THE LANCET
Global Health

Supplementary appendix

Economic impact of Tuberculosis mortality in 120 countries and the cost of failing to achieve the Sustainable Development Goals Tuberculosis targets – A full-Income Analysis

SI Appendix

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Table of Contents

Tables

Figures

Section 1.1: Methods - Country Selection

We removed all countries whose population in 2020 were less than 4,101,000 with the exception of Uruguay, Mongolia, Namibia, Botswana, Lesotho, and Cyprus. The removed countries are listed in Table 1 below. We additionally removed Democratic People's Republic of Korea, Somalia, South Sudan and the Syrian Arab Republic due to the absence of reliable essential data (GDP per capita and GNI per capita in constant 2010 US$). In countries where GDP per capita was not available (in constant 2010 US$) but GNI per capita was available (in constant 2010 US$), the latter was used (Iran and Venezuela).

Country Name	Reason for removal
Hong Kong	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Lao People's Democratic Republic	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Kyrgyzstan	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Turkmenistan	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Slovakia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
State of Palestine	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Costa Rica	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Mauritania	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Panama	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Croatia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Republic of Moldova	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Georgia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Eritrea	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Bosnia and Herzegovina	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)

Jamaica	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Armenia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Qatar	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Albania	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Puerto Rico	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Lithuania	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
North Macedonia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Slovenia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Latvia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Bahrain	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Trinidad and Tobago	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Estonia	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Timor-Leste	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Mauritius	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Guyana	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Bhutan	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Chi, Macao SAR	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Montenegro	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)

Luxembourg	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Suriname	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Malta	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Belize	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Iceland	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Barbados	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Curaao	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)
Burundi	Population less than 4,101,000 or absence of reliable essential data (national income, population or demographic data)

Table 1: Countries not included in the analysis

Country Name	WHO Region	Population in 2020	TB Deaths in 2020	GNI per capita
Philippines[†]	East Asia & Pacific	109581	19076	$4,544
China[‡]	East Asia & Pacific	1439324	29296	$9,925
Republic of Korea	East Asia & Pacific	51269	1839	$32,131
Thailand[‡]	East Asia & Pacific	69800	10219	$7,510
Vietnam[†]	East Asia & Pacific	97339	11582	$2,370
Indonesia[‡]	East Asia & Pacific	273524	69492	$5,175
New Zealand	East Asia & Pacific	4822	9	$42,094
Myanmar[‡]	East Asia & Pacific	54410	24527	$1,961
Australia	East Asia & Pacific	25500	38	$64,427
Mongolia	East Asia & Pacific	3278	232	$5,451
Singapore	East Asia & Pacific	5850	44	$65,785
Japan	East Asia & Pacific	126476	2112	$61,899
Malaysia	East Asia & Pacific	32366	954	$14,127
Cambodia	East Asia & Pacific	16719	2589	$1,423
Papua New Guinea[‡]	East Asia & Pacific	8947	2930	$2,375
France	Europe & Central Asia	65274	347	$52,747
Tajikistan[†]	Europe & Central Asia	9538	552	$1,905

Bulgaria	Europe & Central Asia	6948	82	$10,941
Hungary	Europe & Central Asia	9660	75	$20,398
Belarus[†]	Europe & Central Asia	9449	388	$7,884
Switzerland	Europe & Central Asia	8655	15	$86,145
Finland	Europe & Central Asia	5541	23	$58,255
Czechia	Europe & Central Asia	10709	39	$27,029
Greece	Europe & Central Asia	10423	32	$28,068
Azerbaijan[†]	Europe & Central Asia	10139	402	$7,585
Poland	Europe & Central Asia	37847	409	$20,212
Austria	Europe & Central Asia	9006	45	$60,183
Portugal	Europe & Central Asia	10197	184	$28,466
Belgium	Europe & Central Asia	11590	46	$55,192
Denmark	Europe & Central Asia	5792	13	$78,046
United Kingdom	Europe & Central Asia	67886	259	$49,670
Sweden	Europe & Central Asia	10099	19	$68,929
Ireland	Europe & Central Asia	4938	14	$75,506
Romania	Europe & Central Asia	19238	749	$14,110
Russian Federation[†]	Europe & Central Asia	145934	10219	$13,752
Netherlands	Europe & Central Asia	17135	31	$66,737
Uzbekistan[†]	Europe & Central Asia	33469	1703	$2,315
Turkey	Europe & Central Asia	84339	429	$17,423
Spain	Europe & Central Asia	46755	211	$39,723
Germany	Europe & Central Asia	83784	238	$57,679
Kazakhstan[†]	Europe & Central Asia	18777	579	$11,115
Italy	Europe & Central Asia	60462	252	$42,389
Cyprus	Europe & Central Asia	1207	2	$36,474
Norway	Europe & Central Asia	5421	9	$111,644
Serbia	Europe & Central Asia	8737	57	$8,517
Ukraine[†]	Europe & Central Asia	43734	5042	$3,778
Venezuela (Bolivarian Republic of)	Latin America & Caribbean	28436	654	$5,993
Dominican Republic	Latin America & Caribbean	10848	477	$9,525
Mexico	Latin America & Caribbean	128933	1976	$11,860
Paraguay	Latin America & Caribbean	7133	211	$6,352
Peru[†]	Latin America & Caribbean	32972	1976	$7,326
Bolivia(Plurinational State of)	Latin America & Caribbean	11673	1022	$3,054
Cuba	Latin America & Caribbean	11327	42	$7,492

Country	Region			
Ecuador	Latin America & Caribbean	17643	518	$5,691
Nicaragua	Latin America & Caribbean	6625	143	$1,895
Haiti	Latin America & Caribbean	11403	1226	$845
Chile	Latin America & Caribbean	19116	354	$17,586
Uruguay	Latin America & Caribbean	3474	82	$15,658
El Salvador	Latin America & Caribbean	6486	89	$3,966
Honduras	Latin America & Caribbean	9905	286	$2,510
Argentina	Latin America & Caribbean	45196	525	$10,125
Brazil*	Latin America & Caribbean	212559	5042	$12,640
Guatemala	Latin America & Caribbean	17916	266	$3,650
Colombia	Latin America & Caribbean	50883	1158	$8,384
Yemen	Middle East & North Africa	29826	1635	$1,871
Jordan	Middle East & North Africa	10203	7	$3,748
Morocco	Middle East & North Africa	36911	1976	$3,924
Israel	Middle East & North Africa	8656	12	$41,990
Lebanon	Middle East & North Africa	6825	43	$7,006
Algeria	Middle East & North Africa	43851	2248	$5,145
Oman	Middle East & North Africa	5107	13	$17,522
Iraq	Middle East & North Africa	40223	661	$6,746
Egypt	Middle East & North Africa	102334	293	$3,426
Libya	Middle East & North Africa	6871	497	$9,108
Iran (Islamic Republic of)	Middle East & North Africa	83993	674	$8,546
Saudi Arabia	Middle East & North Africa	34814	572	$24,168
Kuwait	Middle East & North Africa	4271	10	$43,459
United Arab Emirates	Middle East & North Africa	9890	43	$47,024
Tunisia	Middle East & North Africa	11819	102	$5,060
United States of America	North America	331003	416	$66,288
Canada	North America	37742	89	$58,830
Afghanistan	South Asia	38928	9538	$637

Pakistan[†]	South Asia	220892	31339	$1,554
Sri Lanka	South Asia	21413	640	$4,575
India[‡]	South Asia	1380004	320207	$2,673
Nepal	South Asia	29137	3406	$1,033
Bangladesh[†]	South Asia	164689	44965	$1,655
Nigeria[‡]	Sub-Saharan Africa	206140	105600	$2,612
Botswana*	Sub-Saharan Africa	2352	1294	$9,313
Namibia*	Sub-Saharan Africa	2541	2316	$6,558
Zimbabwe[‡]	Sub-Saharan Africa	14863	4020	$1,995
Lesotho*	Sub-Saharan Africa	2142	4292	$1,836
Burkina Faso	Sub-Saharan Africa	20903	1294	$930
Togo	Sub-Saharan Africa	8279	484	$818
Guinea	Sub-Saharan Africa	13133	3134	$1,057
Rwanda	Sub-Saharan Africa	12952	647	$1,038
Cameroon*	Sub-Saharan Africa	26546	9538	$1,725
Malawi*	Sub-Saharan Africa	19130	8176	$616
Niger	Sub-Saharan Africa	24207	2861	$476
Mozambique[‡]	Sub-Saharan Africa	31255	39515	$686
Mali	Sub-Saharan Africa	20251	1226	$907
Madagascar	Sub-Saharan Africa	27691	8857	$567
Ghana*	Sub-Saharan Africa	31073	10901	$2,249
Zambia*	Sub-Saharan Africa	18384	12263	$1,483
United Republic of Tanzania*	Sub-Saharan Africa	59734	38152	$1,169
Liberia*	Sub-Saharan Africa	5058	2725	$504
Sierra Leone	Sub-Saharan Africa	7977	3611	$707
Angola[‡]	Sub-Saharan Africa	32866	16351	$3,622
Central African Republic*	Sub-Saharan Africa	4830	5723	$532
Sudan	Sub-Saharan Africa	43849	5042	$1,874
Benin	Sub-Saharan Africa	12123	886	$1,104
Ethiopia[‡]	Sub-Saharan Africa	114964	21120	$688
Kenya[‡]	Sub-Saharan Africa	53771	39515	$1,480
Chad*	Sub-Saharan Africa	16426	3406	$786
South Africa[‡]	Sub-Saharan Africa	59309	60635	$8,144
Congo*	Sub-Saharan Africa	5518	3475	$3,180
Democratic Republic of the Congo[‡]	Sub-Saharan Africa	89561	44284	$479
Uganda*	Sub-Saharan Africa	45741	14988	$822
Senegal	Sub-Saharan Africa	16744	1771	$1,854
Coted'Ivoire	Sub-Saharan Africa	26378	5655	$2,025

‡ represents countries considered as high TB-HIV and high MDR-TB burden countries. † represents countries considered as high MDR-TB burden countries. *represents countries considered as high TB-HIV burden countries. The remaining countries were considered as high TB burden countries.

Section 1.2: Methods - Demographic Model

We first calculated the central death rate $(_nM_x)$ due to all causes, based on the population and deaths by age interval, as a crude rate. We then calculated the fraction of the age interval lived on average, by those who die in that interval, when all causes are operating $(_na_x)$. We then calculated the conditional probabilities of dying by all causes $(_nq_x)$, the probability of survival when all causes are operating $(_nP_x)$ and the number of persons reaching each age who will eventually leave the lifetable (l_x), and the decrements by all causes (assuming a radix of 100,000). Lastly, we calculated the person-years lived in the age interval due to all causes $(_nL_x)$ and the person-years lived above the age (T_x), based on which we calculated the life expectancy when all causes are operating (e_x). To summarize:

$$_nq_x = \frac{n_nm_x}{1 + (n - \,_na_x)_nm_x} \qquad (1)$$

$$_nd_x = \,_nq_x \cdot l_x$$

$$l_{x+n} = l_x - \,_nd_x$$

$$_nL_x = n.\,l_{x+n} + \,_na_x \cdot \,_nd_x$$

For the last age interval, we calculated the following:

$$e_\varpi = \frac{1}{_nm_x}$$

$$L_\varpi = l_\varpi.\,e_\varpi$$

Populating from the bottom up, we set:

$$T_\varpi = L_\varpi$$

Then calculated:

$$T_x = T_{x-1} + l_{x+n}$$

$$e_x = \frac{T_x}{L_x}$$

we then extended the lifetable by first calculating the proportion of observed deaths in each age interval due to all causes but with reductions in TB deaths (R) corresponding to the scenarios considered. We calculated the probability of survival $({}_nP_{x,(-TB)})$, the number of persons reaching each age who will eventually leave the lifetable $(l_{x,(-TB)})$, the decrements due to reduced TB mortality $({}_nd_{x,(-TB)})$, the conditional probabilities of dying $({}_nq_{x,(-TB)})$, and the fraction of the age interval lived on average by those who die in that interval $({}_na_{x,(-TB)})$. Based on those parameters, we calculated the person-years lived in the age interval $({}_nL_{x,(-TB)})$ and the person-years lived above the age $(T_{x,(-T\ )})$, based on which we calculated the life expectancies $\left(e_{x(-TB)}\right)$ for the two scenarios[1]. We calculated the difference in life expectancies (Δe_x) between the BAU scenario (where TB deaths decline at 2% annually from 2020 to 2050) and the intervention scenarios (where the SDG TB target was met in 2030 or 2045).

