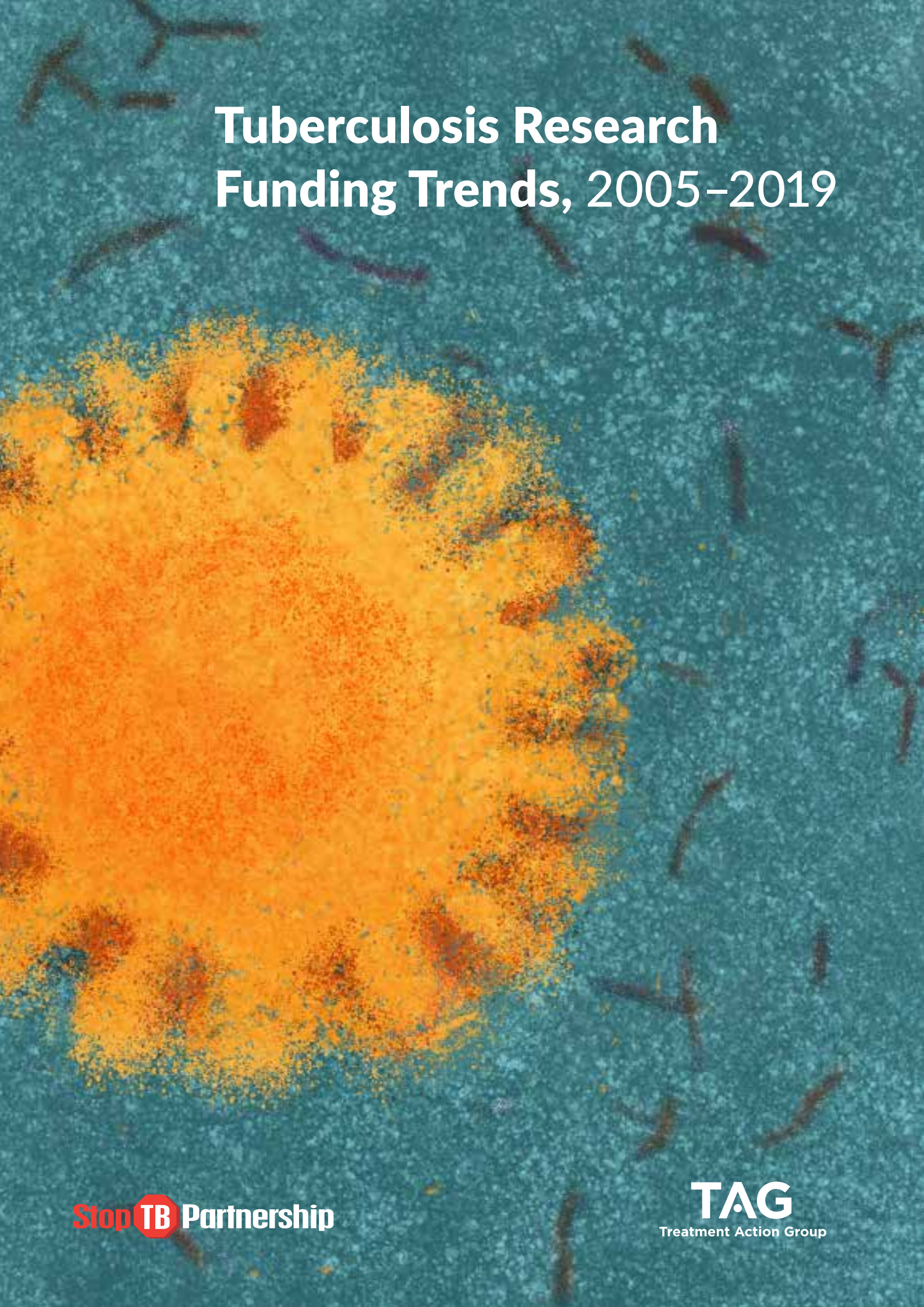
Tuberculosis Research Funding Trends, 2005–2019



Stop TB Partnership

TAG
Treatment Action Group

ACKNOWLEDGEMENTS

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ABOUT TAG

TAG is an independent, activist, and community-based research and policy think tank fighting for better treatment and prevention, a vaccine, and a cure for HIV, tuberculosis (TB), and hepatitis C virus (HCV). TAG works to ensure that all people with HIV, TB, and HCV receive lifesaving treatment, care, and information. We are science-based treatment activists working to expand and accelerate vital research and effective community engagement with research and policy institutions. TAG catalyzes open collective action by all affected communities, scientists, and policy makers to end HIV, TB, and HCV.

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Tuberculosis Research Funding Trends, 2005–2019

DECEMBER 2020

TREATMENT ACTION GROUP

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Executive Summary

> "Intensified research and increased funding [are] a real priority for TB community and essential conditions for progress towards ending TB, as well as one of the three pillars of the [WHO] End TB Strategy. But time is going on and it's becoming more and more obvious that the pillar three is actually becoming a principal pillar one, because without innovation [. . .] there is no chance in the twenty-first century for real progress toward ending TB."
>
> —Tereza Kasaeva, World Health Organization Global TB Programme

For the second year, global funding for tuberculosis (TB) research and development (R&D) surpassed US$900 million—this time, just barely, with US$900,964,590 spent on TB R&D in 2019. An optimist would emphasize that this figure represents the second highest level of funding for TB research ever recorded by Treatment Action Group (TAG) and the Stop TB Partnership. A realist would point out that funding for TB R&D continues to fall more than halfway short of the US$2 billion per year called for in the political declaration of the 2018 United Nations High-Level Meeting on TB (UN HLM).[1]

The realist has a point: although 2019 marks the second consecutive year in which TB research funding exceeded US$900 million, the data in this report also provide seemingly incontrovertible evidence that the goal of US$9 billion for TB R&D set forth in the Stop TB Partnership's *Global Plan to End TB*, which formed the basis of the UN HLM commitment, remains frustratingly out of reach,[2] even more so now that the 2018–2022 update to the *Global Plan* calls for the world to spend US$12.8 billion on TB research over the next five years.[3] This higher target recognizes that a shortfall in one year means that the TB community must raise more money in the next to keep scientific progress on pace to meet the global goal of ending TB by 2030.

The present moment calls for optimism and realism in equal measure. The 2019 funding data presented in this report provide a snapshot of TB science before the world lurched full tilt into the COVID-19 crisis in 2020. The figures show a field steadily building the momentum required to increase funding from the US$700 million range, which defined the better part of the last decade, toward US$900 million per year, nearly halfway to US$2 billion.

Funding increases over the past several years have walked in step with promising scientific advances. TB research has made undeniable progress across the board, from improved basic understanding of TB to successful clinical trials and strengthened operational research. Another possibility is that the money has followed the science, growing as funders began to see tangible returns on their investments. The sudden emergence of the COVID-19 pandemic makes it difficult to predict where TB research, and funding for it, will go from here. Many observers worry that COVID-19 will eclipse TB, obliterating fragile gains and obscuring the need for continued TB innovation.

It will take several years to fully document and understand the effects of COVID-19 on TB R&D. For now, the almost frenetic scientific activity on COVID-19 means that the TB field will need to harness some of this energy (not to mention tap into the vast sums of money pouring in to COVID-19 R&D) to sustain progress into the next decade. Readers should take a long look at the numbers in this report and remember the momentum, excitement, and urgency that marked the TB field before COVID-19. If that momentum falters in the future—if funding is diverted from TB and other global health priorities to COVID-19, if government budgets sag, if pharmaceutical companies disinvest, if research programs shift focus and work on TB slows or is cut—then readers

should remember these figures as the absolute minimum acceptable floor for TB research funding when the initial intensity of the pandemic settles into a more sustained response. As TB researchers and advocates prepare their arguments to protect tenuous research and funding gains, it is worth recalling what the field looked like in 2019, before the world changed. Here are 10 key findings from this year's report on the state of TB R&D funding in 2019:

- Seventy-one percent of total TB research funding came from the public sector. Public sector funding in 2019 reached a record high of US$640 million.

- Only three countries (the United Kingdom, the Philippines, and New Zealand) met their fair-share targets, defined as giving at least 0.1% of overall R&D spending to TB research.

- The United States remained far and away the largest funder of TB research, with eight government agencies spending just shy of US$400 million in 2019 (44% of the total). The second-largest public sector funder, the government of the United Kingdom, spent US$56 million.

- India spent more on TB research than any other high-TB-burden country (US$28 million) and more than other top-spending nations, including Germany, South Korea, Canada, Australia, and Japan.

- Funding from multilateral organizations reached its highest level ever, jumping by nearly $20 million between 2018 and 2019. Robust spending by Unitaid, sizeable expenditures by the Global Fund, and first-ever estimates of TB R&D spending from the World Bank drove multilateral funding increases.

- Private sector investments of US$75 million in 2019 mark the lowest amount reported by this sector since 2008's figure of US$72 million.

- The U.S. National Institutes of Health (NIH) accounted for 32% of total TB research funding in 2019. From 2005 to 2019, the NIH spent US$3.1 billion on TB research. This comprises one-third of all money spent on TB research globally, but less than 1% of the US$472 billion in appropriations the NIH received over this period.

- At US$117 million, the Bill & Melinda Gates Foundation made up 13% of the TB funding landscape. This includes US$32 million for the Gates Medical Research Institute.

- 2019 funding by research area broke down as follows: US$309 million (34%) for drug R&D, US$168 million (19%) for basic science, US$144 million (16%) for operational research/epidemiology, US$117 million (13%) for vaccine R&D, US$94 million (10%) for diagnostics R&D, and US$69 million (8%) for infrastructure/unspecified projects.

- Funding for pediatric TB research totaled US$58 million, down slightly from 2018.

Introduction

> "When we say that funds are at a good level, we are still far away from what was requested after the UN High-Level Meeting. I acknowledge that funding is increasing year after year. But we are still far away from . . . the goal that was fixed."
>
> —Patrick Agbassi, Global TB CAB

Although 2019 marks the second consecutive year in which TB research funding exceeded US$900 million, the 2019 funding data presented in this report provide seemingly incontrovertible evidence that the goal of spending US$9 billion on TB R&D from 2016 to 2020, as set forth in the *Global Plan to End TB*, remains frustratingly out of reach.[4] In its updated 2018–2022 *Global Plan*, the Stop TB Partnership raised the annual funding target from US$2 billion to US$2.5 billion, recognizing that the global community must now spend more per year in order to overcome the deficit created by underspending in previous years.[5] Whether the annual global target is US$2 billion or US$2.5 billion, one thing is clear: funding must increase substantially if the world is going to make more than incremental scientific progress towards ending TB.

TAG has tracked global TB research funding trends since 2005 as one way to assess public, private, philanthropic, and multilateral commitments to ending TB. This year's report presents new data on funding for TB R&D in 2019 and reviews trends in funding for the 15 years from 2005 to 2019, with a focus on the last 10 years. In addition to the funding data, which TAG collects annually through a survey (see box below and Appendix 1 for a full methodology description), the report contains interviews with TB scientists, donors, and activists whose reflections on the field put the financials into larger context. Four common themes emerged from the interviews this year: 1) the risk COVID-19 poses to TB R&D, 2) the imperative to cultivate new TB research funders, 3) the need to prioritize advocacy and equity, and 4) the importance of building activist capacity to contribute to the scientific agenda.

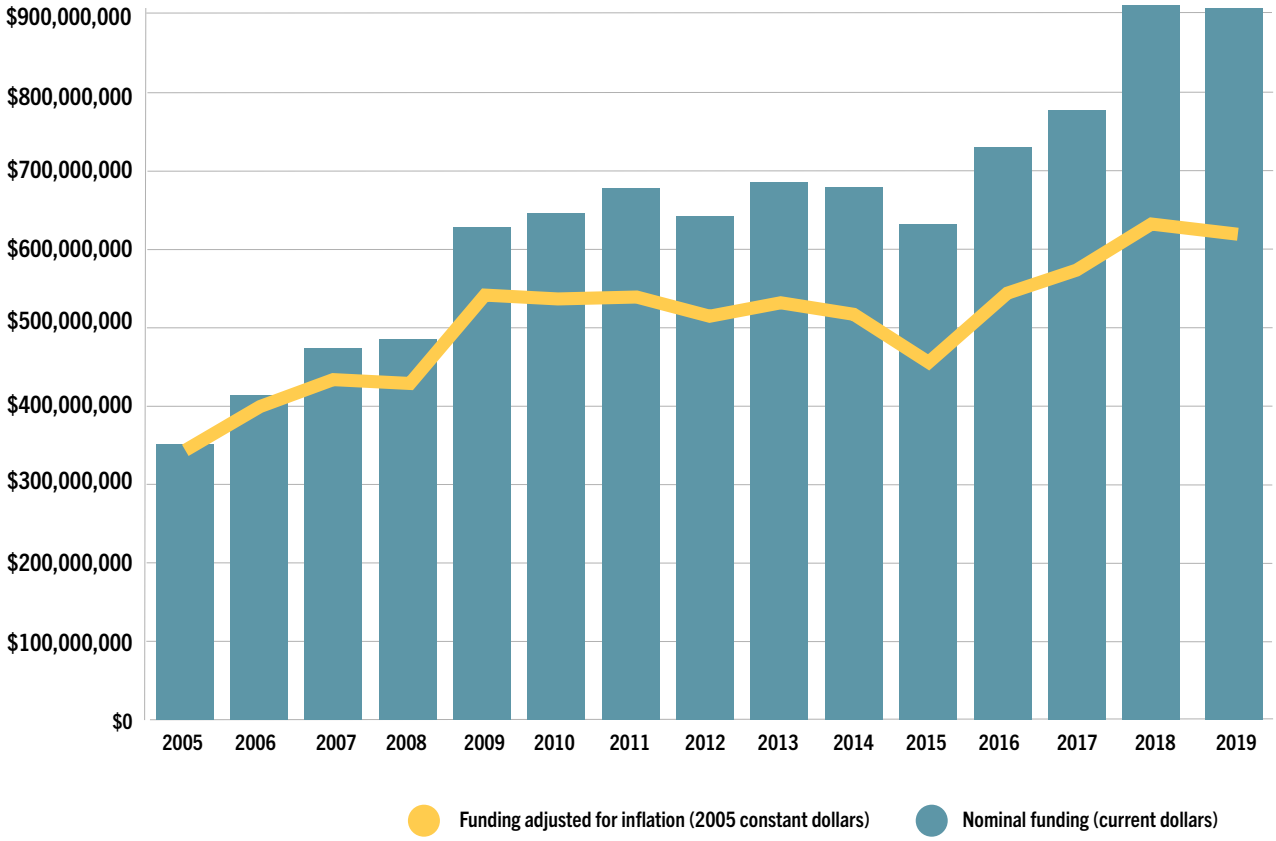
Total expenditures on TB R&D from 2016 to 2019 amounted to US$3.3 billion, or 36.7% of the US$9 billion target. Funding decreased slightly from 2018 to 2019 (US$906 million to US$900 million), remaining essentially flat. On the one hand, this indicates that advocates and scientists should now consider US$900 million a year for TB research the absolute minimum acceptable standard (as opposed to the US$700 million annual funding level that prevailed for most of the last decade). On the other hand, the slight decrease observed between 2018 and 2019 could signal an impending plateau unless new funders enter the field and existing donors raise their commitments. The effects of COVID-19 on TB research funding will not be seen until next year's report, but it is reasonable to assume that funding is unlikely to increase significantly.

And yet, there is reason for hope.

An emerging takeaway from the COVID-19 pandemic is that funders and policymakers are able to mobilize impressive amounts of resources quickly when the sense of urgency is clear. Many of the individuals interviewed this year expressed optimism about leveraging the attention and funding that materialized to confront COVID-19 for the TB response. In the words of Matt Rose, director of U.S. policy and advocacy at Health GAP, "Why not invest in the largest ongoing infectious disease killer in the world [TB] to teach us novel lessons about how to deal with infectious agents that

FIGURE 1

Total TB R&D Funding, 2005–2019



Year	Nominal funding (current dollars)
2005	$358,119,753
2006	$418,928,300
2007	$478,343,421
2008	$494,168,892
2009	$636,979,349
2010	$643,360,390
2011	$675,328,887
2012	$638,783,272

Year	Nominal funding (current dollars)
2013	$686,303,295
2014	$674,036,492
2015	$620,600,596
2016	$725,726,643
2017	$771,839,742
2018	$906,445,319
2019	$900,964,590

are either droplet or airborne?" Certainly, prior investments in TB research have already been leveraged to respond to COVID-19. In a policy brief released earlier this year, TAG sketched the intersection of COVID-19 and TB R&D and showed how tools, concepts, capacity, and infrastructure established through years of public and donor investments in TB have informed and jump-started COVID-19 research.[6] Now more than ever, the urgency of substantial and sustained investment in TB R&D is clear.

"We're getting these incremental increases in funding, which are commendable but obviously not what we need."

—Lele Rangaka, University College London

Note on Methodology:

See Appendix 1 for a detailed description of the survey methodology.

The expenditure data published in this report are collected through a global survey of TB research funders. Over 200 organizations received a request to participate in the survey, and 148 returned responses to TAG. Twenty-nine of the 30 largest funders in 2018 participated in the 2019 survey. The top 30 donors typically comprise over 90% of total funding in any given year, so a high response rate from this group suggests that the survey captured the bulk of global spending by known funders of TB research. Notes throughout the text indicate omissions or where information from specific funders is lacking.

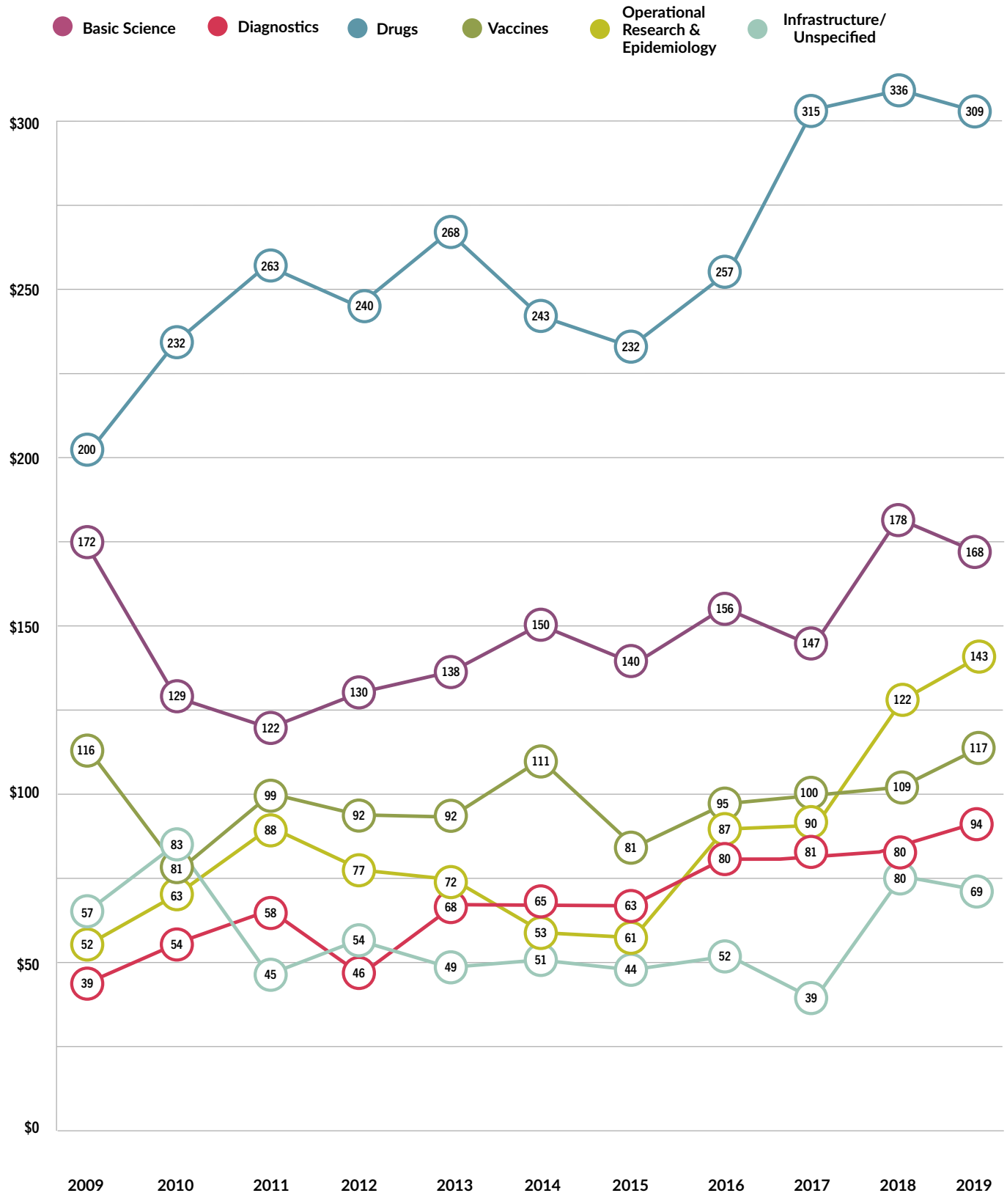
To supplement the funding data, TAG conducted 12 qualitative interviews with TB scientists, donors, activists, and implementers. Interviewees each received an early look at preliminary data in early September 2020 and generously offered their views on progress in and funding for TB research. Quotations from the interviews are included through the report to help readers contextualize the funding numbers.

