Global Tuberculosis Targets and Milestones set for 2016–2035: Definition and Rationale

Katherine Floyd, Philippe Glaziou, Rein Houben, Tom Sumner, Richard White, Mario Raviglione

Affiliations

Katherine Floyd: Global Tuberculosis Programme, World Health Organization, Geneva, Switzerland

Philippe Glaziou: Global Tuberculosis Programme, World Health Organization, Geneva, Switzerland

Rein Houben: Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, UK

Tom Sumner: Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, UK

Richard White: Department of Infectious Disease Epidemiology, London School of Hygiene and Tropical Medicine, London, UK

Mario Raviglione: Global Tuberculosis Programme, World Health Organization, Geneva, Switzerland

Corresponding Author: Tom Sumner, London School of Hygiene and Tropical Medicine, Keppel Street, London, UK. tom.sumner@lshtm.ac.uk

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Summary

Background

Global tuberculosis (TB) targets were set as part of WHO's End TB Strategy (2016–2035) and the Sustainable Development Goals (2016–2030).

Objective

To define and explain the rationale for these targets.

Design

Scenarios for plausible reductions in TB deaths and cases were developed using empirical evidence from best-performing countries and modelling of the scale-up of under-used interventions and hypothetical TB vaccines. Results were discussed at consultations in 2012 and 2013. A final proposal was presented to the World Health Assembly in 2014 and unanimously endorsed by all Member States.

Results

The 2030 targets are a 90% reduction in TB deaths and 80% reduction in TB incidence, compared with 2015 levels. The 2035 targets are for reductions of 95% and 90%, respectively. A third target - that no TB-affected households experience catastrophic costs due to the disease by 2020 - was also agreed.

Conclusion

The global TB targets and milestones are ambitious. Achieving them requires concerted action on many fronts, but two things are fundamental: progress towards universal health coverage, so that everyone with TB can access high-quality treatment; substantial investment in research and development for new tools to prevent TB disease among the approximately 1.7 billion people infected.

Introduction

At the turn of the 21st-century, the United Nations (UN) established 8 Millennium Development Goals (MDGs) and associated targets for 2015. These were endorsed by all countries and became the focus of national and international development efforts (www.un.org/millenniumgoals). Within this framework, three targets for reductions in the burden of disease caused by tuberculosis (TB) were set: incidence should be falling by 2015, and prevalence and mortality rates should be halved by 2015 compared with 1990 levels. WHO's Stop TB Strategy, 2006−2015, was designed to achieve these targets.[1] WHO published its assessment of whether the targets were achieved in its 2015 global TB report; incidence was estimated to have been falling at an average of 1.5% per year since 2000, and prevalence and mortality rates were assessed to have fallen by 47% and 42% respectively compared with 1990.[2]

Work on post-2015 UN goals and targets began in 2012 and 17 Sustainable Development Goals (SDGs) for 2030 were agreed in September 2015.[3] One of the SDGs is to "Ensure healthy lives and promote well-being for all at all ages", under which a target is to "End the epidemics of AIDS, TB, malaria and neglected tropical diseases, and combat hepatitis, water-borne diseases and other communicable diseases". Within this context, WHO initiated the development of a post-2015 global TB strategy and targets in 2012.

Following two years of consultations, the new strategy, now known as the End TB Strategy and covering the period 2016–2035, was endorsed by the World Health Assembly in 2014.[4, 5] The overall goal is to "End the global TB epidemic", and ambitious targets for reductions in TB deaths and cases are set for 2030 (the SDG end date) and 2035. This paper defines and explains the rationale for these targets and associated milestones set for 2020 and 2025.

55   **Methods**

56

57   Target setting was underpinned by seven principles (Table 1) consistent with those used in the

58   SDGs.[6]

59

60   The number of TB deaths and the TB incidence rate (new cases per 100 000 population) were

61   selected as the two most important indicators for which targets should be set.

62

63   The number of TB deaths is directly measurable at country-level via national vital registration

64   systems in which causes of death are recorded using standard international coding systems; 128

65   countries had such systems in 2015 (Figure 1) and they could be introduced elsewhere. Targets

66   for reductions in TB deaths can be more ambitious than those for TB cases, since mortality can

67   fall faster than disease incidence if both incidence *and* the proportion of TB cases who die from

68   the disease (case fatality ratio, CFR) are falling. Reductions in TB deaths can also be linked to

69   equity: whatever the number of cases, all countries can aim to reach the same low CFR based on

70   universal health coverage (UHC) i.e. access for all to essential preventive and treatment health

71   care interventions, with financial protection.[7, 8]

72

73   TB incidence was selected as an indicator for measuring reductions in the number of cases of TB

74   disease. Although incidence was estimated with considerable uncertainty in most countries in the

75   MDG era,[2] notifications of TB cases to national authorities provide a good proxy if there is

76   limited under-reporting of detected cases, limited under-diagnosis and limited misdiagnosis.