$$R = ({}_nd_x - {}_nd_{x(-TB)})\frac{1}{{}_nd_x} \qquad (2)$$

$${}_np_x = 1 - {}_nq_x$$

$${}_np_{x(-TB)} = ({}_np_x)^R$$

We started with a radix of 100,000 and calculated:

$$l_{x+n(-TB)} = l_{x(-TB)} * {}_np_{x(-T\ )}$$
$${}_nd_{x(-TB)} = l_{x(-TB)} - l_{x+n(-TB)}$$

$${}_nq_{x(-TB)} = {}_nd_{\frac{x(-TB)}{l_{x(-TB)}}}$$

$${}_nL_{x(-TB)} = n * l_{x+n(-TB)} + {}_na_{x(-TB)} * {}_nd_{x(-TB)}$$

$$T_{x(-TB)} = \sum L_{i(-TB)} \ for \ i \geq x$$

$$e_{x(-T\ )} = T_{\frac{x(-TB)}{l_x(-TB)}}$$

$$\Delta e_x = e_{x(-TB)} - e_x$$

Section 1.3: Methods - Economic Model

Following Jamison et al.[2], we first transformed the excess hazard of mortality due to TB (change in the hazard of mortality from e_0 to e_{TB}) to Standardized Mortality Units (Δsmu) (a 1/10,000 change in mortality risk) as most VSL literature value mortality reduction by 1/10,000. Thereafter, we calculated the population value of this risk change for each country and year (p_k), by multiplying the Δsmu value by the population in each age interval ($n(a)$) and rescaling for the age interval using age 35 as the reference age. The rescaling permitted us to transform the value of the risk change to a value of annual income, based on empirical estimates linking mortality risk change to life expectancy change and annual income changes, which use age 35 as the reference age.

$$\Delta smu(a) = \frac{e(a)}{e(35)} \Delta smu(e_0,\ e_{TB})n(a) \qquad (3)$$

To arrive at the monetary value of the risk change, we summed the age-specific population values for each country and year and then multiplied by the value of a statistical life year (VSLY) (for the country and year), calculated as a proportion of the income per capita (γ), which we projected through 2050 as described in Section 1.5. We calculated VSL values based on benefits transfer, by adjusting the VSL in the United States (US$9,702,616) at an income of US$63,280 (in purchasing power parity adjusted international $ rates)[3], assuming an income elasticity of 1.0 (1.5 considered in the sensitivity analysis). The income elasticity incorporates income sensitivity of individual willingness to pay for small risk changes over a defined period (which is represented by VSL values). We calculated the present value of full-income from the perspective of 2020, assuming a discount rate (r) of 3% (and 5% in the sensitivity analysis).

$$V(e_0, e_{TB}, y) = y.\gamma \int_0^\infty n(a)\,\Delta smu(e_0, e_{TB})\frac{e(a)}{e(35)}\,da \qquad (4)$$

All calculations including the life table calculations for the 120 countries for 30 years and the sensitivity analysis, were performed using Stata (Stata/IC version 14.2).

Section 1.4: Methods - Per Capita Income Prediction

To model per capita income from 2020 to 2050, we employed two approaches. In the first approach, we predicted future growth rates based on historical growth rates from 2000 to 2018 (available from the World Bank) using a non-parametric locally weighted smoothing regression with a band width of 0.8. For this purpose, we used the Locally Weighted Scatter-plot Smoother (LOWESS) function available from Stata. We then applied the predicted growth rates recursively to each predicted value of per capita income. In the second approach (which we used for a subset of countries – India, Kenya, Nigeria, Indonesia and Bangladesh), we identified a probability distribution function that best described the per capita income from 1960 to 2018, by iteratively fitting 14 distributions based on Maximum Likelihood Estimation (MLE) (using Matlab version R2017a). To determine the distribution that best described the data, we evaluated the significance level ($P<0.05$), the Anderson-Darling statistic, the Akaike Information Criterion (AIC), which takes into account the log likelihood[4] and the likelihood ratio test result. Once we had identified the probability distribution function, to evaluate its parameter values (for example the shape and scale of a Weibull distribution), we used a least-squares minimization routine that we implemented via the Microsoft Excel Optimizer. Using the parameter values and the distribution, we predicted future per capita income through 2050. The second approach was much more resource intensive and did not provide an improvement in fit that was justifiable. We therefore relied on the fitting from the first approach.

Features	Locally Weighted Scatter-plot Smoothing	Distribution fitting
Approach	Each index value is assigned a smoother value based on a weighted regression (evaluated using maximum likelihood estimation) fitting a neighborhood on either side of the index value (known as bandwidth, often specified as a percent of the data) . This method was used to estimate growth rates of per capita income which were then applied to recursively.	A distribution best describing the data is identified via fitting routines implemented in a suitable software package such as Matlab. Its parameters are then evaluated using a least squares minimization routine. The distribution, along with its parameters, are then used to predict future values.
Disadvantages	The predictive capability is limited by the locally weighted linear or polynomial regression at the sample end point.The computational demand is abstracted by the software package making the method less time consuming as compared to the parametric method, in predicting the per capita income for 120 countries through 2050.	Assumes that the historical per capita income fits a finite number of known probability distributions (14), given the software used for the fitting. While affording predictive capacity, is resource intensive given the number of countries for which the distributions need to be fitted.

Table 3: Comparison of forecasting methods

Section 1.5: Methods - TB Mortality Projection

Annual declines in TB deaths between 2015 and 2018 have been 2.2% in the WHO Region of the Americas, 3.6% in the Eastern Mediterranean Region, 2.2% in the South East Asia Region, 3.6% in the Western Pacific. Excluding the WHO European Region where the annual decline in deaths was 8%, in the other regions, annual declines averaged 2.9%. Given this average decline, and following prior studies[5, 2], we considered a lower bound of 2% for the business-as-usual scenario. For the scenarios where the SDG TB target is met in 2030 and 2045, we calculated the annual reduction assuming an exponential decline from 2015 (to 2030 or 2045), where the TB deaths in 2030 or 2045 are reduced by 90 percent compared to TB deaths in 2015. To calculate the age distribution of the TB deaths (not including those in PLHIV), we used the age distribution of TB deaths in 2019 to calculate the age specific proportions. We applied the proportions to TB deaths each year through 2050 (assuming that the distributions remains constant). For TB deaths in PLHIV, we used the age distribution of HIV deaths (available from UNAIDS AIDSInfo) instead of the age distribution of TB deaths. When calculating age-specific proportions, as the proportions by the life table age intervals are needed, we mapped the age interval reported in the Global TB Report 2019 to the life table age intervals. For age interval 0-1 in the life table, we divided the TB deaths from ages 0-5 reported in the Global TB report and allocated 1/4th. For the age interval 1-5 in the life table, we divided the TB deaths from ages 0-5 reported in the Global TB report and allocated 3/4th. For the age intervals from 65 to 95 in the life table, we divided the TB deaths reported for ages 65+ in the Global TB report and allocated them evenly.

Scenario	Target	Rationale
Business-as-usual scenario	Exponential reduction in TB deaths due to all causes, at an annual rate of 2%	Average annual decline in TB deaths in WHO regions excluding Europe, from 2015-2018 was 2.8%. Other studies have assumed a 2% reduction[5, 2]
SDG target met in 2030	Exponential reduction at a rate permitting each country to reduce TB deaths due to all causes, by 90% compared to TB deaths in 2015, 2030	SDG target as defined, which in order to be met requires a 35% reduction in TB deaths (due to all causes) by 2020, compared to TB deaths in 2015, which allowed the exponential rate of decline to be estimated.

| SDG target met in 2045 | Exponential reduction at a rate permitting each country to reduce TB deaths due to all causes, by 90% compared to TB deaths in 2015, 2045 | Our assumption that it would not be feasible to meet the SDG target until 2045. Exponential rate of decline computed based on this assumption. |

Table 4: Scenarios considered in the analysis

Section 1.6 Methods - COVID-19 Excess Mortality Projection

We used the categorization in the 2019 Global TB Report and designated the 120 countries as high TB burden countries, high TB/HIV burden countries, high multi-drug resistant (MDR) TB burden countries, or as countries that do not qualify to be in either category. We assumed that high TB burden countries would have the same number of excess TB deaths due to COVID-10 as would India, per the projections by Cilloni et al. for the scenario where the COVID-19 disruptions are assumed to be due to 3-months of suspension of services followed by 10-months of restoration. For countries with a high TB/HIV burden, we assumed that the excess cases would be the same as in Kenya and for countries with high MDR-TB burdens, the excess cases would be the same as in the Ukraine. For countries that do not qualify to be in any one of the categories, we assumed that the excess deaths would be the same as the deaths estimated for the global level. For countries that qualify to be in more than one grouping, we assumed that the effect is the multiple of the effect for each contributing grouping. We calculated the adjustment to the counterfactual scenario from 2020 to 2025 based on data we received from Cilloni et al. We summarize the calculated values in Table 5 below.

Year	India No Disruption Scenario	India Disruption Scenario	India Adjustment Factor	Kenya No Disruption Scenario	Kenya Disruption Scenario	Kenya Adjustment Factor	Ukraine No Disruption Scenario	Ukraine Disruption Scenario	Ukraine Adjustment Factor	Global Adjustment Factor
2020	463082	565566	1.22	37401	38949	1.04	5825	6441	1.11	1.26
2021	455915	555643	1.22	35848	39521	1.10	5837	6303	1.08	1.13
2022	449001	509758	1.14	34536	37344	1.08	5856	6150	1.05	1.11
2023	443798	496802	1.12	33230	35366	1.06	5844	6093	1.04	1.09
2024	439756	484118	1.10	31765	33527	1.06	5833	6070	1.04	1.08
2025	436331	474793	1.09	30668	32185	1.05	5850	6056	1.04	1.07

Table 5: TB mortality due to COVID-19 disruptions (adjustment to pre-COVID-19 deaths)

Section 1.7 Methods - Sensitivity Analysis

For the probabilistic sensitivity analysis, which we implemented for a single country and year, we sampled values for each parameter between their upper and lower bounds, which we either

estimated or extracted from literature. We implemented the multiway simulation with 5,000 draws based on Latin Hypercube Sampling and randomization based on Mersenne Twister pseudorandom number generator. The probabilistic analysis of the sensitivity of global full-income losses were limited to the social choice parameters - the discount rate, the US VSL and income elasticity, and per capita income. We assumed that each parameter was distributed normally, between and upper and lower bounds that we either estimated or extracted from literature (Table 7). We report sensitivity in terms of the range of full-income means corresponding to each parameter, and the distribution of those full-income means (SI Appendix 2 Section 1.2).

The sensitivity of global full-income to demographic parameters and TB deaths could not be analyzed using the same method as global estimates are calculated by aggregating country estimates by year and age group, which made the simulation intractable. Instead, we estimated upper and lower bounds for global full-income corresponding to the upper and lower bounds for TB death by country and age group, and additionally estimated probabilistically, the sensitivity to TB deaths as well as the full set of demographic parameters in India, South Africa and the Ukraine (a high TB burden, a high TB-HIV burden and a high MDR-TB country), using the probabilistic simulation described above. We considered imprecision in deaths at each age a $(_nD_x)$, population at each age $a, n(a)$ and TB Deaths per year (R).