"Why not invest in the largest ongoing infectious disease killer in the world to teach us novel lessons about how to deal with infectious agents that are either droplet or airborne?"

—Matt Rose, Health GAP

FIGURE 2

Total TB R&D Funding by Research Area, 2009–2019 (in Millions)



Note: Data for years 2005–2008 not shown.

Results

"It is encouraging to see the significant upward trend in funding over the last few years. This increased investment is reflected in the advancements we are seeing in the availability and uptake of shorter and better treatment regimens for MDR-TB and TB infection and more optimized medicines for children. But much more needs to be done."

—Janet Ginnard, Director of Strategy, Unitaid

The Big Picture

The cautious optimism that followed the UN HLM on TB in 2018 has not yet borne out measurable increases in funding; global TB research investments in 2019 decreased slightly from 2018, to just under US$901 million.

In absolute numbers, the US$900 million investment in 2019 was 2.5 times greater than the 2005 investment (US$358 million). Calculated in 2005 constant dollars, the 2019 investment is US$615 million, or just over 1.7 times the 2005 investment. Adjusted for inflation, 2019 funding is on par with the US$620 million spent in 2015.

While R&D spending decreased slightly from 2018 to 2019, total investments from the largest donors increased overall. The top 15 funders of TB research, who account for 80% of overall TB research spending, increased their collective expenditure from US$715 million in 2018 to US$720 million in 2019. The top 5 funders, which account for 58% of total spending, increased their contributions from US$501 million in 2018 to US$522 million in 2019. If repeated in future years, this would suggest that the UN HLM strengthened the resolve of the most committed TB research funders without generating much money from new supporters or raising investments among the donors that spend less than US$10 million annually. This suggests a possible three-pronged advocacy agenda to 1) maintain support among the largest funders; 2) raise investments by moderate donors now spending between US$1 million and US$10 million per year; and 3) bring new funders into the field to grow and diversify the funding base.

Public sector and multilateral funding both increased from 2018 to 2019, while private sector and philanthropic funding decreased. The U.S. government remained far and away the largest funder of TB research, spending over US$397 million in 2019, or 44% of all TB R&D spending. At US$117 million, the Bill & Melinda Gates Foundation (Gates Foundation) accounted for 13% of the funding landscape.

TABLE 1

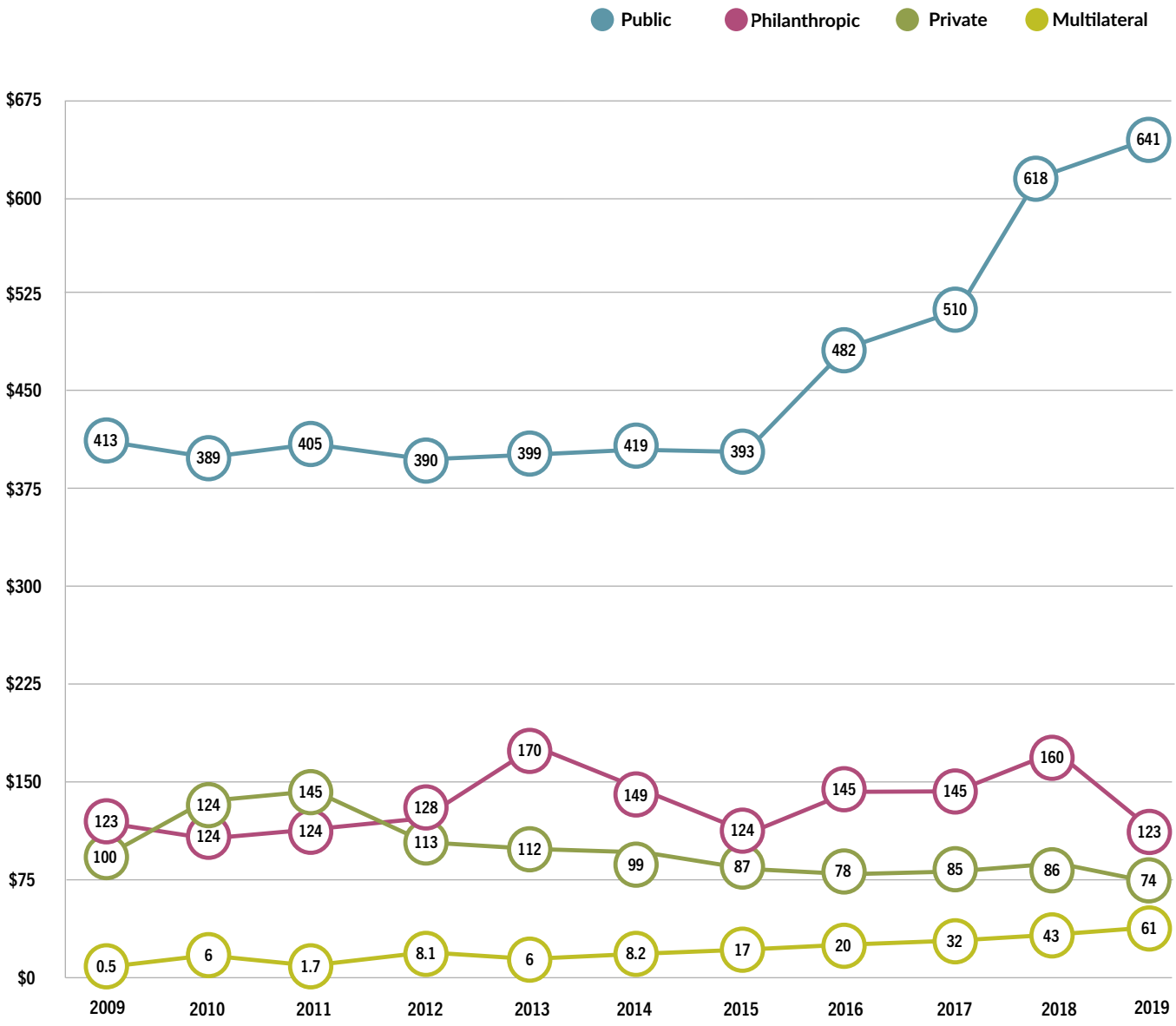
Top 15 Funders of TB Research, 2019

RANK	FUNDER	FUNDER TYPE	2019 FUNDING	2018 FUNDING
1	U.S. National Institutes of Health, National Institute of Allergy and Infectious Diseases (NIAID)	P	$286,972,907	$253,434,034
2	Bill & Melinda Gates Foundation	F	$117,557,700	$141,115,233
3	U.S. National Institutes of Health, Other Institutes and Centers (NIH Other ICs)	P	$44,949,029	$43,946,795
4	U.S. Agency for International Development (USAID)	P	$37,139,231	$36,735,190
5	Unitaid	M	$35,800,429	$26,193,134
6	Company X	C	$32,183,188	$30,319,517
7	U.K. Department for International Development (DFID)	P	$25,022,125	$24,677,306
8	European and Developing Countries Clinical Trials Partnership (EDCTP)	P	$24,591,735	$24,491,122
9	German Federal Ministry of Education and Research (BMBF)	P	$23,543,671	$16,351,364
10	Indian Council of Medical Research (ICMR)	P	$19,070,083	$24,243,814
11	Otsuka Pharmaceutical	C	$15,435,292	$28,405,543
12	U.S. Centers for Disease Control and Prevention (CDC)	P	$15,432,560	$17,619,008
13	U.K. Medical Research Council (U.K. MRC)	P	$15,384,488	$16,395,195
14	European Commission	P	$14,252,272	$18,527,670
15	Global Affairs Canada	P	$12,965,569	$12,949,750

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector R&D Agency

FIGURE 3

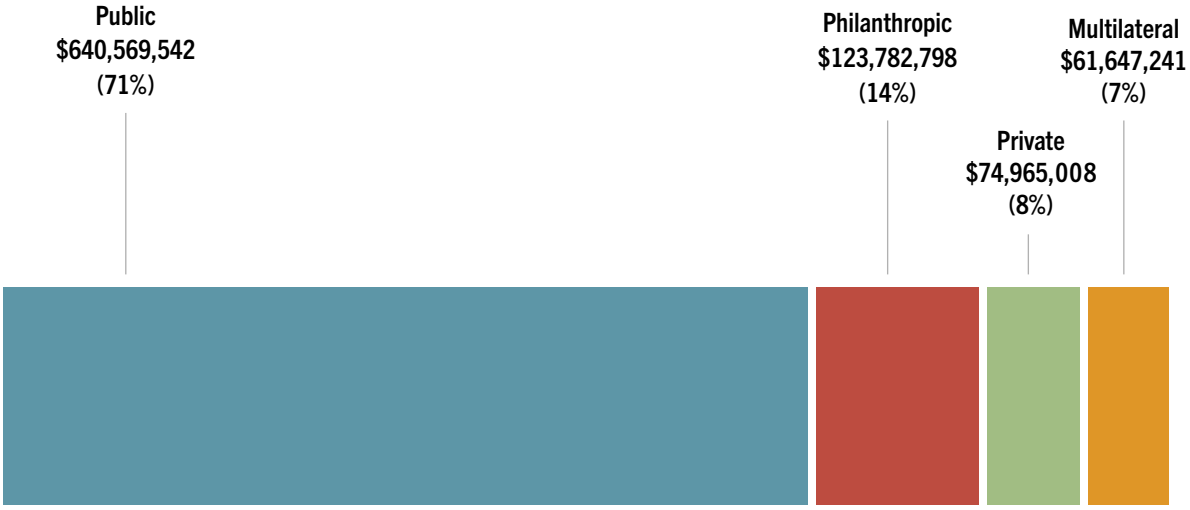
Total TB R&D Funding by Funder Category, 2009–2019 (in Millions)



Note: Data for years 2005–2008 not shown.

FIGURE 4

Total TB R&D Funding by Funder Category, 2019
Total: $900,964,590



"The Western world reading some data and making some assumptions isn't going to deliver the results [in the TB endemic countries]. You need to be in direct conversation to the people who are actually living through it and really have that lived experience and that firsthand knowledge that's so critical."

—Matt Rose, Health GAP

Trends in Public Sector Funding

Public sector funding increased for a fourth straight year in 2019, reaching a record high of US$640 million, 71% of all TB research spending. More than 60% of all TB research funders (100 of 161) were public sector entities.

Public sector funding was distributed across all areas of TB research. Of the total funding pool, 96% of basic science, 96% of infrastructure/unspecified, 74% of diagnostics, 66% of vaccine, 59% of operational research and epidemiology, 58% of drug research, and 52% of all pediatric funding came from the public sector.

No single research category accounted for more than 30% of total public sector spending. Drug research, at nearly US$180 million, was the largest category (28%), closely followed by basic science research with an investment of US$161 million (25%). Operational research and epidemiology (US$85 million, 13%), vaccine research (US$77 million, 12%), diagnostics research (US$70 million, 11%), and infrastructure/unspecified projects (US$66 million, 10%) rounded out the public sector investment.

While a fuller discussion of public sector spending by country appears later in this report, an overview of trends is provided here. The United States spent more on TB research than any other country, investing over US$397 million in 2019, or 44% of all TB R&D spending, across eight government agencies. As in previous years, the bulk of that spending originated from the National Institutes of Health (NIH), which spent nearly

> "All these excuses government use to not finance TB cannot be accepted. Because when it's an issue to all the society members—poor and rich—it [COVID-19] became a priority area for the investments. TB is recognized as a disease of poverty, and it means that nobody cares."
>
> —Tereza Kasaeva, WHO Global TB Programme

US$332 million on TB R&D in 2019. The largest single funder of TB R&D was the National Institute of Allergy and Infectious Diseases (NIAID) at NIH, with an expenditure of US$286 million. Other NIH institutes and centers accounted for the remaining US$45 million of the NIH investment.

Public sector funding remained concentrated in Western countries. The United Kingdom remained the second-largest public sector funder, with total 2019 investments of more than US$56 million. The European Union, India, Germany, South Korea, Canada, and Australia each invested more than US$10 million in TB research.

As in previous years, neither the Russian Federation nor China responded to multiple requests to provide funding data. Combined, the remaining BRICS countries (Brazil, India, and South Africa) spent just under US$33 million in 2019, which amounts to 3.65% of all 2019 TB R&D funding.

As Tereza Kasaeva, director of the World Health Organization (WHO) Global TB Program, noted in her interview, the COVID-19 pandemic provides unequivocal evidence that it is possible for countries to quickly mobilize money for research: "All these excuses governments use to not finance TB cannot be accepted. Because when it's an issue to all the society members—poor and rich—it became a priority area for the investments. But TB is recognized as a disease of poverty, and it means that nobody cares."

Closer Look: NIH TB Research Funding

The NIH stands out for being the largest funder of TB research in each of the 15 years TAG has tracked global TB R&D expenditures. For this reason, understanding shifts in TB R&D funding over time requires understanding how TAG analyzes and reports NIH data.

How much does the NIH spend? From 2005 to 2019, the NIH spent US$3.1 billion on TB research. This comprises one-third of all money spent on TB research globally, but less than 1% of the US$472.5 billion in appropriations received by all NIH institutes and centers over this period. The total NIH budget was US$39.3 billion in 2019; from 2005 to 2019, NIH appropriations added up to US$472.5 billion.[7] While some observers may wonder why the NIH spends so much on TB given that the United States is a low-TB-burden country, when judged against the larger NIH budget, the amount given to TB is a sliver of the agency's overall spending. Moreover, it is important to recall the mission of the NIH—"To seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability"[8]—is not couched in terms of burden of disease or national interest. As a result, the NIH occupies a singular place in the TB funding landscape. It is the largest funder overall and in all of the research areas tracked by TAG. It supports organizations in the United States and other countries, and it funds activities along the entire spectrum of TB R&D, from basic science to implementation science.

Where does NIH money go? It is worth examining which institutions receive NIH awards and where they are located (which is not always the same as knowing where the money is spent or where the research itself is conducted). **Figure 5** presents a map of which U.S. states had universities, research institutes, or companies receive at least one NIH contract or grant for TB research in 2019. The NIH issued 636 TB awards in 2019; 577 of these awards went to entities in the United States. The states that received the most funding—Massachusetts (US$49 million), Washington (US$34 million), California (US$31 million), New York (US$31 million), and Maryland (US$17 million)—all have major academic medical centers with flagship TB research labs. Take, for example, Massachusetts, where 17 universities, teaching hospitals, and companies received 81 individual awards worth a combined US$49 million. Perhaps as expected, Harvard University received more money than any other institution (US$15.5 million), but the University of Massachusetts had the most individual awards (16), and universities in rural parts of Massachusetts received money alongside their urban counterparts in Boston and Cambridge.

More awards (81) went to Massachusetts, which reported a TB incidence rate of 2.9 per 100,000 in 2018,[9] than to the country of South Africa, which had a 2018 TB incidence rate of 520 per 100,000.[10] In 2019, the NIH awarded approximately US$17 million to institutions located outside of the United States. About a third of this money went to South Africa, where the NIH runs a joint funding program with the South African Medical Research Council.[11] The NIH spent more on TB research conducted at its own internal labs (in the figure: NIH Internal, US$24 million) than it sent abroad.

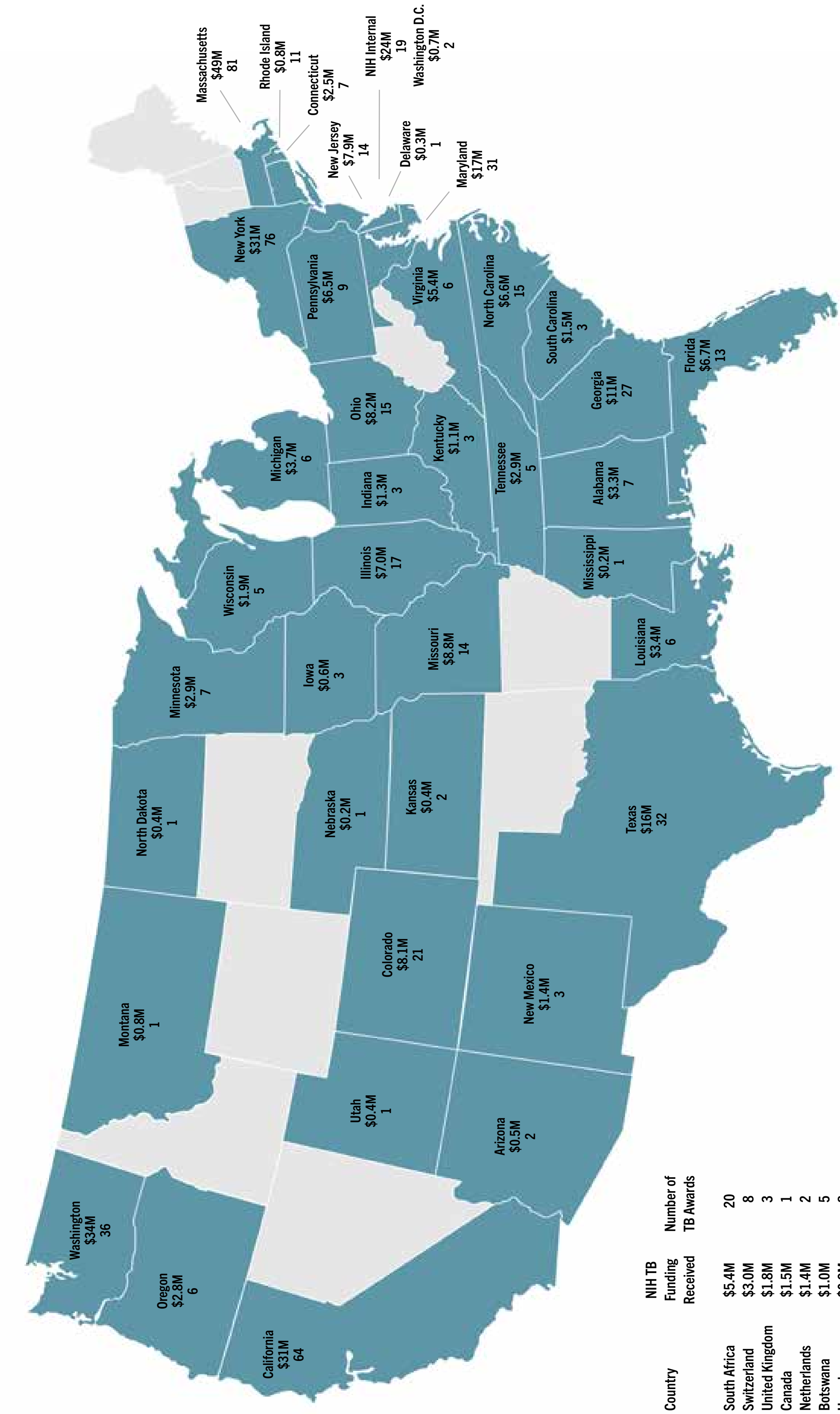
How does TAG report NIH funding? Close readers will notice that the number TAG reports for NIH spending is lower than what the agency publishes via its RePORT Expenditures and Results Tool. The difference arises from a number of methodological considerations detailed in **Figure 6**. First, TAG carefully reviews the title and abstract of each award tagged “tuberculosis” in the RePORT system. TAG then assigns each award to the relevant research category and removes awards judged unrelated to TB. In 2019, TAG removed US$1.6 million in grants deemed unrelated to TB (0.3% of the total figure reported by NIH).

