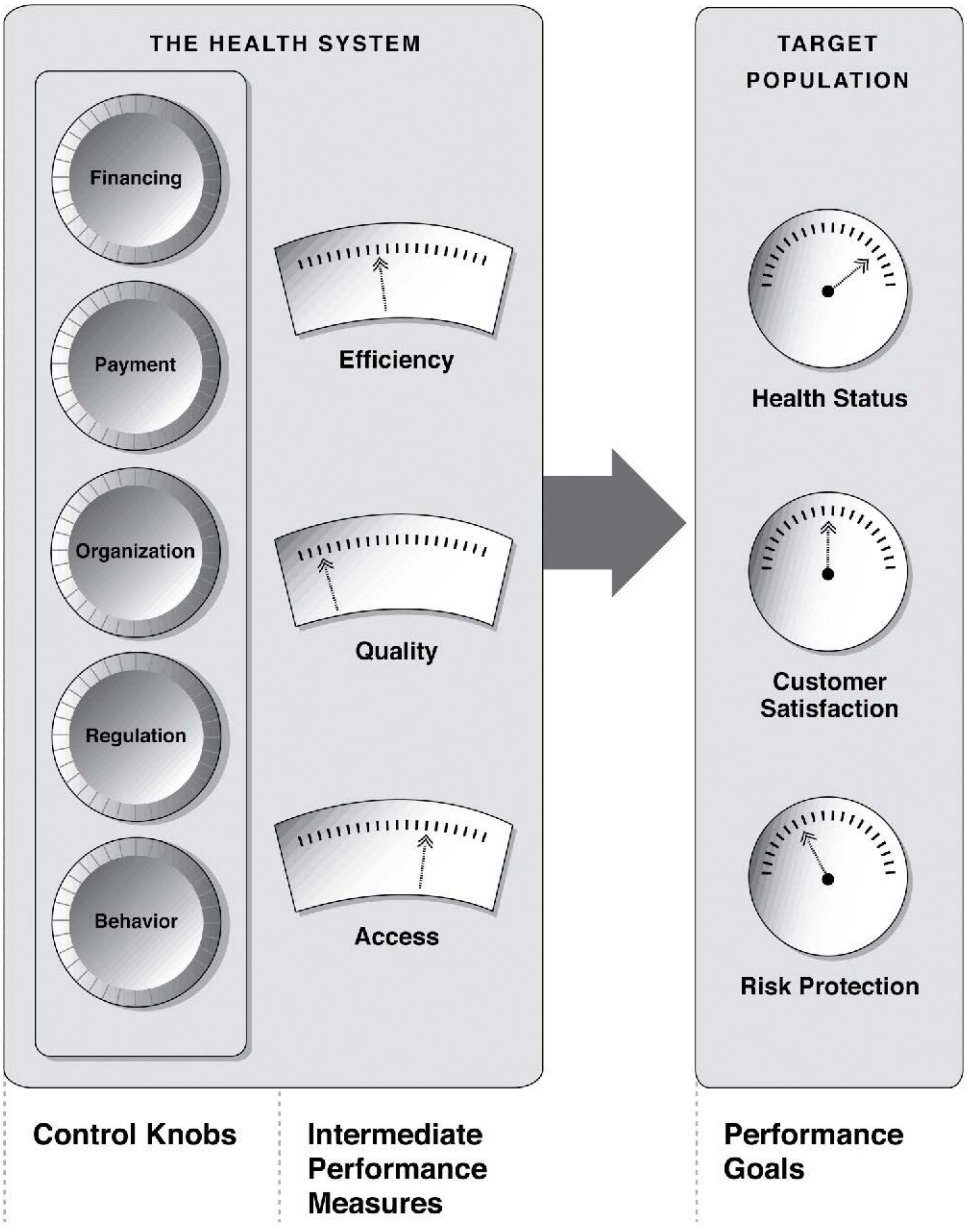
[a] Miners in South Africa, for example, have a TB incidence rate between 3,000 and 7,000 per 100,000 compared to the global incidence of 128 per 100,000.


THE HEALTH SYSTEM
Financing
Payment
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Regulation
Behavior
Efficiency
Quality
Access
TARGET POPULATION
Health Status
Customer Satisfaction
Risk Protection
Control Knobs
Intermediate Performance Measures
Performance Goals