77   Under-reporting, under-diagnosis and misdiagnosis can be addressed by strengthening national

78   surveillance and health systems. The alternative indicator of TB prevalence was considered

79   unsuitable because it will not be measured directly in most countries after 2015. As TB disease

80   falls, the sample sizes required for national prevalence surveys become prohibitively expensive

81   and logistically challenging.[9]

82

4

83   To define plausible scenarios for the reductions in TB deaths and incidence that could be

84   achieved between 2015 and 2035, two periods were considered: 2015−2025 and 2026-2035. The

85   status of the pipelines for new TB diagnostics, drugs and vaccines suggested that no major

86   breakthroughs will occur during this first period.[2] A new TB vaccine or equivalent treatment for

87   latent TB infection could become available in the second period.

88

89   Reductions in TB deaths are driven by two factors: the annual rate at which TB incidence falls;

90   and changes in the CFR. Illustrative scenarios for the reductions in TB deaths that could be

91   achieved by 2025 were constructed for different combinations of these variables, allowing for

92   projected growth in population.[10] The assumed trajectories for changes in the incidence rate and

93   the CFR are shown in Figure 2.

94

95   A "plausibility zone" for targets was defined based on historic evidence about the speed at which

96   the TB incidence rate can fall and the lowest levels of the CFR observed in settings where the

97   coverage and quality of TB treatment are high. The limit for the decline in incidence was set at

98   10% per year. This is the best-ever performance historically at national level, achieved between

99   the 1950s and 1970s in parts of Western Europe (Figure 3) in the context of rapid socio-economic

100   development, UHC and the introduction of chemotherapy.[11] Faster declines have only been

101   documented in the 1950s and 1960s, in subpopulations with incidence rates ten times the 2015

102   global average.[12,13] The global CFR limit was defined as 6.5%, the 2013–2014 average in high-

103   income countries.

104

105   The "plausibility zone" reflected historic performance without allowing for the possibility of a

106   hypothetical scale-up of two interventions: mass screening for TB infection and disease followed

107   by treatment for disease and isoniazid preventive therapy (IPT) (hereafter MST). In the MDG era,

108   such mass campaigns were very limited but were considered to explore the potential reductions in

109   TB burden that could be achieved. The potential impact of MST was explored using a simple

110   dynamic transmission model similar in structure to other published models.[14, 15] The negative

111   consequences of MST (number of false-positive individuals treated for infection or disease and

112   deaths associated with the side-effects of IPT) were also quantified (see appendix).

113

114   For 2026−2035, further modelling was undertaken to explore the impact of a technological

115   breakthrough. For practical purposes, the analysis focused on the potential impact of a new

116   vaccine with 60% efficacy, introduced in 2025, providing protection for at least 10 years and

117   achievement of 90% effective coverage by 2035 (see appendix).

118

119   Global consultations were held to inform the development of the End TB Strategy in 2012 and

120   2013, of which two were especially important. The first, in February 2013, considered the

121   analyses described above to reach consensus on targets/milestones for 2025.[16] The second, in

122   June 2013, considered the recommendations of the February 2013 consultation, results of the

123   modelling work up to 2035 and associated target proposals for 2030 and 2035 that would

124   correspond to the goal of ending the global TB epidemic.[17]

125

126   No ethical approval was required for this work.

127 **Results**

128

129 The combinations of reductions in TB incidence and the CFR that would be required for

130 reductions in TB deaths ranging from 50% to 90% by 2025 (compared with 2015) are shown in

131 Figure 4. The "plausibility zone" for targets that could be reached by 2025 is shown in green. If

132 recent trends continued (bottom right corner) the number of TB deaths would fall by about 18%

133 between 2015 and 2025. In the most optimistic scenario in which incidence is falling at 10% per

134 year by 2025 and the CFR falls to 6.5% (red dot), a 75% reduction in the number of TB deaths

135 would be achieved.

136

137 The dynamic model suggested that with a background of a 2% annual decline in TB incidence

138 and a CFR of 16% combined with the MST intervention, the number of TB deaths could fall 22–

139 65% by 2025 (Figure 5). With the most optimistic background scenario (CFR 6.5%; annual

140 incidence decline 10%/yr by 2025), the incremental impact of the MST intervention would be

141 lower and the total number of TB deaths could fall 77–90% by 2025 (Figure 6). MST may also

142 result in considerable undesirable effects and over-treatment, with 81–93% of those provided

143 with TB treatment not having TB.