Second, TAG removes core funding provided to the AIDS Clinical Trials Group (ACTG) and the International Maternal Pediatric Adolescent AIDS Clinical Trials (IMPAACT) network. As part of the NIH-supported HIV/AIDS Clinical Trials Networks, ACTG and IMPAACT conduct clinical trials on HIV and its comorbidities, including TB. ACTG and IMPAACT core grants are used for network- and site-level operations, including to support sites that do not conduct TB research. For this reason, TAG removes ACTG and IMPAACT core awards; in their place, TAG surveys ACTG and IMPAACT network leadership to obtain expenditures on TB study protocols. The net effect of these adjustments is a reduction in the amount of reported NIH expenditures ranging from 17% in 2016 to 32% in 2019. The adjusted figures reported by TAG provide a more conservative picture of NIH investment in TB research.

Core awards to ACTG and IMPAACT constitute the primary difference between the TAG and NIH numbers. It is important to note that before 2015 the NIH did not label these core awards as “tuberculosis” in the RePORT system. In future years, TAG hopes to work with the NIH to devise a method for estimating the proportion of ACTG and IMPAACT core funding that supports TB activities (e.g., as a percentage of network- and site-level effort). Until then, TAG will continue to publish both the adjusted and unadjusted figures so that readers can track the difference.

FIGURE 5

Recipients of NIH TB R&D Funding, 2019



LEGEND

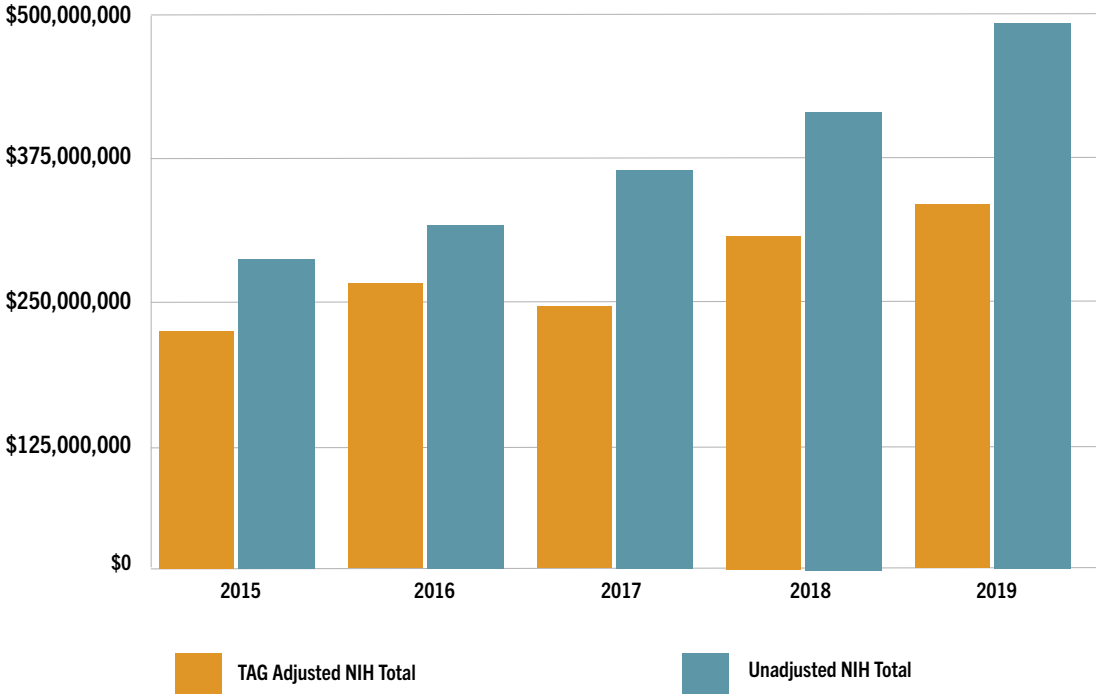
State
NIH TB R&D Funding Received (millions)
Number of TB Awards*

*some awards may support the same project

Country	NIH TB Funding Received	Number of TB Awards
South Africa	$5.4M	20
Switzerland	$3.0M	8
United Kingdom	$1.8M	3
Canada	$1.5M	1
Netherlands	$1.4M	2
Botswana	$1.0M	5
Uganda	$0.9M	8
Denmark	$0.6M	1
Argentina	$0.5M	1
Thailand	$0.2M	1
Georgia	$0.2M	1
Peru	$0.2M	3
Brazil	$0.1M	1
The Gambia	$0.1M	1
Mali	$0.1M	2
Namibia	<$0.1M	1

FIGURE 6

Adjusted vs. Unadjusted NIH TB Research Funding, 2015–2019



	2015	2016	2017	2018	2019
Unadjusted NIH Total	**$279,295,423**	**$311,373,666**	**$360,304,001**	**$415,390,649**	**$491,273,401**
TAG Adjusted NIH Total	**$213,606,591**	**$256,616,221**	**$248,052,975**	**$297,380,829**	**$331,921,936**
Exclusions as % of Unadjusted Total	**23.5%**	**17.6%**	**31.2%**	**28.4%**	**32.4%**
ACTG/IMPAACT Network-level Awards	16.4%	4.5%	20.7%	18.3%	15.6%
ACTG/IMPAACT Site-level Awards	6.9%	12.3%	9.7%	9.1%	16.5%
Grants judged not related to TB	0.3%	0.8%	0.8%	0.9%	0.3%

Trends in Philanthropic Funding

After a peak in 2018 at US$159 million, philanthropic funding returned to 2015 levels (US$123 million) in 2019. Philanthropies make up second largest funder category in terms of absolute investment, representing 14% of total spending.

With an investment of over US$117 million, the Gates Foundation accounted for 95% of all philanthropic funding for TB R&D (and 13% of all TB research funding). Only two other philanthropic organizations (the Wellcome Trust and Institut Pasteur) gave more than US$1 million in 2019. Funding by the Wellcome Trust decreased from US$10.3 million in 2018 to US$1.5 million in 2019. The charity attributed this drop to the unpredictable outcomes of open funding calls—which are not disease specific—rather than to any change in the Wellcome Trust's commitment to TB research.[12] Indeed, the Wellcome Trust's new science strategy singles out infectious diseases as one of four priority areas for its future grantmaking.[13]

Last year, TAG called the formation of the Gates Medical Research Institute (GMRI) "the biggest shift in philanthropic funding for TB research in recent years."[14] The size of that shift is starting to become apparent. The US$117 million spent by the Gates Foundation in 2019 included US$32.4 million for the GMRI. About 40% of that amount went toward TB drug R&D, with the remaining 60% spent on TB vaccine development (note: this split is an estimate and not exact). The GMRI is a wholly owned subsidiary of the Gates Foundation and operates as a not-for-profit biotech focused on translational science and clinical development for TB and other diseases. TAG expects the Gates Foundation's financial commitments to the GMRI to increase in coming years as the institute pursues a phase III trial of TB vaccine candidate M72/AS01E, completes two other phase II TB vaccine studies, and advances initiatives to develop novel TB drugs and drug regimens with industry partners. It is too soon to say whether the advent of the GMRI will translate into a sustained increase in the Gates Foundation's overall support for TB research or become a new channel for existing money.

Broken down by research category, almost half of philanthropic funding went to drug research (US$59 million, 48%), followed by vaccine research (US$34 million, 28%), diagnostics research (US$13 million, 10%), operational research (US$9 million, 7%), and basic science (US$5 million, 4%). This breakdown shows that the bulk of philanthropic funding is directed toward product development and the creation of new tools to prevent, diagnose, and treat TB.

Twenty-six philanthropic funders are represented in this year's report, up from 14 in 2018. A majority of philanthropic funders (53%) invested in a single category of research. Excluding the Gates Foundation's significant contribution, the mean philanthropic investment was just under US$250,000.

"I'm not seeing any philanthropy from Africa—there are billionaires there as well. So where is their money going? How do we engage them in this conversation?"

—Lele Rangaka,
University College London

Trends in Private Sector Funding

"I find it a real concern that almost three-quarters of all money comes from the public sector, and then just mainly comes from one donor, which is the U.S. NIH. Also, the philanthropic sector is basically just one donor [the Gates Foundation.] The huge underfunding by the private sector, and extremely skewed funding in the public sector, to me, is a real problem."

—Frank Cobelens, Amsterdam University Medical Centers and Amsterdam Institute for Global Health & Development

Private sector funding decreased by more than US$10 million between 2018 and 2019, falling from US$85 million to US$74 million. Investments by the private sector have fluctuated over the last decade, but the 2019 total is the lowest amount reported since the US$72 million reported in 2008. Several factors may underlie the decline in industry expenditures in 2019. One factor: a large pediatric trial conducted by Otsuka Pharmaceutical (the second-largest private sector funder) is winding down, which explains the drop in Otsuka's investment from US$28 million in 2018 to US$15 million in 2019. Otsuka expects its expenditures to increase in 2020 and 2021.[15]

Private sector funding accounted for 8% of all TB R&D spending but had the second-highest absolute number of funding entities (27). The mean reported TB R&D investment was US$2.7 million, although only 12 companies spent US$1 million or more. For every dollar spent by the private sector, $0.81 went to drug research, $0.11 to diagnostics, $0.07 to vaccine research, $0.01 to infrastructure/unspecified, and less than a penny to operational and basic science research.

Company X, one of the anonymous reporters, was the largest private sector funder, allocating US$32 million to TB R&D in 2019. Two private sector funders (Company X and Otsuka Pharmaceutical) invested a combined US$47 million, together accounting for nearly two-thirds (63%) of all private sector spending.

"Obviously, TB is a public good and maybe not a moneymaker for the private sector, but one would hope to see a bigger contribution given the burden of disease."

—I.D. Rusen, Vital Strategies

"Obviously, TB is a public good and maybe not a moneymaker for the private sector, but one would hope to see a bigger contribution given the burden of disease," said I.D. Rusen, research division lead at Vital Strategies. Beyond remarking on the private sector's level of investment, Rusen pointed to the need for funders from different sectors to work together to overcome narrow interests: "The private sector answers questions that are relevant to their products and how they can move that forward. The public sector will answer questions of particular interest to one NGO [nongovernmental organization] or one university. That fragmentation really is one of the reasons—when it comes to MDR-TB [multidrug-resistant TB] in particular—that there are so few trial sites that [have the capacity] to really do the research the way we'd like it to be done. Everybody is trying to do their own research on their own question, and ultimately there's not enough to go around."

Trends in Multilateral Funding

Multilateral funding increased for a sixth consecutive year, jumping by more than US$18 million from 2018 to 2019. At US$62 million, multilateral investment reached its highest level yet in 2019. With just eight discrete funders, and representing 7% of all TB research spending, multilaterals still comprise the smallest category of research funding—but one that is growing in importance. Multilateral funders play a crucial role in building connections across sectors and in funding projects that fall outside the scope of other donors.

Much of this year's increase in multilateral expenditures came from Unitaid, whose TB research investment leapt from US$26 million in 2018 to US$35 million in 2019. Unitaid has quickly climbed the ranks of top funders, moving from the 21st-largest funder of TB research in 2014 to the fifth largest in 2019. In 2019, Unitaid supported research related to multidrug-resistant TB (MDR-TB) treatment, pediatric TB diagnosis, child-friendly formulations of MDR-TB drugs, TB preventive therapy (the 3HP regimen), and digital adherence technologies. When asked about Unitaid's dramatic increase in TB R&D funding, Unitaid director of strategy Janet Ginnard explained: "Few countries are on track to meet the target of reducing TB deaths among people living with HIV, and [they] will be in danger of not meeting the target if governments do not adopt new technologies and act to reach the most vulnerable people and help reduce these avoidable deaths. For all those reasons, Unitaid has intensified its commitment to end TB, increasing its efforts to identify relevant investments in research that would allow innovations such as optimized formulations for children and scale-up of the 3HP regimen to reach people most affected by TB in LMICs [low- and middle-income countries]." Ginnard pointed out that "TB is curable and preventable when patients have access to the right tools and treatments."

"Unitaid has intensified its commitment to end TB, increasing its efforts to identify relevant investments in research that would allow innovations… to reach people most affected by TB in low- and middle-income countries [. . .] TB is curable and preventable when patients have access to the right tools and treatments."

—Janet Ginnard, Unitaid

The World Bank and Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) each spent more than US$10 million on TB research in 2019. Together, Unitaid, the World Bank, and the Global Fund accounted for 95% of all multilateral funding.

The US$12.1 million spent by the World Bank in 2019 is substantially higher than its previous reported investments. This increase reflects a change in reporting, namely the effort by World Bank staff to identify research-related expenditures within the World Bank's projects with the governments of India and Papua New Guinea.[16] Though substantial, these figures represent a modest fraction of the World Bank's US$400 million Program Toward Elimination of TB in India. For the second year, the Global Fund provided TAG with an annual estimate of its support for TB operational research. The 2019 figure of US$10.6 million is on par with the 2018 number and was derived by identifying spending on surveys and other research activities across four types of Global Fund grants (TB, HIV/TB, resilient and sustainable systems for health, and

multi-component awards). Readers should interpret this figure as a minimum estimate of Global Fund support for TB research; a more granular review of Global Fund grants would likely uncover additional spending not recorded here.

With expenditures just under US$2 million, the Global Health Innovative Technology Fund (GHIT) made up a smaller share of the multilateral total, though its investments have paid off with several notable advances. Most noteworthy is Fujifilm's SILVAMP TB-LAM, a urine-based, point-of-care test for diagnosing TB in people with HIV.[17] In addition, the GHIT-funded phase II trial of TB vaccine candidate DAR-901 published results in September 2020.[18] GHIT is a joint initiative of the Government of Japan, Gates Foundation, Wellcome Trust, United Nations Development Programme, and 16 Japanese pharmaceutical companies.

Correction to 2018 Figures:

Last year's report published an incorrect figure for funding given by TDR (the Special Programme for Research and Training in Tropical Diseases). The published number (US$169,846) omitted a large part of TDR's spending. In fact, TDR spent US$489,846 on TB research in 2018.

TAG regrets the error in last year's report and has updated all 2018 figures to reflect the correct information. In the process of implementing this correction, TAG undertook a comprehensive review of all TDR submissions since 2012. Working with TDR staff, TAG made further adjustments to the TDR totals in fiscal years 2016 and 2017 to remove awards that were double counted (i.e., attributed to both TDR and to another donor).

For several years, TAG has reported TDR funding under the World Health Organization name. Starting this year, TAG will list TDR separately as "TDR (the Special Programme for Research and Training in Tropical Diseases) *hosted by the World Health Organization*." This naming convention more accurately reflects the multilateral foundation of TDR's mission to support research to address diseases of poverty. TDR is co-sponsored by the United Nations Children's Fund, the United Nations Development Programme, the WHO, and the World Bank and receives additional support from foundations (e.g., Gates Foundation) and development agencies.

Fair Share Funding Targets

The fair share targets provide a metric for evaluating a country's investment in TB research relative to its total spending on all forms of R&D. If every country prioritized its R&D funding such that 0.1% of its overall research spending went to TB R&D, then together the world could meet the US$2 billion annual target set forth in the UN HLM political declaration.[19] As in previous years, the overwhelming majority of countries did not satisfy their TB R&D fair share targets (**Table 2**). Only three countries met their fair share funding targets in 2019: the United Kingdom, the Philippines, and New Zealand. The United States came close, meeting 89% of its target. Canada (76%) and South Africa (68%) were the only other countries to achieve more than two-thirds of their fair share targets.

Glenda Gray, president and CEO of the South African Medical Research Council, called on the leadership of TB high-burden countries to do better: "The political question we need to ask is, 'Why don't low- and middle-income countries invest in TB research?' You know, given the high burden of TB in these countries, where's their commitment to solving the problem? [. . .] Even in the countries where TB is high burden, nobody cared, quite frankly. And if the countries themselves don't care, how do you expect world leaders to care?"

The idea behind the fair share targets—that all nations should contribute to TB research in relation to their R&D capacities—is an increasingly accepted approach for defining state obligations to fund health R&D. For instance, the political declaration of the UN HLM called on UN member states to see the promotion of TB research and development as "a shared responsibility," one guided by the principles of affordability, effectiveness, efficiency, and equity.[20] The WHO *Global Strategy for TB Research and Innovation* proposes the following "measure of effectiveness" for its second objective (increase financial investments in TB research and innovation): "At the country level, proportion of gross domestic expenditure on research and development that is allocated to TB research."[21] This metric is similar in both spirit and method to the fair share targets backed by TB civil society. The point is to set a target for TB research funding and measure progress toward it at an individual level (country by country) and not just in the aggregate (globally).

The continued need for governments to step up funding of TB research is apparent. Released as a follow up to the UN HLM, the 2020 United Nations Secretary-General's TB Progress Report recognizes that "high-level commitments and targets have galvanized global and national progress towards ending TB, yet urgent and more ambitious investments and actions are required to end TB."[22] Likewise, the Stop TB Partnership notes the stark reality that "it will be impossible to fulfill 100% of the UN HLM targets by 2022 with less than 50% of the funds. . . . The TB community has worked hard to prioritize, improve efficiency, and achieve better value for money, but the most ambitious national strategic plan, that aims to reach 100% coverage, will never be fully implemented if it is not fully funded."[23] The same logic applies to TB research: eking out ever more efficiencies with limited money will not unlock the scientific progress needed to end the TB epidemic. Governments at all levels of income and TB burden must substantially increase funding for TB research. By delineating each nation's share of the overall financial need, the fair share targets establish a framework for holding governments accountable for meeting these global goals.

"If you think that science is a luxury, then that's the first thing that gets cut— it's ridiculous! In fact, this where you should be investing anyway. Why aren't countries spending 2% of their health budget on research like they're supposed to? Where's the commitment to public health system strengthening and where's the commitment to diagnosing and treating people?"

