RESEARCH ARTICLE

The World Bank & financing tuberculosis control, 1986-2017 [version 2; peer review: 2 approved with reservations]

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Abstract

Background: Tuberculosis is among the leading contributors to global mortality and morbidity from infectious diseases and has had a major socioeconomic cost in recent history. The World Bank is a leading institution for global health governance and financing, but little research has concentrated on the role of the World Bank in global tuberculosis control.

Methods: We tracked the development of the World Bank’s policies and associated financial flows for tuberculosis control. First, we performed a scoping review of both published and grey literature. Second, we used the World Bank’s Projects & Operations database to construct a dataset of all World Bank projects with funding allocated to the “Tuberculosis” theme from 1986 to 2017. Finally, we analysed the World Bank’s funding patterns alongside wider funding for tuberculosis using the Institute of Health Metrics and Evaluation’s Development Assistance for Health database.

Results: We identified four periods in the World Bank’s involvement in global tuberculosis control, from the recognition of tuberculosis as a global health issue to the creation of a global coalition against tuberculosis. Between 1986 and 2017 the World Bank undertook 79 projects with financing from its core lending divisions with a tuberculosis control theme or focus. Within the 79 projects, the World Bank committed 19.6% of funding, or $0.9bn, towards tuberculosis control. The World Bank has invested significantly into Direct Observation of Treatment, Short-course chemotherapy (DOTS). After the formation of private-public partnerships against tuberculosis in 2002 such as the Global Fund to Fight HIV/AIDS, TB and Malaria, the World Bank’s core financing decreased and private-public partnerships provided increasing levels of substitutive financing for tuberculosis control.

Conclusions: The World Bank has been pivotal in leading global financing, garnering advocacy and creating widespread coalition in the battle against tuberculosis control in recent decades.

Keywords

World Bank, Tuberculosis, Global Health, Financing, Governance
This article is included in the The World Bank in Global Public Health collection.

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Author roles: Rahi M: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Software, Visualization, Writing – Original Draft Preparation; Fernandes G: Conceptualization, Methodology, Writing – Review & Editing; Winters J: Writing – Review & Editing; Sridhar D: Conceptualization, Funding Acquisition, Methodology, Supervision, Validation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: This work was supported by the Wellcome Trust [106635]

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First published: 23 Aug 2018, 3:103 (https://doi.org/10.12688/wellcomeopenres.14759.1)
Introduction

Tuberculosis (TB) is the principal cause of mortality from infectious diseases globally, causing an estimated 10.4 million new cases and 1.6 million deaths each year. While the global incidence of TB has been declining, 44 million disability-adjusted life years (DALYs) are lost to the disease each year. The decline in the incidence of tuberculosis has not been uniform across regions; incidence remains high in HIV/AIDS endemic areas and those experiencing slow economic growth, such as Sub-Saharan Africa and South-East Asia. TB is the sixth leading cause of death in individuals aged 15–49 worldwide.

The World Bank became the largest funder of global health in 1983 and remains the largest health investor within the UN system. Its health disbursements are currently only surpassed by one multilateral organization, the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). Since 1979, the World Bank’s health-related activities have been supported through a dedicated health unit, which is now called the Health, Nutrition and Population (HNP) division. The World Bank provides core financial disbursements through its two major arms, the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). The IBRD provides market-rate loans, whereas the IDA delivers grants and low-interest loans to the poorest states. Core funding can originate from either one of the lending agencies or via blended finance from both agencies. The World Bank’s current HNP portfolio focuses on poverty alleviation, global economic growth, and health-specific mandates for universal health coverage and health system strengthening.

The World Bank presidents from Robert McNamara (1968–1981) to Jim Kim (2012–2019) have suggested that good population health outcomes contribute to a healthy workforce and socioeconomic development. TB has been a significant source of human and economic loss. The cost of disease can occur as direct losses, such as the cost of medical treatment, and indirect losses associated with loss of wages and education. TB disproportionately affects individuals of working age, and indirect losses also result from children being removed from school to work in order to cover the shortfall in family earnings and medical costs associated with TB.

This paper examines the World Bank’s global influence in TB control. We first review published and grey literature on the World Bank’s policies for TB control. We then analyse financial data from the World Bank’s Projects & Operations portal to determine the extent and mechanisms of World Bank investments into global TB control initiatives from 1986–2017, and compare this financial data with broader development assistance for health (DAH) for TB control. Based on this policy and financial analysis, we identify four key periods in the World Bank’s involvement in TB control between 1986 and 2017 (Figure 1). Using these periods, we conclude with a discussion of the political and financial commitments to TB projects by the World Bank, relative to other major multilateral actors.

The World Bank’s historical role in global TB control policy

In the 1970s and early 1980s, World Bank commitments towards TB control were limited to support for project components in other sectors. During this period, both funding and interest for TB control diminished following a period of decline in the incidence of TB in high-income countries. In the mid-1980s, TB gained increased attention within the global health community, due to the resurgence of TB cases in high-income urban centres such as New York and Miami and the growing incidence of multi-drug resistance TB (MDR-TB) and HIV-TB co-infection. In 1986, the World Bank’s HNP division adopted the ‘Tuberculosis’ theme and funded its first TB-focused project. This initial project implemented short-course chemotherapy as a means of TB control and management. Short-course chemotherapy was developed in the 1970s to include improved anti-TB drugs and a modified duration of treatment, but until the 1980s the intervention had been poorly disseminated beyond narrow academic circles. In 1991, the World Bank established a study of the cost-effectiveness of numerous health interventions, including short-course chemotherapy for the treatment of TB. Cost-effectiveness analysis has been used to produce key metrics in priority setting and resource allocation for the World Bank and in 1993, the World Bank published the Investing in Health World Development Report (WDR), announcing short-course chemotherapy for TB as “one of the most cost-effective of all interventions.” The publication of the WDR coincided with the declaration of TB as a “global health emergency” by the WHO Director General in 1993, further reinvigorating interest in TB control. In 1995, short-course chemotherapy was packaged alongside TB management guidelines into Direct Observation of Treatment, Short-course chemotherapy (DOTS). The DOTS strategy, founded on the 1994 WHO Framework for Effective Tuberculosis Control, was aggressively promoted as the leading global policy for TB control by the World Bank and by 1997 DOTS was utilised in 96 countries.