Symbol	Parameter	Measure of Imprecision and Source	Sensitivity Analysis
$(_nD_x)$	Deaths at each age a	Upper and lower bounds for each age a, available from abridged lifetables from WPP[6].	Sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for India, South Africa and the Ukraine for 2020.
$n(a)$	Population at each age a	Upper and lower bounds for each age a, available from abridged lifetables from WPP[6].	Sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for India, South Africa and the Ukraine for 2020.
R	TB Deaths per year	Upper and lower bounds available from the 2019 Global TB Report.	Sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for global estimate.
y	Income per capita	Projected based on the variance in growth rates from 2015-2018, available from IMF and World Bank.	Sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for

			India, South Africa and the Ukraine for 2020.
γ	Value of a statistical life in the US.	US\$ 9,702,616 (range: US\$ 1,764,112-US\$ 17,641,121) from the US Health and Human Services Guidelines[7].	Values between upper and lower bounds sampled using 5000 draws using Latin Hypercube Sampling, assuming that values are distributed normally. Implented for global estimate.
ε	Income elasticity	1. Assumed to be 1.5 when extrapolating from the US VSL. 2. Assumed to be 100 times the GNI/capita in the target country[8]. 3. Assumed to be 160 times the GNI per capita in the target country[8].	Scenarios 1-3 considered. Additionally, elasticities between 0.5 and 1.5 sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for global estimate.
r	Discount rate	1. Assumed to be 3% as recommended by the BCA reference case[8]. 2. Assumed to be equal to twice the projected near-term GDP per capita growth rate (as recommeded by the BCA reference case[8].	Scenarios 1-2 considered. Additionally, discount rates between 3 and 5% sampled using 5000 draws using Latin Hypercube Sampling, assuming that values between the upper and lower bounds are distributed normally. Implented for global estimate.

Table 6: Parameters considered in sensitivity analysis, measures of imprecision and methods of analysis

Section 1.8 Methods - CHEERS Checklist

Section or item	Item number	CHEERS recommendation	Reported on page number and line number
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as "cost-effectiveness analysis", and describe the interventions compared.	Not applicable. We have identified the study as a modelling study.
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	Manuscript page 2 lines 27-56
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study.	Manuscript page 5 lines 103-115
		Present the study question and its relevance for health policy or practice decisions.	Manuscript page 5 lines 115-119
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	Manuscript page 6 lines 152-167 SI Appendix 1 pages 2-7
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	Not applicable
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	Not applicable

Section or item	Item number	CHEERS recommendation	Reported on page number and line number
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	Manuscript page 6 lines 144-150
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	Manuscript page 6 lines 144-150
Discount rate	9	Report the choice of discount rate(s) used for costs and outcomes and say why appropriate.	Manuscript page 7 lines 188-189 IS Appendix 1 page 15 Table 7
Choice of health outcomes	10	Describe what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed.	Manuscript pages 5-6 lines 129-136 Manuscript page 6 lines 144-145
Measurement of effectiveness	11a	*Single study-based estimates:* Describe fully the design features of the single effectiveness study and why the single study was a sufficient source of clinical effectiveness data.	Not applicable
	11b	*Synthesis-based estimates*: Describe fully the methods used for identification of included studies and synthesis of clinical effectiveness data.	Not applicable
Measurement and valuation of preference based outcomes	12	If applicable, describe the population and methods used to elicit preferences for outcomes.	Not applicable
Estimating resources and costs	13a	*Single study-based economic evaluation:* Describe approaches used to estimate resource use associated with the alternative interventions. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	Not applicable
	13b	*Model-based economic evaluation:* Describe approaches and data sources used to estimate resource use associated with model health states. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	Not applicable
Currency, price date, and conversion	14	Report the dates of the estimated resource quantities and unit costs. Describe methods for adjusting estimated unit costs to the year of reported costs if necessary. Describe methods for converting costs into a common currency base and the exchange rate.	Not applicable
Choice of model	15	Describe and give reasons for the specific type of decision-analytical model used. Providing a figure to show model structure is strongly recommended.	SI Appendix 1 page 8, line 25 (demographic model). SI Appendix 1 page 9, line 95 (economic model).
Assumptions	16	Describe all structural or other assumptions underpinning the decision-analytical model.	SI Appendix 1 page 8, line 25 (demographic model). SI Appendix 1 page 9, line 95 (economic model).
Analytical methods	17	Describe all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty.	SI Appendix 1 Section 1.4 (page 10) to SI Appendix 1 Section 1.7 (page 15).

Section or item	Item number	CHEERS recommendation	Reported on page number and line number
Results			
Study parameters	18	Report the values, ranges, references, and, if used, probability distributions for all parameters. Report reasons or sources for distributions used to represent uncertainty where appropriate. Providing a table to show the input values is strongly recommended.	SI Appendix 1, page 14-15 Table 7
Incremental costs and outcomes	19	For each intervention, report mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, report incremental cost-effectiveness ratios.	Manuscript Tables 1 and 2, Figures 1-5
Characterising uncertainty	20a	*Single study-based economic evaluation:* Describe the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact of methodological assumptions (such as discount rate, study perspective).	Not applicable (incremental cost effectiveness not calculated)
	20b	*Model-based economic evaluation:* Describe the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions.	SI Appendix 1 Section 1.7 Page 13
Characterising heterogeneity	21	If applicable, report differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information.	Not applicable
Discussion			
Study findings, limitations, generalisability, and current knowledge	22	Summarise key study findings and describe how they support the conclusions reached. Discuss limitations and the generalisability of the findings and how the findings fit with current knowledge.	Manuscript lines 326-404
Other			
Source of funding	23	Describe how the study was funded and the role of the funder in the identification, design, conduct, and reporting of the analysis. Describe other non-monetary sources of support.	Manuscript page 8 line 206
Conflicts of interest	24	Describe any potential for conflict of interest of study contributors in accordance with journal policy. In the absence of a journal policy, we recommend authors comply with International Committee of Medical Journal Editors recommendations.	Manuscript page 14 line 407

Section 1.9: Data - TB Deaths, Life Expectancy Losses (at Birth) and Full-Income Losses by Country

In 2018

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Birth
Afghanistan	10825	1077627008	0.732
Algeria	3268	2753633792	0.226
Angola	21828	11749390336	1.580
Azerbaijan	990	1205522688	0.264
Argentina	747	701756992	0.037
Australia	71	431419328	0.009
Austria	41	121391856	0.006
Bangladesh	45993	8369466880	0.748
Belgium	53	213086048	0.011
Bolivia(Pluri-national State of)	1371	551550656	0.333
Botswana	1775	1977346560	1.936
Brazil	6399	6924665856	0.067
Bulgaria	80	63080748	0.020
Myanmar	24593	6008517120	1.073
Belarus	547	423670944	0.127
Cambodia	3333	626077760	0.515
Cameroon	12855	3081380608	1.064
Canada	159	775413248	0.010
Central African Republic	7818	681897536	3.300
Sri Lanka	808	453589344	0.107
Chad	4847	634046656	0.628
Chile	520	760117376	0.072
China	38929	47002218496	0.090
Colombia	1585	1070898304	0.077
Congo	5244	2590893056	2.303
Democratic Republic of the Congo	52392	3358049024	1.486
Cuba	65	52953172	0.014
Cyprus	0	45503.156	0.000
Czechia	45	82457336	0.009
Benin	1285	240350928	0.257
Denmark	27	126124104	0.007
Dominican Republic	494	408338976	0.118
Ecuador	697	418534944	0.114
El Salvador	145	54715856	0.053
Ethiopia	26747	3134238720	0.616
Finland	31	95056264	0.010
France	381	1277623552	0.012
Germany	330	1420539008	0.010
Ghana	15805	5645720064	1.149
Greece	50	73712920	0.007
Guatemala	360	142735056	0.063
Guinea	4449	610230464	0.824
Haiti	1877	234110048	0.388
Honduras	461	137310720	0.143
Hungary	55	74983768	0.010
India	443661	150988931072	0.809
Indonesia	95711	52025049088	0.787
Iran(Islamic Republic of)	879	598535040	0.021

Iraq	845	1161103872	0.054
Ireland	24	72349784	0.007
Israel	25	90406064	0.007
Italy	329	672533568	0.007
Coted' Ivoire	8019	2115287424	0.620
Japan	2913	10939864064	0.051
Kazakhstan	467	552812992	0.056
Jordan	15	9764118	0.004
Kenya	32743	6582023168	1.552
Republic of Korea	2426	5192769536	0.117
Kuwait	17	86689584	0.009
Lebanon	71	64100136	0.027
Lesotho	4129	1035261888	3.210
Liberia	3757	283752864	1.863
Libya	421	594888704	0.158
Madagascar	12867	988384960	1.234
Malawi	10849	931310912	1.460
Malaysia	1469	2328157440	0.114
Mali	1776	206589104	0.218
Mexico	2452	3615727872	0.053
Mongolia	335	201624176	0.250
Morocco	2855	892243328	0.173
Mozambique	42606	4610260480	3.187
Oman	20	39341988	0.009
Namibia	3066	2858974464	2.795
Nepal	5374	623355072	0.446
Netherlands	45	194610096	0.005
New Zealand	25	73425984	0.011
Nicaragua	197	50098264	0.086
Niger	4242	363679616	0.483
Nigeria	155562	59117522944	1.468
Norway	31	185498736	0.010
Pakistan	42969	8448712704	0.469
Papua New Guinea	4642	1802490112	1.145
Paraguay	307	163070992	0.111
Peru	2543	1570381056	0.185
Philippines	24606	8221635584	0.514
Poland	504	839037888	0.030
Portugal	223	333876480	0.033
Romania	963	1138310400	0.103
Russian Federation	9891	15729951744	0.158
Rwanda	928	121854144	0.192
Saudi Arabia	779	2329583360	0.056
Senegal	2870	810050688	0.447
Serbia	61	24677092	0.008
Sierra Leone	3262	366460448	0.777
Singapore	70	208941920	0.020
Vietnam	12696	3355977728	0.360
South Africa	63177	69723037696	2.165
Zimbabwe	4549	931751808	0.687
Spain	336	970986048	0.017
Sudan	4799	1256171008	0.273
Sweden	35	166074992	0.007
Switzerland	42	257747632	0.009
Tajikistan	811	248283408	0.225
Thailand	10661	8195431424	0.400
Togo	287	31693900	0.076

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Age 35-40
United Arab Emirates	72	382963520	0.034
Tunisia	147	123234584	0.038
Turkey	394	471497504	0.010
Uganda	18831	2836727808	1.107
Ukraine	5631	2554321408	0.326
Egypt	433	141322128	0.009
United Kingdom	315	983702912	0.008
United Republic of Tanzania	38455	6966564864	1.729
United States of America	681	3409292032	0.004
Burkina Faso	1778	259041664	0.211
Uruguay	113	136791088	0.066
Uzbekistan	1963	715710784	0.145
Venezuela(Bolivarian Republic of)	942	537462784	0.068
Yemen	1964	577204160	0.166
Zambia	17862	4747215360	2.500

Table 7: TB Deaths, Life Expectancy Losses (at Birth) and Full-Income Losses by Country

‡ represents countries considered as high TB-HIV and high MDR-TB burden countries. † represents countries considered as high MDR-TB burden countries. *represents countries considered as high TB-HIV burden countries. The remaining countries were considered as high TB burden countries.