—**Glenda Gray, South African Medical Research Council**

TABLE 2

Majority of Countries Have Not Met TB R&D Fair Share Funding Targets

RANK	COUNTRY	2019 FUNDING	ANNUAL FAIR SHARE TARGET	PERCENT OF TARGET MET IN 2019
1	United States	$397,123,557	$444,500,000	89%
2	United Kingdom	$56,317,780	$40,400,000	139%
3	European Union	$38,844,007	$202,400,000	19%
4	India	$28,570,953	$46,500,000	61%
5	Germany	$24,290,971	$99,700,000	24%
6	South Korea	$19,554,816	$64,000,000	31%
7	Canada	$19,277,700	$25,300,000	76%
8	Australia	$12,148,939	$21,200,000	57%
9	Japan	$8,129,865	$154,900,000	5%
10	France	$7,393,331	$55,400,000	13%
11	Sweden	$4,542,620	$13,700,000	33%
12	Netherlands	$4,394,265	$15,100,000	29%
13	Switzerland	$3,325,545	$13,400,000	25%
14	South Africa	$3,142,906	$4,600,000	68%
15	Norway	$2,724,073	$5,300,000	51%
16	Philippines	$2,349,973	$700,000	336%
17	New Zealand	$1,856,506	$1,800,000	103%
18	Ireland	$1,397,485	$3,300,000	42%
19	Brazil	$1,196,568	$35,000,000	3%
20	Colombia	$927,862	$1,748,730	53%
21	Thailand	$580,953	$4,900,000	12%
22	Denmark	$545,864	$7,500,000	7%
23	Spain	$481,639	$20,799,869	2%
24	Mexico	$312,049	$10,300,000	3%
NA	China	Not reported	$305,600,000	---
NA	Indonesia	Not reported	$2,100,000	---
NA	Nigeria	Not reported	$7,000,000	---
NA	Pakistan	Not reported	$2,400,000	---
NA	Singapore	Not reported	$8,400,000	---
NA	Russian Federation	Not reported	$36,500,000	---
NA	Vietnam	Not reported	$1,300,000	---

Table includes countries that reported more than $250,000 in TB R&D funding to TAG and select other high-income or high-TB-burden countries.

Countries that met the target of spending at least 0.1% of overall R&D expenditures on TB research are shaded.

Funding by Research Area

FIGURE 7

Total TB R&D Funding by Research Area, 2019
Total: $900,964,590

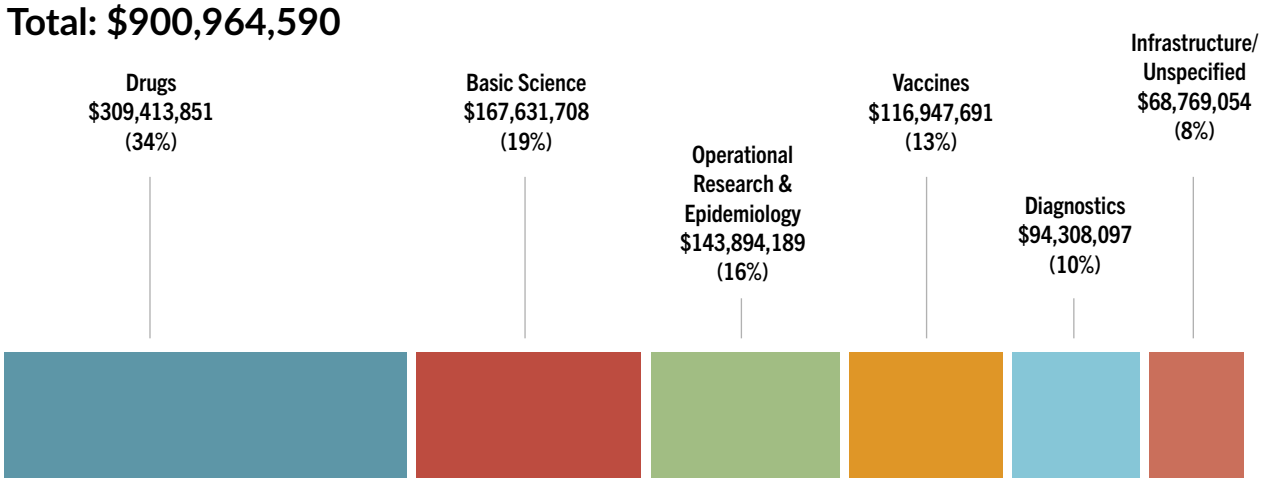
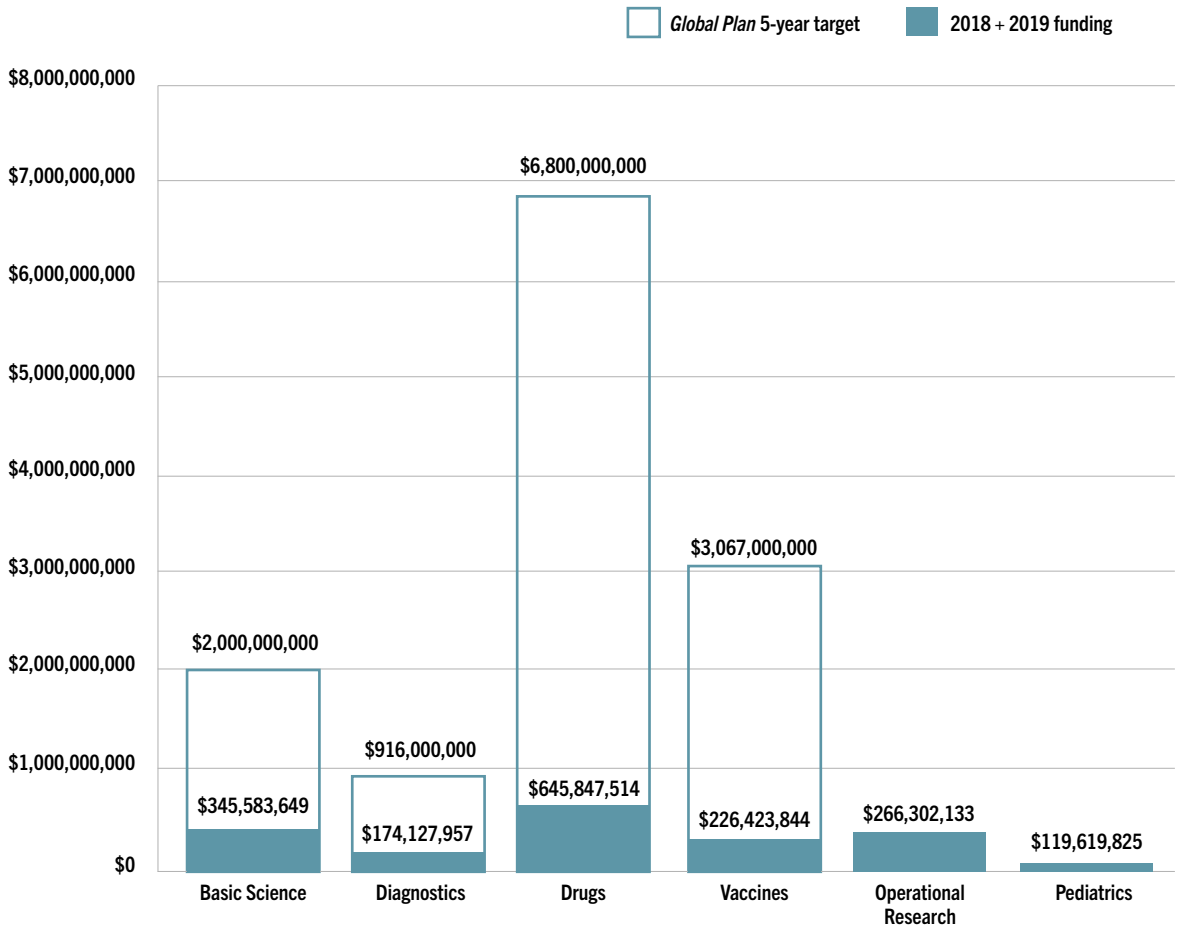


FIGURE 8

Progress toward *Global Plan* 5-Year TB Research Funding Targets

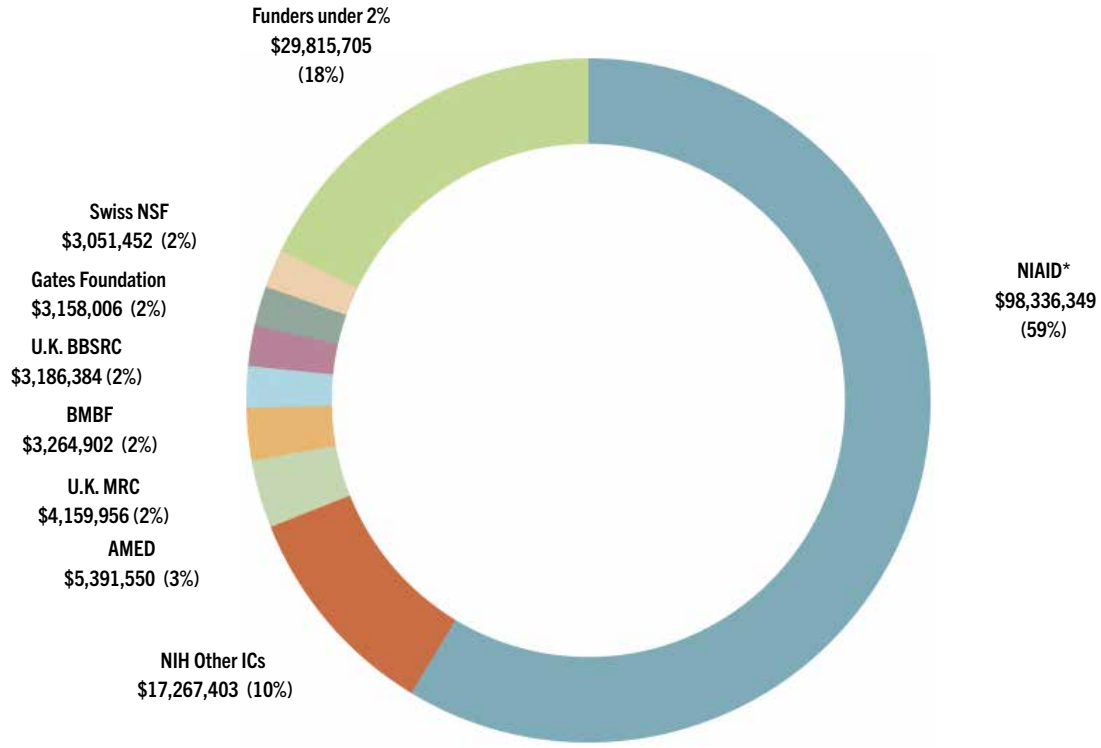


The Global Plan to End TB did not set funding targets for TB operational research or pediatric TB R&D.

Basic Science

FIGURE 9

Basic Science: $167,631,708



Funders with investments under 2%

Australian National Health and Medical Research Council	$2,910,279
Korean Ministry of Science and ICT	$2,882,957
French National Institute of Health & Medical Research (INSERM)	$2,608,755
European Commission	$2,483,981
French National Research Agency (ANR)	$2,295,479
Indian Ministry of Science and Technology	$1,894,393
Norwegian Ministry of Education and Research	$1,267,844
Swedish Research Council	$1,260,049

Canadian Institutes of Health Research (CIHR)	$1,203,497
U.S. National Science Foundation (NSF)	$1,149,962
Wellcome Trust	$1,084,705
U.S. Department of Veterans Affairs	$812,750
Institut Pasteur	$736,484
South African Department of Science and Technology	$658,995
South African Medical Research Council (SAMRC)	$650,203
Marsden Fund	$592,822
Other funders with investments <$500,000	$5,322,548

> "The bottleneck at the moment is that we don't understand what's happening in TB. We don't really understand the host-pathogen interactions. And I think that's across all these areas—diagnostics, treatments—at least not well enough to make the kind of changes that would propel the field forward. So I think the thing that we need to do is invest in basic research. That's going to pay off."
>
> —Frank Cobelens, Amsterdam University Medical Centers and Amsterdam Institute for Global Health & Development

At US$167 million, global spending on TB basic science decreased by approximately US$10 million from 2018 to 2019. The NIH remained the largest funder of TB basic science: NIAID's US$98 million investment accounted for 59% of all funding in this area. Combined with the US$17 million from other NIH institutes and centers, the NIH funded US$0.69 of every dollar spent on basic science research.

The remaining funders with expenditures over US$3 million were the Japan Agency for Medical Research and Development (US$5.3 million), U.K. Medical Research Council (US$4.1 million), German Federal Ministry of Education and Research (US$3.2 million), U.K. Biotechnology and Biological Sciences Research Council (US$3.1 million), Gates Foundation (US$3.1 million), and Swiss National Science Foundation (US$3 million). Aside from the Gates Foundation, all of the funders whose investments amounted to 2% or more of total spending in this area were public sector funders.

The Stop TB Partnership's updated *Global Plan* calls for a total investment of US$2 billion in basic science research from 2018 to 2022. At current funding levels, the projected shortfall in funding for basic science will total US$1.6 billion. Meeting the US$2 billion target will require an average annual investment of US$551 million for each of the next three years: a 328% increase from current levels.

There is palpable excitement among the TB researchers interviewed by TAG about the potential for basic science research to help answer fundamental questions about the nature of TB infection and disease over the next few years—assuming the money for these activities arrives. Emily MacLean, a doctoral candidate in epidemiology at McGill University, put it this way: "There's some really basic questions, like what is really happening in a granuloma? . . . It does seem like there's been a historic lack of funding if there's still these kinds of questions. Of course, a lot of questions in basic science are going to be able to be answered now that different techniques are evolving and we're getting better ways of observing and measuring different phenomena."

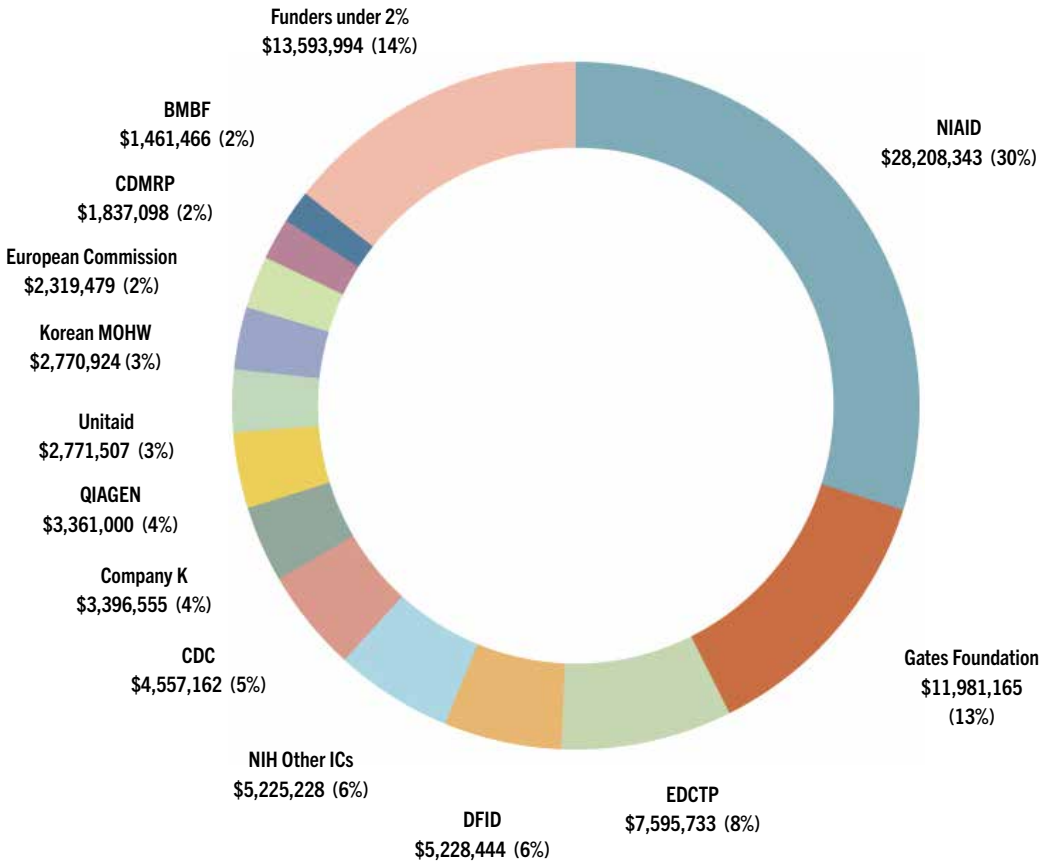
Frank Cobelens of the Amsterdam Institute for Global Health and Development agreed, pointing out that advances in basic science would allow developers of new TB diagnostics, vaccines, and therapeutics to move from taking incremental steps forward to making transformational leaps: "Across all fields [of TB research], there have been improvements over the past five years, but I think that with maybe one or two exceptions they've all been incremental. So my concern, really, is that if you want to be serious about eliminating tuberculosis worldwide, then we have to come up with real breakthroughs scientifically." Cobelens highlighted underfunding as one obstacle to making such breakthroughs: "I think we are really far from that, which I think is to a large extent [. . .] due to the huge underfunding of basic research."

Missing from these data: the German Research Foundation, which spent US$3.4 million on TB basic science in 2018, did not return a survey by this year's deadline.

Diagnostics

FIGURE 10

Diagnostics: $94,308,097



Funders with investments under 2%

Australian Department of Foreign Affairs and Trade (DFAT)	$1,309,683
Korean Ministry of SMEs and Startups	$1,299,633
U.K. Engineering and Physical Sciences Research Council (EPSRC)	$1,095,907
Rapid Biosensor Systems Ltd	$1,000,000
U.K. Medical Research Council (U.K. MRC)	$903,567
Australian National Health and Medical Research Council (NHMRC)	$787,255
U.K. National Institute for Health Research	$758,803
U.S. Agency for International Development (USAID)	$714,018
Indian Council of Medical Research (ICMR)	$569,889
Other funders with investments <$500,000	$5,155,238

> "We are starting to have better tools for diagnosing TB, but we still see that there's such a gap between who's presenting with symptoms of TB, and then told to go get a diagnosis, and then who actually gets diagnosed, and then who actually starts treatment. [These are] all losses along the cascade of care."
>
> —Emily MacLean, McGill University

Funding for TB diagnostics research climbed from just under US$80 million in 2018 to an all-time high of US$94 million in 2019, an 18% increase. Diagnostics research tied with operational research for the largest year-on-year increase from 2018 to 2019, a welcome change after two years of decreased or flat funding in this area.

In terms of absolute investment, diagnostics was the second-smallest research funding category, accounting for 10% of all TB R&D spending. NIAID and the Gates Foundation were the two largest funders of diagnostic research, spending US$28 million and nearly US$12 million, respectively, in 2019. Other funders with investments greater than US$3 million included the European and Developing Countries Clinical Trials Partnership (US$7.5 million), the U.K. Department for International Development (US$5.2 million), other NIH institutes and centers (US$5.2 million), the U.S. Centers for Disease Control and Prevention (US$4.5 million), Company K (US$3.3 million), and QIAGEN (US$3.3 million).

Spending on TB diagnostic research came primarily from the public sector (65%), with the philanthropic and private sectors representing a respective 19% and 14% of the total. Unitaid was the only multilateral funder with a presence in diagnostics R&D.