Between 1998 and 2002 global actors recognized that they could better control TB through a coordinated partnership approach. The new millennium saw two important milestones in the global battle against TB. The first was the formalization of the structure of the Stop TB Partnership on 24th March 2000, World TB Day. Leading figures from the WHO and World Bank signed the Amsterdam Declaration as partners, committing to the greater international coalition, political will and financial resources required to implement DOTS in 20 high burden countries. The second milestone was the inclusion of TB within the Millennium Development Goals. In 2001, the Washington Commitment operationalized the Amsterdam Declaration, uniting the World Bank, the WHO and over 200 other agencies to
build the political backing for the Stop TB Partnership and the Global Plan to Stop TB 2001–2005\(^{22,23}\). The Global Fund to Fight AIDS, Tuberculosis and Malaria was formed in 2002, with the World Bank acting as a trustee and board member. The Global Fund has continued to collaborate with a number of multilateral organizations, including the Stop TB Partnership, in TB control efforts. In 2018 the Global Fund began hosting shared offices with global health organizations at the Global Health Campus in Geneva to promote greater coordination between the Global Fund and its partners\(^{24}\).

From 2003 onwards, the World Bank invested its financial and political resources to further the Stop TB Partnership. The World Bank was among the founding members of the Stop TB Partnership’s precursor public-private partnership (PPP) in 1998\(^{18,25}\), and has served since 2003 as a permanent member of the Stop TB Partnership’s Coordinating Board, acting as both a financier and knowledge institution for the partnership. It has provided board-level administrative support, annual financial contributions and economic studies for the partnership\(^{26}\). The launch of the Global Plan 2006–2015 by the Stop TB Partnership at the 2006 World Economic Forum aimed to enhance global cohesion and advocacy for TB control, working towards the TB-specific Millennium Development Goals\(^{27}\). The World Bank has helped to transform DOTS into the Stop TB Partnership’s leading strategy and has encouraged the global expansion of DOTS coverage in line with the 2006–2015 Global Plan\(^{28}\). In a 2007 economic study for the Stop TB Partnership, the World Bank reaffirmed its support for enhanced DOTS coverage by emphasizing the cost-effectiveness of the strategy in Sub-Saharan Africa and 22 high burden countries\(^{29}\). The Global Plan was succeeded by the WHO’s End TB strategy, developed by partners including the World Bank and encompassed the 2016 Sustainable Development Goals (SDGs) into new targets for TB elimination by 2035\(^{30}\).

**Methods**

**Scoping review of literature**

To summarise the Bank’s policies for TB control, a scoping review of literature was undertaken. Embase, Ovid Medline, and Global Health databases were searched for peer-reviewed academic literature to cover literature from social and health policy. A search of Google Scholar was used to identify additional relevant literature. The World Bank Research and Publications database was searched for grey literature. 114 peer-reviewed papers, 453 grey literature papers and 10 pages of Google Scholar
were assessed, and 19 papers in total were identified as suitable for use in the policy review after application of the inclusion and exclusion criteria (Extended Data- Appendix A). In selecting relevant literature, we primarily focused on the World Bank’s global investment patterns and policy history regarding TB control. Selected articles and reports were reviewed and relevant text was thematically organised and subsequently used to construct a timeline of the key moments of influence that the World Bank has had in TB control history.

Analysis of financial data

First, we searched all health sector projects, as of 27/12/17, in the Bank’s Projects & Operations database, and selected health projects with a ‘Tuberculosis’ theme (n=72). We excluded any projects with a tuberculosis theme that were dropped by the World Bank (n=1). Next, we identified additional tuberculosis projects by searching for the key words ‘tuberculosis’ and ‘TB’ in the Projects & Operations database. We downloaded the major reports for these identified projects – the most recent and complete Implementation Completion Reports (ICR) and/or the Implementation Status and Results Report (ISR), as available – and manually searched each project document for references to ‘tuberculosis’ or ‘TB’. We included any projects with a specific tuberculosis activity listed in its report (n=8). We refer to World Bank projects with a World Bank-assigned ‘tuberculosis’ theme or a specific identified tuberculosis activity as ‘TB-focused’.

We created a tuberculosis financing dataset, using data captured from the TB-focused projects (n=79 total). Data collected for each project included the project identifying number, region, country, approval and closing date, project status (active or closed), lending instrument (IBRD or IDA), commitment amount and disbursement amount (Extended Data- Appendix B). The value of World Bank funding to each sector and theme was calculated by multiplying the World Bank’s total commitment to each project with the percentage of funding allocated to the assigned sectors or themes within the project. All figures used in analysis are the gross dollar amount quoted in the project ICR or ISR. The dollar values were not adjusted for inflation.

Projects and the corresponding funding were classified using the approval date. Finally, we supplemented this data on the World Bank’s core financing with a limited analysis of its trust fund support for TB control. We searched a database created by the Global Health Governance Programme in 2017, which included trust funds from 2005–2014 and filled-in gaps in descriptive information, for trust funds with ‘tuberculosis’ or ‘TB’ in the trust fund title or description. Data was analysed using RStudio 1.1423 and Excel 2016.

The Institute for Health Metrics and Evaluations (IHME) database

IHME’s Development Assistance for Health (DAH) database was downloaded on 24 October 2017. Only disbursements equal to or greater than $1000 were included in the analysis. The database was analysed for funding streams into the TB health focus area by geographical region and funding source over time. Data analysis was performed on RStudio 1.1423.

