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I wrote this Comment while employed as a Public Health Physician and Principal Epidemiologist at the New Zealand Ministry of Health; views expressed in this paper are solely those of the author and do not necessarily represent the policy advice of the New Zealand Ministry of Health. I declare no competing interests.

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## Reducing global tuberculosis deaths—time for India to step up

As another World Tuberculosis Day passes by the outlook for tuberculosis control is far from optimistic, especially for India, the ground zero for the global epidemic. Last year, WHO declared that the tuberculosis epidemic was worse than previously thought, with an estimated 10.4 million new tuberculosis cases worldwide in 2015.<sup>1</sup> WHO estimated that globally 1.8 million people died from tuberculosis in 2015, of whom 0.4 million were also infected with HIV.<sup>1</sup> Although global tuberculosis deaths declined by 22% between 2000 and 2015, it is remarkable that tuberculosis today is responsible for more deaths than HIV and malaria combined, and continues to rank among the top ten causes of deaths worldwide.<sup>1</sup>

WHO estimates that India accounts for 2.8 million (27%) of the 10.4 million new cases, and 29% of the 1.8 million deaths.<sup>1</sup> According to the Registrar General of India’s Million Death Study, which documented causes of death in 1.4 million households, tuberculosis remained one of the top five causes of death among people aged 30–69 years.<sup>2</sup> By contrast, in China tuberculosis is no longer one of the top ten reasons for dying.<sup>3</sup> Importantly, the declines in the age-standardised tuberculosis death rates in India mostly occurred between 2001 and 2007, with a slowing of the decline from 2008 to 2013.<sup>4</sup> Most tuberculosis deaths in India continue to be among young adults in the economically productive age group, with high economic and social costs.<sup>4</sup>

Why are so many Indians dying of a curable infectious disease in 2017? There are several factors that contribute to India’s enormous tuberculosis death toll. First, India has not adequately tackled key determinants of tuberculosis, especially malnutrition and tobacco smoking, which have been clearly linked with excess tuberculosis mortality.<sup>5,6</sup> Second, India continues to underinvest in health, with governmental expenditure on health being one of the lowest in the world at 1.4% of the gross domestic product.<sup>7</sup> This underinvestment is reflected in India’s Revised National Tuberculosis Control Program (RNTCP) that has struggled to receive budgets commensurate with the scale of India’s epidemic.

Third, implementation failures and a weak health system have led to suboptimal cascade of care in the public system. About half a million patients with tuberculosis in



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India reach tuberculosis diagnostic facilities but are either not effectively diagnosed or not started on treatment.<sup>8</sup> While RNTCP only reports data on the number of patients who complete tuberculosis therapy, a considerable proportion of these patients relapse with tuberculosis disease within 1 year of treatment completion.<sup>8</sup>

Fourth, poor quality of tuberculosis care is a big concern in the private sector, a major provider of health services in India. Drug sales data suggest that 2.2 million patients with tuberculosis could plausibly have been treated in the private sector alone in 2014—more than double the number suggested by previous estimates.<sup>9</sup> Although the implementation of the RNTCP resulted in an increase in patients seeking care in government facilities, more than half of patients still initially seek care in the private or informal sector or get bounced around between the private and public sectors.<sup>10,11</sup> Indeed, several studies show complex care seeking pathways, long delays in diagnosis, underuse of microbiological tests, widespread empirical management, and poor adherence to tuberculosis diagnostic and treatment standards.<sup>10–12</sup> Thus, poor quality of care, in both public and private sectors, increases the risk of drug resistance and mortality.<sup>13</sup>

In a 2016 Comment in *The Lancet*, the Indian Minister of Health and Family Welfare proposed that tuberculosis should be made a top priority on national agendas.<sup>14</sup> The Minister of Finance in India's 2017 Union Budget outlined an ambitious goal of eliminating tuberculosis by 2025.<sup>15</sup> Subsequently, RNTCP published its new draft National Strategic Plan for Tuberculosis Elimination 2017–2025.<sup>16</sup> The plan is bold, comprehensive, and potentially a game changer. It includes private sector engagement, new tools and approaches to plug gaps in the tuberculosis care cascade, active tuberculosis case-finding among key populations, and measures to prevent the development of active tuberculosis in high-risk groups. Although these statements show high-level political commitment, it is essential to follow up with full funding (estimated at US\$2485 million in the new plan)<sup>16</sup> for the new National Strategic Plan for Tuberculosis.