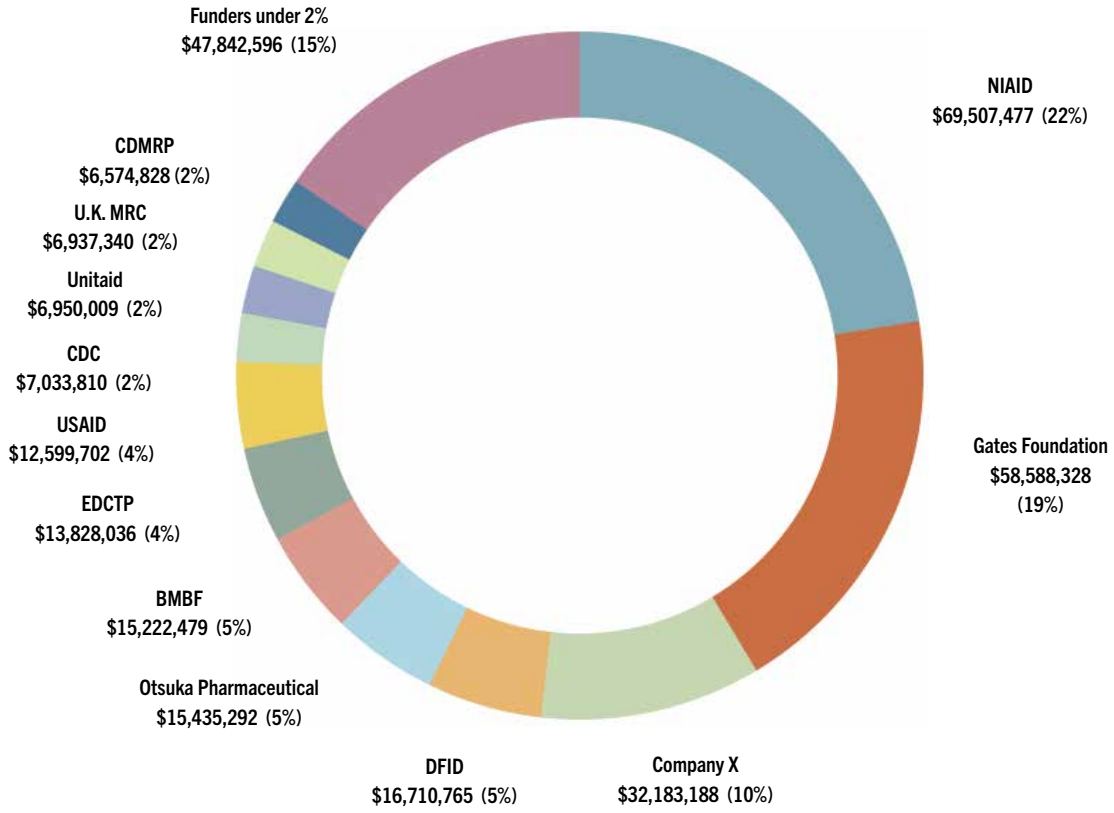
Diagnostic spending for 2018 and 2019 adds up to US$174 million, or 19% of the 2018–2022 *Global Plan* target. To meet the target by 2022, diagnostic R&D expenditures will need to jump to US$741 for the next three years—a 789% increase. Such a massive leap sounds nearly impossible. However, as Janet Ginnard of Unitaid commented, the COVID-19 response can be instructive for future TB diagnostics research and scale up. "We are seeing accelerated innovation in response to COVID-19, and a need for effective contact tracing and test-and-treat approaches. This could have positive implications and learnings for TB," said Ginnard. "TB R&D also will need to shift to identify cross-collaborations and applications for health products such as the implementation of diagnostic platforms that can be used to respond both to TB, COVID-19, and other related diseases."

Missing from these data: Fujifilm, Molbio, Qure.ai, and QuantuMDx are among the diagnostics developers that did not respond to the survey. In addition, FIND did not return a survey this year. FIND is not an original-source funder, so its absence does not necessarily mean the diagnostics total is seriously underreported (the published figures include funding given to FIND by development agencies and other donors).

Drugs

FIGURE 11

Drugs: $309,413,851



Funders with investments under 2%

U.S. National Institutes of Health, Other Institutes and Centers (NIH Other ICs)	$5,850,306
LegoChem Biosciences	$4,657,000
Dutch Ministry of Foreign Affairs (formerly DGIS)	$3,454,281
Merck (known as MSD outside of the U.S. and Canada)	$2,664,600
Australian Department of Foreign Affairs and Trade (DFAT)	$2,619,366
Macleods Pharmaceuticals	$2,500,000
Korean Ministry of Science and ICT	$2,401,430
Korean Ministry of Health and Welfare	$2,292,920
European Commission	$2,170,856
Global Health Innovative Technology Fund (GHIT)	$1,906,315
Swedish Research Council	$1,472,497

Indian Council of Medical Research (ICMR)	$1,459,498
French National Research Agency (ANR)	$1,378,568
Company V	$1,316,731
Ireland Department of Foreign Affairs and Trade (formerly Irish Aid)	$1,132,185
Company L	$1,130,000
Canadian Institutes of Health Research (CIHR)	$1,018,729
Qurient	$861,906
U.S. Department of Veterans Affairs	$711,941
Public Health England	$526,642
U.S. Food and Drug Administration (FDA)	$499,957
Funders with investments <$500,000	$5,816,868

> "I often think of what research and development was able to do in the HIV space around antiretrovirals and all the money and effort and energy pumped into proving those. [. . .] And I wonder what would have happened had we had the same kind of focused work in the TB space."
>
> —Matt Rose, Health GAP

In 2019, US$309 million—more than one-third of all TB R&D spending—went to TB drug research. Drug research has been the largest category of spending in every year that TAG has tracked TB research expenditures. The three largest funders of drug research—NIAID, the Gates Foundation, and Company X—spent a combined US$160 million in 2019. An additional five funders invested more than US$10 million each on drug R&D.

Drug research was the largest category of TB research spending, but it also had one of the largest shortfalls in terms of progress toward the *Global Plan*'s revised 5-year target. Combined 2018 and 2019 funding amounts to US$645 million, which is just 9% of the US$6.8 billion target for 2018–2022. After experiencing an 8% decline from 2018 to 2019, drug funding will need to increase dramatically over the next 3 years to meet the *Global Plan* target.

Community advocates, researchers, funders, and policymakers are all energized by TB drug research. Patrick Agbassi, chair of the Global TB Community Advisory Board, expressed his excitement about "advances being made in testing drugs in combination in order to improve their efficacy or to shorten the regimen. This is something that I'm really excited by because better treatments lead to better adherence, to more people being treated, and to less resistance."

The sense of excitement voiced by Agbassi was validated in October 2020 when the TB Trials Consortium (TBTC) at the U.S. CDC and the ACTG at NIH shared results of a phase III trial demonstrating that it is possible to cure drug-susceptible TB in four months. TBTC Study 31/ACTG A5349 showed that a four-month regimen containing isoniazid, rifapentine, pyrazinamide, and moxifloxacin (HPZM) is as effective as the standard six-month regimen that has been in place for four decades.[24] Commenting on the results, Barbara Seaworth, co-chair of the community advisory board to TBTC, echoed many of Agbassi's views: "Shorter treatment regimens will be easier for both patients and health care providers; more patients will complete therapy and be cured. This is a landmark event in our quest for even shorter treatments and should be implemented immediately."[25]

This landmark trial is also a testament to the money, time, and collaboration required to advance TB therapeutics research. Concluding the presentation of study results, one of the primary investigators reflected that the outcome represented the combined contribution of two global clinical trials networks, two major government agencies, and one pharmaceutical partner working across 34 clinical research sites in 13 countries on four continents.[26]

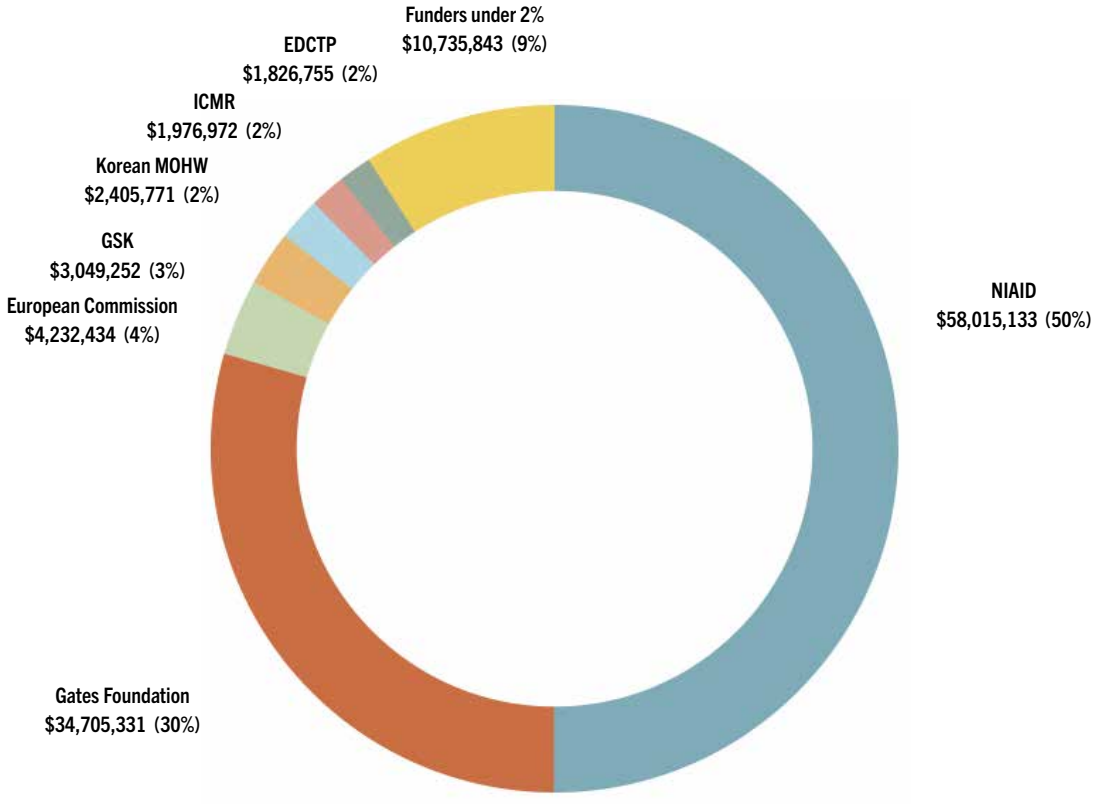
With the success of TBTC Study 31/ACTG A5349, the TB field is entering the next decade with a six-month month regimen for treating the most extensively resistant forms of TB (BPaL), a four-month regimen for drug-susceptible TB (HPZM), and a one-month regimen for TB infection (1HP). This impressive progress in shortening TB treatment is accompanied by a revitalized pipeline of TB drug candidates, with multiple new agents (including some from novel classes) in phase I and II development.[27]

Missing from these data: The Innovative Medicines Initiative did not respond to the survey. A survey from Company H arrived after the deadline with a reported US$3.7 million spent on drug development. These figures will be added to the 2019 figures in next year's report.

Vaccines

FIGURE 12

Vaccines: $116,947,691



Funders with investments under 2%

Archivel Farma	$1,726,582
Public Health England	$1,357,117
Canadian Institutes of Health Research (CIHR)	$888,116
German Federal Ministry of Education and Research (BMBF)	$727,682
U.K. Biotechnology and Biological Sciences Research Council (BBSRC)	$640,094
U.K. Medical Research Council (U.K. MRC)	$551,909
U.S. National Institutes of Health, Other Institutes and Centers (NIH Other ICs)	$522,044
São Paulo Research Foundation (FAPESP)	$500,000
Norwegian Agency for Development Cooperation (NORAD)	$436,472
U.S. Department of Veterans Affairs	$423,000
Swedish Research Council	$300,384
Max Planck Society	$299,000
Funders with investments <$300,000	$2,363,443

Global investments in TB vaccine research in 2019 totaled US$116 million, a 7% increase from 2018 and the highest amount ever reported in this research category. Vaccine research funding has fluctuated over the last decade from highs of more than US$115 million in 2009 and 2019 to lows of approximately US$80 million in 2010 and 2015.

Vaccine research accounted for 13% of all TB R&D funding. Half of all vaccine funding came from NIAID (US$58 million), and 30% came from the Gates Foundation (US$34 million). Three entities (the European Commission, GlaxoSmithKline [GSK], and the Korean Ministry of Health and Welfare) spent more than US$2 million on vaccine R&D in 2019. A handful of additional funders invested more than US$1 million. GSK's investment in TB vaccine R&D has decreased from US$17.5 million in 2015 to just over US$3 million in 2019, an expected trajectory given the conclusion of its phase IIb trial of vaccine candidate M72/AS01E. In January 2020, GSK announced it had signed a license giving the GMRI rights to develop and commercialize M72/AS01E "for use in low-income countries with high TB burdens,"[28] a signal that direct investment by GSK is unlikely to rebound.

Measured against the 2018–2022 *Global Plan* targets, vaccine research funding has the largest deficit of any category. Combined 2018 and 2019 funding amounts to US$226 million, barely 7% of the US$3 billion target. To reach the vaccine funding target, average investment for the next three years would need to increase more than eightfold, to US$946 million, more than has ever been spent in one year on all forms of TB research combined. This level of expenditure would be on par with annual funding for HIV vaccine research (which averaged US$857 million per year from 2005–2018),[29] though still well under the tens of billions of dollars governments have committed to the search for a COVID-19 vaccine. By way of comparison, the US$1.5 billion contract the U.S. Government signed with Moderna for the clinical testing and commercial scale manufacturing of its COVID-19 vaccine candidate exceeds the US$1.4 billion spent on TB vaccine research by all actors globally from 2005–2019.[30] For further comparison, between 2004 and 2015, the world spent US$11.9 billion on HIV vaccine R&D, a sum already surpassed by spending on COVID-19 vaccine research.[31]

Missing from these data: The Serum Institute of India, Vakzine Projekt Management, Anhui Zhifei Longcom, and Quratis did not respond to the survey this year.

"Advancing TB research is an urgent scientific, public health, and human rights priority for our communities. And the development of a new TB vaccine is a critical piece of the TB research agenda. Advocates really welcome what is being done in terms of advances regarding TB vaccines."

—**Patrick Agbassi, Global TB CAB**

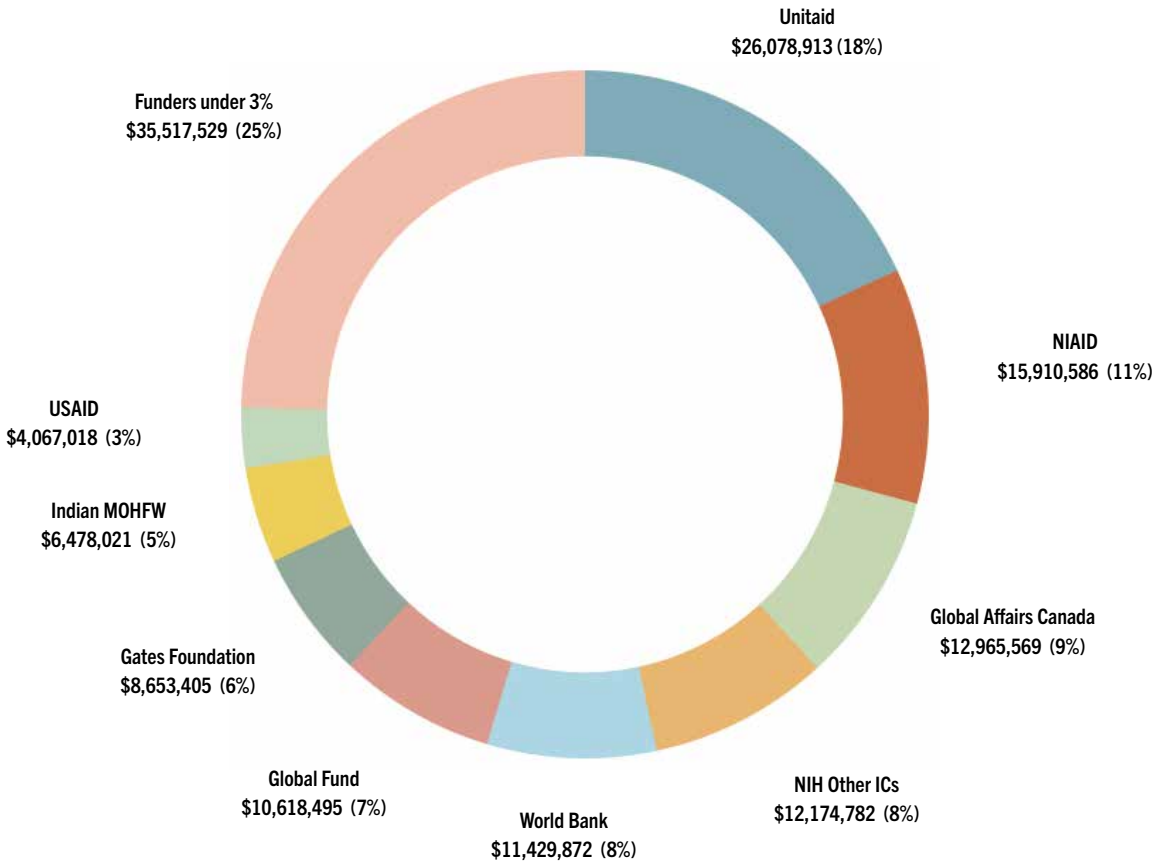
"When we're talking about infectious diseases, the principle of prevention is key for elimination. There is no single successful story of the elimination of an infectious disease without effective vaccines. And we're still using a vaccine more than 100 years old [BCG], which of course is not effective for everyone but at least protects children of early ages. Definitely, research is the key."

—**Tereza Kasaeva, World Health Organization Global TB Programme**

Operational Research & Epidemiology

FIGURE 13

Operational Research & Epidemiology: $143,894,189



Funders with investments under 3%

U.K. Department for International Development (DFID)	$3,082,917
U.K. Medical Research Council (U.K. MRC)	$2,831,715
European Commission	$2,561,499
Canadian Institutes of Health Research (CIHR)	$2,439,424
Australian Department of Foreign Affairs and Trade (DFAT)	$2,238,685
Indian Council of Medical Research (ICMR)	$1,962,484
Australian National Health and Medical Research Council (NHMRC)	$1,910,484
Philippine Council for Health Research and Development	$1,807,958
U.K. Biotechnology and Biological Sciences Research Council (BBSRC)	$1,726,213
U.S. Centers for Disease Control and Prevention (CDC)	$1,711,108
U.K. National Institute for Health Research	$1,662,957
South African Medical Research Council (SAMRC)	$1,188,097
TDR (the Special Programme for Research and Training in Tropical Diseases), hosted by the World Health Organization	$1,025,844
U.K. Engineering and Physical Sciences Research Council (EPSRC)	$832,433
Colombian Ministry of Science, Technology and Innovation (MINCIENCIAS)	$829,875
State Government of Madhya Pradesh	$783,375
Swedish Research Council	$751,650
European and Developing Countries Clinical Trials Partnership	$677,229
Expertise France/Initiative 5%	$670,068
U.K. Economic and Social Research Council (ESRC)	$644,104
Brazilian Ministry of Health	$560,045
National Research Coucil of Thailand	$498,650
Funders with investments <$500,000	$3,120,715

> "You can have all the best tools in the world, but if you can't actually deliver them or get people to use them, then it's not going to make any difference."
>
> —Emily MacLean, McGill University

Spending on operational research and epidemiology increased in 2019 to a record US$143 million. Unitaid was the largest funder in this category with an investment of US$26 million. NIAID, Global Affairs Canada, other NIH institutes and centers, the World Bank, and the Global Fund each invested over US$10 million in operational research and epidemiology.

More than US$85 million of the money spent in this category came from the public sector, with multilateral entities (US$49 million) and philanthropic groups (US$9 million) providing nearly all of the remaining funding.

The *Global Plan* does not include a funding target for operational research, but tracking of this category over time indicates that funding is increasing. Combined 2018 and 2019 funding for operational research was US$266 million, more than funders spent on vaccines, diagnostics, or pediatrics but less than expenditures on basic science or drug research.