Results

World Bank tuberculosis funding over time

We identified 79 projects which included a component of TB funding from 1986–2017. The World Bank’s IBRD/IDA core lending divisions committed $5.4bn to all themes and sectors through the TB-focused projects. Within the 79 projects, $3.8bn was committed to the health sector (Table 1). 24.8% of the commitments to the health sector were allocated towards TB control. Within the TB-focused projects between 1986–2017, 19.9% of total project funding projects was committed towards TB control. The proportion of project funding committed towards TB control within the TB-focused projects increased over subsequent periods (Figure 2). Only 5.6% of project funding was committed towards TB control during Period I which increased to 23.3% of total project funding committed towards TB control within the TB-focused projects during Period IV (Table 1).

74 TB-focused projects had funding from a single core lending agency only. Five projects (4% of overall TB funding) had a

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Number of Projects</th>
<th>World Bank Total Commitments ($ Millions USD)</th>
<th>World Bank Commitments to the Health Sector ($ Millions USD)</th>
<th>World Bank Commitment towards TB Control ($ Millions USD)</th>
<th>Proportion of Project Funding Committed to TB Control (%)</th>
<th>Average size of Commitment towards TB Control per Project ($ Millions USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986–1993</td>
<td>7</td>
<td>705.8</td>
<td>675.4</td>
<td>89.7</td>
<td>5.6</td>
<td>12.8</td>
</tr>
<tr>
<td>1994–1997</td>
<td>6</td>
<td>339.7</td>
<td>314.2</td>
<td>75.9</td>
<td>15.3</td>
<td>12.6</td>
</tr>
<tr>
<td>1998–2002</td>
<td>20</td>
<td>994.1</td>
<td>800.0</td>
<td>241.4</td>
<td>18.4</td>
<td>12.1</td>
</tr>
<tr>
<td>2003–2017</td>
<td>46</td>
<td>3339.9</td>
<td>1969.7</td>
<td>524.9</td>
<td>23.3</td>
<td>11.4</td>
</tr>
<tr>
<td>1986–2017</td>
<td>79</td>
<td>5379.5</td>
<td>3759.3</td>
<td>931.9</td>
<td>19.9</td>
<td>11.8</td>
</tr>
</tbody>
</table>
blend of core funding, with funding from both IBRD and IDA. In total, IBRD provided 31% of funding towards TB-focused projects and IDA provided the remaining 69%. In comparison to this core financing, trust fund support for TB control from 2005–2014 was small. We identified only nine trust funds for TB control, which channelled $49.4m from the WHO, European Commission, and United Kingdom. The majority of the trust funds (72.6%) were from the United Kingdom to the Tuberculosis Control Project in China.

Period I: Recognizing TB as a critical global health issue (1986–1993). The World Bank committed $89.7m for TB-focused projects over this period. The IBRD committed $68.1m towards TB-focused projects and the IDA committed $21.5m. The average size of the World Bank’s commitment to TB initiatives per project was $12.8m (Table 1).

Three of the seven TB-focused projects over this time period allocated funding to develop national TB control programmes. The remaining four projects had financing towards TB integrated into wider infectious disease control programmes, including HIV/AIDS and schistosomiasis.

Period II: Supporting direct observation of treatment, short-course chemotherapy (DOTS) (1994–1997). During this period, the World Bank committed $75.9m for TB control. The IDA was the largest donor of the World Bank’s TB funding, providing $72.1m, while the IBRD committed $3.7m. The World Bank committed an average of $12.6m to each TB-focused project (Table 1).

Six of the seven TB-focused projects over this time period allocated funding towards DOTS for TB control. Four projects funded strengthening of existing national TB control programmes through adoption of DOTS into the programmes, or the expansion of national DOTS coverage. Two projects helped to establish national TB programmes founded on DOTS, in the Kyrgyz Republic (1995) and in Macedonia (1996).

Period III: Establishing private-public partnerships to tackle TB (1998–2002). During this period, the number of TB projects receiving World Bank financing rose dramatically, to 20 TB-focused projects. World Bank commitments to these projects also rose to $241.4m. The IBRD committed $124.2m towards TB control and the IDA committed $117.1m. The average size of the World Bank’s commitment per project was $12.1m (Table 1).

Two TB-focused projects over this time period allocated funding towards the adoption of new national TB control programmes in Latvia and Moldova. Eight projects funded strengthening of existing national TB control programmes through

Figure 2. The average proportion of World Bank funding in TB-focused projects committed to TB control during each period from 1986–2017. The proportion of funding committed to TB control increased over subsequent periods within World Bank TB-focused projects, as indicated by the dashed lines across each period. Volatility arises within the data due to total projects commitments being allocated to the year of the project approval date, even if the projects spanned multiple years.
adoption of DOTS into the programmes, and six additional projects funded the expansion of national and regional DOTS coverage. Six projects had partnerships with the Global Fund, NGOs, and foundations.

Two large TB-focused projects were adopted in 2002 by the World Bank. The ‘Tuberculosis and HIV/AIDS Control Project’ in the Ukraine and the ‘Tuberculosis Control Project’ based in China both allocated 50% of project funding towards TB control. In total, these projects committed $82.0m towards TB-focused projects which represented over a third of the World Bank’s commitments towards TB during this period.

**Period IV: Public-private partnerships become the leading governance structures in global TB control (2003–2017).**

Between 2003 and 2017 the World Bank funded 46 TB-focused projects and committed $524.9m towards TB control. The World Bank committed $11.4m on average to TB control per project (Table 1). IDA committed $431.3m to TB-focused projects and IBRD committed $88.5m.

Nearly half (22) of the projects received funding and technical assistance in partnership with the Global Fund. In its Great Lakes Initiative on HIV/AIDS (GLIA) Support (P080413) ICR document, the World Bank argued that its country-based lending for TB could support global PPPs like the Global Fund: “The Bank can play a critical role in supporting regional institutions, particularly as funding from the Global Fund and bilateral donors is focused primarily on country programs.”