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Age 35-40
Afghanistan	10825	1077627008	0.461
Algeria	3268	2753633792	0.095
Angola	21828	11749390336	0.883
Azerbaijan	990	1205522688	0.087
Argentina	747	701756992	0.028
Australia	71	431419328	0.003
Austria	41	121391856	0.006
Bangladesh	45993	8369466880	0.416
Belgium	53	213086048	0.006
Bolivia(Pluri-national State of)	1371	551550656	0.164
Botswana	1775	1977346560	1.131
Brazil	6399	6924665856	0.057
Bulgaria	80	63080748	0.012
Myanmar	24593	6008517120	0.428
Belarus	547	423670944	0.076
Cambodia	3333	626077760	0.238
Cameroon	12855	3081380608	0.645
Canada	159	775413248	0.005
Central African Republic	7818	681897536	2.182
Sri Lanka	808	453589344	0.046
Chad	4847	634046656	0.455
Chile	520	760117376	0.042
China	38929	47002218496	0.024
Colombia	1585	1070898304	0.066
Congo	5244	2590893056	1.309
Democratic Republic of the Congo	52392	3358049024	1.029
Cuba	65	52953172	0.007
Cyprus	0	45503.156	0.000
Czechia	45	82457336	0.005
Benin	1285	240350928	0.174

Denmark	27	126124104	0.005
Dominican Republic	494	408338976	0.100
Ecuador	697	418534944	0.078
El Salvador	145	54715856	0.034
Ethiopia	26747	3134238720	0.316
Finland	31	95056264	0.006
France	381	1277623552	0.007
Germany	330	1420539008	0.005
Ghana	15805	5645720064	0.649
Greece	50	73712920	0.005
Guatemala	360	142735056	0.049
Guinea	4449	610230464	0.506
Haiti	1877	234110048	0.175
Honduras	461	137310720	0.088
Hungary	55	74983768	0.006
India	443661	150988931072	0.315
Indonesia	95711	52025049088	0.454
Iran(Islamic Republic of)	879	598535040	0.018
Iraq	845	1161103872	0.019
Ireland	24	72349784	0.006
Israel	25	90406064	0.004
Italy	329	672533568	0.006
Coted' Ivoire	8019	2115287424	0.380
Japan	2913	10939864064	0.020
Kazakhstan	467	552812992	0.042
Jordan	15	9764118	0.001
Kenya	32743	6582023168	0.777
Republic of Korea	2426	5192769536	0.063
Kuwait	17	86689584	0.003
Lebanon	71	64100136	0.007
Lesotho	4129	1035261888	1.826
Liberia	3757	283752864	1.134
Libya	421	594888704	0.066
Madagascar	12867	988384960	0.733
Malawi	10849	931310912	0.898
Malaysia	1469	2328157440	0.065
Mali	1776	206589104	0.154
Mexico	2452	3615727872	0.027
Mongolia	335	201624176	0.101
Morocco	2855	892243328	0.140
Mozambique	42606	4610260480	1.633
Oman	20	39341988	0.005
Namibia	3066	2858974464	1.532
Nepal	5374	623355072	0.260
Netherlands	45	194610096	0.003
New Zealand	25	73425984	0.007
Nicaragua	197	50098264	0.055
Niger	4242	363679616	0.323
Nigeria	155562	59117522944	0.905
Norway	31	185498736	0.007
Pakistan	42969	8448712704	0.260
Papua New Guinea	4642	1802490112	0.525
Paraguay	307	163070992	0.095
Peru	2543	1570381056	0.140
Philippines	24606	8221635584	0.455
Poland	504	839037888	0.019
Portugal	223	333876480	0.026

Romania	963	1138310400	0.063
Russian Federation	9891	15729951744	0.087
Rwanda	928	121854144	0.104
Saudi Arabia	779	2329583360	0.028
Senegal	2870	810050688	0.210
Serbia	61	24677092	0.007
Sierra Leone	3262	366460448	0.513
Singapore	70	208941920	0.020
Vietnam	12696	3355977728	0.181
South Africa	63177	69723037696	1.122
Zimbabwe	4549	931751808	0.406
Spain	336	970986048	0.008
Sudan	4799	1256171008	0.177
Sweden	35	166074992	0.004
Switzerland	42	257747632	0.005
Tajikistan	811	248283408	0.102
Thailand	10661	8195431424	0.203
Togo	287	31693900	0.047
United Arab Emirates	72	382963520	0.021
Tunisia	147	123234584	0.013
Turkey	394	471497504	0.009
Uganda	18831	2836727808	0.678
Ukraine	5631	2554321408	0.143
Egypt	433	141322128	0.007
United Kingdom	315	983702912	0.006
United Republic of Tanzania	38455	6966564864	1.162
United States of America	681	3409292032	0.003
Burkina Faso	1778	259041664	0.142
Uruguay	113	136791088	0.047
Uzbekistan	1963	715710784	0.066
Venezuela(Bolivarian Republic of)	942	537462784	0.056
Yemen	1964	577204160	0.104
Zambia	17862	4747215360	1.398

Table 8: TB Deaths, Life Expectancy Losses (ages 35-40) and Full-Income Losses by Country

‡ represents countries considered as high TB-HIV and high MDR-TB burden countries. † represents countries considered as high MDR-TB burden countries. *represents countries considered as high TB-HIV burden countries. The remaining countries were considered as high TB burden countries.

In 2030, with 2% annual reduction from 2020 to 2050 – SDG TB Target not met

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Birth
Afghanistan	8491	777945728	0.446
Algeria	2560	1838565760	0.169
Angola	17131	9486539776	0.944
Azerbaijan	777	1229695104	0.211
Argentina	584	362557760	0.026
Australia	49	390835040	0.005
Austria	28	118011824	0.005
Bangladesh	36092	16978604032	0.557

Belgium	41	208399248	0.009
Bolivia(Pluri-national State of)	1081	715380288	0.237
Botswana	1389	2377887744	1.207
Brazil	5023	6860070912	0.049
Bulgaria	67	95154616	0.019
Myanmar	19297	10582838272	0.827
Belarus	431	556028992	0.117
Cambodia	2617	1040334784	0.384
Cameroon	10088	3174120192	0.664
Canada	128	737669696	0.008
Central African Republic	6135	986179072	2.133
Sri Lanka	638	520440512	0.090
Chad	3803	279301824	0.380
Chile	403	775560128	0.048
China	30549	82093260800	0.080
Colombia	1246	871908480	0.054
Congo	4113	1350712192	1.436
Democratic Republic of the Congo	41109	3650239488	0.887
Cuba	55	38776320	0.011
Cyprus	0	65417.254	0.000
Czechia	30	93631792	0.006
Benin	1008	254805984	0.158
Denmark	21	144578944	0.007
Dominican Republic	389	758498752	0.084
Ecuador	549	339067136	0.079
El Salvador	115	52224700	0.036
Ethiopia	20987	3626394368	0.387
Finland	25	120027336	0.008
France	290	1295595136	0.009
Germany	259	1527152000	0.008
Ghana	12405	7218272768	0.758
Greece	40	94921416	0.008
Guatemala	277	140244976	0.039
Guinea	3493	742743744	0.503
Haiti	1471	213121232	0.286
Honduras	359	171011216	0.093
Hungary	43	118502792	0.008
India	348156	268420481024	0.620
Indonesia	75107	76026298368	0.583
Iran(Islamic Republic of)	687	591274048	0.016
Iraq	664	1134294400	0.035
Ireland	21	130708576	0.005
Israel	19	115632400	0.007
Italy	253	709576576	0.005
Coted' Ivoire	6286	3166276608	0.392
Japan	2241	12744630272	0.043
Kazakhstan	369	500155840	0.045
Jordan	7	5173671	0.002
Kenya	25696	9492024320	0.961
Republic of Korea	1868	4249731072	0.058
Kuwait	15	88691256	0.009
Lebanon	53	42765604	0.022
Lesotho	3240	971111488	2.518
Liberia	2948	155286736	1.143
Libya	331	309137984	0.115
Madagascar	10100	1101280640	0.768
Malawi	8515	1064101184	0.901

Malaysia	1156	2851781120	0.085
Mali	1393	253328480	0.130
Mexico	1917	3614629376	0.039
Mongolia	269	689935552	0.187
Morocco	2241	1014653696	0.122
Mozambique	33429	5001287680	1.984
Oman	17	35547644	0.008
Namibia	2407	2173689856	1.898
Nepal	4213	946716480	0.308
Netherlands	32	223000736	0.004
New Zealand	19	76046640	0.010
Nicaragua	155	24720010	0.058
Niger	3333	322292160	0.280
Nigeria	122071	46957289472	0.951
Norway	23	182142000	0.008
Pakistan	33720	11577207808	0.311
Papua New Guinea	3646	1626293248	0.759
Paraguay	239	203406784	0.071
Peru	1996	1783257472	0.134
Philippines	19309	12944444416	0.329
Poland	392	1185418112	0.020
Portugal	170	416880736	0.026
Romania	749	1516137216	0.075
Russian Federation	7763	18415888384	0.149
Rwanda	732	214256528	0.124
Saudi Arabia	613	2132522496	0.041
Senegal	2253	1129942656	0.279
Serbia	45	43023904	0.006
Sierra Leone	2563	803196864	0.522
Singapore	53	265556768	0.014
Vietnam	9961	6472826368	0.288
South Africa	49574	57174233088	1.601
Zimbabwe	3568	4722394112	0.458
Spain	258	991020928	0.013
Sudan	3763	789664896	0.171
Sweden	23	104037344	0.004
Switzerland	32	172275648	0.006
Tajikistan	638	352472704	0.153
Thailand	8362	11553671168	0.346
Togo	224	39007640	0.049
United Arab Emirates	55	341166368	0.016
Tunisia	120	107187936	0.030
Turkey	308	490427744	0.007
Uganda	14779	2452089600	0.647
Ukraine	4415	3585534976	0.310
Egypt	340	173885008	0.006
United Kingdom	243	931239616	0.006
United Republic of Tanzania	30175	7791992320	1.034
United States of America	534	4064555776	0.003
Burkina Faso	1397	397795488	0.129
Uruguay	90	120537392	0.050
Uzbekistan	1538	687767872	0.108
Venezuela(Bolivarian Republic of)	739	68205728	0.045
Yemen	1545	589027776	0.104
Zambia	14017	3460659712	1.464

Table 9: TB Deaths, Life Expectancy Losses (at Birth) and Full-Income Losses by Country

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Age 35-40
Afghanistan	8491	777945728	0.257
Algeria	2560	1838565760	0.061
Angola	17131	9486539776	0.502
Azerbaijan	777	1229695104	0.061
Argentina	584	362557760	0.020
Australia	49	390835040	0.001
Austria	28	118011824	0.003
Bangladesh	36092	16978604032	0.267
Belgium	41	208399248	0.004
Bolivia(Pluri-national State of)	1081	715380288	0.104
Botswana	1389	2377887744	0.639
Brazil	5023	6860070912	0.039
Bulgaria	67	95154616	0.012
Myanmar	19297	10582838272	0.297
Belarus	431	556028992	0.061
Cambodia	2617	1040334784	0.149
Cameroon	10088	3174120192	0.368
Canada	128	737669696	0.003
Central African Republic	6135	986179072	1.398
Sri Lanka	638	520440512	0.036
Chad	3803	279301824	0.258
Chile	403	775560128	0.030
China	30549	82093260800	0.019
Colombia	1246	871908480	0.043
Congo	4113	1350712192	0.816
Democratic Republic of the Congo	41109	3650239488	0.594
Cuba	55	38776320	0.007
Cyprus	0	65417.254	0.000
Czechia	30	93631792	0.002
Benin	1008	254805984	0.100
Denmark	21	144578944	0.005
Dominican Republic	389	758498752	0.067
Ecuador	549	339067136	0.049
El Salvador	115	52224700	0.025
Ethiopia	20987	3626394368	0.179
Finland	25	120027336	0.005
France	290	1295595136	0.005
Germany	259	1527152000	0.003
Ghana	12405	7218272768	0.394
Greece	40	94921416	0.005
Guatemala	277	140244976	0.028
Guinea	3493	742743744	0.286
Haiti	1471	213121232	0.109
Honduras	359	171011216	0.050
Hungary	43	118502792	0.005
India	348156	268420481024	0.211
Indonesia	75107	76026298368	0.322
Iran(Islamic Republic of)	687	591274048	0.011