In relation to all TB research funding, operational research and epidemiology accounted for about US$0.16 of every TB research dollar, an amount that will need to increase for innovations to be scaled up and reach all people with and at risk of TB. As Thea Hutanamon, advocacy and communications manager at Stop TB Partnership, Indonesia, explained: "Implementation research is still lacking. In countries like Indonesia, the scale-up of the most recent innovations hasn't happened as fast as we hoped. I hope countries are mobilizing resources to conduct this kind of implementation research in order to increase uptake of innovations and enable rapid application of new TB guidelines."

Mishal Khan, co-director of the TB Centre at the London School of Hygiene and Tropical Medicine, saw the adaptation of TB programs in response to COVID-19 as a field of study in its own right: "I've been looking at how TB and HIV services have had to adapt in light of COVID [and which] adaptations might be taken forward into the future. There might be research on how we adapt service delivery." Khan pointed out that many of these adaptations are about bringing health services closer to the community—an objective that is not unique to TB. "[This] isn't something that should be used just for TB, but it could be TB, HIV, malaria, maternal and child health. So bringing some of these innovations together, now if there's research on the effectiveness and cost-effectiveness of these service delivery changes, could we do them together, as a group of different health conditions, rather than just TB doing it alone?"

In discussing operational research, both Hutanamon and Khan emphasized that studying technologies in context requires a political analysis in addition to a scientific analysis. "Whatever the innovation that someone provides, a country needs really good leadership and stewardship for this innovation to be successful in the country," commented Hutanamon. Khan made a similar point: "There's always been a small amount [of funding] for what was called operational and epidemiological research, but there hasn't been the systems and policy research bit of it, which is to understand, even at a country or regional level, what are the messages and who are the political actors that really hold power? Can we just assume that it's the Minister of Health?"

Missing from these data: the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), which spent US$3.5 million on TB operational research in 2018, did not return a survey by this year's deadline.

Pediatric TB Research

"There are plenty of really fantastic examples of how in the pediatric TB community, important work has been generated. There are strong research networks that have undertaken important studies. A number of stakeholders have worked to support the development of the first pediatric FDC [fixed-dose combination] in TB. That was transformative. Over the last few years, there have been innovative ways of looking at trial design so that trials can be undertaken more quickly and in a more agile way. These new approaches can now be used for TB more systematically."

—Martina Penazzato,
GAP-f lead, World Health Organization,
Department of Research for Health

From 2018 to 2019, pediatric TB funding declined slightly, from US$61 million to US$58 million. Unitaid was the largest single pediatric funder, spending US$15.8 million in this category. Other significant players in pediatric TB R&D included NIAID, Company X, and other NIH institutes and centers; each accounted for 10% or more of all pediatric research funding.

Part of the decline in pediatric TB research funding may be attributable to the IMPAACT network's nonparticipation in the 2019 survey. In 2018, IMPAACT spent US$2.6 million on TB clinical trials involving children and pregnant women. IMPAACT's absence means that the reported NIH contribution to pediatric TB research is less than the true figure.

As in 2018, the largest share of pediatric research funding in 2019 went to drugs (33%). However, the absolute investment in pediatric TB drug research dropped from US$29 million in 2018 to US$19 million in 2019. Part of this decrease may be due to the lack of information from the IMPAACT network, which in 2018 spent US$2.6 million on clinical trials to improve TB treatment and preventive therapy for children and pregnant women. Pediatric vaccine spending also decreased from 2018 to 2019, from US$8 million to US$5 million. Basic science and diagnostic research remained relatively stable, while operational research spending doubled, from US$7 million to US$14 million.

Martina Penazzato, GAP-f lead at the WHO Department of Research for Health, described the WHO's commitment to a comprehensive pediatric research agenda: "From WHO's side, we're really keen to work with all the other stakeholders that are active in this space, because we believe that only by coordinating and collaborating on this can we really get to that last mile that is required for children. We need to address and fill those gaps that currently are being left unaddressed."

Missing from these data: the IMPAACT network, which spent US$2.6 million on pediatric TB research in 2018, did not return a survey by the deadline. Otsuka, which has participated in each year of the TAG report, indicated that it cannot delineate spending on pediatric projects within its total TB research investment of US$15.4 million.

TABLE 3

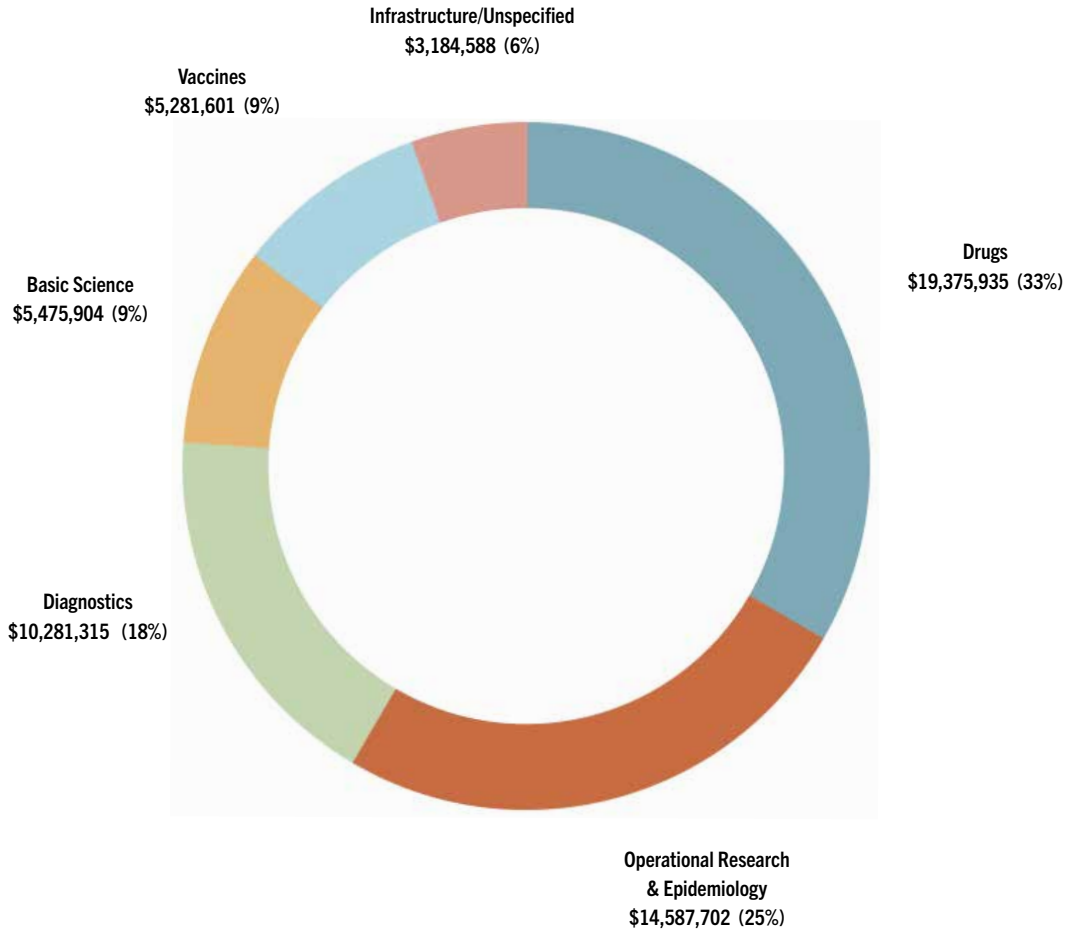
Pediatric TB R&D Funders by Rank, 2019

2019 RANK	FUNDER	FUNDER TYPE	2019 FUNDING	PERCENTAGE
1	Unitaid	M	$15,835,667	27%
2	U.S. National Institutes of Health, National Institute of Allergy and Infectious Diseases (NIAID)	P	$10,102,821	17%
3	Company X	C	$6,700,000	12%
4	U.S. National Institutes of Health, Other Institutes and Centers (NIH Other ICs)	P	$6,101,891	10%
5	U.S. Agency for International Development (USAID)	P	$4,500,000	8%
6	U.K. Medical Research Council (U.K. MRC)	P	$3,300,693	6%
7	Macleods Pharmaceuticals	C	$2,500,000	4%
8	Bill & Melinda Gates Foundation	F	$1,807,060	3%
9	European and Developing Countries Clinical Trials Partnership (EDCTP)	P	$1,494,310	3%
10	Philippine Council for Health Research and Development	P	$1,199,127	2%
11	South African Medical Research Council (SAMRC)	P	$709,878	1%
12	São Paulo Research Foundation (FAPESP)	P	$500,000	1%
13	Brazilian Ministry of Health	P	$486,999	1%
14	QIAGEN	C	$450,000	1%
15	Norwegian Agency for Development Cooperation (NORAD)	P	$354,904	1%
16	Indian Council of Medical Research (ICMR)	P	$316,816	1%
17	Public Health Agency of Canada	P	$283,717	<1%
18	Japan Agency for Medical Research and Development (AMED)	P	$260,302	<1%
19	Thrasher Research Fund	F	$229,481	<1%
20	Australian National Health and Medical Research Council (NHMRC)	P	$224,209	<1%
21	Swedish Research Council	P	$193,104	<1%
22	Ministry of Health of the Republic of Belarus	P	$136,424	<1%
23	German Federal Ministry of Education and Research (BMBF)	P	$101,897	<1%
24	Butantan Institute	P	$100,000	<1%
25	India Health Fund (supported by Tata Trusts)	F	$97,653	<1%
26	National Research Coucil of Thailand	P	$58,508	<1%
27	Other funders with expenditures <$50,000		$141,583	<1%
	Total		$58,187,045	

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector R&D Agency

FIGURE 14

Pediatric TB R&D Funding by Research Area, 2019
Total: $58,187,045



Pediatric TB research resource tracking methodology

TAG's survey asks all funders to delineate support for pediatric research and assign any relevant spending to one of the six core research areas tracked by the report. TAG further identified research related to pediatric TB by conducting a keyword search of titles and abstracts contained in returned surveys. We used the following search terms: pediatric, paediatric, infant, child, kid, adolescent, teen, natal, and pregnant. This methodology provides a reasonable estimate of pediatric TB research spending, but it does not necessarily capture research that informs the development of pediatric health technologies without studying TB infection or disease in children directly. Additionally, some funders have told TAG that they cannot disaggregate pediatric research funding from overall expenditures. Funders supporting studies or surveys that include people of all age groups can rarely specify the proportion of funds devoted to children. TAG encourages all funders to develop ways of disaggregating pediatric TB research spending to enable more accurate estimation in this area.

Discussion

The major themes emerging from this year's funding data and qualitative interviews are the impact of COVID-19 on TB R&D (positive and negative), the imperative of cultivating new and diverse funders in the TB space, the need to prioritize advocacy and equity, and the importance of building activist (and activists') capacity to contribute to the TB R&D agenda.

COVID-19 and TB R&D

While the impact of COVID-19 on TB funding will not be clear until next year's report, everyone TAG interviewed commented on how COVID-19 has upended TB research. The pandemic and related mitigation measures have disrupted TB research studies and networks in every country, presenting challenges—and possibly incurring lost opportunities—for the TB response.[32] I.D. Rusen of Vital Strategies described the pandemic's impact on the STREAM MDR-TB treatment trial as follows: "The magnitude of the disruption to the ongoing research is huge. In our case, we're four years into [the STREAM trial], and the last thing you want is for it to be jeopardized. It's stressful for everybody involved. It's not just about resources going away; it's also about pure disruption to research activities."

"The magnitude of the disruption to the ongoing research is huge . . . It's stressful for everybody involved. It's not just about resources going away; it's also about pure disruption to research activities."

—I.D. Rusen, Vital Strategies

Restarting research activities—whether a massive, multiyear, multicountry study like STREAM or a single-site basic science study—requires extra effort, time, and money. Emily MacLean of McGill University worries that "there may just be a dearth of research in the next couple of years because all of these real-time, on-the-ground projects that were happening have all had to be paused, and probably a lot of them are not going to resume for a long time. If they can resume, [then] maybe the funding is not going to be there anymore."

Concerns about lost momentum were expressed frequently in the interviews. Mishal Khan, co-director of the London School of Hygiene & Tropical Medicine TB Center, expressed both disappointment and hope: "It's unfortunate that there was so much momentum building and COVID-19 is going to disrupt it. We'll need to shift the tide so that it isn't a disruption, but rather something that allows us to build on the fact that now there is more political attention to health overall."

"It's unfortunate that there was so much momentum building following the HLM on TB and COVID is going to disrupt it. We'll need to shift the tide so that it isn't a disruption, but rather something that allows us to build on the fact that now there is more political attention to health overall."

—Mishal Khan, London School of Hygiene & Tropical Medicine

There is a real opportunity to leverage the cross-sector partnerships developed in response to COVID-19 to inform future models of TB advocacy and research. The truly unprecedented mobilization and redistribution of funds demonstrates that seemingly impossible political and financial responses are, in fact, possible when the political will exists. Matt Rose of Health GAP explains, "we have seen hundreds of billions of dollars be pumped into fighting COVID, which is important. And COVID is very bad. But to this point in time [September 2020], TB has still killed more people in

the world than COVID. And it does it almost every year, and yet marshaling those kinds of resources seems much harder to do—and we make it much easier to put it out of sight, out of mind. For what we do in our TB response, even doing a fraction of what we do for COVID might teach us things."

More Funders, More Collaboration

Despite yearly fluctuations in funding, the composition of the TB funding landscape has not changed dramatically over the last few years. A review of TAG TB funding data from 2015 to 2019 reveals remarkable sameness among the top TB funders. Based on available data, and in the absence of responses from several known funders (for example, a one-time non-response from PEPFAR in 2019, or a pattern of non-response from Russia and China), a picture of stability emerges. The rank order of the four largest funders (NIAID, Gates Foundation, other NIH institutes and centers, USAID) remained constant during this time period, while the number five spot was held by Unitaid (2019 and 2017), Company X (2018), and Otsuka Pharmaceutical (2015 and 2016).

"I think the biggest problem is the lack of low- and middle-income country investment. TB is a disease of the poor. And [it's concentrated] in low- and middle-income countries. Yet they're the countries that are least likely to invest. I think that if you really want to make an impact on TB R&D it's to get [these] countries to put their own money into TB research."

—Glenda Gray, South African Medical Research Council

With the exception of Unitaid, GHIT, and the Singapore National Medical Research Council, the TB research field has not benefitted from major new entrants in recent years. Viewed from one angle, funder stability is a positive sign. The majority of TB funders have demonstrated a sustained commitment to TB research. However, with few new entities among the top 30 funders each year, increased funder diversity is sorely needed. Lele Rangaka (University College London) noted as much in her interview: "The only way that we're going to get to those two billion [dollars] is if we get new people, new players involved. That's where we come in as the TB community. I mean, are we just in an echo chamber, talking to the same people, talking to ourselves, even just saying the same thing? How do we break that mold? There's definitely something to be learned from COVID [in terms of engaging funders]."

"It's not just about financing, but it's also about collaboration. It's also about data sharing. All these different elements make research success."

—Tereza Kasaeva, World Health Organization

Speaking from Amsterdam, Frank Cobelens voiced similar concerns that "almost three-quarters of all the money comes from the public sector and then mainly comes from one donor, which is the US NIH. And the philanthropic sector is basically just one donor, it's basically the Gates Foundation . . . The extremely skewed funding in the public sector, to me, is a real problem." Rangaka's and Cobelens's comments on the paucity of new funders reflect the principal challenge for TB R&D advocacy: how do stakeholders already in the field engage new partners in the TB response?

Increasing absolute funding for TB research will bring the world closer to ending TB. Increasing funding *and* increasing collaboration can bring the global community there more quickly. As Tereza Kasaeva at WHO explained, "It's not just about financing, but it's also about collaboration.

It's also about data sharing. All these different elements make research success, both the implementation of research and then the translation of the research into policy." Similarly, Mishal Khan describes a vision of the TB research community where, "rather than TB being siloed as one infectious disease, could we come together, taking [a] more systems-based approach? Can we be more efficient?" Khan continued: "I think we have to be realistic that there is likely to be less money. There's a lot of money that's already been spent and governments are building bigger debts." For Khan and others, efficiency and collaboration are strategies for harnessing limited R&D investments to cover research needs across multiple disease areas.

Advocacy and Equity

As in previous years, the role of continued and sustained advocacy in driving the TB research agenda emerged as a cross-cutting theme. I.D. Rusen spoke at length about the need to engage communities both earlier and more extensively in the research process: "Communities now get engaged once the questions are decided, once the protocol is written, and delivered to a particular site. And I think that that remains a challenge. How do you have that iterative process where you really, truly engage at community level earlier? We need to find out: what are the important questions for you? What are important things we could consider for this particular study, and [then] feed that into the development of research plans, so that when that's implemented, that engagement is a continuation, not just the starting point." Funders, policymakers, and other institutional entities must invest time and money in the critical work of community education, outreach, and empowerment at all stages of R&D, but especially at earlier stages.

"For each TB initiative, there should be a component of the funding that is directed toward building [the] capacity of the community. We need to have the community willing and able to engage."

—**Patrick Agbassi, Global TB CAB**

Whether TB funding increases or not, the mechanisms by which funders and scientists develop research agendas must do better at centering the needs and priorities of TB-affected communities. Multiple interviewees critiqued the power disparity in which predominantly Western funders have ultimate decision-making authority in terms of what research gets done. Lele Rangaka described the power imbalance thusly: "We fund research in developing countries, in high-burden countries, but the [research] questions seem to me to be coming from the West, right? And I guess it's almost as if we don't really trust people on the ground in those countries where we work to actually come up with the questions themselves, and don't really trust them with the money. I think if the funders looked at how they dole out the money, and they had a very rigorous and systematic way of making sure that we address the inequities in global health research, then we will get somewhere."

"Communities now get engaged once the questions are decided . . . And I think that that remains a challenge. How do you have that iterative process where you really, truly engage at community level earlier? We need to find out: what are the important questions for you?"

—**I.D. Rusen, Vital Strategies**

Rangaka further challenged funders to put their money behind their stated commitments to equity: "[Funders] say gender equity is important. They say equitable partnerships

are important. They definitely say community engagement is important. But regardless of what I [as a researcher] say in those three sections, if my science is good, I will still [get funded]. If we can get funders to actually care about those things, then we will get to decolonize health research. That is how you create ownership—not just people flying in and hiring really cheap labor to run around as field workers and then fly out again."

"The current [research] system is a formalized structure, and that structure was developed and ingrained and built over time. Changing it is going to require a formalized intervention to make those new nodes, new connections, and new routes of thinking about how we do things."

—Matt Rose, Health GAP

Matt Rose called on the TB research community—funders and scientists—to formalize community-centered R&D processes, as well as to integrate justice and equity into both agenda setting and funding decisions. For Rose, "we need to start with the endemic countries, saying, 'What do you need? What types of interventions do you need us to do more research in? What is going to be helpful for you to deploy in your countries?' And then the Western countries need to fork over the cash. Because we [the West]—for various reasons and a lot of colonialist practices—have absorbed and captured enough of the world's wealth where we need to be giving it back to the people who are owed justice and equity."

While Rangaka and Rose challenged funders to decolonize research practices, recent reports of bullying, racism, and harassment in the TB community[33] have reminded TAG and other advocates that "collective accountability work [also requires] holding our own institutions accountable."[34] Advocacy groups must continually engage in the difficult work of confronting injustice wherever it manifests, including in the realm of science and research.

Building Activist Capacity

"We have this thing called the TB Research Network. Many of the members are PhDs and doctors, and many TB patients and advocates feel like we're not equal in their expertise. We, as in the global community, need to change that mindset and democratize expertise."