**World Bank Funding by region and country**

From 1991–2017, Africa had the largest number of TB-focused projects across all regions, with 20 projects in the region between 2002 and 2017. South Asia, which had the third-largest number of projects, was the largest recipient of total TB project funding ($278m) (Figure 3) (Extended Data- Appendix C). World Bank TB-focused projects targeted 49 individual countries. India was the largest recipient of funding for TB with $230.5 million committed to the nation in total. Brazil, Russia, India and China were among the top five countries receiving commitments for TB from 1986–2017 (Extended Data- Table A7). These countries all ranked in the top 20 countries with the highest TB incidence per 100,000 population from 2000–2016 (Extended Data- Figure A4).

**Total development assistance for health funding towards TB control**

The IHME recorded a total of 45,931 DAH disbursements towards the TB health focus area between 1990 and 2016, spread over 146 countries (Extended Data- Appendix D). In total $15.9bn of DAH was directed towards the TB health focus area. The Global Fund ($6.5bn) was the largest funding source of development assistance for TB, with disbursements from 2002-2016. The World Bank channelled $0.8bn of DAH towards the TB health focus. NGOs and Foundations ($3.7bn), UN Agencies ($2.5bn), Bilateral Agencies ($2.4bn) also provided development assistance for TB from 1990-2016.

From 2002, there was an increase in DAH directed to TB in all regions except high-income regions. Sub-Saharan Africa received the most disbursements of any region at $2.8bn. Around $2.5bn of the development assistance for TB to Sub-Saharan Africa was disbursed between 2002 and 2016. The Global Fund provided the greatest value of disbursements towards TB of any funding source, disbursing $6.5bn between 2002 and 2016 (Figure 4).

**Figure 3. The proportion of World Bank commitments towards TB control from 1986–2017 per region.** South Asia, which had the third largest number of projects, was the largest recipient of funding, receiving 32% of all TB commitments between 1986 and 2017.
Discussion

Substantial World Bank investments towards DOTS

A pivotal moment in the World Bank’s historical investment towards TB control was the 1993 *Investing in Health* report, which emphasized the cost-effectiveness of short-course chemotherapy. Between 1986 and 1993, the World Bank had relatively limited financial and political commitments towards TB control. During this time, there was limited evidence for an established and cost-effective means for TB control for the World Bank to support. The period after the World Bank’s 1993 report marked an era of greater financial investment into TB-focused projects. Research conducted by World Bank has prompted further investment by the development bank in other sectors such as nutrition. The 1993 *Investing in Health* report suggested policies to improve the allocation of healthcare expenditure through promoting competition in the provision of healthcare services and by improving the efficiency of government spending on healthcare. The report’s strategy was centred on maximising the DALYs, a complex quantitative measure of disease burden, saved by a number of health interventions. Priority illnesses, such as TB, were identified as those which had a large disease burden and a health intervention with a low-cost per DALYs saved. This methodology promoted cost-effectiveness analysis as a tool for priority setting at the World Bank and more widely in global health since the early 1990’s. However, cost-effectiveness analysis has been criticized by some scholars as a way of inserting a business model into health that may distort priority settings.

Short-course chemotherapy, later included into the DOTS strategy, was quickly and vigorously adopted into the World Bank TB-focused projects, backed by significant political and financial investment. Between 1995 and 1997, the World Bank made DOTS the leading TB control strategy within its TB-focused projects. As the World Bank commitments towards TB control continued to grow, the DOTS strategy became an increasingly integral component of the World Bank’s approach to TB control. Four national TB programmes, all adopting DOTS as the primary strategy for TB control, were created between 1995 and 2006 with financial assistance from World Bank TB-focused projects. During its early years the DOTS strategy was criticised as being practically and operationally limited within low- and middle-income countries (LMICs), resulting in a slow uptake of the health intervention in LMICs. The World Bank’s economic reports exemplified the socioeconomic benefit of greater DOTS coverage in high-burden countries and LMICs.
The World Bank has also provided increasing numbers of low-interest and concessional loans within TB-focused projects to LMICs over time, via the IDA.

**Substitutive development assistance from the Global Fund, NGOs, and Foundations**

Comparing the World Bank’s financing for TB control to wider development assistance funding reveals that IDA and the IBRD have a less significant role in global health funding than newer health financiers, such as the Global Fund. Within the past three decades, global DAH grew at the fastest rate between 2000 and 2009, at an annualized rate of 11.3%. During the same period, the World Bank reduced its core funding for DAH by almost two-thirds. This decrease in the World Bank’s relative contributions to DAH through core channels reflects its use of ‘extra-budgetary’ or voluntarily-contributed resources from public and private donors. These resources, typically called trust funds, have become an increasingly popular mechanism of financing health initiatives, and their disbursements for health now rival core IDA and IBRD funding. In 2016 the World Bank oversaw $11bn of trust fund financing which assisted in funding almost two-thirds of the World Bank’s ‘knowledge production’ and analytic work. Trust funds provide discretionary financing to the World Bank earmarked forTB projects. The majority of such trust fund support has gone to LMICs, which are experiencing large and rising levels of TB incidence. The majority of TB cases have occurred in LMICs, with a large proportion of TB cases occurring in countries with high prevalence of drug-resistant disease. We found that over two-thirds of World Bank funding towards TB was disbursed through the World Bank’s IDA core lending division, which serves LMICs. Both World Bank funding and development assistance for TB control was highest in South Asia and Africa, reflecting the sustained high TB incidence in these regions, compared with other regions. BRICS were among the largest recipients for World Bank commitments for TB projects; between 1986 and 2017, India and China received the highest level of World Bank commitments and DAH for TB.

Further political commitment and financing is needed to tackle TB in LMICs, but there can be numerous structural barriers to optimizing TB control within these countries, including weak health systems, workforce shortages, and supply chain management issues. The WHO considers advancements in health system strengthening to be fundamental for delivering successful programmes for TB control. The World Bank core funded projects have focused on health system strengthening and health infrastructure projects. It has been demonstrated that vertical programming without adequate health system strengthening can result in impaired coordination of health systems and fragmentation of services, which has led to impaired management of TB control projects in LMICs. Vertical programming for TB control without investment into health system strengthening is unlikely to challenge the underlying structural drivers of sub-optimal TB control in LMICs. As a result, the effectiveness of vertical programmes for TB control will be reduced as will the ability for long-term, country-led priority setting in LMICs.

