Investing in R&D to End TB: A Global Priority

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Ending the unrelenting global tuberculosis (TB) epidemic demands better diagnostic, treatment, and prevention options, which can only be realized through accelerated and patient-driven research and development (R&D). In keeping with recently concluded G20 and United Nations (UN) High-Level Meetings that featured antimicrobial resistance (AMR), increased investments from public, industry, and philanthropic sources are required for health technology innovations. *The Global Plan to End TB* estimates that achieving the scientific advances necessary to end TB will require US$8.836 billion from 2016 to 2020.[1] Because TB is a public health disease that attracts scant industry investment, public funding will continue to be the main source of funding.

To concretize this target, in advance of pivotal events such as the 2017 Global Ministerial Meeting on Ending TB in the Sustainable Development Era and the 2018 United Nations High-Level Meeting on TB, this brief presents annual, country-specific targets for TB R&D based on countries' demonstrated capacity to invest in R&D. These targets are intended to raise awareness and build political will for these governments to commit to meeting research and other public health needs for TB, to encourage countries to continue existing investments and leverage new R&D funding, and to support civil society in providing accountability for commitments to end TB.

Results

The majority of public funding required for TB R&D must come from two sources: 1) donor countries with high gross domestic products (GDP) and low burdens of TB and 2) countries with moderate to high burdens of TB as well as moderate to high GDPs, many of them with existing or increasing R&D investments and capacities, such as the BRICS countries (see Tables 1 and 2). We have included much more modest targets for countries with low GDP but high TB burden to show the need for co-ownership in addressing TB, as currently the citizens and health systems in these nations stand to benefit most from increased TB R&D (see Table 3).

Table 1. Donor countries (countries with high GDP and low tuberculosis burden)

Country	Annual target (US$)
Australia	21,200,000
Austria	11,300,000
Belgium	10,900,000
Canada	25,300,000
Denmark	7,500,000
European Union*	202,400,000
Finland	7,300,000
France	55,400,000
Germany	99,700,000
Iceland	300,000
Ireland	3,300,000
Italy	27,500,000
Japan	154,900,000
Luxembourg	675,000
Netherlands	15,100,000
New Zealand	1,800,000
Norway	5,300,000
Sweden	13,700,000
Switzerland	13,400,000
United Kingdom	40,400,000
United States	444,500,000
Total	**1,161,875,000**

*The European Union is considered a G20 member.

Table 2. Countries with moderate to high GDP and tuberculosis burden

Country	Annual target (US$)
Angola	1,500,000
Argentina	4,800,000
Bangladesh	2,700,000
Brazil	35,000,000
Brunei Darussalam	12,700,000
China	305,600,000
Hong Kong SAR, China	9,900,000
India	46,500,000
Indonesia	2,100,000
Israel	10,700,000
Mexico	10,300,000
Nigeria	7,000,000
Pakistan	2,400,000
Qatar	1,300,000
Russia	36,500,000
Saudi Arabia	11,900,000
Singapore	8,400,000
South Africa	4,600,000
South Korea	64,000,000
Thailand	4,900,000
Turkey	12,500,000
Vietnam	1,300,000
United Arab Emirates	4,000,000
Total	**600,600,000**

Table 3. Countries with high tuberculosis burden

Country	Annual target (US$)
Cambodia	100,000
Central African Republic	13,000
Congo	100,000
Democratic Republic of Congo	300,000
Democratic People's Republic of Korea	100,000
Ethiopia	500,000
Kenya	800,000
Lesotho	2,000
Liberia	28,000
Mozambique	100,000
Myanmar	900,000
Namibia	100,000
Papua New Guinea	200,000
Philippines	700,000
Sierra Leone	36,000
Tanzania	500,000
Zambia	300,000
Zimbabwe	100,000
Total	**4,879,000**

Methodology

To set targets for nations with the most to give to or benefit from TB R&D, the analysis included the 62 countries that belong to at least one of the following three groupings: G20 countries, countries with high burdens of TB according to the World Health Organization (WHO), and the top richest independent countries as defined by GDP per capita not already captured by the first two categories.[2,3,4] We then calculated targets specific to each country based on its recent gross domestic expenditure on research and development (GERD), which closely correlates with GDP but may give a more accurate picture of a country's capacity and willingness to fund research specifically. Each country would have to spend slightly less than 0.1% (0.0982%) of its current total R&D spending on TB R&D to amount to the annualized *Global Plan* target.[5] For a full description of the methodology, please refer to http://bit.ly/2zj7PL9.