—Thea Hutanamon, Stop TB Partnership–Indonesia

A final theme of this year's funding report is the value of building activist capacity. Energy and commitment are high in the research and advocacy communities, but so far have remained unmatched (and unfunded) by many of those with the needed resources. Community engagement, as a concept, is widely lauded, but the systems to build and sustain advocacy networks are lacking. Thea Hutanamon of Stop TB Partnership–Indonesia observed that the increased presence of community members does not always translate to increased power in setting research agendas. As Hutanamon noted: "In Indonesia, communities have long been a part of TB efforts, but mainly in ensuring community-based TB service. Community empowerment is stronger today than it was [two years ago] but still seems like it's very new at the global level."

Emily MacLean, a PhD candidate in epidemiology and young investigator, recalled the changes in community engagement that she has observed since becoming involved in TB research: "I've noticed since starting in this area a few years ago that there seems to be more of an emphasis now on engaging with patient advocates or people who are recovering or have recovered from TB and trying to actually hear what

they have to say. I suppose it's an attempt to get towards the advocacy and community engagement that happened in HIV. That seems to be a promising trend, but at the same time I'm always really wary about tokenizing people."

Like community engagement, capacity-building is frequently cited as an essential element of TB policy and research. Many of the advocates interviewed this year identified capacity-building for advocacy as an essential component of the TB response. MacLean sees an important role for institutionally affiliated actors in building activist capacity. From MacLean's perspective, "If we want people to step up and advocate for other people with TB, there needs to be support there for those people so that they can be properly equipped to advocate. I don't think it's very fair to invite a TB survivor to speak on a panel without having given them any resources or information . . . without properly equipping people to do the best job if they decide that they want to get involved in advocacy. Throwing people in like that seems unfair if we do want to have people at the table." MacLean concluded: "If we want to be taking what they're saying seriously, and we want what they say to be meaningful, it would be helpful to have mentorship for people. Compensating people for their time would also encourage a lot more people to come forward."

"How do we find new agitators? How do we get everybody to come along?. . . How do we get entire communities to actually care?"

—Lele Rangaka, University College London

"If we want people to step up and advocate for other people with TB, there needs to be support . . . I don't think it's very fair to invite a TB survivor to speak on a panel without having given them any resources or information."

—Emily MacLean, McGill University

Mishal Khan described the downstream benefit of investing—monetarily—in building activist capacity as a way to make advocacy more efficient and effective, asking "What are we investing in when we have a pot of research money? Are we going to put some of that money into understanding the political climate, and messaging, and how to be more effective? Or do we just assume that advocates know what to do without actually having an evidence base for their own strategies?" Along with other interviewees, Khan noted that neither TB disease nor TB advocacy exist in a vacuum, making political literacy as crucial as scientific literacy. Patrick Agbassi, chair of the Global TB CAB, argued that "in order to have communities more engaged, for each TB initiative, there should be a component of the funding that is directed toward building [the] capacity of the community. We need to have the community willing and able to engage."

"Are we going to put some of [our] money into understanding the political climate, and messaging, and how to be more effective? Or do we just assume that advocates know what to do without actually having an evidence base for their own strategies?"

—Mishal Khan, London School of Hygiene & Tropical Medicine

Intentional and organized efforts to build activist capacity—for example, mentoring—could be an important first step in restructuring TB advocacy. Hutanamon described the perceived expertise gap she's observed, explaining, "We have this thing called the TB Research Network. Many of the members are PhDs and doctors, and many TB patients feel like we're not equal in their expertise. We, as in the global community, need to change that mindset and democratize expertise." For MacLean, a "concerted effort to engage younger people in the community, whether they're researchers or TB survivors or people who are involved in not just scientific research," could invigorate both advocacy and research.

Conclusion

"I think it's time for us to be unreasonable."

—Lele Rangaka, University College London

This year's funding report provides a snapshot of TB research at an unprecedented moment in time, one just on the cusp of the COVID-19 pandemic. The R&D expenditures captured here were made before COVID-19, at a time when both political will and advocates' optimism were high. The interviews, conducted in the latter half of 2020, were tinged with varying degrees of uneasiness, frustration, and uncertainty about the impact COVID-19 will have on TB research. While it will not be possible to quantify the effect of COVID-19 on TB research funding for a few years' time, it is prudent to begin considering how COVID-19 might affect TB research and research advocacy.

The COVID-19 pandemic has definitively shown that funders can make unprecedented investments at unbelievable speed—if the sense of urgency is clear. Tereza Kasaeva noted as much, explaining, "When there is a high-level commitment and understanding of the threat, the progress is much, much faster—many vaccines [being studied for COVID-19] and all the countries are involved and competing with each other, investments are coming very fast. And this is not our reality [in TB]."

Flat (or decreased) TB R&D funds will have to be stretched through greater efficiency and deeper collaboration. If advocates, researchers, and policymakers are able to both push the largest funders to maintain support for TB research, while also engaging new funders, COVID-19-related setbacks to TB research might not be insurmountable.

Many interviewees identified silver linings in the COVID-19 pandemic, among them, a renewed focus on social and political determinants of health. From Frank Cobelens's perspective, "One of the benefits of the COVID-19 situation is that I think people are starting to understand that the investment in health, or disinvestment in health, has major implications for the economy." For Lele Rangaka, "We're getting these incremental increases in funding, which are commendable, but obviously not what we need . . . Maybe we've reached the limit of how much governments are willing to care about TB, so we have to reframe the problem differently, to try get the light bulb to go on in their head."

Even in the face of COVID-19, there remain innumerable good reasons for governments, pharmaceutical companies, philanthropies, and multilateral organizations to increase support for TB R&D. Not least: the moral imperative to save the 1.4 million lives TB takes each year. Innovation is one critical piece of ending this toll, but over and beyond any particular R&D agenda, saving lives—whether from TB or COVID-19—will require a commitment to tackling inequalities. "If we don't take care of inequalities, the things that make people vulnerable to disease in general," reflected Rangaka, "then we lose out when we're hit with unexpected pandemics."

Endnotes

1. United Nations General Assembly. Resolution 73/3, Resolution adopted by the General Assembly on 10 October 2018: Political declaration of the high-level meeting of the General Assembly on the fight against tuberculosis. https://undocs.org/en/A/RES/73/3
2. Stop TB Partnership. Global Plan to End TB: 2016–2020. The paradigm shift. Geneva: Stop TB Partnership; 2015. http://www.stoptb.org/global/plan/plan2/
3. Stop TB Partnership. Global Plan to End TB: 2018–2022. The paradigm shift. Geneva: Stop TB Partnership; 2019. http://www.stoptb.org/global/plan/plan1822.asp
4. Stop TB Partnership. Global Plan to End TB: 2016–2020.
5. Stop TB Partnership. Global Plan to End TB: 2018–2022.
6. Treatment Action Group. TB research investments provide returns in combating both TB and COVID-19. New York: Treatment Action Group; 2020. https://www.treatmentactiongroup.org/publication/tb-research-investments-provide-returns-in-combating-both-tb-and-covid-19/
7. National Institutes of Health Office of Budget. History of congressional appropriations, fiscal years 2000–2020 [Internet]. 2020 November 3. https://officeofbudget.od.nih.gov/pdfs/FY21/Approp%20History%20by%20IC%20FY%202000%20-%20FY%202020%20R2.pdf
8. National Institutes of Health. Mission and goals [Internet]. 2020 November 2. https://www.nih.gov/about-nih/what-we-do/mission-goals
9. Commonwealth of Massachusetts. Tuberculosis data and statistics [Internet]. 2020 November 3. https://www.mass.gov/lists/tuberculosis-data-and-statistics
10. https://www.who.int/tb/country/data/profiles/en/
11. National Institutes of Health. New FOAs for U.S.-South African collaborative research [Internet]. 2019 April 3. https://www.niaid.nih.gov/grants-contracts/us-south-africa-collaborative-research
12. Thakur, Matt (Wellcome Trust, London, United Kingdom). Personal communication with: Mike Frick (Treatment Action Group, New York, USA). 2020 September 4.
13. Farrar J. Wellcome's bold ambitions to improve health through our new strategy [Internet]. 2020 October 20. https://wellcome.org/news/wellcomes-bold-ambitions-improve-health-through-our-new-strategy
14. Barr L. Report on tuberculosis research funding trends, 2005–2018. New York: Treatment Action Group; 2019. https://www.treatmentactiongroup.org/resources/tbrd-report/
15. Destito, Marc (Otsuka Pharmaceutical, Geneva, Switzerland). Personal communication with: Mike Frick (Treatment Action Group, New York, USA). 2020 June 22.
16. Bayona Garcia, Jaime (World Bank, Washington, D.C.). Personal communication with: Mike Frick (Treatment Action Group, New York, USA). 2020 September 11.
17. For more information on Fujifilm's SILVAMP TB-LAM, see: Branigan D. TB diagnostics pipeline report. New York: Treatment Action Group; 2020. https://www.treatmentactiongroup.org/resources/pipeline-report/2020-pipeline-report/
18. Munseri R, Said J, Amour M, et al. DAR-901 vaccine for the prevention of infection with Mycobacterium tuberculosis among BCG-immunized adolescents in Tanzania: a randomized controlled, double-blind phase 2b trial. Vaccine. 2020;38(46):7239–45. doi: 10.1016/j.vaccine.2020.09.055.
19. For more information on the fair share targets, see: Lovinger E. From fair share to fair shot: capitalizing on opportunities to ensure success of U.S. government-funded TB research. New York: Treatment Action Group; 2020. https://www.treatmentactiongroup.org/publication/from-fair-share-to-fair-shot-capitalizing-on-opportunities-to-ensure-success-of-u-s-government-funded-tb-research/
20. United Nations General Assembly. Resolution 73/3.
21. World Health Organization. Global strategy for TB research and innovation. Geneva: World Health Organization; 2020. https://www.who.int/teams/global-tuberculosis-programme/development-of-a-global-strategy-for-tb-research-and-innovation
22. World Health Organization. Overview: progress towards achieving global tuberculosis targets and implementation of the UN Political Declaration on Tuberculosis. Geneva: World Health Organization; 2020. https://www.who.int/docs/default-source/documents/tuberculosis/overview-progress-unga.pdf?sfvrsn=e8ad804d_1&download=true
23. Stop TB Partnership (Press Release). Impossible task for TB response: achieving 100% of targets with less than 50% of funding. 2020 October 14. http://www.stoptb.org/news/stories/2020/ns20_029.html
24. Dorman S. The design and primary efficacy results of Study 31/A5349. High-dose rifapentine with or without moxifloxacin for shortening treatment of TB: TB Trials Consortium Study 31/ACTG A5349 phase III clinical trial results (SP-10). Presentation at: 51st Union World Conference on Lung Health. 2020 October 21.
25. Treatment Action Group (Press Release). Finally—a new four-month treatment for drug-susceptible TB! 2020 October 21. https://www.treatmentactiongroup.org/statement/finally-a-new-four-month-treatment-for-drug-susceptible-tb/
26. Chaisson D. Lessons learned and next steps. High-dose rifapentine with or without moxifloxacin for shortening treatment of TB: TB Trials Consortium Study 31/ACTG A5349 phase III clinical trial results (SP-10). Presentation at: 51st Union World Conference on Lung Health. 2020 October 21.
27. McKenna L. TB treatment pipeline report. New York: Treatment Action Group; 2020. https://www.treatmentactiongroup.org/resources/pipeline-report/2020-pipeline-report/
28. GlaxoSmithKline (Press Release). GSK licenses tuberculosis vaccine candidate to the Bill & Melinda Gates Medical Research Institute for continued development. 2020 January 27. https://www.gsk.com/en-gb/media/press-releases/gsk-licenses-tuberculosis-vaccine-candidate-to-the-bill-melinda-gates-medical-research-institute-for-continued-development/
29. The Resource Tracking for HIV Prevention R&D Working Group. HIV prevention research & development investments in 2018: investing to end the epidemic. New York: AVAC; 2019. https://www.avac.org/resource/hiv-prevention-research-development-investments-2018-investing-end-epidemic
30. BARDA. COVID-19 medical countermeasures portfolio [Internet]. 2020 November 2. https://medicalcountermeasures.gov/app/barda/coronavirus/COVID19.aspx?filter=vaccine
31. Cornish L. Interactive: who's funding the COVID-19 response and what are the priorities? Devex. 2020 November 5. https://www.devex.com/news/interactive-who-s-funding-the-covid-19-response-and-what-are-the-priorities-96833
32. Treatment Action Group. TB research investments provide returns.
33. Mandavilli A. "A global health star under fire." New York Times [Internet]. 2020 September 12. https://www.nytimes.com/2020/09/12/health/ditiu-stoptb-united-nations.html
34. Treatment Action Group (Press Release). Treatment Action Group condemns reported bullying, harassment, and racism at Stop TB Partnership. 2020 September 13. https://www.treatmentactiongroup.org/statement/treatment-action-group-condemns-reported-bullying-harassment-and-racism-at-stop-tb-partnership/

Appendix 1: Methodology

TAG tracks global funding for TB R&D by surveying organizations with known or potential investments in TB research from the public, private, philanthropic, and multilateral sectors. The survey asks recipients to report expenditures on TB research in a given fiscal year and categorize spending by six research areas: basic science, diagnostics, drugs, vaccines, operational research, and infrastructure/unspecific projects. Surveyed institutions may report spending by individual projects or aggregate expenditures by research area. Within these categories, the survey asks recipients to indicate any funding for pediatric TB research (see box). Respondents report expenditures according to how their fiscal year is defined, so the funding reported here does not align with calendar year 2019 perfectly.

TAG surveyed 214 organizations for this year's report and received 148 surveys in return. This return rate of 69% is higher than the 62% rate last year. From these 148 surveys, we identified 161 institutions funding TB research in 2019. Twenty-three organizations that returned surveys reported no money on TB R&D in 2019, and five groups declined to participate.

The survey asks organizations to report funding in local currencies, which TAG converts into U.S. dollars using the July 1, 2019, interbank exchange rates published by the OANDA Corporation. All dollar figures in the report are published as U.S. dollars unless otherwise noted and are rounded to the nearest dollar. Dollar figures represent disbursements (i.e., the actual transfer of funds) made in 2019, rather than commitments, pledges, or allocations for future years. The survey is designed to capture direct expenditures on TB research and so does not necessarily reflect indirect funding through salaries, overhead, or infrastructure that is not TB specific.

TAG assiduously reviews each returned survey for completeness. We take careful measure to avoid double-counting awards reported by more than one funder. Double counting can arise under several scenarios, including the fact that many organizations fund some projects while receiving outside money for others. To help minimize the risk of double counting, the survey asks recipients to note whether spending represents one of three categories: funding given to others, funding received from others, or self-funded research. Any awards listed by more than one survey enter our database as reported by the original source funder. For projects supported by more than one organization, we ask funders to report only their share of the project.

In addition to the survey, TAG conducted 12 qualitative interviews with scientists, donors, activists, policymakers, and members of TB-affected communities (see box). Each interviewee received an embargoed copy of preliminary survey findings in early September 2020 with a list of open-ended questions and was asked to reflect on the state of TB research and funding for it. TAG interviewed 11 individuals over the phone; one person submitted answers in writing. TAG recorded and transcribed each phone interview and pulled quotations from the transcripts, grouped these into common themes, and selected the excerpts that appear within and alongside the text of this report. In some places, we edited quotations for length or clarity.

Limitations to the Data

The comprehensiveness of the data in this report depends on the proportion of institutions funding TB research that participate in the survey. This proportion cannot be calculated since the true number of TB research funders worldwide is unknown. TAG makes a considerable effort to ensure a wide survey reach and yield. The survey is available in six languages (English, French, Spanish, Russian, Chinese, and Portuguese). TAG routinely updates the survey frame by adding new organizations, most of which do not have known investments in TB R&D but either fund health research generally or have a record of investing in related diseases. Finally, TAG makes a particular effort to encourage the continued participation of the 30 largest funders from the

previous year's report. The high degree of concentration of TB research funding means that the top 30 donors typically comprise over 90% of total spending, and the composition of this group has remained remarkably stable over time. This year, 29 of the top 30 funders from 2018 participated in the survey (the exception was the German Research Foundation).

A number of funders with known investments did not return surveys this year or submitted information after the deadline. These groups are noted in the sections of the report that describe funding by research area. TAG received no information from entities in Russia and China.

TAG encourages all funders not listed here to participate in future report rounds. Funders may reach out to TAG at tbrdtracking@treatmentactiongroup.org with information or corrections to share. Any corrections submitted to TAG will enter print in next year's publication.

This report would not be possible without considerable time and effort on the part of the dozens of funding officers and administrative staff who complete the survey each year. TAG is grateful to the 148 organizations around the world that participated in this year's survey. Appendix 2 acknowledges organizations that have reported to TAG every year since 2005 with a dagger (†) appearing next to their names.