**Limitations**

Only the World Bank core-funded projects with a World Bank-assigned ‘Tuberculosis’ theme or with clear TB control activity were included in this study. Our analysis of the World Bank’s financing of TB control is limited by the World Bank’s theme classification system, and therefore may signify an incomplete representation of its total investment into TB control. Furthermore, this study did not include an in-depth analysis of the World Bank’s financing of TB control through trust funds. While we identified some TB-focused trust funds in the World Bank Finances database, we were limited by the lack of descriptors or ‘themes’ with which trust funds are classified and the limited years covered by this database. Further analysis of trust fund financing towards TB control would require using resources like the World Bank’s Trust Fund Directories and Trust Fund Annual Reports to identify all health trust funds from the 1980s to the present, and then searching the World Bank Documents portal, Project and Operations portal, and Archives for documents relevant to these trust funds. Such an in-depth trust fund analysis was beyond the scope of our study, and it is unlikely that identified trust fund project documents will have TB theme percentages or detailed financial data. However, because trust funds now constitute a major proportion of health project financing at the World Bank,
this detailed analysis would enrich the overall understanding of the World Bank’s influence on global TB control efforts, particularly its fiscal role within global PPPs like the Stop TB Partnership.

Conclusions
From 1986, the World Bank has been heavily involved in developing and promoting key global TB control policies, including the formation and coordination of the Stop TB Partnership and the widespread expansion of the DOTS programme. At the same time, commitments towards TB initiatives from the World Bank core divisions have steadily declined with newer financiers, such as the Global Fund, contributing greater levels of funding for global TB control efforts. The World Bank remains an integral partner in the global governance of TB through its inclusion in the executive boards of the Stop TB Partnership and the Global Fund.

The World Bank’s agenda to reduce global poverty and increase economic output makes TB a prime candidate for targeted funding because of its continued contribution to significant socioeconomic losses around the world. Meeting the ambitious targets set for TB control set out by the SDGs in the context of rising costs for treating drug-resistant disease will require greater financial and political investment from the World Bank in the future. As trust funds and alternative financiers such as the Global Fund provide a growing source of financing for TB initiatives, research should focus on their effect on the World Bank’s capacity to address key structural barriers to adequate TB control in high-burden regions and LMICs. Future study will be required to understand the effect of this pattern of health programming on the outcomes of TB control projects and long-term priority setting in countries affected by TB.

Data availability
Underlying data

This project contains the following underlying data:

- Co-financiers_database.csv (Financial contributions from partner organizations to the 79 World Bank funded TB-focused projects)
- Coded_Questionnaire.csv (A summary of the raw data used in the analysis of the 79 World Bank funded TB-focused projects)
- Glossary and Variable Description Guide.pdf (A glossary for using the IHME database)
- IHME_DAH_DATABASE_24-10-17.csv (Development assistance for health contributions to health areas, including TB, as recorded by the IHME)
- World Bank and TB.R (R code for the analysis of 79 World Bank funded TB-focused projects)

Extended data (All extended data as referenced as in-text citations)

This project contains the following the extended data:

- Extended Data.pdf (Extended data includes an overview of the scoping literature search, further data on the World Bank TB-focused projects and IHME development assistance for TB)

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).

Grant information
This work was supported by the Wellcome Trust [106635].

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Open Peer Review

In this article, the authors detail the World Bank’s engagement with financing global TB control, drawing on literature and quantitative financing data available via the World Bank’s website. The authors are commended for adding this important component of the history of global TB control to the literature, emphasizing the World Bank’s critical role during a turning point in TB programs, with insights to understand current global coordination to End TB.

I have two general, substantive comments that the authors should consider during revisions.

First, currently, the manuscript has statements that need to be substantiated, rephrased, or deleted. While seemingly mundane or inconsequential, such words and phrasing have important baring on the nuances of TB history, especially phrasing that implies causality. For example, in the opening paragraph, the authors write: “Due to the sustained TB burden over the last several decades, there has been increasingly [sic] co-ordinated global response from multilateral organizations, such as the World Bank and WHO.” What exactly is meant by “last several decades”? Has TB burden been “sustained,” and is this, and this alone, the causal reason for increased global coordination, as implied by “due to”? How to measure “global coordination” to assess if it is increasing? To avoid aphorisms, authors should critically review the words and phrasing used and their implications. Statements that are editorial or cannot be substantiated should be rephrased or eliminated. Precision is needed.

Second, the authors should more fully attend to the World Bank’s relative position within global TB control as well as changes in global health more generally. When the World Bank began financing health projects at the end of the 1970s and into the 1980s, it did so in a moment of transition for global coordination for health. The valiant goals of “Health for All,” put forward by the primary health care movement and galvanized by the Alma Ata Declaration (1979), had to be scaled back given global economic downturn starting in the 1970s and leading into the 1980s. Such economic downturn resulted in decreased international aid, increased non-governmental actors in health, and structural adjustment programs that affected public services (including health). As the major director of such programs, World Bank was at the locus of restructuring of health. Conceptually, these changes marked a transition from “international” to “global” health paradigms.
For TB, major funding cuts during the 1970s and 1980s coincided with an increase burden after a period of decline following introduction of effective chemotherapies (along with increased wealth and other factors affecting TB epidemiology), the emergence of HIV-TB coinfections, and increased cases of multidrug resistant TB. Renewed attention to TB galvanized by WHO Director Nakajima’s declaration of a “TB Global Emergency” coincided with World Bank’s Global Development report (both in 1993), which reported that TB was the most cost-effective disease control program, stemming largely from positive preliminary results from the large-scale implementation of the Union’s program in coordination with China MOH and WHO, which later was branded as DOTS by WHO and partners. At the time, TB burden remained high in China, and the focus on TB dovetailed with the much larger changes taking place following economic liberalization again starting in the late 1970s and early 1980s; World Bank had interests in China beyond TB.

