



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Building a tuberculosis-free world while responding to the COVID-19 pandemic

In March, 2019, the *Lancet* Commission on Tuberculosis¹ highlighted the opportunity to build a tuberculosis-free world. After years of neglect of this disease, the UN High-Level Meeting on Tuberculosis in September, 2018, made ending tuberculosis a global priority; global leaders committed to important steps, including ambitious country-specific tuberculosis case-finding and prevention targets, and a revitalised research agenda.² The *Lancet* Commission concluded that the prospect of a tuberculosis-free world was a realistic objective that could be achieved with sufficient accountability and resources, and detailed the catastrophic consequences of failing to build on that momentum. In India alone, deaths from tuberculosis would cost the economy at least US\$32 billion each year over the next 30 years.³

In October, 2020, however, the possibility of achieving a tuberculosis-free world seems challenging. Even before the COVID-19 pandemic, declines in tuberculosis incidence fell short of targets.² Despite consensus on the importance of global accountability,¹ efforts to secure meaningful global accountability were mired in obfuscation and bureaucracy.³ Moreover, the COVID-19 response has reduced access to tuberculosis services worldwide, including in China,⁴ India,⁵ South Africa,⁶ and Nigeria.⁷ The potential advantages of physical distancing on tuberculosis transmission⁸ notwithstanding, COVID-19 is also likely to reduce access to tuberculosis diagnostics, especially for those at greatest risk of drug-resistant tuberculosis. The impact of the COVID-19 response on care-seeking behaviour among people with tuberculosis is unknown, but available data suggest

that fewer people are accessing tuberculosis services than would usually be expected.⁹

The potential impacts of these various challenges on tuberculosis transmission have been estimated;^{10,11} even a temporary disruption resulting from COVID-19 societal lockdowns might cause a long-term increase in tuberculosis incidence and mortality. In India, Kenya, and Ukraine, a 3-month lockdown, followed by a 10-month recovery period, is projected to lead to an estimated 1.65 million, 41 400, and 7960 additional incident tuberculosis cases in the next 5 years, respectively, because of limited access to drugs, diagnostics, and prevention programmes in the past few months.¹⁰ The economic burden due to these additional incident tuberculosis cases is likely to be profound.

We calculated the health spending due to these additional incident cases of tuberculosis using estimates of government tuberculosis spending per case¹² and out-of-pocket spending on tuberculosis care and projected the additional annual health-care costs that would result from these excess tuberculosis cases in India, Kenya, and Ukraine. After accounting for annual growth rates, we estimate that a 3-month lockdown, followed by a 10-month recovery, would result in an excess cost of \$1.95 billion in India, \$29 million in Kenya, and \$96 million in Ukraine with an increase of 7.9%, 5.5%, and 4.1% in average annual health spending on tuberculosis in each country over the next 5 years (table). If the disruptions were to extend by an additional 3 months on top of the 3 months of lockdowns and 10 months of recovery (6 months of lockdown and 13 months of recovery), then these costs would

	India		Kenya		Ukraine	
	2-month lockdown and 2-month recovery	3-month lockdown and 10-month recovery	2-month lockdown and 2-month recovery	3-month lockdown and 10-month recovery	2-month lockdown and 2-month recovery	3-month lockdown and 10-month recovery
Additional incident tuberculosis cases	473 000 (429 000–529 000)	1 650 000 (1 490 000–1850 000)	12 200 (8570–18 200)	41 400 (28 900–62 200)	2630 (2120–3300)	7960 (6250–9880)
Additional total spending (US\$, millions)	560	1954	8.7	29	32	96

Health spending categories include national tuberculosis programme, outpatient care, inpatient care, and drugs purchased in addition to those purchased by the national tuberculosis programme. We used the estimates by Cilloni and colleagues¹⁰ to estimate the additional incident cases of tuberculosis that would result due to a 2-month lockdown with a 2-month recovery and a 3-month lockdown with a 10-month recovery. We calculated health spending due to the additional cases using estimates of tuberculosis spending per case, per year, in 2017, along with the annual growth rates reported by Su and colleagues.¹² All costs are reported in inflation-adjusted 2019 US\$. Additional incident tuberculosis cases values are reported with 95% Bayesian credible intervals.

Table: Estimates of additional incident tuberculosis cases and spending in India, Kenya, and Ukraine due to COVID-19 lockdowns and recovery

increase to \$3 billion in India, \$45 million in Kenya, and \$160 million in Ukraine. In India, as much as 44% of that additional cost will be borne by individuals and households (appendix). Our estimates do not take into account the excess health-system costs from COVID-19 alone, which are likely to be substantially greater still. Moreover, our estimates assume that the distribution of costs between the government versus the individuals and households, would remain unchanged over a 5-year period and that costs increase at a constant annual rate.