Iraq	664	1134294400	0.011
Ireland	21	130708576	0.004
Israel	19	115632400	0.003
Italy	253	709576576	0.005
Coted' Ivoire	6286	3166276608	0.227
Japan	2241	12744630272	0.017
Kazakhstan	369	500155840	0.030
Jordan	7	5173671	0.001
Kenya	25696	9492024320	0.433
Republic of Korea	1868	4249731072	0.042
Kuwait	15	88691256	0.003
Lebanon	53	42765604	0.006
Lesotho	3240	971111488	1.238
Liberia	2948	155286736	0.659
Libya	331	309137984	0.043
Madagascar	10100	1101280640	0.429
Malawi	8515	1064101184	0.509
Malaysia	1156	2851781120	0.042
Mali	1393	253328480	0.088
Mexico	1917	3614629376	0.019
Mongolia	269	689935552	0.067
Morocco	2241	1014653696	0.093
Mozambique	33429	5001287680	0.954
Oman	17	35547644	0.003
Namibia	2407	2173689856	0.920
Nepal	4213	946716480	0.155
Netherlands	32	223000736	0.002
New Zealand	19	76046640	0.005
Nicaragua	155	24720010	0.033
Niger	3333	322292160	0.186
Nigeria	122071	46957289472	0.559
Norway	23	182142000	0.005
Pakistan	33720	11577207808	0.151
Papua New Guinea	3646	1626293248	0.323
Paraguay	239	203406784	0.056
Peru	1996	1783257472	0.094
Philippines	19309	12944444416	0.279
Poland	392	1185418112	0.015
Portugal	170	416880736	0.022
Romania	749	1516137216	0.054
Russian Federation	7763	18415888384	0.074
Rwanda	732	214256528	0.062
Saudi Arabia	613	2132522496	0.017
Senegal	2253	1129942656	0.120
Serbia	45	43023904	0.005
Sierra Leone	2563	803196864	0.314
Singapore	53	265556768	0.012
Vietnam	9961	6472826368	0.124
South Africa	49574	57174233088	0.735
Zimbabwe	3568	4722394112	0.257
Spain	258	991020928	0.006
Sudan	3763	789664896	0.104
Sweden	23	104037344	0.002
Switzerland	32	172275648	0.004
Tajikistan	638	352472704	0.062
Thailand	8362	11553671168	0.167
Togo	224	39007640	0.028

United Arab Emirates	55	341166368	0.006
Tunisia	120	107187936	0.009
Turkey	308	490427744	0.006
Uganda	14779	2452089600	0.367
Ukraine	4415	3585534976	0.124
Egypt	340	173885008	0.004
United Kingdom	243	931239616	0.004
United Republic of Tanzania	30175	7791992320	0.656
United States of America	534	4064555776	0.002
Burkina Faso	1397	397795488	0.081
Uruguay	90	120537392	0.037
Uzbekistan	1538	687767872	0.040
Venezuela(Bolivarian Republic of)	739	68205728	0.036
Yemen	1545	589027776	0.056
Zambia	14017	3460659712	0.759

Table 10: TB Deaths, Life Expectancy Losses (ages 35-40) and Full-Income Losses by Country

In 2030, with annual reduction from 2020 to 2050 allowing SDG TB Target to be met in 2030

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Birth
Afghanistan	1381	126326456	0.073
Algeria	323	232482384	0.021
Angola	2380	1319758592	0.130
Azerbaijan	62	95491792	0.016
Argentina	70	43534828	0.003
Australia	21	258218672	0.003
Austria	10	38298600	0.002
Bangladesh	6461	3039947264	0.099
Belgium	19	112367752	0.005
Bolivia(Pluri-national State of)	150	98417176	0.033
Botswana	189	322114784	0.162
Brazil	705	968506176	0.007
Bulgaria	25	32005244	0.008
Myanmar	3541	1941839488	0.150
Belarus	53	70152368	0.015
Cambodia	376	149313584	0.055
Cameroon	1383	435545728	0.089
Canada	44	455455648	0.005
Central African Republic	828	133162544	0.278
Sri Lanka	91	75780808	0.013
Chad	493	36259636	0.049
Chile	113	311574688	0.019
China	4185	11265853440	0.011
Colombia	157	111213016	0.007
Congo	503	165725456	0.173
Democratic Republic of the Congo	6423	570419264	0.137
Cuba	13	11629510	0.004
Cyprus	0	65417.254	0.000
Czechia	10	48044380	0.004

Benin	130	32711594	0.020
Denmark	9	68848928	0.004
Dominican Republic	68	130621040	0.015
Ecuador	119	105251096	0.021
El Salvador	30	15630646	0.009
Ethiopia	3069	530393536	0.057
Finland	11	75324616	0.005
France	73	592047680	0.004
Germany	69	733076224	0.005
Ghana	1581	920222720	0.096
Greece	4	9153161	0.001
Guatemala	40	18273210	0.006
Guinea	454	96786664	0.066
Haiti	175	25640658	0.034
Honduras	43	20216294	0.011
Hungary	21	50528428	0.003
India	46440	35810799616	0.083
Indonesia	9959	10082187264	0.077
Iran(Islamic Republic of)	93	79414408	0.002
Iraq	94	161107696	0.004
Ireland	5	25085668	0.001
Israel	2	5.71e+05	0.001
Italy	30	84700408	0.000
Coted' Ivoire	823	414062464	0.051
Japan	616	6888200704	0.028
Kazakhstan	84	110021648	0.011
Jordan	0	39328.289	0.000
Kenya	5753	2125747712	0.213
Republic of Korea	442	1173219584	0.021
Kuwait	7	37796692	0.005
Lebanon	10	3604855	0.002
Lesotho	619	186073056	0.467
Liberia	399	20910210	0.152
Libya	70	66215692	0.024
Madagascar	1283	140145024	0.096
Malawi	1183	148153008	0.124
Malaysia	139	343577568	0.011
Mali	171	31355080	0.015
Mexico	285	535835936	0.006
Mongolia	31	80940880	0.021
Morocco	273	124169304	0.015
Mozambique	5746	860175872	0.335
Oman	3	4.06e+06	0.001
Namibia	338	303225568	0.261
Nepal	491	109784208	0.035
Netherlands	16	141292496	0.003
New Zealand	11	58327472	0.008
Nicaragua	46	10052184	0.020
Niger	416	40042980	0.035
Nigeria	15358	5908755456	0.119
Norway	11	128315248	0.005
Pakistan	4492	1542340480	0.041
Papua New Guinea	422	188343504	0.087
Paraguay	32	25039298	0.009
Peru	274	244326160	0.018
Philippines	2649	1776395264	0.045
Poland	94	322331488	0.005

Portugal	40	66240780	0.004
Romania	168	377171520	0.021
Russian Federation	1481	3516303872	0.028
Rwanda	90	26389258	0.015
Saudi Arabia	80	282801824	0.006
Senegal	253	128414144	0.032
Serbia	15	13979704	0.002
Sierra Leone	526	164219744	0.106
Singapore	17	36487076	0.003
Vietnam	1663	1079554304	0.047
South Africa	8788	10133882880	0.279
Zimbabwe	585	773509184	0.074
Spain	69	443584544	0.007
Sudan	725	152043936	0.033
Sweden	5	51913252	0.002
Switzerland	8	61708272	0.002
Tajikistan	79	43486516	0.020
Thailand	1454	2007986176	0.061
Togo	73	12634771	0.016
United Arab Emirates	13	75358688	0.004
Tunisia	13	13170909	0.003
Turkey	60	91012544	0.001
Uganda	2180	361964160	0.095
Ukraine	728	593254912	0.051
Egypt	41	20613866	0.000
United Kingdom	49	314070752	0.002
United Republic of Tanzania	5522	1426105984	0.187
United States of America	117	1612656256	0.001
Burkina Faso	183	52237656	0.017
Uruguay	28	31696920	0.014
Uzbekistan	243	110418840	0.017
Venezuela(Bolivarian Republic of)	91	8.10e+06	0.005
Yemen	238	91051328	0.016
Zambia	1787	440785088	0.183

Table 11: TB Deaths, Life Expectancy Losses (at Birth) and Full-Income Losses by Country

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Age 35-40
Afghanistan	1381	126326456	0.042
Algeria	323	232482384	0.007
Angola	2380	1319758592	0.069
Azerbaijan	62	95491792	0.005
Argentina	70	43534828	0.003
Australia	21	258218672	0.000
Austria	10	38298600	0.001
Bangladesh	6461	3039947264	0.048
Belgium	19	112367752	0.002
Bolivia(Pluri-national State of)	150	98417176	0.015
Botswana	189	322114784	0.087
Brazil	705	968506176	0.006
Bulgaria	25	32005244	0.003
Myanmar	3541	1941839488	0.054
Belarus	53	70152368	0.007

Cambodia	376	149313584	0.021
Cameroon	1383	435545728	0.050
Canada	44	455455648	0.000
Central African Republic	828	133162544	0.182
Sri Lanka	91	75780808	0.005
Chad	493	36259636	0.033
Chile	113	311574688	0.004
China	4185	11265853440	0.003
Colombia	157	111213016	0.005
Congo	503	165725456	0.098
Democratic Republic of the Congo	6423	570419264	0.092
Cuba	13	11629510	0.001
Cyprus	0	65417.254	0.000
Czechia	10	48044380	0.000
Benin	130	32711594	0.013
Denmark	9	68848928	0.001
Dominican Republic	68	130621040	0.011
Ecuador	119	105251096	0.007
El Salvador	30	15630646	0.003
Ethiopia	3069	530393536	0.026
Finland	11	75324616	0.002
France	73	592047680	0.001
Germany	69	733076224	0.000
Ghana	1581	920222720	0.050
Greece	4	9153161	0.000
Guatemala	40	18273210	0.005
Guinea	454	96786664	0.037
Haiti	175	25640658	0.013
Honduras	43	20216294	0.006
Hungary	21	50528428	0.002
India	46440	35810799616	0.028
Indonesia	9959	10082187264	0.043
Iran(Islamic Republic of)	93	79414408	0.002
Iraq	94	161107696	0.002
Ireland	5	25085668	0.000
Israel	2	5.71e+05	0.001
Italy	30	84700408	0.001
Coted' Ivoire	823	414062464	0.029
Japan	616	6888200704	0.002
Kazakhstan	84	110021648	0.007
Jordan	0	39328.289	0.000
Kenya	5753	2125747712	0.096
Republic of Korea	442	1173219584	0.006
Kuwait	7	37796692	0.000
Lebanon	10	3604855	0.000
Lesotho	619	186073056	0.230
Liberia	399	20910210	0.088
Libya	70	66215692	0.009
Madagascar	1283	140145024	0.054
Malawi	1183	148153008	0.070
Malaysia	139	343577568	0.005
Mali	171	31355080	0.011
Mexico	285	535835936	0.003
Mongolia	31	80940880	0.008
Morocco	273	124169304	0.011
Mozambique	5746	860175872	0.161
Oman	3	4.06e+06	0.000

Namibia	338	303225568	0.127
Nepal	491	109784208	0.018
Netherlands	16	141292496	0.001
New Zealand	11	58327472	0.003
Nicaragua	46	10052184	0.005
Niger	416	40042980	0.023
Nigeria	15358	5908755456	0.070
Norway	11	128315248	0.002
Pakistan	4492	1542340480	0.020
Papua New Guinea	422	188343504	0.037
Paraguay	32	25039298	0.008
Peru	274	244326160	0.013
Philippines	2649	1776395264	0.038
Poland	94	322331488	0.002
Portugal	40	66240780	0.003
Romania	168	377171520	0.008
Russian Federation	1481	3516303872	0.014
Rwanda	90	26389258	0.008
Saudi Arabia	80	282801824	0.002
Senegal	253	128414144	0.013
Serbia	15	13979704	0.001
Sierra Leone	526	164219744	0.064
Singapore	17	36487076	0.002
Vietnam	1663	1079554304	0.020
South Africa	8788	10133882880	0.128
Zimbabwe	585	773509184	0.042
Spain	69	443584544	0.000
Sudan	725	152043936	0.020
Sweden	5	51913252	0.000
Switzerland	8	61708272	0.000
Tajikistan	79	43486516	0.008
Thailand	1454	2007986176	0.029
Togo	73	12634771	0.009
United Arab Emirates	13	75358688	0.000
Tunisia	13	13170909	0.001
Turkey	60	91012544	0.001
Uganda	2180	361964160	0.054
Ukraine	728	593254912	0.020
Egypt	41	20613866	0.000
United Kingdom	49	314070752	0.001
United Republic of Tanzania	5522	1426105984	0.119
United States of America	117	1612656256	0.000
Burkina Faso	183	52237656	0.011
Uruguay	28	31696920	0.007
Uzbekistan	243	110418840	0.006
Venezuela(Bolivarian Republic of)	91	8.10e+06	0.005
Yemen	238	91051328	0.009
Zambia	1787	440785088	0.096