There are many references that could be useful for contextualizing this review. Here are a few:


Additional Comments:

General
- Consistency: World Bank vs. the Bank? Poverty-stricken countries vs low- and middle-income countries (LMICs)?
- Citations: As much as possible, use primary sources for citations (e.g., Najakima’s Global TB Emergency). Also, review citations in-text (seems like not all are appropriately connected to citations in Bibliography).

Introduction
- Pg 3: WHO Global TB Report should be used as citation for first sentence. Also, it can be updated with most recent Global TB Report, out in September 2018.

Methods
- Remove editorial comments from the Methods; should appear in Discussion.
- What was the criteria for differentiating the time periods? Post-hoc? Could this history be split up in a different way more closely following from the quantitative analysis?
- Pg 3: Consider adding a flow diagram to supplement to illustrate the results of literature review

Results
- Remove editorial comments from the Results; should appear in Discussion.
- Would be interesting to see the breakdown of what was funded, especially to support the author’s different time periods. Might also be interesting to show trends of the number of TB patients supported through World Bank-funded programs.
- Results miss many important events in TB history that happened over this time. Consider revising Results so it sticks more closely to describing quantitative analysis or providing a more detailed history of development of TB control over this time period.
- Pg 4-5: Much of the first 4 paragraphs should be in Background, not Results.
Pg 5: The first World TB Day was coordinated by the Union in 1982, celebrating the 100 year anniversary of Robert Koch’s isolation of Mycobacterium tuberculosis. I believe WHO started also celebrating World TB Day in the 1990s, prior to the 2000 event mentioned in text.

Discussion

Pg 8: The DOTS-Plus Strategy was spearheaded by WHO with partners; World Bank did not publish this guidance. Please check your citation.

Figures/Tables

- Print these out in black and white to ensure that Figures/Tables retain important shading/formatting. E.g., Figure 1 cannot differentiate between shades.
- Consider selecting the 3-4 main figures and tables, and putting the rest as supplements.

References


Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.
Reviewer Expertise: History of TB control; history of global health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 13 Jun 2019

Manveer Rahi, University of Edinburgh, Edinburgh, UK

We would like to thank Dr Dirlikov for his insightful comments regarding this study. The comments from Dr Dirlikov have encouraged a richer analysis of the history of TB control and have encouraged greater precision within the paper.

In this article, the authors detail the World Bank’s engagement with financing global TB control, drawing on literature and quantitative financing data available via the World Bank’s website. The authors are commended for adding this important component of the history of global TB control to the literature, emphasizing the World Bank’s critical role during a turning point in TB programs, with insights to understand current global coordination to End TB.

I have two general, substantive comments that the authors should consider during revisions.

1) First, currently, the manuscript has statements that need to be substantiated, rephrased, or deleted. While seemingly mundane or inconsequential, such words and phrasing have important baring on the nuances of TB history, especially phrasing that implies causality. For example, in the opening paragraph, the authors write: “Due to the sustained TB burden over the last several decades, there has been increasingly [sic] co-ordinated global response from multilateral organizations, such as the World Bank and WHO.” What exactly is meant by “last several decades”? Has TB burden been “sustained,” and is this, and this alone, the causal reason for increased global coordination, as implied by “due to”? How to measure “global coordination” to assess if it is increasing? To avoid aphorisms, authors should critically review the words and phrasing used and their implications. Statements that are editorial or cannot be substantiated should be rephrased or eliminated. Precision is needed.

We have edited the text as per advised to add greater precision to the paper.

2) Second, the authors should more fully attend to the World Bank’s relative position within global TB control as well as changes in global health more generally. When the World Bank began financing health projects at the end of the 1970s and into the 1980s, it did so in a moment of transition for global coordination for health. The valiant goals of “Health for All,” put forward by the primary health care movement and galvanized by the Alma Ata Declaration (1978), had to be scaled back given global economic downturn starting in the 1970s and leading into the 1980s. Such economic downturn resulted in decreased international aid, increased non-governmental actors in health, and structural adjustment programs that affected public services (including health). As the major director of such programs, World Bank was at the locus of restructuring of health. Conceptually, these changes marked a transition from “international” to “global” health paradigms.

For TB, major funding cuts during the 1970s and 1980s coincided with an increase burden after a period of decline following introduction of effective chemotherapies (along with increased wealth and other factors affecting TB epidemiology), the emergence of HIV-TB coinfections, and
increased cases of multidrug resistant TB. Renewed attention to TB galvanized by WHO Director Nakajima’s declaration of a “TB Global Emergency” coincided with World Bank’s Global Development report (both in 1993), which reported that TB was the most cost-effective disease control program, stemming largely from positive preliminary results from the large-scale implementation of the Union’s program in coordination with China MOH and WHO, which later was branded as DOTS by WHO and partners. At the time, TB burden remained high in China, and the focus on TB dovetailed with the much larger changes taking place following economic liberalization again starting in the late 1970s and early 1980s; World Bank had interests in China beyond TB.

- We have edited the layout of the text and now included a section called “The World Bank’s Historical Role in Global TB Control Policy” which summarises the World Banks political involvement in TB control. We have attempted to contextualise the policies of the World Bank with major historical events in TB control history. Please see this section for further details.

**Additional Comments:**
Consistency: World Bank vs. the Bank? Poverty-stricken countries vs low- and middle-income countries (LMICs)?
- Edited as per comment.

Citations: As much as possible, use primary sources for citations (e.g., Najakima’s Global TB Emergency). Also, review citations in-text (seems like not all are appropriately connected to citations in Bibliography).
- Edited as per comment.