A Way Forward

Investing in the scale-up of TB R&D will mitigate the human and economic costs that a country and its residents will bear if TB is not addressed. Many countries have already made progress toward reaching the targets set here. But without increased investment, TB will continue to dominate as the leading infectious killer, and drug-resistant TB as the leading cause of AMR-related deaths, translating to an estimated world GDP loss of 6.08% by 2050.[6,7,8] Such investments will not only catalyze an end to TB and contribute progress toward the Sustainable Development Goals but also enhance economies through improved research capacity and job creation. The upcoming high-profile events in TB offer a pivotal platform for nations to take action and pledge concrete financial investments in R&D to shape a future free of TB.

Certain principles and mechanisms must be in place to ensure that investments in TB R&D fulfill human rights, including the right to science and the right to health, and the greatest rewards to human well-being:

Participation: Affected communities must be engaged in research design, conduct, and translation of findings into practice.

Collaboration, openness, effectiveness, and efficiency: TB research gaps are global, and efforts to resolve them will require collaboration and direction to ensure that research is needs driven and that resources are used optimally, avoiding duplication of efforts and targeting funding to the most pressing research questions or product development needs. A centralized, collaborative mechanism among TB R&D funders for coordinating funding flows and the overarching research agenda may be useful; the Life Prize for TB treatment regimen development presents one option for doing so.[9,10]

Equity: During research, the principle of equity requires that 1) investments support the purposive development of interventions to meet the needs of those most vulnerable to TB, including people with HIV, children and adolescents, pregnant women, and people who use drugs, alcohol, or opioid substitution therapy, and 2) the benefits of research reach all those who need them, including and especially marginalized groups and those with limited resources. As such, ensuring equity post-research also links closely to access, availability, affordability, and quality.

Access, availability, affordability, and quality: To ensure appropriate use of and access to technologies and interventions resulting from investments in TB R&D, to avoid taxpayers or donors paying twice—once to finance research and once to make a technology available—and to prevent the irrational use of medicines, public and philanthropic funding should de-link R&D costs from both prices and sales. For example, including upfront clauses in both push and pull incentives would ensure appropriate and affordable access (including access to intellectual property generated). Again, the Life Prize offers a model for how to ensure access, affordability, and appropriate use/stewardship through the creation of public health-driven incentives for innovation.

Transparency: Governments, philanthropies, the private sector, and others investing in TB R&D should report publicly on how much, to whom, and for what they have invested; on the outcomes of clinical trials; on the cost of manufacturing; and on other key data to improve the research and development process, as recommended by the 2016 report of the UN Secretary-General's High Level Panel on Access to Medicines.[11] Currently, only 28 countries worldwide have reported investments on TB R&D in 2017. Investments can be reported to TBRD@treatmentactiongroup.org.

[1] Stop TB Partnership. Global plan to end TB: the paradigm shift 2016–2020. Geneva: Stop TB Partnership; 2015.

[2] Frick M. No time to lose: G20 leaders must fund R&D to end TB. New York: Treatment Action Group; 2017.

[3] World Health Organization. Use of high burden country lists for TB by WHO in the post-2015 era. Geneva: World Health Organization; 2015.

[4] World Bank Group. GDP per capita (current US$) [Internet]. 2016. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD.

[5] Though this analysis does not explicitly include all countries or private-sector and foundation partners, as the Global Plan target does not include certain kinds of necessary research (e.g., basic science and implementation science), additional contributions will be needed, so the Global Plan sum will indeed have to be surpassed.

[6] KPMG LLP. The global economic impact of anti-microbial resistance. KPMG LLP; 2014.

[7] The Union. The Union welcomes the WHO's recognition of Mycobacterium tuberculosis alongside other pathogens as priority for R&D [Internet]. 2017. https://www.theunion.org/news-centre/news/the-union-welcomes-the-whos-recognition-of-tb-alongside-other-pathogens-as-priority-for-rd.

[8] World Bank Group. Drug-resistant infections: a threat to our economic future. Washington: World Bank Group; March 2017.

[9] The Union. '3P Project' WHO Bulletin editorial emphasises urgent need for R&D funding innovation [Internet]. 2017 May 11. https://www.theunion.org/news-centre/news/3p-project-who-bulletin-editorial-emphasises-urgent-need-for-rd-innovation.

[10] Brigden G, Castro J, Ditiu L, et al. Tuberculosis and antimicrobial resistance – new models of research and development needed. Bull World Health Org. 2017;95(5):315.

[11] United Nations Secretary-General's High-Level Panel on Access to Medicines. Report of the United Nations Secretary-General's High-Level Panel on Access to Medicines: Promoting innovation and access to health technologies. New York: United Nations; September 2016.