Table 12: TB Deaths, Life Expectancy Losses (ages 35-40) and Full-Income Losses by Country

In 2030, with annual reduction from 2020 to 2050 allowing SDG TB Target to be met in 2045

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Birth
Afghanistan	4358	398851520	0.228
Algeria	1035	741237248	0.068
Angola	7529	4170827520	0.412
Azerbaijan	184	290802592	0.049
Argentina	229	139440560	0.010
Australia	33	332488992	0.004
Austria	22	100375072	0.004
Bangladesh	20430	9610421248	0.314
Belgium	29	150026576	0.006
Bolivia(Pluri-national State of)	468	309229728	0.103
Botswana	593	1009244608	0.510
Brazil	2237	3057523200	0.022
Bulgaria	47	64843712	0.014
Myanmar	11195	6140255744	0.478
Belarus	177	226324944	0.047
Cambodia	1181	469516832	0.173
Cameroon	4381	1377617024	0.286
Canada	70	561761984	0.007
Central African Republic	2631	422418240	0.893
Sri Lanka	287	234651056	0.041
Chad	1569	115004344	0.156
Chile	213	471586880	0.029
China	13236	35577634816	0.035
Colombia	501	349770208	0.022
Congo	1593	523070336	0.550
Democratic Republic of the Congo	20317	1803957120	0.435
Cuba	25	18741464	0.006
Cyprus	0	65417.254	0.000
Czechia	26	78859648	0.005
Benin	407	103055944	0.064
Denmark	17	106539128	0.005
Dominican Republic	211	403922624	0.045
Ecuador	277	189178912	0.042
El Salvador	54	26116242	0.017
Ethiopia	9709	1677915776	0.179
Finland	17	91546096	0.006
France	171	904695232	0.006
Germany	137	1025305472	0.006
Ghana	4998	2908342784	0.304
Greece	14	33359724	0.003
Guatemala	119	59322396	0.017
Guinea	1435	305518752	0.207
Haiti	562	81614496	0.109
Honduras	130	61687344	0.034
Hungary	43	118502792	0.008
India	146861	113232142336	0.261
Indonesia	31499	31887190016	0.243
Iran(Islamic Republic of)	288	246252384	0.007
Iraq	307	521245632	0.016
Ireland	13	74304704	0.003
Israel	6	35284840	0.003
Italy	102	275593120	0.002
Coted' Ivoire	2597	1308755072	0.161
Japan	1192	8971064320	0.033

Kazakhstan	263	355381728	0.032
Jordan	0	39328.289	0.000
Kenya	18200	6723238912	0.678
Republic of Korea	960	2299940096	0.035
Kuwait	9	50494608	0.006
Lebanon	24	16073092	0.008
Lesotho	1958	587223232	1.499
Liberia	1253	65877224	0.481
Libya	226	208368560	0.078
Madagascar	4068	443728480	0.307
Malawi	3740	467525376	0.393
Malaysia	433	1072718336	0.032
Mali	562	101771928	0.052
Mexico	896	1692761856	0.019
Mongolia	105	269871968	0.072
Morocco	868	393874080	0.047
Mozambique	18170	2718620160	1.066
Oman	7	13730450	0.003
Namibia	1063	960515072	0.828
Nepal	1546	347102752	0.112
Netherlands	26	204124576	0.004
New Zealand	11	58327472	0.008
Nicaragua	91	16314426	0.036
Niger	1312	126782512	0.110
Nigeria	48565	18683592704	0.375
Norway	17	155195456	0.007
Pakistan	14207	4877473280	0.131
Papua New Guinea	1344	599227200	0.278
Paraguay	92	78356568	0.027
Peru	859	766413440	0.058
Philippines	8382	5619389440	0.142
Poland	216	675482816	0.011
Portugal	90	202070864	0.012
Romania	399	831785280	0.043
Russian Federation	4689	11132699648	0.090
Rwanda	295	86981096	0.050
Saudi Arabia	263	911356288	0.018
Senegal	817	408342528	0.101
Serbia	27	27934684	0.004
Sierra Leone	1656	519037888	0.336
Singapore	29	118118912	0.007
Vietnam	5254	3413079552	0.151
South Africa	27785	32044341248	0.889
Zimbabwe	1841	2438426624	0.235
Spain	133	630256640	0.009
Sudan	2293	481291040	0.104
Sweden	11	69283368	0.003
Switzerland	14	80167032	0.003
Tajikistan	252	141160528	0.061
Thailand	4595	6350799360	0.190
Togo	220	38322368	0.048
United Arab Emirates	29	151624048	0.009
Tunisia	50	43778592	0.012
Turkey	187	301982688	0.004
Uganda	6901	1144778880	0.301
Ukraine	2311	1876305792	0.162
Egypt	128	67086728	0.002

Country Name			
United Kingdom	123	539716416	0.004
United Republic of Tanzania	17464	4509158400	0.594
United States of America	239	2326000896	0.002
Burkina Faso	593	169002224	0.055
Uruguay	48	64426336	0.027
Uzbekistan	775	346806336	0.054
Venezuela(Bolivarian Republic of)	284	26324796	0.017
Yemen	747	284210272	0.050
Zambia	5650	1394691200	0.583

Table 13: TB Deaths, Life Expectancy Losses (at Birth) and Full-Income Losses by Country

Country Name	TB Deaths	Full-Income Losses (2018 US$)	Life Expectancy Reduction at Age 35-40
Afghanistan	4358	398851520	0.131
Algeria	1035	741237248	0.025
Angola	7529	4170827520	0.219
Azerbaijan	184	290802592	0.014
Argentina	229	139440560	0.008
Australia	33	332488992	0.000
Austria	22	100375072	0.003
Bangladesh	20430	9610421248	0.151
Belgium	29	150026576	0.003
Bolivia(Pluri-national State of)	468	309229728	0.045
Botswana	593	1009244608	0.271
Brazil	2237	3057523200	0.018
Bulgaria	47	64843712	0.008
Myanmar	11195	6140255744	0.172
Belarus	177	226324944	0.025
Cambodia	1181	469516832	0.067
Cameroon	4381	1377617024	0.159
Canada	70	561761984	0.001
Central African Republic	2631	422418240	0.585
Sri Lanka	287	234651056	0.017
Chad	1569	115004344	0.107
Chile	213	471586880	0.013
China	13236	35577634816	0.009
Colombia	501	349770208	0.017
Congo	1593	523070336	0.313
Democratic Republic of the Congo	20317	1803957120	0.292
Cuba	25	18741464	0.003
Cyprus	0	65417.254	0.000
Czechia	26	78859648	0.002
Benin	407	103055944	0.040
Denmark	17	106539128	0.003
Dominican Republic	211	403922624	0.037
Ecuador	277	189178912	0.023
El Salvador	54	26116242	0.009
Ethiopia	9709	1677915776	0.082
Finland	17	91546096	0.003
France	171	904695232	0.003
Germany	137	1025305472	0.001

Ghana	4998	2908342784	0.158
Greece	14	33359724	0.002
Guatemala	119	59322396	0.012
Guinea	1435	305518752	0.117
Haiti	562	81614496	0.042
Honduras	130	61687344	0.018
Hungary	43	118502792	0.005
India	146861	113232142336	0.089
Indonesia	31499	31887190016	0.135
Iran(Islamic Republic of)	288	246252384	0.005
Iraq	307	521245632	0.005
Ireland	13	74304704	0.002
Israel	6	35284840	0.001
Italy	102	275593120	0.002
Coted' Ivoire	2597	1308755072	0.093
Japan	1192	8971064320	0.007
Kazakhstan	263	355381728	0.021
Jordan	0	39328.289	0.000
Kenya	18200	6723238912	0.306
Republic of Korea	960	2299940096	0.019
Kuwait	9	50494608	0.002
Lebanon	24	16073092	0.002
Lesotho	1958	587223232	0.739
Liberia	1253	65877224	0.278
Libya	226	208368560	0.030
Madagascar	4068	443728480	0.172
Malawi	3740	467525376	0.222
Malaysia	433	1072718336	0.016
Mali	562	101771928	0.035
Mexico	896	1692761856	0.009
Mongolia	105	269871968	0.026
Morocco	868	393874080	0.036
Mozambique	18170	2718620160	0.513
Oman	7	13730450	0.000
Namibia	1063	960515072	0.402
Nepal	1546	347102752	0.056
Netherlands	26	204124576	0.002
New Zealand	11	58327472	0.003
Nicaragua	91	16314426	0.016
Niger	1312	126782512	0.073
Nigeria	48565	18683592704	0.221
Norway	17	155195456	0.004
Pakistan	14207	4877473280	0.063
Papua New Guinea	1344	599227200	0.119
Paraguay	92	78356568	0.022
Peru	859	766413440	0.040
Philippines	8382	5619389440	0.120
Poland	216	675482816	0.007
Portugal	90	202070864	0.011
Romania	399	831785280	0.026
Russian Federation	4689	11132699648	0.045
Rwanda	295	86981096	0.025
Saudi Arabia	263	911356288	0.008
Senegal	817	408342528	0.044
Serbia	27	27934684	0.003
Sierra Leone	1656	519037888	0.202
Singapore	29	118118912	0.006

Vietnam	5254	3413079552	0.065
South Africa	27785	32044341248	0.409
Zimbabwe	1841	2438426624	0.133
Spain	133	630256640	0.002
Sudan	2293	481291040	0.063
Sweden	11	69283368	0.000
Switzerland	14	80167032	0.001
Tajikistan	252	141160528	0.024
Thailand	4595	6350799360	0.092
Togo	220	38322368	0.027
United Arab Emirates	29	151624048	0.004
Tunisia	50	43778592	0.003
Turkey	187	301982688	0.003
Uganda	6901	1144778880	0.171
Ukraine	2311	1876305792	0.065
Egypt	128	67086728	0.002
United Kingdom	123	539716416	0.002
United Republic of Tanzania	17464	4509158400	0.377
United States of America	239	2326000896	0.000
Burkina Faso	593	169002224	0.035
Uruguay	48	64426336	0.016
Uzbekistan	775	346806336	0.020
Venezuela(Bolivarian Republic of)	284	26324796	0.014
Yemen	747	284210272	0.027
Zambia	5650	1394691200	0.303

Table 14: TB Deaths, Life Expectancy Losses (ages 35-40) and Full-Income Losses by Country