TB experts interviewed by TAG

1. Patrick Agbassi, Chair, Global TB Community Advisory Board
2. Frank Cobelens, Professor of Global Health, Amsterdam University Medical Centers and Amsterdam Institute for Global Health and Development
3. Janet Ginnard, Director of Strategy, Unitaid
4. Glenda Gray, President and CEO, South African Medical Research Council
5. Thea Hutanamon, Advocacy and Communications Manager, Stop TB Partnership–Indonesia
6. Tereza Kasaeva, Director, Global TB Programme, World Health Organization
7. Mishal Khan, TB Centre Co-Director, London School of Hygiene and Tropical Medicine
8. Emily MacLean, PhD candidate epidemiology, McGill University
9. Martina Penazzato, GAP-f lead, Department of Research for Health, World Health Organization
10. Lele Rangaka, Clinical Associate Professor, University College London
11. Matt Rose, Director of U.S. Policy and Advocacy, Health GAP
12. I.D. Rusen, Senior Vice President of Research and Development, Vital Strategies

Appendix 2: TB R&D Funders by Rank

TB R&D Funders by Rank, 2019

2019 RANK	FUNDER	FUNDER TYPE	TOTAL
1	U.S. National Institutes of Health, National Institute of Allergy and Infectious Diseases (NIAID)†	P	$286,972,907
2	Bill & Melinda Gates Foundation†	F	$117,557,700
3	U.S. National Institutes of Health, Other Institutes and Centers (NIH Other ICs)†	P	$44,949,029
4	U.S. Agency for International Development (USAID)†	P	$37,139,231
5	Unitaid	M	$35,800,429
6	Company X†	C	$32,183,188
7	U.K. Department for International Development (DFID)†	P	$25,022,125
8	European and Developing Countries Clinical Trials Partnership (EDCTP)†	P	$24,591,735
9	German Federal Ministry of Education and Research (BMBF)	P	$23,543,671
10	Indian Council of Medical Research (ICMR)	P	$19,070,083
11	Otsuka Pharmaceutical†	C	$15,435,292
12	U.S. Centers for Disease Control and Prevention (CDC)†	P	$15,432,560
13	U.K. Medical Research Council (U.K. MRC)†	P	$15,384,488
14	European Commission†	P	$14,252,272
15	Global Affairs Canada	P	$12,965,569
16	World Bank	M	$12,124,303
17	Global Fund to Fight AIDS, Tuberculosis and Malaria	M	$10,618,495
18	U.S. Department of Defense Congressionally-Directed Medical Research Program	P	$9,032,220
19	Korean Ministry of Health and Welfare	P	$8,531,522
20	Indian Ministry of Health and Family Welfare	P	$6,541,313
21	Australian Department of Foreign Affairs and Trade (DFAT)	P	$6,167,734
22	U.K. Biotechnology and Biological Sciences Research Council (BBSRC)	P	$6,108,551
23	Korean Ministry of Science and ICT	P	$5,956,070
24	Australian National Health and Medical Research Council (NHMRC)	P	$5,939,465
25	Canadian Institutes of Health Research (CIHR)†	P	$5,743,070
26	Japan Agency for Medical Research and Development (AMED)	P	$5,663,852
27	LegoChem Biosciences	C	$4,743,191
28	U.K. National Institute for Health Research	P	$4,193,775
29	Swedish Research Council	P	$4,034,006
30	French National Research Agency (ANR)	P	$3,805,188
31	QIAGEN	C	$3,477,000
32	Dutch Ministry of Foreign Affairs (formerly DGIS)†	P	$3,454,281
33	Company K	C	$3,396,555
34	Swiss National Science Foundation (SNSF)	P	$3,325,545

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector Agency; † Organization has reported to TAG each year since 2005

BASIC SCIENCE	DIAGNOSTICS	DRUGS	VACCINES	OPERATIONAL RESEARCH	INFRASTRUCTURE/ UNSPECIFIED
$98,336,349	$28,208,343	$69,507,477	$58,015,333	$15,910,586	$16,994,819
$3,158,006	$11,981,165	$58,588,328	$34,705,331	$8,653,405	$471,465
$17,267,403	$5,225,228	$5,850,306	$522,044	$12,174,782	$3,909,266
$0	$714,018	$12,599,702	$0	$4,067,018	$19,758,493
$0	$2,771,507	$6,950,009	$0	$26,078,913	$0
$0	$0	$32,183,188	$0	$0	$0
$0	$5,228,444	$16,710,765	$0	$3,082,917	$0
$0	$7,595,733	$13,828,036	$1,826,755	$677,229	$663,981
$3,264,902	$1,461,466	$15,222,479	$727,682	$0	$2,867,142
$174,161	$569,889	$1,459,498	$1,976,972	$1,962,484	$12,927,080
$0	$0	$15,435,292	$0	$0	$0
$0	$4,557,162	$7,033,810	$0	$1,711,108	$2,130,480
$4,159,956	$903,567	$6,937,340	$551,909	$2,831,715	$0
$2,483,981	$2,319,479	$2,170,856	$4,232,434	$2,561,499	$484,024
$0	$0	$0	$0	$12,965,569	$0
$0	$0	$0	$0	$11,429,872	$694,431
$0	$0	$0	$0	$10,618,495	$0
$465,370	$1,837,098	$6,574,828	$154,925	$0	$0
$248,666	$2,770,924	$2,292,920	$2,405,771	$140,491	$672,751
$2,233	$0	$0	$0	$6,478,021	$61,060
$0	$1,309,683	$2,619,366	$0	$2,238,685	$0
$3,186,384	$186,112	$369,748	$640,094	$1,726,213	$0
$2,882,957	$377,502	$2,401,430	$294,181	$0	$0
$2,910,279	$787,255	$331,447	$0	$1,910,484	$0
$1,203,497	$193,304	$1,018,729	$888,116	$2,439,424	$0
$5,391,550	$260,302	$0	$0	$12,000	$0
$0	$86,191	$4,657,000	$0	$0	$0
$0	$758,803	$0	$0	$1,662,957	$1,772,015
$1,260,049	$249,426	$1,472,497	$300,384	$751,650	$0
$2,295,479	$17,153	$1,378,568	$0	$113,988	$0
$0	$3,361,000	$0	$0	$116,000	$0
$0	$0	$3,454,281	$0	$0	$0
$0	$3,396,555	$0	$0	$0	$0
$3,051,452	$113,044	$161,049	$0	$0	$0

Appendix 2

TB R&D Funders by Rank, 2019 (continued)

2019 RANK	FUNDER	FUNDER TYPE	TOTAL
35	GlaxoSmithKline Biologicals (GSK)	C	$3,049,252
36	Merck (known as MSD outside of the U.S. and Canada)	C	$2,664,600
37	Korean Ministry of Education	P	$2,633,296
38	French National Institute of Health & Medical Research (INSERM)	P	$2,608,755
39	Macleods Pharmaceuticals	C	$2,500,000
40	Philippine Council for Health Research and Development	P	$2,246,329
41	Indian Ministry of Science and Technology	P	$2,158,774
42	U.K. Engineering and Physical Sciences Research Council (EPSRC)	P	$2,149,885
43	South African Medical Research Council (SAMRC)	P	$2,080,011
44	Japanese Ministry of Health, Labour and Welfare	P	$2,025,197
45	Public Health England	P	$1,972,377
46	U.S. Department of Veterans Affairs	P	$1,947,691
47	Global Health Innovative Technology Fund (GHIT)	M	$1,906,315
48	Archivel Farma	C	$1,726,582
49	Norwegian Ministry of Education and Research	P	$1,575,770
50	Wellcome Trust	F	$1,521,953
51	Company V	C	$1,316,731
52	Korean Ministry of SMEs and Startups	P	$1,299,633
53	U.S. National Science Foundation (NSF)	P	$1,149,962
54	Ireland Department of Foreign Affairs and Trade (formerly Irish Aid)	P	$1,132,185
55	Company L	C	$1,130,000
56	South African Department of Science and Technology	P	$1,062,895
57	TDR (the Special Programme for Research and Training in Tropical Diseases), hosted by the World Health Organization	M	$1,025,844
58	New Zealand Health Research Council	P	$1,014,570
59	Institut Pasteur	F	$1,004,542
60	Rapid Biosensor Systems Ltd	C	$1,000,000
61	Colombian Ministry of Science, Technology and Innovation (MINCIENCIAS)	P	$927,862
62	Qurient	C	$861,906
63	Marsden Fund	P	$841,936
64	Sequella	C	$800,000
65	State Government of Madhya Pradesh	P	$783,375
66	Taiwan Centers for Disease Control	P	$771,593
67	Netherlands Organization for Health Research and Development (ZonMw)	P	$764,495
68	Max Planck Society	P	$747,300
69	Norwegian Agency for Development Cooperation (NORAD)	P	$741,476

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector Agency; † Organization has reported to TAG each year since 2005

BASIC SCIENCE	DIAGNOSTICS	DRUGS	VACCINES	OPERATIONAL RESEARCH	INFRASTRUCTURE/ UNSPECIFIED
$0	$0	$0	$3,049,252	$0	$0
$0	$0	$2,664,600	$0	$0	$0
$362,556	$141,667	$49,806	$84,267	$0	$1,995,000
$2,608,755	$0	$0	$0	$0	$0
$0	$0	$2,500,000	$0	$0	$0
$196,489	$241,883	$0	$0	$1,807,958	$0
$1,894,393	$0	$232,887	$0	$31,494	$0
$94,948	$1,095,907	$126,597	$0	$832,433	$0
$650,203	$62,185	$151,181	$28,344	$1,188,097	$0
$2,769	$0	$0	$0	$109,087	$1,913,341
$88,618	$0	$526,642	$1,357,117	$0	$0
$812,750	$0	$711,941	$423,000	$0	$0
$0	$0	$1,906,315	$0	$0	$0
$0	$0	$0	$1,726,582	$0	$0
$1,267,844	$0	$75,053	$232,874	$0	$0
$1,084,705	$326,977	$17,018	$0	$93,253	$0
$0	$0	$1,316,731	$0	$0	$0
$0	$1,299,633	$0	$0	$0	$0
$1,149,962	$0	$0	$0	$0	$0
$0	$0	$1,132,185	$0	$0	$0
$0	$0	$1,130,000	$0	$0	$0
$658,995	$212,579	$191,321	$0	$0	$0
$0	$0	$0	$0	$1,025,844	$0
$418,201	$83,640	$244,323	$32,527	$235,879	$0
$736,484	$47,176	$220,883	$0	$0	$0
$0	$1,000,000	$0	$0	$0	$0
$0	$15,000	$82,987	$0	$829,875	$0
$0	$0	$861,906	$0	$0	$0
$592,822	$0	$53,162	$195,952	$0	$0
$0	$0	$300,000	$0	$0	$500,000
$0	$0	$0	$0	$783,375	$0
$200,317	$0	$142,000	$0	$429,276	$0
$0	$0	$308,298	$0	$456,197	$0
$448,300	$0	$0	$299,000	$0	$0
$38,462	$91,185	$175,357	$436,472	$0	$0

Appendix 2

TB R&D Funders by Rank, 2019 (continued)

2019 RANK	FUNDER	FUNDER TYPE	TOTAL
70	Fundació Bancaria "La Caixa"	F	$705,348
71	Expertise France/Initiative 5%	P	$670,068
72	U.K. Economic and Social Research Council (ESRC)	P	$644,104
73	Brazilian Ministry of Health	P	$596,568
74	National Research Coucil of Thailand	P	$580,953
75	The Swedish Heart-Lung Foundation	F	$518,699
76	India Health Fund (supported by Tata Trusts)	F	$509,631
77	National Research Foundation of Korea	P	$504,404
78	São Paulo Research Foundation (FAPESP)	P	$500,000
79	U.S. Food and Drug Administration (FDA)†	P	$499,957
80	Doris Duke Charitable Foundation	F	$495,000
81	Korean Ministry of Land, Infrastructure and Transport	P	$473,700
82	Norwegian Ministry of Health and Care Services	P	$406,827
83	Innovate UK	P	$402,490
84	Public Health Agency of Canada	P	$384,391
85	Japan BCG Laboratory	C	$335,080
86	French National Agency for AIDS Research (ANRS)	P	$309,320
87	Danish International Development Agency	P	$303,175
88	Japan Society for the Promotion of Science	P	$281,994
89	Irish Health Research Board	P	$265,300
90	Mexican National Council of Science and Technology (CONACYT)	P	$259,789
91	Rockefeller Foundation	F	$250,000
92	Independent Research Fund Denmark	P	$242,689
93	Thrasher Research Fund	F	$229,481
94	Vinnova	P	$186,500
95	Canada Foundation for Innovation	P	$180,856
96	Netherlands Ministry of Health, Welfare and Sport	P	$175,489
97	Carlos III Health Institute	P	$170,620
98	Forte/Swedish Research Council for Health, Working Life and Welfare	P	$162,529
99	Formas/Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning	P	$159,585
100	U.K. Department for Environment, Food and Rural Affairs	P	$151,916
101	Joachim Herz Foundation	F	$140,128
102	Ministry of Health of the Republic of Belarus	P	$136,424
103	Médecins Sans Frontières	F	$129,635
104	Foundation of TB Research Unit of Barcelona	F	$113,218
105	U.K. Science and Technology Facilities Council (STFC)	P	$112,047

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector Agency

† Organization has reported to TAG each year since 2005

BASIC SCIENCE	DIAGNOSTICS	DRUGS	VACCINES	OPERATIONAL RESEARCH	INFRASTRUCTURE/ UNSPECIFIED
$0	$26,040	$113,218	$0	$0	$566,090
$0	$0	$0	$0	$670,068	$0
$0	$0	$0	$0	$644,104	$0
$0	$36,523	$0	$0	$560,045	$0
$0	$0	$82,303	$0	$498,650	$0
$223,679	$85,824	$209,196	$0	$0	$0
$0	$352,611	$0	$0	$157,020	$0
$64,643	$0	$344,762	$94,999	$0	$0
$0	$0	$0	$500,000	$0	$0
$0	$0	$499,957	$0	$0	$0
$330,000	$0	$0	$0	$165,000	$0
$0	$473,700	$0	$0	$0	$0
$46,645	$0	$360,182	$0	$0	$0
$0	$113,714	$288,776	$0	$0	$0
$9,152	$274,565	$0	$0	$100,674	$0
$111,793	$0	$0	$223,288	$0	$0
$20,724	$0	$282,536	$0	$6,061	$0
$0	$0	$0	$0	$303,175	$0
$217,195	$43,199	$0	$0	$21,600	$0
$0	$0	$141,253	$124,048	$0	$0
$259,789	$0	$0	$0	$0	$0
$0	$0	$250,000	$0	$0	$0
$0	$0	$0	$242,689	$0	$0
$0	$143,053	$0	$86,428	$0	$0
$0	$28,440	$158,059	$0	$0	$0
$180,856	$0	$0	$0	$0	$0
$0	$0	$0	$175,489	$0	$0
$65,757	$89,793	$15,069	$0	$0	$0
$0	$0	$0	$0	$162,529	$0
$159,585	$0	$0	$0	$0	$0
$0	$0	$0	$151,916	$0	$0
$140,128	$0	$0	$0	$0	$0
$0	$52,834	$30,240	$0	$53,350	$0
$0	$70,095	$0	$0	$59,540	$0
$0	$0	$0	$0	$0	$113,218
$0	$112,047	$0	$0	$0	$0

Appendix 2

TB R&D Funders by Rank, 2019 (continued)

2019 RANK	FUNDER	FUNDER TYPE	TOTAL
106	Stop TB Partnership (UNOPS)	M	$106,855
107	Research Institute of Tuberculosis/Japan Anti-Tuberculosis Association	P	$103,650
108	Butantan Institute	P	$100,000
109	Korea Foundation For International Healthcare	F	$96,964
110	U.K. Natural Environment Research Council (NERC)	P	$95,073
111	CRDF Global	F	$88,711
112	QuantaMatrix	C	$86,191
113	SD Biosensors	C	$86,191
114	Spanish Ministry of Economy and Competitiveness	P	$81,517
115	Taiwan Centers for Disease Control	P	$81,327
116	U.K. National Centre for the 3Rs (NC3Rs)	P	$80,948
117	Center for Biomedical Research Network/Respiratory Diseases (CIBERES)	P	$78,684
118	Philippines Department of Science and Technology	P	$78,474
119	Fondation pour la Recherche Médicale (FRM)	F	$77,441
120	Korean Rural Development Administration	P	$70,000
121	Spanish Ministry of Science, Innovation, and Universities	P	$68,308
122	Individual donors to TB Alliance	F	$67,763
123	Korean Institute of Tuberculosis	P	$60,333
124	Fondation Mérieux	F	$60,006
125	APOPO	F	$60,000
126	Taiwan Ministy of Science and Technology	P	$60,000
127	Hamburg Investment and Development Bank	C	$56,938
128	Japan International Cooperation Agency	P	$55,171
129	Secretariat of Education, Science, Technology and Innovation of Mexico City	P	$52,260
130	Global Good Fund	F	$45,832
131	Australian Research Council	P	$41,739
132	Meiji Seika Pharma	C	$38,879
133	British Council	F	$37,979
134	Spanish Society of Pulmonology and Thoracic Surgery (SEPAR)	F	$37,362
135	Chilean Scientific and Technological Development Support Fund (FONDEF)	P	$35,280
136	World Health Organization	M	$35,000
137	Catalan Government/Agència de Gestió d'Ajuts Universitaris i de Recerca	P	$31,881
138	Pan American Health Organization	M	$30,000
139	Taiwan Ministry of Health and Welfare	P	$30,000
	TOTAL		$906,125,319

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector Agency

† Organization has reported to TAG each year since 2005

BASIC SCIENCE	DIAGNOSTICS	DRUGS	VACCINES	OPERATIONAL RESEARCH	INFRASTRUCTURE/ UNSPECIFIED
$0	$0	$106,855	$0	$0	$0
$0	$0	$0	$0	$0	$103,650
$0	$0	$0	$100,000	$0	$0
$0	$96,964	$0	$0	$0	$0
$0	$0	$0	$0	$95,073	$0
$64,882	$0	$0	$0	$23,829	$0
$0	$86,191	$0	$0	$0	$0
$0	$86,191	$0	$0	$0	$0
$0	$0	$0	$81,517	$0	$0
$81,327	$0	$0	$0	$0	$0
$42,969	$0	$37,979	$0	$0	$0
$0	$0	$0	$0	$0	$78,684
$78,474	$0	$0	$0	$0	$0
$77,441	$0	$0	$0	$0	$0
$0	$0	$70,000	$0	$0	$0
$22,644	$45,665	$0	$0	$0	$0
$0	$0	$67,763	$0	$0	$0
$60,333	$0	$0	$0	$0	$0
$0	$60,006	$0	$0	$0	$0
$0	$0	$0	$0	$60,000	$0
$0	$0	$0	$60,000	$0	$0
$56,938	$0	$0	$0	$0	$0
$55,171	$0	$0	$0	$0	$0
$0	$0	$0	$0	$52,260	$0
$0	$45,832	$0	$0	$0	$0
$41,739	$0	$0	$0	$0	$0
$38,879	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$37,979
$0	$0	$0	$0	$37,362	$0
$0	$35,280	$0	$0	$0	$0
$0	$0	$0	$0	$0	$35,000
$18,597	$0	$0	$0	$0	$13,284
$0	$0	$0	$0	$30,000	$0
$30,000	$0	$0	$0	$0	$0
$177,951,942	$79,819,860	$336,433,663	$109,476,154	$122,087,944	$80,355,757

Appendix 2

TB R&D Funders by Rank, 2019 (continued)

2019 RANK	FUNDER	FUNDER TYPE	TOTAL
140	Institute for Health Science Research Germans Trias i Pujol (IGTP)	P	$27,985
141	Company Y	C	$27,261
142	Korea Atomic Energy Research Institute	P	$25,857
143	National Institute of Health—University of the Philippines Manila	P	$25,170
144	Valencia Region Science Department	P	$22,644
145	Nigerian Institute of Medical Research (NIMR)	P	$20,156
146	Toyobo Corporation	C	$17,446
147	YD Diagnosis	C	$17,238
148	Indian Council of Social Science Research (ICSSR)	P	$11,606
149	Socios En Salud Sucursal Peru	F	$10,000
150	Waksman Foundation of Japan	F	$9,231
151	Kurozumi Medical Foundation	F	$8,308
152	Indian Ministry of Education	P	$5,803
153	FUJIFILM Wako Pure Chemical Corporation	C	$4,985
154	Kyokuto Pharmaceutical	C	$4,985
155	Medical & Biological Laboratories Co.	C	$4,615
156	Bouisson Bertrand Institute	F	$4,560
157	Peruvian National Council of Science, Technology and Technological Innovation (CONCYTEC)	P	$4,535
158	Canada Food Inspection Agency	P	$3,813
159	Pediatric Infectious Disease Society of the Philippines	F	$3,306
160	Faber Daeufer	C	$500
161	Tosoh Corporation	C	$406
	TOTAL		$900,964,590

C = Corporation/Private Sector; F = Foundation/Philanthropy; M = Multilateral; P = Public-Sector Agency

† Organization has reported to TAG each year since 2005

BASIC SCIENCE	DIAGNOSTICS	DRUGS	VACCINES	OPERATIONAL RESEARCH	INFRASTRUCTURE/ UNSPECIFIED
$4,315	$0	$23,669	$0	$0	$0
$0	$27,261	$0	$0	$0	$0
$0	$25,857	$0	$0	$0	$0
$10,973	$3,523	$1,392	$0	$9,282	$0
$22,644	$0	$0	$0	$0	$0
$0	$0	$0	$0	$20,156	$0
$17,446	$0	$0	$0	$0	$0
$0	$17,238	$0	$0	$0	$0
$0	$0	$0	$0	$11,606	$0
$0	$0	$0	$0	$10,000	$0
$9,231	$0	$0	$0	$0	$0
$8,308	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$5,803
$0	$4,985	$0	$0	$0	$0
$4,985	$0	$0	$0	$0	$0
$0	$4,615	$0	$0	$0	$0
$0	$4,560	$0	$0	$0	$0
$0	$0	$0	$0	$4,535	$0
$3,813	$0	$0	$0	$0	$0
$0	$3,306	$0	$0	$0	$0
$0	$0	$500	$0	$0	$0
$406	$0	$0	$0	$0	$0
$167,631,708	$94,308,097	$309,413,851	$116,947,691	$143,894,189	$68,769,054

Notes

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