144

145 Median trajectories for declines in TB deaths and incidence that could be achieved by 2035,

146 assuming a technological breakthrough (i.e. vaccine) by 2025 building on a 75% reduction in TB

147 deaths between 2015 and 2025, are shown in Figure 7. An incidence rate of around 14 per

148 100,000 population (comparable to levels found in countries considered to have a low burden of

149 TB in recent years) and a reduction in TB deaths of around 95% could be achieved by 2035.

150

151 In February 2013, agreement was reached on two targets for 2025: a 75% reduction in TB deaths

152 and a 50% reduction in TB incidence, compared with 2015 levels. Such reductions, and in

153 particular the underlying requirement that the CFR should fall to 6.5% by 2025, implicitly require

154 that all people with TB are able to access diagnosis and treatment, i.e. UHC is in place. A third

155 high-level target linked to UHC was therefore proposed: by 2020, no TB-affected households

156   should suffer catastrophic costs as a result of TB. In June 2013, following extension of the

157   modelling work described above, the targets proposed for 2025 were rephrased as milestones,

158   and 2030 and 2035 targets corresponding to the end dates of the SDGs and End TB Strategy were

159   proposed (Table 2). The targets and milestones shown in Table 2 were endorsed by all 194

160   Member States at the 2014 World Health Assembly.[4, 5]

Discussion

The global TB targets and associated milestones set within WHO's End TB Strategy call for a 90% reduction in TB deaths by 2030 (compared with 2015) and a 95% reduction by 2035, with corresponding reductions of 80% and 90% respectively in the TB incidence rate. By 2025, TB deaths should be reduced by 75%, and by 2020 no TB patients and their households should face catastrophic costs due to TB.

The targets are ambitious but within the limits of plausibility and are consistent with the SDG targets for 2030 of ending the epidemics of major infectious diseases, including TB, and achieving UHC. Comparable targets have also been set in the post-2015 strategies for HIV and malaria: a 90% reduction in the malaria death rate by 2030 compared with 2015 and a 90% reduction in AIDS deaths by 2030 compared with 2010. The TB targets are measurable and promote equity, requiring that all people who develop TB have the same high chance of receiving appropriate care and the same low chance of dying from the disease. They are also consensus-based, having earned unanimous endorsement by UN Member States at the 2014 World Health Assembly and wide buy-in from funding agencies, technical partners and civil society.

The technical work that informed the target setting is grounded in empirical evidence about the two key variables that can drive reductions in TB burden: the annual rate at which it is possible to reduce TB incidence, and the proportion of cases that die from TB when there is universal access to high-quality diagnosis and treatment. They were also based on up-to-date information about the development pipelines for new TB diagnostics, drugs and vaccines, with post-2025 projections allowing for technological breakthroughs that could occur within a decade, and greater use of currently under-used interventions.

To reach the targets, progress is required on many fronts[5] but two things are fundamental. First, UHC for essential health care services including detection and treatment of TB must be achieved by 2025. The 2025 milestone of reducing TB deaths by 75% requires cutting the CFR to 6.5%

190   (the level of high-income countries), which implicitly means that all those with TB disease (both

191   drug-susceptible and drug-resistant, and both adults and children) are able to access high-quality

192   treatment. There is growing momentum to promote UHC and monitor progress towards it.[7, 8, 18, 19]

193   The 10% per year fall in incidence that is needed by 2025 has previously been achieved only

194   within the wider context of UHC and broader socio-economic development, including social

195   protection: Western Europe in the 1950s and 1960s is the best example. Similar improvements in

196   socio-economic status, poverty reduction and improvements in living conditions in low-income

197   countries which have the greatest burden of TB will play a key part in reaching the TB targets.

198   Social protection mechanisms are also essential to ensure that TB patients and their households

199   do not incur catastrophic costs, for example due to lost income from time away from work. The

200   second fundamental requirement is a technological breakthrough by 2025 that will allow an

201   unprecedented acceleration in the rate at which TB incidence falls between 2025 and 2035. This

202   will only happen with substantial investment in research and development, so that new tools to

203   substantially lower the risk of developing TB among people who are already infected can be

204   developed.