Despite these challenges, there are opportunities for synergy to expand tuberculosis programmes, strengthen tuberculosis response, and increase resources towards ending tuberculosis as governments mobilise COVID-19 response efforts while maintaining existing tuberculosis programmes. Furthermore, many of the messages of the *Lancet* Commission on Tuberculosis are as relevant to national COVID-19 responses as they are to national tuberculosis programmes. COVID-19 and tuberculosis both require robust infection control strategies and similar diagnostic infrastructure. Community engagement has been essential in tuberculosis control to address stigma,¹³ which has already been associated with COVID-19. Mitigation strategies that proved successful in tuberculosis can also be deployed to assist in the community control of COVID-19, although the infection dynamics are different. Moreover, people-centred models of care, community-based services, video-supported treatment, or home-based care that have been championed by tuberculosis care providers are relevant to COVID-19 screening and management programmes.¹⁴ Leveraging the extended capabilities of the private sector to improve access to testing capability while pursuing a social protection agenda are important components of the global response to both diseases. In addition, given the scale of testing needed in the COVID-19 pandemic, the introduction of testing capabilities in low-income and middle-income countries should be used for tuberculosis and HIV as well.^{15,16} As the *Lancet* Commission emphasised, global tuberculosis efforts must move beyond traditional siloed development assistance approaches towards greater country ownership and holistic, multisectoral global cooperation. That same approach is crucial for the global COVID-19 response.

In the short term, COVID-19 has inevitably drawn attention away from tuberculosis services and might lead

to an increase in tuberculosis burden and incidence. Now is the time to leverage the political capital that exists for the global COVID-19 response to enable lasting change in the tuberculosis response. COVID-19, like tuberculosis, reminds us of the importance of prioritising health and allocating financial and human resources for universal health coverage and addressing the needs of vulnerable populations. With sound science, effective collaboration, smart investments, and efficient synergies, COVID-19 efforts could strengthen the global tuberculosis response and not undermine it.

We declare no competing interests. MJAR, NA, and EG were Commissioners of the *Lancet* Commission on Tuberculosis.

*Michael J A Reid, Sachin Silva, Nimalan Arinaminpathy, Eric Goosby
michael.reid@ucsf.edu

Institute for Global Health Sciences, University of California, San Francisco, San Francisco, CA 94158, USA (MJAR, EG); School of Medicine and Harvard T H Chan School of Public Health, Harvard University, Cambridge, MA, USA (SS); and Faculty of Medicine, School of Public Health, Imperial College London, London, UK (NA)

- 1 Reid MJA, Arinaminpathy N, Bloom A, et al. Building a tuberculosis-free world: the *Lancet* Commission on tuberculosis. *Lancet* 2019; **393**: 1331–84.
- 2 UN. Political Declaration of the UN General Assembly High-Level Meeting. United Nations High-Level Meeting on the Fight Against Tuberculosis. 2018. <https://www.who.int/tb/unhlmontBDeclaration.pdf> (accessed Oct 12, 2020).
- 3 Harding E. WHO global progress report on tuberculosis elimination. *Lancet Respir Med* 2020; **8**: 19.
- 4 Pang Y, Liu Y, Du J, Gao J, Li L. Impact of COVID-19 on tuberculosis control in China. *Int J Tuberc Lung Dis* 2020; **24**: 545–47.
- 5 Gupta A, Singla R, Caminero JA, Singla N, Mrigpuri P, Mohan A. Impact of COVID-19 on tuberculosis services in India. *Int J Tuberc Lung Dis* 2020; **24**: 637–39.
- 6 National Institute for Communicable Diseases. Impact of COVID-19 intervention on TB testing in South Africa. 2020. <https://www.nicd.ac.za/wp-content/uploads/2020/05/Impact-of-Covid-19-interventions-on-TB-testing-in-South-Africa-10-May-2020.pdf> (accessed Oct 5, 2020).
- 7 Adepoju P. Tuberculosis and HIV responses threatened by COVID-19. *Lancet HIV* 2020; **7**: e319–20.
- 8 McQuaid CF, McCreesh N, Read JM, et al. The potential impact of COVID-19-related disruption on tuberculosis burden. *Eur Respir J* 2020; **56**: 2001718.
- 9 Louie JK, Reid M, Stella J, et al. A decrease in tuberculosis evaluations and diagnoses during the COVID-19 pandemic. *Int J Tuberc Lung Dis* 2020; **24**: 860–62.
- 10 Cillioni L, Fu H, Vesga JK, et al. The potential impact of the COVID-19 pandemic on tuberculosis: a modelling analysis. *medRxiv* 2020; published online May 20. <https://doi.org/10.1101/2020.05.16.20104075> (preprint).
- 11 Hogan AB, Jewell BL, Sherrard-Smith E, et al. Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: a modelling study. *Lancet Glob Health* 2020; **8**: e1132–41.
- 12 Su Y, Garcia Baena I, Harle AC, et al. Tracking total spending on tuberculosis by source and function in 135 low-income and middle-income countries, 2000–17: a financial modelling study. *Lancet Infect Dis* 2020; **20**: 929–42.
- 13 Daftary A, Mitchell EMH, Reid MJA, Fekadu E, Goosby E. To end TB, first ever High-Level Meeting on Tuberculosis must address stigma. *Am J Trop Med Hyg* 2018; **99**: 1114–16.
- 14 Dara M, Sotgiu G, Reichler MR, Chiang CY, Chee CBE, Migliori GB. New diseases and old threats: lessons from tuberculosis for the COVID-19 response. *Int J Tuberc Lung Dis* 2020; **24**: 544–45.
- 15 Loeffelholz MJ, Alland D, Butler-Wu SM, et al. Multicenter evaluation of the Cepheid Xpert Xpress SARS-CoV-2 test. *J Clin Microbiol* 2020; **58**: e00926–20.
- 16 McMahon JH, Hoy JF, Kamarulzaman A, Bekker LG, Beyrer C, Lewin SR. Leveraging the advances in HIV for COVID-19. *Lancet* 2020; **396**: 943–44.

See Online for appendix