**Introduction**

Pg 3: WHO Global TB Report should be used as citation for first sentence. Also, it can be updated with most recent Global TB Report, out in September 2018.
- The citation has been updated to reflect the new Global TB report 2018.

**Methods**

Remove editorial comments from the Methods; should appear in Discussion.
- Editorial comments have been removed.

What was the criteria for differentiating the time periods? Post-hoc? Could this history be split up in a different way more closely following from the quantitative analysis?
- We have attempted to make the differentiation of the periods clearer to the reader by adding the following sentences to the Introduction: “We have identified four key periods in the World Bank’s involvement in TB control between 1986 and 2017 (Figure 1). These time periods are based on key historical eras in the World Bank’s political investment towards TB control. Using these periods, we discuss the political and financial commitments to TB projects by the World Bank.”

Pg 3: Consider adding a flow diagram to supplement to illustrate the results of literature review
- The methods have been updated to include a Google Scholar search. We have chosen to not include a flow diagram into the article to reduce the number of diagrams and tables within the text, as requested in an additional comment from the reviewer.

**Results**

Remove editorial comments from the Results; should appear in Discussion.
- Editorial comments have been removed and moved to Discussion.

Would be interesting to see the breakdown of what was funded, especially to support the author’s different time periods. Might also be interesting to show trends of the number of TB patients supported through World Bank-funded programs.
- No data existed for the number of TB patients supported within TB projects. We have undertaken additional work to examine themes supported within each TB-focused project. A summary of these can be found in the last paragraph of each ‘Period’ within the Results
section. We have added additional analysis of this in the first section of the Discussion:

“Four national TB programmes, all adopting DOTS as the primary strategy for TB control, were created between 1995 and 2006 with financial assistance from World Bank TB-focused projects.”

Results miss many important events in TB history that happened over this time. Consider revising Results so it sticks more closely to describing quantitative analysis or providing a more detailed history of development of TB control over this time period.

- The World Bank political involvement has been moved to the Introduction to form a more cohesive and richer description of the political involvement of the Bank towards TB control. Please see “The World Bank’s Historical Role in Global TB Control Policy”.

Pg 4-5: Much of the first 4 paragraphs should be in Background, not Results.
- Edited as per comment.

Pg 5: The first World TB Day was coordinated by the Union in 1982, celebrating the 100 year anniversary of Robert Koch’s isolation of Mycobacterium tuberculosis. I believe WHO started also celebrating World TB Day in the 1990s, prior to the 2000 event mentioned in text.
- Edited as per comment.

Discussion
Pg 8: The DOTS-Plus Strategy was spearheaded by WHO with partners; World Bank did not publish this guidance. Please check your citation.
- Edited as per comment.

Figures/Tables
Print these out in black and white to ensure that Figures/Tables retain important shading/formatting. E.g., Figure 1 cannot differentiate between shades.
Consider selecting the 3-4 main figures and tables, and putting the rest as supplements.
- Edited as per comment.

Competing Interests: None
accommodating ‘donor-led’ financing: the authors argue that such trends in health financing may erode support for the cross-cutting, long-term interventions that are increasingly needed in TB control today.

This is, to my knowledge, the first time this evidence has been collected and quantified in a systematic way. The manuscript is well-written: however, I have the following comments for clarification and improvement.

Main comments
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-- From results in Figure 2, the authors conclude that TB-related projects have become more TB-focused over time. However, with all the volatility in this figure, it would be helpful to clarify precisely how these trends have been judged. The dashed line on figure 2 suggests that the authors have conducted a least-squares fit over time (see also minor comment below). Does the conclusion follow from this line? If so, it is important to address how much this apparent trend is driven by the spikes in 2001 (with the launch of the Partnership), and in 2016 - that is, because of specific events, rather than any secular trend. Indeed, the authors may consider dropping the line altogether, and instead simply adding a column to table 1 to show the overall increases in each period - which would tell the story just as well.

-- The discussion identifies the growing use of trust funds by WB, a trend that seems rather important in understanding Figure 2. However, the reader is left with only a partial view, as Figure 2 (and much of the manuscript) concentrates on core funding. What is really needed is an idea of the contribution from trust funds, relative to core funding. It would help to either: present this proportion over time, or (in case this data is not available), add further discussion to describe the evidence for the importance of these vehicles.

-- The discussion would benefit from a fuller description of the limitations of this analysis. For example, the search strategy focuses on projects naming TB as a theme. To what extent could it miss out on other WB core funding that may nonetheless have important implications for TB (for example, on projects aimed at health systems strengthening)? Other limitations might address the scope of the analysis, for example.

Other comments:
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p.4, “Tuberculosis was among the primary causes of death…” This is background rather than results, and would be better placed in the introduction. Also in this paragraph, reference to the ‘adoption of antibiotics’ could be dropped - for today’s HICs, the bulk of 20th-century reductions in TB burden occurred prior to the discovery of streptomycin in the 1940s.

p.5 onwards: Results refer repeatedly to ‘TB-focused’ projects, which I assume are WB projects identifying TB as a theme (regardless of the proportion of funds for TB?). Please define this term in the Methods.

p.7, “While the global incidence of TB has been declining, the infection still inflicts…” Replace ‘infection’ by ‘disease’ to avoid confusion with latent TB infection, which by itself has no known cost in DALYs. Similarly for p.3, “The cost of infection…”

Figure 2 can be a little hard to interpret, for the reasons described above: presumably the volatility arises because the figure plots commitments by year of approval, rather than actual disbursements over time. If the latter data is available, it would be helpful to see these plotted too, perhaps as a supporting
Also relating to figure 2, it would be helpful to describe what the dashed line represents (e.g. line-of-best-fit?), in the figure caption. Alternatively, authors may consider dropping this line, in place of horizontal dashed lines, showing the average proportion in each period.

Fig.10 illustrates the emergence of GFATM as a leading source of funding: in the discussion this is associated with funding priorities being more donor-led. However, we know that health systems strengthening is now also a strategic priority for GFATM. Some acknowledgement to this effect could be helpful.