The final plan must include quality improvement as an integral part of the tuberculosis programme, and test novel approaches such as decentralised molecular diagnostics and Information Communication Technology solutions to plug the gaps in the care cascade. Any plan to substantially reduce tuberculosis mortality in India must include a comprehensive

approach to working with the private sector, and address key social determinants such as malnutrition and lack of social protection. Additionally, India needs to address the implementation failures and bureaucratic inertia that have plagued the health system. For example, India is one of the few countries that is still reliant on intermittent tuberculosis drug regimens. Responding to activist petitions, in January, 2017, the Indian Supreme Court ordered the Indian Government to switch from intermittent tuberculosis therapy to an internationally accepted daily regimen.<sup>17</sup>

Effective control requires accountable surveillance and tracking. The creation, in November, 2016, of the India TB Research and Development Corporation—an initiative involving the Indian Council of Medical Research and national and international stakeholders to develop new drugs, diagnostics, and vaccines for tuberculosis—is promising, and will hopefully spur periodic prevalence surveys, nationwide drug resistance surveillance, tracking of tuberculosis deaths, and other indicators of quality of care. With timely, accessible, and high-quality tuberculosis care, there is no reason why India cannot stem the tide of premature deaths due to a curable infection. Global progress depends on India stepping up.

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## Sustaining tuberculosis decline in the UK

The re-emergence of tuberculosis in England began in the late 1980s increasing to a peak in 2011; since then incidence has fallen throughout the UK, in both the UK and non-UK born population, including in children.<sup>1</sup> After 4 consecutive years of declining incidence of tuberculosis, sustained progress is finally being made with a 30% decline between 2011 and 2015.<sup>1</sup> However, tuberculosis incidence in the UK remains higher than in most other high-income European countries and more than four times higher than in the USA.<sup>2</sup>

The decline in tuberculosis follows a combination of local, national, and global action, as well as changes in migration patterns. A collaborative national tuberculosis strategy was developed by Public Health England and NHS England between 2013 and 2015, while concurrently implementing new local and national

tuberculosis control initiatives, such as cohort reviews<sup>3</sup> and active case finding.<sup>4</sup> The collaborative strategy involved ten evidence-based areas for action backed up by new investment. Two particular priorities were latent tuberculosis testing and treatment for new entrants to the UK and targeted case finding and supported management for vulnerable groups, such as people who are homeless, drug and alcohol users, and those in contact with the criminal justice system. Monitoring has allowed continuous updating of the focus of the programme, but an evaluation and review of the effect of specific investments is also warranted in due course.

73% of individuals identified with tuberculosis in England in 2015 were born abroad, a population with a 15 times higher tuberculosis rate than the UK born population.<sup>1</sup> While migration drives the overall trends, tuberculosis continues disproportionately to affect people with social risk factors such as homelessness and problem drug use. The rate of decline in incidence of tuberculosis among people with a social risk factor was more than ten times lower between 2011 and 2015 than the fall in overall incidence in England.<sup>1</sup> In 2015, tuberculosis patients with social risk factors had higher levels of drug-resistant tuberculosis, were twice as likely to have infectious tuberculosis, and were three times more likely to be UK born than people without social risk factors.<sup>1</sup> The ongoing north London isoniazid resistant tuberculosis outbreak, which began in 1995, suggests continuing transmission in this group.<sup>5</sup> Treatment outcomes in individuals with social risk factors were worse than in those without social risk factors.<sup>1</sup> A greater focus on finding and treating patients with



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