Section 2.0: Data - The Cost of Inaction in terms of TB deaths and economic losses excluding people living with HIV (by World Bank Region, 2018).
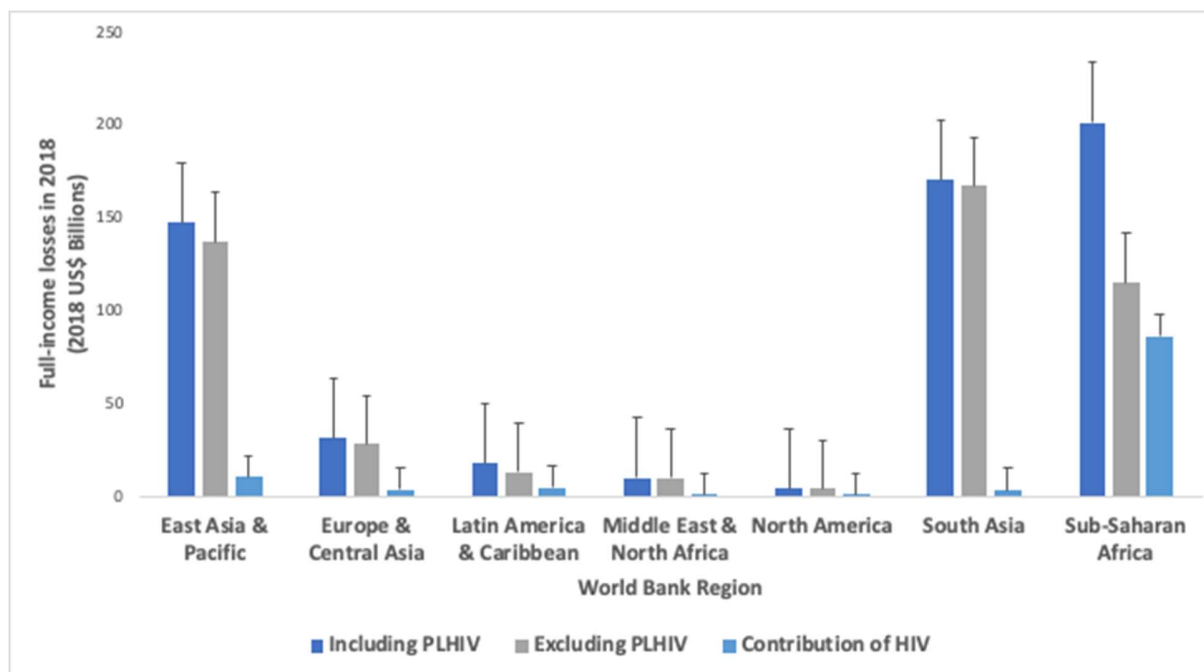

Figure 1: Economic losses in 2018: By World Bank region and by TB deaths, in people living with without and without HIV (in 2018 US$ billions). Error bars represent 95% confidence intervals.

Section 2.1: Data - The Cost of Inaction in terms of TB deaths and economic losses excluding people living with HIV (by World Bank Region, from 2020-2050).

Scenario	East Asia & Pacific (Range)	Europe & Central Asia (Range)	Latin America Caribbean (Range)	Middle East & North Africa (Range)	South Asia (Range)	Sub-Saharan Africa (Range)	Economic Losses (Range)	TB Deaths (Range)
Business as usual (including PLHIV)	$5,110	$763	$351	$172	$7,120	$3,840	$17,456	31.,8 million
	($4,530-5,750)	($706-871)	($303-402)	($126-223)	($6,470-7,850)	($2,690-5,190)	($14,921-20,389)	(25.2 mil-39.5 mil)
Business as usual (excluding PLHIV)	$4,740	$675	$259	$167	$6,990	$2,160	$15,055	26,400,000
Target met in 2030 (including PLHIV)	$1,250	$253	$93	$43	$1,540	$1,110	$4,337	8 million
	($1,110-1,400)	($239-268)	($82-104)	($32-57)	($1,400-1,690)	($779-1,510)	($3,689-5,077)	(6.3mil-10.1 mil)
Target met in 2030 (excluding PLHIV)	$1,140	$225	$71	$42	$1,480	$514	$3,490	6,166,545
Savings from meeting target in 2030 (including PLHIV)	$3,860	$510	$258	$129	$5,580	$2,730	$13,119	23.8 million
	($3,420-4,350)	($467-603)	($220-298)	($94-166)	($5,070-6,160)	($1,911-3,680)	($11,232-15,311)	($18.9 mil-29.5 mil)
Savings from meeting target in 2030 (excluding PLHIV)	$3,600	$450	$189	$125	$5,510	$1,646	$11,566	20,233,455
Business as usual (including PLHIV)	$5,110	$763	$351	$172	$7,120	$3,840	$17,456	31,800,000
	($4,530-5,750)	($706-871)	($303-402)	($126-223)	($6,470-7,850)	($2,690-5,190)	($14,921-20,389)	(25.2 mil-39.5 mil)
Business as usual (excluding PLHIV)	$4,740	$675	$259	$167	$6,990	$2,160	$15,055	26,400,000
Target met in 2045 (including PLHIV)	$2,080	$422	$162	$76	$2,600	$1,900	$7,299	13.7 million
	($1,840-2,340)	($396-450)	($143-183)	($57-101)	($2,370-2,860)	($1,330-2,590)	($6,192-8,583)	(10.8 mil-17.2 mil)

Target met in 2045 (excluding PLHIV)	$1,900	$379	$123	$75	$2,500	$877	$5,881	10,600,000
Savings from meeting target in 2045 (including PLHIV)	$3,030	$341	$189	$96	$4,520	$1,940	$10,157	18.1 million
	($2,690-3,410)	($310-421)	($160-219)	($69-122)	($4,100-4,990)	($1,360-2,600)	($8,729-11,805)	(14.3 mil-22.4 mil)
Savings from meeting target in 2045 (excluding PLHIV)	$2,840	$296	$136	$92	$4,490	$1,283	$9,174	15,800,000
Cost of Inaction								
Cost of inaction (including PLHIV)	$830	$169	$69	$34	$1,060	$790	$2,962	5.7 million
	($730-940)	($157-182)	($61-79)	($25-44)	($970-1,170)	($551-1,080)	($2,503-3,506)	(5.1 mil-8.1 mil)
Cost of inaction (excluding PLHIV)	$760	$154	$53	$33	$1,020	$363	$2,391	4,433,455
PLHIV contribution	$70	$15	$17	$1	$40	$427	$571	1,263,880
PLHIV contribution (%)	8.43%	8.88%	24.13%	1.49%	3.77%	54.05%	19.27%	22.18%

Table 15: The Cost of Inaction in terms of TB deaths and economic losses (by World Bank Region, from 2020-2050): Cost of Inaction computed as the difference in TB deaths and economic losses between the scenario of meeting the End TB target in 2030 versus 2045.

Section 2.2: Data - Excess full-Income losses due to COVID-19-related disruptions.

Scenario	*East Asia & Pacific*	*Europe & Central Asia*	*Latin America & Caribbean*	*Middle East & North Africa*	*South Asia*	*Sub-Saharan Africa*	*Economic Losses*
Business as usual (excluding COVID impacts)	5,110	763	351	172	7,120	3,840	17,456
Business as usual (including COVID impacts)	5,380	793	367	178	7,490	4,160	18,470
Business as usual (COVID excess)	270	30	16	6	370	320	1,014

Target met in 2030 (excluding COVID impacts)	1,250	253	93	43	1,540	1,110	4,337
Target met in 2030 (including COVID impacts)	1,370	269	100	46	1,690	1,260	4,784
Target met in 2030 (COVID excess)	120	16	7	3	150	150	447
Savings from meeting target in 2030 (excluding COVID)	3,860	510	258	129	5,580	2,730	13,119
Savings from meeting target in 2030 (including COVID)	4,010	524	267	132	5,800	2,900	13,686
Increase in savings due to COVID	150	14	9	3	220	170	567
Business as usual (excluding COVID impacts)	5,110	763	351	172	7,120	3,840	17,456
Business as usual (including COVID impacts)	5,380	793	367	178	7,490	4,160	18,470
Target met in 2045 (excluding COVID impacts)	2,080	422	162	76	2,600	1,900	7,299
Target met in 2045 (including COVID impacts)	2,270	450	174	81	2,850	2,150	8,035
Target met in 2045 (COVID excess)	190	28	12	5	250	250	737
Savings from meeting target in 2045 (excluding COVID)	3,030	341	189	96	4,520	1,940	10,158
Savings from meeting target in 2045 (including COVID)	3,110	343	193	97	4,640	2,010	10,435
Cost of Inaction							
Cost of inaction (excluding COVID)	830	169	69	33	1,060	790	2,961
Cost of inaction (including COVID)	900	181	74	35	1,160	890	3,251
Cost of inaction due to COVID	$70	$12	$5	$2	$100	$100	$290

Table 16: Excess full-Income losses due to COVID-19-related disruptions in 120 countries from 2020-2050 (in 2018 US$ billions).

Losses reported from the perspective of 2020 assuming a discount rate of 3% and an income elasticity of 1.0 (for estimating VSL values using benefits transfer).

Section 2.3: Sensitivity Analysis

Sensitivity to uncertainty in TB deaths – Full-income by upper and lower bounds of TB deaths (2020-2050)

Scenario	TB Deaths	*Full-Income Losses						
		Full-Income - East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	South Asia	Sub-Saharan Africa	Economic Losses
Business as usual (including PLHIV)	31,800,000	$5,110	$763	$351	$172	$7,120	$3,840	$17,456
	(25153447-39544354)	($4530-5750)	($706-871)	($303-402)	($126-223)	($6470-7850)	($2690-5190)	($14921.2-20389)
Target met in 2030 (including PLHIV)	8,002,665	$1,250	$253	$93	$43	$1,540	$1,110	$4,337
	(6277341-10059515)	($1110-1400)	($239-268)	($82.3-104)	($31.8-56.9)	($1400-1690)	($779-1510)	($3689.1-5077.5)
Savings from meeting target in 2030 (including PLHIV)	23,797,335	$3,860	$510	$258	$129	$5,580	$2,730	$13,119
		($3420-4350)	($467-603)	($220.7-298)	($94.2-166.1)	($5070-6160)	($1911-3680)	($11232.1-15311.5)
Business as usual (including PLHIV)	31,800,000	$5,110	$763	$351	$172	$7,120	$3,840	$17,456
	(25153447-39544354)	($4530-5750)	($706-871)	($303-402)	($126-223)	($6470-7850)	($2690-5190)	($14921.2-20389)
Target met in 2045 (including PLHIV)	13,700,000	$2,080	$422	$162	$76	$2,600	$1,900	$7,298
	(10814324-17174148)	($1840-2340)	($396-450)	($143-183)	($56.6-101)	($2370-2860)	($1330-2590)	($6192.2-8583.4)
Savings from meeting target in 2045 (including PLHIV)	18,100,000	$3,030	$341	$189	$96	$4,520	$1,940	$10,158
	(14339123-22370206)	($2690-3410)	($310-421)	($160-219)	($69.4-122)	($4100-4990)	($1360-2600)	($8729-11805.6)
Cost of Inaction								
Cost of inaction (including PLHIV)	5,697,335	$830	$169	$69	$34	$1,060	$790	$2,962
	(7114633-8061782)	($730-940)	($157-182)	($60.7-79)	($24.8-44.1)	($970-1170)	($551-1080)	($2503.1-3505.9)

Table 17: Sensitivity of full-income to uncertainty in TB deaths - 2020-2050 by WHO Region