205

206   Achievement of the targets for reductions in TB deaths and incidence at global level does not

207   mean that all countries need to make progress at the same pace. The strategy recognizes that

208   countries will need to make adaptations to the overall targets. WHO has issued guidance that

209   includes ten priority operational indicators and associated targets that should be reached by 2025

210   at the latest, and recommendations for how to set country-specific targets for 2020 and 2025.[20] In

211   addition, the Global Plan to End TB produced by the Stop TB Partnership provides a roadmap for

212   countries working towards the 2020 milestones. Progress in the countries with the highest burden,

213   such as China, India, Indonesia, Nigeria, Pakistan, Philippines and South Africa (collectively

214   about two-thirds of estimated incident cases in 2015), will strongly influence whether global

215   targets can be achieved.

216

217   All of the indicators for which post-2015 global TB targets have been set are measurable.

218   However, direct measurement of TB deaths and TB incidence (as opposed to indirect estimation

219 reliant on modelling and expert opinion) will require strengthening of routine information
220 systems in many countries. Guidance exists on how to assess the capacity of national notification
221 and vital registration systems to provide direct measurements of TB cases and deaths,
222 respectively, and to use results to close identified gaps.[21] Guidance on the measurement of
223 catastrophic costs using special surveys has been developed.[22] WHO and the World Bank plan to
224 issue an annual report on progress towards UHC from 2015 onwards.[19] Strengthening health
225 information systems, in particular civil and vital registration systems, is already a prominent part
226 of the post-2015 health agenda.[23]

227

228 The 2035 targets set within the End TB Strategy define the end of the global TB epidemic.
229 Following endorsement by all UN Member States at the World Health Assembly, intensified
230 action at national and global levels to operationalize the strategy is imperative.

Author contributions

KF led the writing of the paper, and revised the text based on input from all other authors. PG led the analytical work related to projections of reductions in TB cases and deaths between 2016 and 2025, with contributions from all other authors. RW, RH and TS led the modelling work required to assess plausible reductions in TB cases and deaths between 2026 and 2035. TS wrote the technical appendix. All authors agreed on the final version of the paper. All authors participated in global and regional consultations at which post-2015 global TB targets were discussed.

Competing interests

None of the authors have any competing interests to declare in relation to this work.

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Tables

Table 1: Principles to underpin post-2015 global TB targets

Measurability	It must be possible to measure progress towards targets at country level and, in turn, globally. Targets based on indicators that cannot be measured (or measured very imprecisely) can become subject to debate and dispute, and it is not possible to assess definitively whether they are achieved.
Ambition	Targets should be ambitious and translate into tangible results (such as lives saved), to energise and catalyse greater global and national efforts in TB prevention, care and control.
Feasibility	Targets should be achievable based on current and historical evidence, as well as new developments such as technological breakthroughs that could be achieved before the target date. The UN high-level panel cautioned against goals and targets that are "insufficiently stretching – business as usual".
Wide relevance	Targets need to be relevant to many countries as well as globally.
Wide context	Targets should be consistent with the wider development agenda.
Equity	Targets should be set with consideration of equity, such that all individuals at risk of experiencing active TB disease should have access to high-quality health services.
Consensus	Targets need to be capable of earning broad buy-in and support including from the TB community (e.g. national TB programmes, technical partners, civil society organizations, non-governmental organizations, financial partners, nongovernmental organizations) and endorsement by Member States at the World Health Assembly.

Table 2. The End TB Strategy's three high-level global indicators and associated targets (2030 and 2035) and milestones (2020 and 2025)

Indicators	Milestones		Targets	
	2020	**2025**	**SDG 2030**	**End TB 2035**
Percentage reduction in the absolute number of TB deaths *(compared with 2015 baseline)*	35%	75%	90%	95%
Percentage reduction in the TB incidence rate *(compared with 2015 baseline)*	20%	50%	80%	90%
Percentage of TB patients and their households experiencing catastrophic costs due to TB *(level in 2015 unknown)*	0%	0%	0%	0%

