The impact of social protection and poverty elimination on global tuberculosis incidence: a statistical modelling analysis of Sustainable Development Goal 1

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Summary

Background The End TB Strategy and the Sustainable Development Goals (SDGs) are intimately linked by their common targets and approaches. SDG 1 aims to end extreme poverty and expand social protection coverage by 2030. Achievement of SDG 1 is likely to affect the tuberculosis epidemic through a range of pathways. We estimate the reduction in global tuberculosis incidence that could be obtained by reaching SDG 1.

Methods We developed a conceptual framework linking key indicators of SDG 1 progress to tuberculosis incidence via well described risk factor pathways and populated it with data from the SDG data repository and the WHO tuberculosis database for 192 countries. Correlations and mediation analyses informed the strength of the association between the SDG 1 subtargets and tuberculosis incidence, resulting in a simplified framework for modelling. The simplified framework linked key indicators for SDG 1 directly to tuberculosis incidence. We applied an exponential decay model based on linear associations between SDG 1 indicators and tuberculosis incidence to estimate tuberculosis incidence in 2035.

Findings Ending extreme poverty resulted in a reduction in global incidence of tuberculosis of 33.4% (95% credible interval 15.5–44.5) by 2035 and expanding social protection coverage resulted in a reduction in incidence of 76.1% (45.2–89.9) by 2035; both pathways together resulted in a reduction in incidence of 84.3% (54.7–94.9).

Interpretation Full achievement of SDG 1 could have a substantial effect on the global burden of tuberculosis. Cross-sectoral approaches that promote poverty reduction and social protection expansion will be crucial complements to health interventions, accelerating progress towards the End TB targets.

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Introduction

The Sustainable Development Goals (SDGs) came into being in 2016 as a more detailed and globally focused successor to the Millennium Development Goals. Covering a broad range of environmental, economic, and social development initiatives, the SDG targets are regarded as being profoundly interlinked, integrated, and inseparable from one another.1 For example, progress in health (SDG 3) will depend on progress in poverty reduction efforts (SDG 1), highlighting the need for cross-sectoral thinking in their implementation. Tuberculosis, as a disease that features complex interactions with poverty and its associated social and structural factors, offers the opportunity to investigate closely how the SDGs align with disease control efforts.

The SDG targets share a conceptual and pragmatic vision with WHO’s End TB Strategy.1 From the conceptual perspective, both the End TB Strategy and the SDG targets are concerned with the root determinants of human health.1 In line with this thinking, the social determinants of tuberculosis are increasingly recognised as a research and programmatic priority, and the overarching aims of the End TB and SDG agendas should be regarded as linked. The End TB Strategy aims to reduce tuberculosis incidence by 90%, related deaths by 95%, and catastrophic costs by 100% by 2035, and includes a milestone for 2030, reflected in SDG 3, of an 80% reduction in tuberculosis incidence.1

Specifically, the eventual elimination of tuberculosis will require progress on the SDG 1 subtargets, which include efforts towards the reduction of poverty and expansion of social protection coverage. The links between increased social protection and reduced tuberculosis burden are well known to be applicable at the ecological level.14 Biosocial theories of disease provide a potential mechanism by which social protection and poverty reduction could reduce tuberculosis burden at the individual level.15 Because biomedical innovation in the response to tuberculosis alone will not be able to accelerate the reduction in tuberculosis incidence required to meet the programmatic targets of the End TB Strategy,16 what impact a reduction in the socioeconomic drivers of tuberculosis might have is also important to investigate. The SDG 1 subtargets include several indicators designed to operationalise and measure progress towards poverty reduction and expansion of social protection programmes.
In view of the ubiquity of SDGs in the development agenda, the SDG 1 indicators and timeline provide an appropriate framework.

In this Article, reflecting a key target of the End TB Strategy, we estimate the reduction in global tuberculosis incidence that could be obtained by reaching SDG 1’s targets of reducing poverty and expanding social protection.

Methods
Overview
To produce an estimate of the impact of attaining SDG 1 on tuberculosis incidence, we undertook three key steps: generation of a conceptual framework, reduction of that conceptual framework, and statistical modelling.

Research in context
Evidence before this study
Sustainable Development Goal 1 (SDG 1) commits to ending poverty and expanding social protection coverage. The link between poverty and tuberculosis has been well described and evidence from ecological studies supports an association between increased social protection and decreased tuberculosis burden. Both poverty reduction and social protection are codified as part of WHO’s End TB Strategy to implement and strengthen bold policies and supportive systems. Two articles published in 2016 describe a shared conceptual and pragmatic alignment between the End TB Strategy and the broader SDGs, but no quantitative evidence or projections of effect exist to support this strategic link.

Added value of this study
Conceptually, our study is the first to adopt an SDG framework to quantify the interdependence between tuberculosis elimination and development. Methodologically, the use of a well defined conceptual framework and clear operationalisation of indicators and outcomes provides a robust approach to transferring. We excluded subtargets SDG 1.4 (access to land rights and basic services for all) and SDG 1.5 (reduce mortality from climate-related disasters) from the overall analysis on the grounds of no evidence in the scientific literature for a relevant link to tuberculosis burden.9

The tuberculosis risk factors were selected on the basis of a review by Lönnroth and colleagues10 as proximal risk factors with the highest population attributable fraction. The risk factors include malnutrition, HIV infection, housing quality, and health behaviour. The health behaviour (smoking prevalence and diabetes prevalence) and housing quality (proportion exposed to indoor air pollution and proportion living in an urban slum) risk factors are composite factors informed by a principal components analysis done on the data. Care was taken to select only those risk factors that were thought to be more proximal to tuberculosis than the SDG 1 subtargets themselves.

Data were extracted to populate the framework for 192 countries from 2010 to 2015 corresponding to the SDG subtargets and measures for the tuberculosis risk factors. The most recent value was carried forward. No data were more recent than 2015, so we consider 2015 the baseline year.

We populated the SDG subtargets with data taken from the SDG repository for their corresponding indicator.11 Indicators for SDG 1.1 and 1.2 are measures of poverty reduction. The primary indicator for SDG 1.1 is the proportion of individuals living under the extreme poverty line of $1.90 per day. The primary indicator for SDG 1.2 is the value of the multidimensional poverty index for that country. SDG 1.3 is composed of three primary indicators that are measures of social protection expansion: the proportion of people covered by labour market interventions, contributory welfare programmes, and cash or resource...
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