Sensitivity to choice of discount rate, US VSL and income elasticity – Global Estimate (2020-2050).
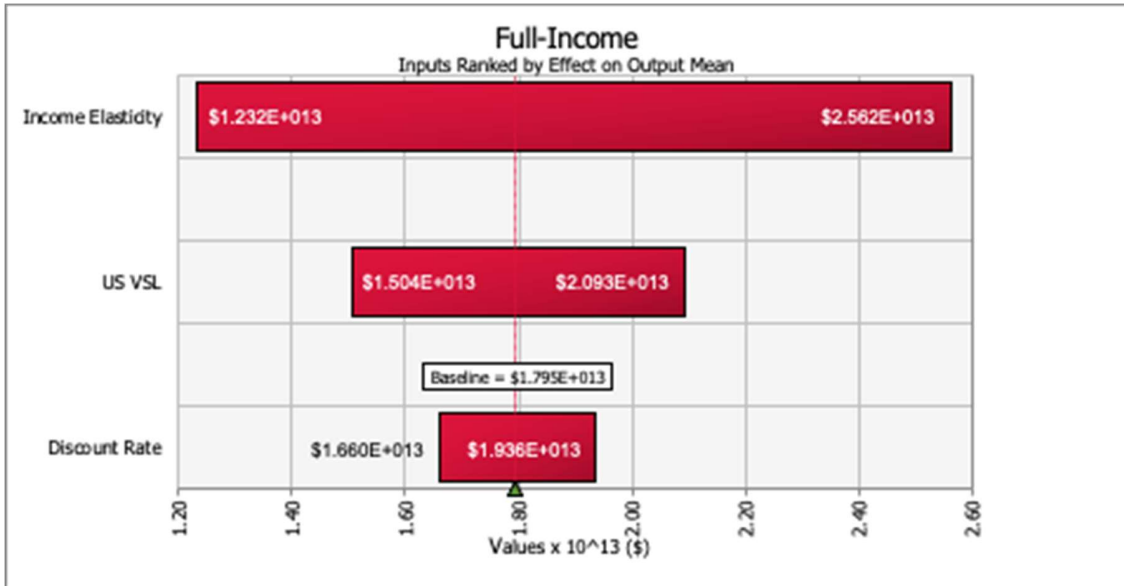
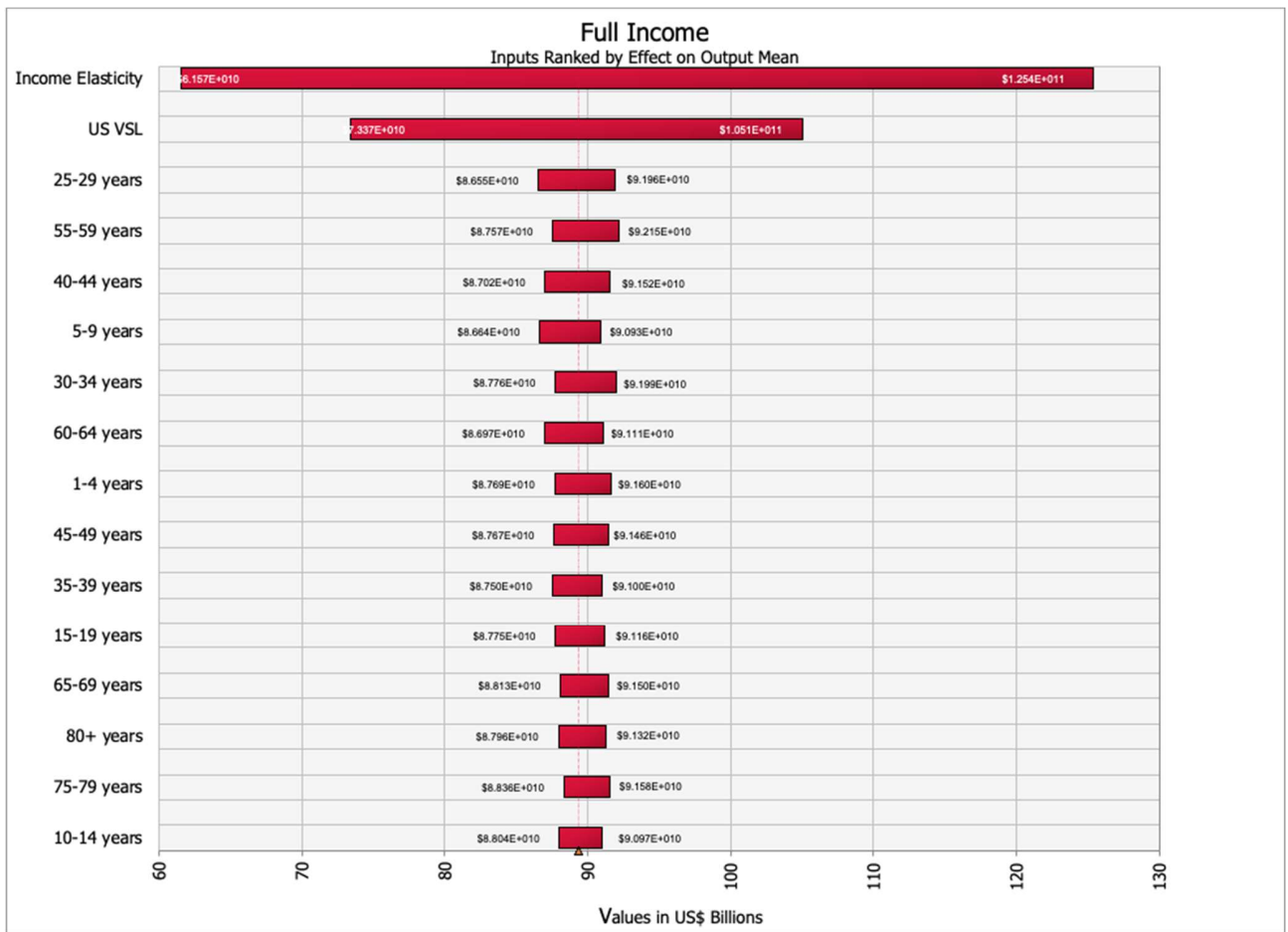*Figure 2: Tornado Plot - Sensitivity of full-income to income elasticity, US VSL and discount rate (2020-2050).*
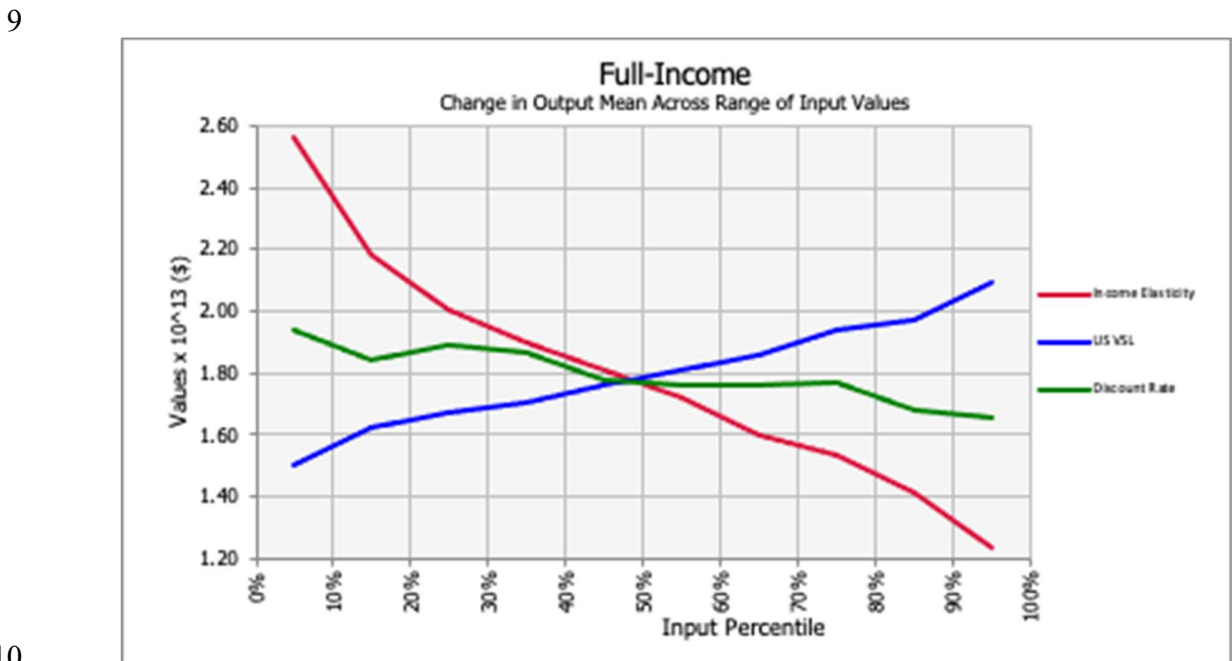
Figure 3: Spider Diagram - Sensitivity of full-income to income elasticity, US VSL and discount rate (2020-2050).

Rank	Name	Range of Mean
1	Income Elasticity	US$ 13,300,486,135,291
2	US VSL	US$5,882,734,408,126
3	Discount Rate	US$2,764,080,697,018

Table 18: Sensitivity of full-income to economic parameters – Range of mean (2020-2050)

Sensitivity to uncertainty in TB deaths at each age, discount rate, VSL and income elasticity – South Africa (2020)

Figure 4: Tornado Plot - Sensitivity of full-income to TB deaths by age interval, income elasticity, US VSL and discount rate - South Africa (2020). All age interval indicated.

27
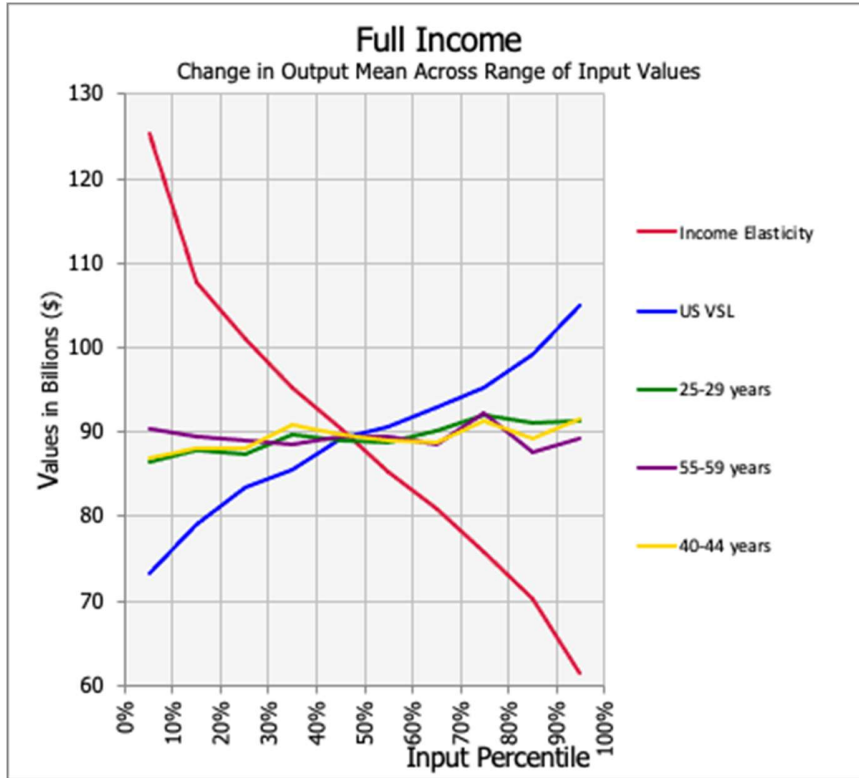
Figure 5: Spider Diagram - Sensitivity of full-income to TB deaths by age interval, income elasticity, US VSL and discount rate - South Africa (2020). The three age intervals with sensitivity of full-income to TB deaths are included.

31

Rank	Parameter	Range of Mean
1	Income Elasticity	$63,832,071,969
2	US VSL	$31,703,323,404
3	Uncertainty in TB deaths (25-29 years	$5,417,339,337
4	Uncertainty in TB deaths (55-59 years	$4,577,662,766
5	Uncertainty in TB deaths (40-44 years	$4,499,580,691
6	Uncertainty in TB deaths (5-9 years	$4,293,378,405
7	Uncertainty in TB deaths (30-34 years	$4,228,281,517
8	Uncertainty in TB deaths (60-64 years	$4,146,416,462
9	Uncertainty in TB deaths (1-4 years	$3,910,822,988

10	*Uncertainty in TB deaths (45-49 years*	*$3,796,497,901*
11	*Uncertainty in TB deaths (35-39 years*	*$3,502,032,164*
12	*Uncertainty in TB deaths (15-19 years*	*$3,410,294,689*
13	*Uncertainty in TB deaths (65-69 years*	*$3,368,633,016*
14	*Uncertainty in TB deaths (80+ years*	*$3,361,659,177*
15	*Uncertainty in TB deaths (75-79 years*	*$3,220,783,408*
16	*Uncertainty in TB deaths (10-14 years*	*$2,929,499,108*

Table 19: Sensitivity of mean of full-income to economic parameters and uncertainty in TB Deaths – By range of mean (South Africa, 2020-2050)

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55