Figure 1. Availability of vital registration (VR) data. Countries shown in red are those in which TB mortality could be measured directly from vital registration data in 2015.
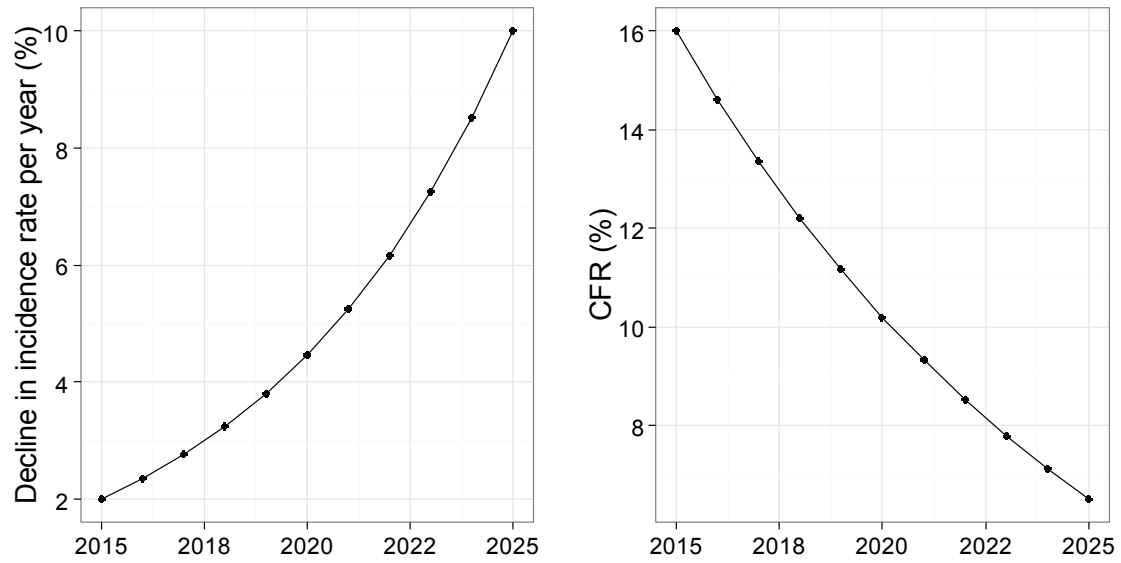
Figure 2. Assumed change in the TB incidence rate (annual rate of decline) and the case fatality ratio (CFR), 2015–2025. The trajectory assumes that the effect of progress towards universal health coverage (and implementation of new diagnostics and drugs currently in the pipeline) intensifies around 2020 and achieves the full potential by 2025. To achieve further improvements, new tools such as a post-exposure vaccine would be required.
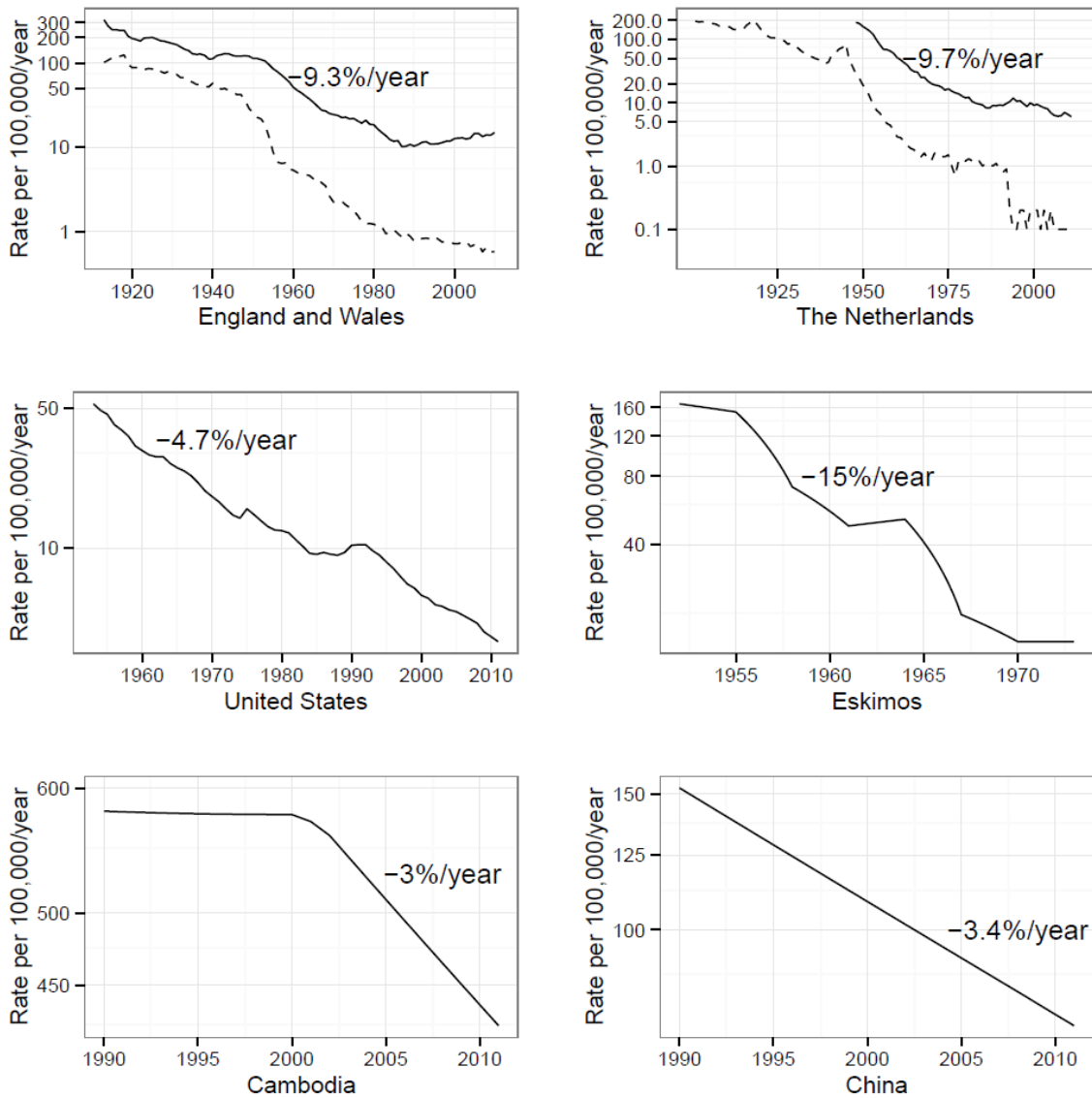
Figure 3. Long-term TB incidence trends in countries with robust surveillance data. At the national level, the best historical declines in TB incidence (solid line) reached about 10%/year (England and Wales; The Netherlands) while