Supporting information: Suggests there’s no need for figure A2, as figure A1 already depicts the relative amounts in the stacked bars.

There are a few typos in the main text, including p.2, “Selected articled…” and p.12, “…reduce countries’ the ability…”

In showing the value of total commitments over time, were these adjusted for dollar value in a given year? Either way, it would be helpful to clarify.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 13 Jun 2019
Manveer Rahi, University of Edinburgh, Edinburgh, UK
We would like to thank Dr Arinaminpathy for his detailed feedback and constructive ideas to improve this paper. We have edited the results and discussion sections to reflect the changes suggested regarding Figure 2 and also added additional discussion regarding the potential effects of trust fund financing upon TB control programmes financed by the World Bank. We believe that the comments from Dr Arinaminpathy have provided us the foundation for a richer discussion within this paper.

This analysis addresses important and topical questions in global health. The authors quantify World Bank (WB) support for TB projects over the last three decades, and they set these trends in the context of development assistance from other organisations, including the Global Fund.

The authors conclude that: (i) TB-related projects funded by the World Bank have become more TB-focused over the study period, (ii) overall WB funding for TB has declined steadily since 2001, and (iii) These recent declines are reflective of a general move towards trust funds and other mechanisms accommodating ‘donor-led’ financing: the authors argue that such trends in health financing may erode support for the cross-cutting, long-term interventions that are increasingly needed in TB control today.

This is, to my knowledge, the first time this evidence has been collected and quantified in a systematic way. The manuscript is well-written: however, I have the following comments for clarification and improvement.

Main comments
---------------------

1) From results in Figure 2, the authors conclude that TB-related projects have become more TB-focused over time. However, with all the volatility in this figure, it would be helpful to clarify precisely how these trends have been judged. The dashed line on figure 2 suggests that the authors have conducted a least-squares fit over time (see also minor comment below). Does the conclusion follow from this line? If so, it is important to address how much this apparent trend is driven by the spikes in 2001 (with the launch of the Partnership), and in 2016 - that is, because of specific events, rather than any secular trend. Indeed, the authors may consider dropping the line altogether, and instead simply adding a column to table 1 to show the overall increases in each period - which would tell the story just as well.

- A new column has been added to table 1 which shows the “Proportion of Project Funding Committed to TB (%)” this has been reflected in Figure 2 through the use of the dashed horizontal lines in each period.

2) The discussion identifies the growing use of trust funds by WB, a trend that seems rather important in understanding Figure 2. However, the reader is left with only a partial view, as Figure 2 (and much of the manuscript) concentrates on core funding. What is really needed is an idea of the contribution from trust funds, relative to core funding. It would help to either: present this proportion over time, or (in case this data is not available), add further discussion to describe the evidence for the importance of these vehicles.

- Further discussion as to the extent and potential implications of trust fund financing has been added to the discussion. This has been added to the discussion under “Substitutive Development Assistance from the Global Fund, NGOs, and Foundations” and “TB Financing Patterns Reflect the Global Burden of Disease”. We have also noted in the limitations that this study was unable to quantify the extent of trust fund financing for TB control at the World Bank, however this may be an area of further study that would overall provide a richer understanding of the World Bank’s influence within TB control.
3) The discussion would benefit from a fuller description of the limitations of this analysis. For example, the search strategy focuses on projects naming TB as a theme. To what extent could it miss out on other WB core funding that may nonetheless have important implications for TB (for example, on projects aimed at health systems strengthening)? Other limitations might address the scope of the analysis, for example.

- Please see ‘Limitations’ section in Discussion.

Other comments:

-----------------------

p.4, “Tuberculosis was among the primary causes of death…” This is background rather than results, and would be better placed in the introduction. Also in this paragraph, reference to the ‘adoption of antibiotics’ could be dropped - for today’s HICs, the bulk of 20th-century reductions in TB burden occurred prior to the discovery of streptomycin in the 1940s.

- Removed as per comment.

p.5 onwards: Results refer repeatedly to ‘TB-focused’ projects, which I assume are WB projects identifying TB as a theme (regardless of the proportion of funds for TB?). Please define this term in the Methods.

- Added to Methods: “We refer to World Bank projects with funding allocated towards the ‘tuberculosis’ theme as ‘TB-focused’ within the text.”

p.7, “While the global incidence of TB has been declining, the infection still inflicts…” Replace ‘infection’ by ‘disease’ to avoid confusion with latent TB infection, which by itself has no known cost in DALYs. Similarly for p.3, “The cost of infection…”

- Edited as per comment.

Figure 2 can be a little hard to interpret, for the reasons described above: presumably the volatility arises because the figure plots commitments by year of approval, rather than actual disbursements over time. If the latter data is available, it would be helpful to see these plotted too, perhaps as a supporting information figure.

- No data regarding the actual disbursement towards TB per year is given in the project documents therefore in the legend for Figure 2 we have acknowledged the volatility: “Volatility arises within the data due to total projects commitments being allocated to the year of the project approval date.”

Also relating to figure 2, it would be helpful to describe what the dashed line represents (e.g. line-of-best-fit?), in the figure caption. Alternatively, authors may consider dropping this line, in place of horizontal dashed lines, showing the average proportion in each period.

- Figure 2, Line of best fit has been removed and replaced with data found in Table 1 (last column) regarding “Proportion of Project Funding Committed to TB (%)

Supporting information: Suggests there’s no need for figure A2, as figure A1 already depicts the relative amounts in the stacked bars.

- Removed as per comment.

There are a few typos in the main text, including p.2, “Selected articulated…” and p.12, “…reduce countries’ the ability…”

- Edited as per comment.

In showing the value of total commitments over time, were these adjusted for dollar value in a given year? Either way, it would be helpful to clarify.

- Comment added in Methods: “All figures used in analysis are the gross dollar amount quoted in the project ICR or ISR. The dollar values were not adjusted for inflation.”

**Competing Interests:** None