faster declines were observed in sub-populations (in Alaska among the Eskimo population). Current best performing countries show a more modest decline of 3–5%/year (Cambodia, China). The current global decline is 2%/year. The dashed line in the top panels shows TB mortality rates
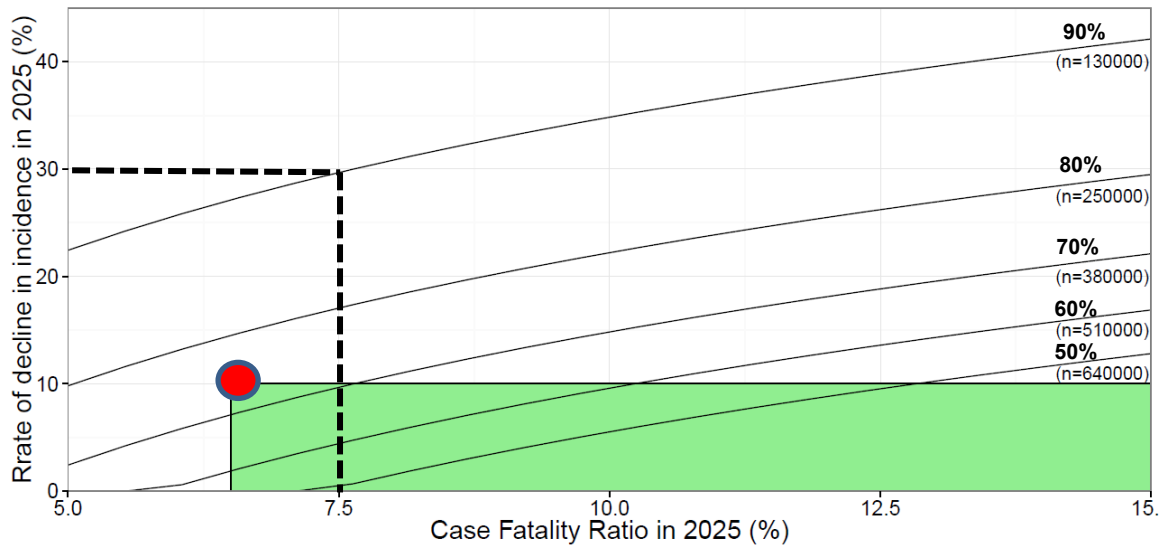
Figure 4. Scenarios for reductions in TB deaths that could be achieved by 2025, and associated "target zone". Contours show combinations of annual ~~percentgae~~ percentage decline in incidence in 2025 (y-axis) and case fataltiy ratio (CFR) in 2025 required to produce the corresponding reductions in TB deaths. For example (dashed lines), a 90% reduction in the number of tuberculosis deaths (to 130 000 by 2025) could be achieved if tuberculosis incidence was falling at 30% per year by 2025 and the CFR was reduced to 7.5% by 2025. The green rectangle illustrates the plausible zone based on previously observed declines and the average CFR in high income countries. The red circle marks the most ambitious scenario within the plausible zone.
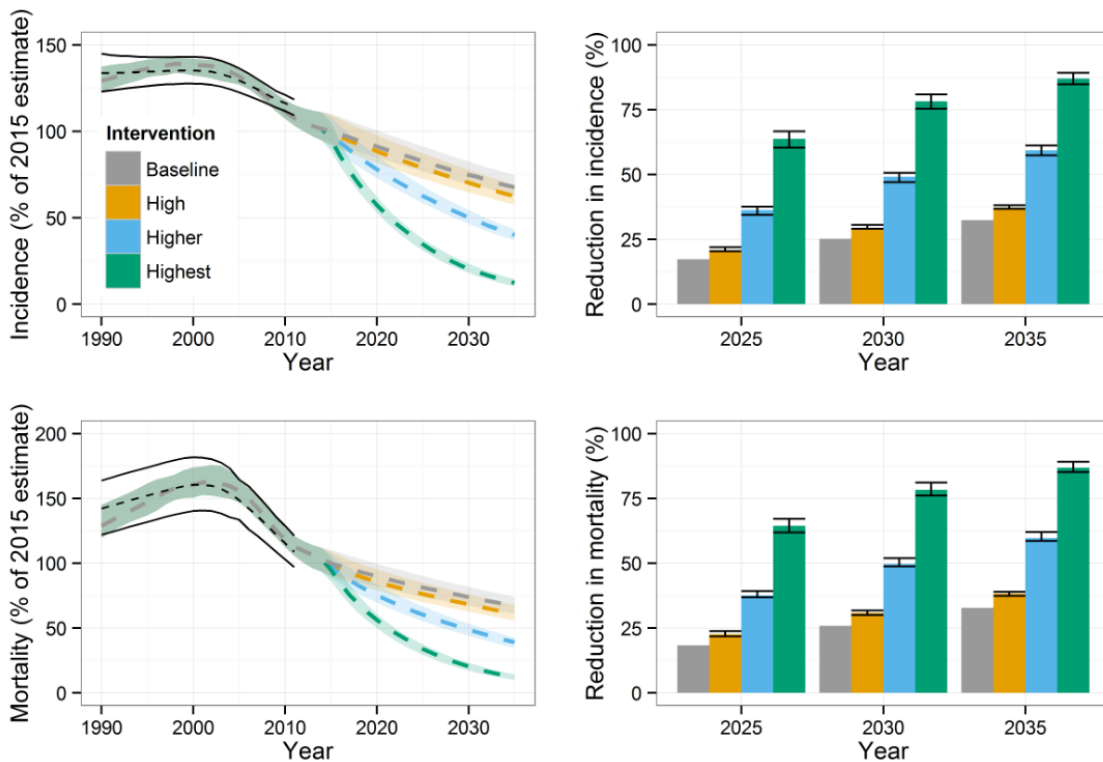
Figure 5. Trends and reductions in TB incidence and mortality as a result of a theoretical expansion of screening and treatment for active TB disease and latent TB infection (MST) – 2% background decline scenario. Left panels show the trends in TB incidence (top) and mortality (bottom) assuming the background decline in TB incidence remains at 2% and the CFR at 16%. Black lines show the WHO estimated incidence, dashed lines show the median model output and shaded areas 95% credible intervals (all values are relative to the 2015 estimated incidence). Right panels show the percentage reduction in incidence (top) and mortality (bottom) compared to 2015. Four different scenarios are considered: no MST (Baseline); 5% of population screened per year, 10% completion of INH (High); 10% screened, 50% completion (Higher); 20% screened, 90% completion (Highest).
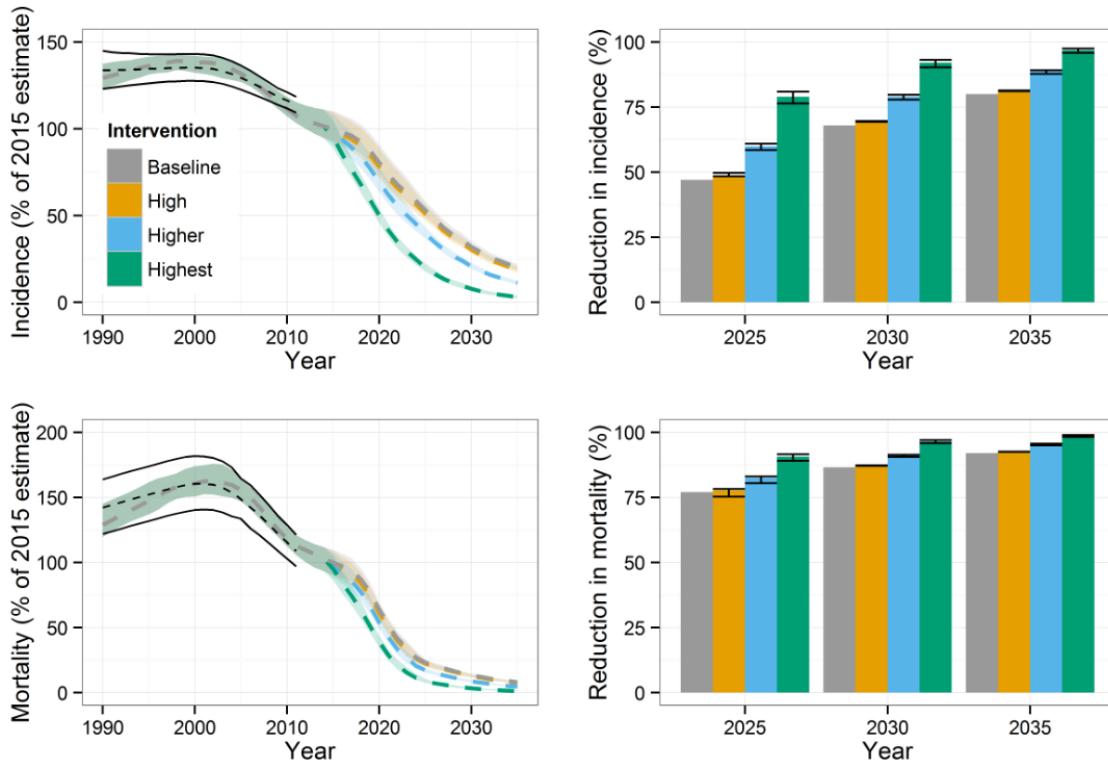
Figure 6. Trends and reductions in TB incidence and mortality as a result of a theoretical expansion of screening and treatment for active TB disease and latent TB infection (MST) – 10% background decline scenario. Left panels show trends and right panels percentage reductions in incidence (top) and mortality (bottom) assuming the decline in incidence increases to 10% and the CFR falls to 6.5% by 2025 (see figure 5 for additional details).
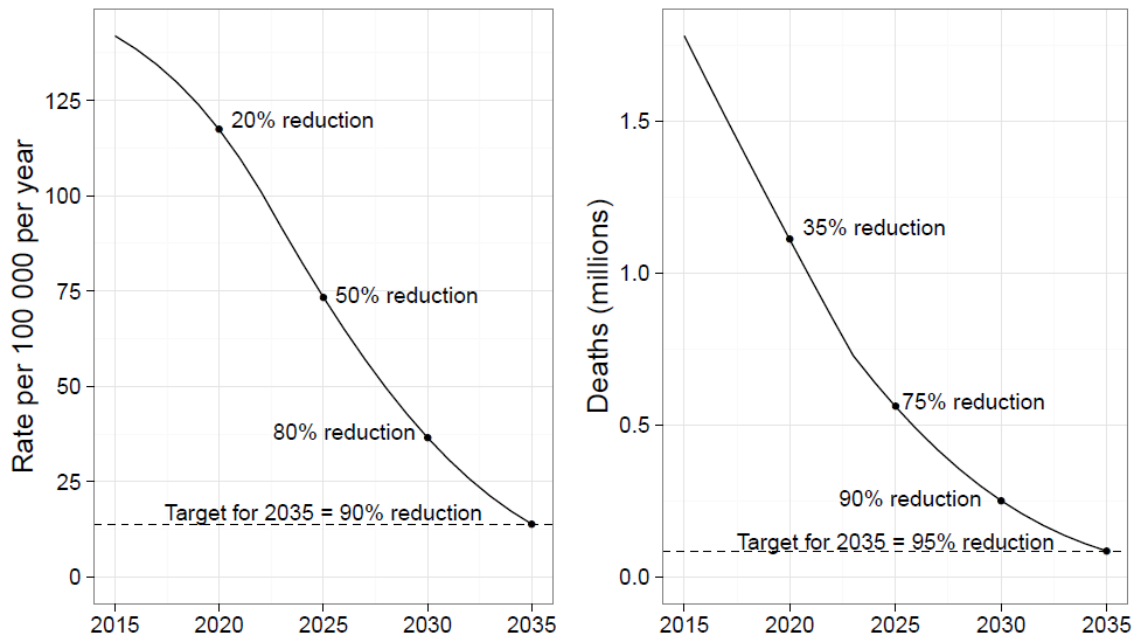
Figure 7. Projected TB incidence and mortality curves to reach targets and milestones, 2015–2035. Assuming the annual decline in incidence reaches 10% per year and the CFR is reduced to 6.5% by 2025 and the availability of an efficacious vaccine post 2025.