

**S1 Table. Model parameters, ranges, and references.** Rates are in units of year<sup>-1</sup> unless

otherwise noted. \*HIV+ individuals on ART have the effect of HIV on the natural history of TB reduced by the effectiveness of ART (parameter *treat*).

Parameter	Symbol	TB Disease Status	HIV–	HIV+ (No ART)	HIV+ (ART)	Reference
Annual population growth rate	$g$		0.0572 (0.02–0.06)	NA	NA	Fitted to [1,2]
Annual mortality rate	$\mu$	Baseline (no TB)	0.003 (0.0009–0.004)	0.0155 (0.004–0.13, CD4+ >350), 0.339 (0.21–0.64, CD4+ ≤350)	0.0155 (0.004–0.13, CD4+ >350), 0.122 (0.004–0.13, CD4+ ≤350)	Fitted to [1,2], ranges adapted from [3-8]
	$\mu_{TB}$	Active TB	0.30 (0.2–0.4)	0.992 (0.75–1)	0.508 (0.2–0.76)	Fitted to [1,2], ranges adapted from [3]
TB transmissibility coefficient	$\beta_{TB}$		$9.52 \times 10^{-5}$	$9.52 \times 10^{-5}$	$9.52 \times 10^{-5}$	Fitted to [1,2]
Relative fitness penalty drug resistance TB (proportion)	$fit_2$	MDR	0.12 (0–0.7)	0.12 (0–0.7)	0.12 (0–0.7)	[3,9]
	$fit_3$	XDR	0.16 (0–0.7)	0.16 (–0.7)	0.16 (0–0.7)	[3,9]
Proportion who develop primary progressive TB	$p$		0.14 (0.08–0.25)	0.67 (0.36–0.8)	*	[3,10]
Endogenous annual TB reactivation rate	$\nu$	Long latency	0.00011 (0.0001–0.0003)	0.17 (0.04–0.2)	*	[3,10]
	$\tau$	Short latency	0.88 (0.76–0.99)	12 (10.4–13.5)	*	[3,10]
Degree susceptibility despite prior TB infection (proportion)	$x_{TB}$		0.35 (0.1–0.6)	0.75 (0.5–1)	*	[3]
Proportion of TB infections that are infectious	$f$		0.65 (0.5–0.65)	0.3 (0.19–0.4)	*	[3]
Rate of conversion from non-infectious to infectious TB	$w$		0.015 (0.007–0.02)	0.015 (0.007–0.02)	0.015 (0.007–0.02)	[3,11]
Rate of natural self cure	$\zeta$		0.2 (0.15–0.25)	0.2 (0.15–0.25)	0.2 (0.15–0.25)	[3]
Baseline TB detection and treatment	$\delta$		1.0299 (0.8415–1.1137)	1.0299 (0.8415–1.1137)	1.0299 (0.8415–1.1137)	Fitted to [1,2]
Proportion cured by 1 <sup>st</sup> line TB drugs	$q_{11}$	DS	0.73 (0.65–0.88)	0.58 (0.52–0.74)	*	[3,9]
	$q_{12}$	MDR	0.47 (0.18–0.58)	0.30 (0.16–0.36)	*	[3,9,12,13]
	$q_{13}$	XDR	0	0	0	[3,9,12,13]
Proportion cured by 2 <sup>nd</sup> line TB drugs	$q_{22}$	MDR	0.67 (0.43–0.80)	0.45 (0.43–0.51)	*	[3,9,12-14]
	$q_{33}$	XDR	0.54 (0.328–0.545)	0.36 (0.328–0.400)	*	[3,12,15]
Duration TB treatment (months)	$\frac{1}{\rho_1}$	DS	6 (6–8)	6 (6–8)	6 (6–8)	[16]
	$\frac{1}{\rho_2}$	MDR	24 (18–24)	24 (18–24)	24 (18–24)	[17]
	$\frac{1}{\rho_3}$	XDR	26 (24.6–27.8)	26 (24.6–27.8)	26 (24.6–27.8)	[10]
Proportion defaulting from TB treatment	$d_{TB1}$	DS	0.07 (0.048–0.088)	0.07 (0.048–0.088)	0.07 (0.048–0.088)	[18]
	$d_{TB2}$	MDR	0.2 (0.19–0.37)	0.2 (0.19–0.37)	0.2 (0.19–0.37)	[19-21]
	$d_{TB3}$	XDR	0.28 (0.19–0.37)	0.28 (0.19–0.37)	0.28 (0.19–0.37)	[17,19,22]

Proportion of treated TB patients who acquire or amplify resistance	$\omega_1$	<i>DS to MDR</i>	0.038 (0.025–0.1)	0.038 (0.025–0.1)	0.038 (0.025–0.1)	[3]
	$\omega_2$	<i>MDR to XDR</i>	0.030 (0.025–0.1)	0.030 (0.025–0.1)	0.030 (0.025–0.1)	[3]
Time to identification of TB treatment failure (months)	$\frac{1}{\kappa}$		2 (1–4)	2 (1–4)	2 (1–4)	[10]
Time from culture collection to MDR treatment initiation (days)	$\frac{1}{\sigma_{DR}}$	<i>Baseline</i>	93 (71–120)	93 (71–120)	93 (71–120)	[23]
	$\frac{1}{\sigma_{DS}}$	<i>Decentralized</i>	72 (56–99)	72 (56–99)	72 (56–99)	[23]
Proportion of cases defaulting before TB treatment initiation	$\phi_{TB}$	<i>DS outpatient (DOTS)</i>	0.15 (0–0.24)	0.15 (0–0.24)	0.15 (0–0.24)	[24]
		<i>MDR inpatient (baseline)</i>	0.5 (0.29–0.73)	0.5 (0.29–0.73)	0.5 (0.29–0.73)	[17]
		<i>XDR inpatient</i>	0.5 (0.29–0.73)	0.5 (0.29–0.73)	0.5 (0.29–0.73)	[17]
HIV transmissibility coefficient	$\beta_{HIV}$		NA	$1.63 \times 10^{-6}$	$1.63 \times 10^{-6}$	Fitted to [1,2]
$\alpha$ (HIV transmission shape parameter)	$\alpha$		NA	4.55 (1–6)	4.55 (1–6)	Fitted to [1,2]
Relative infectivity of HIV on ART (proportion)	$x_{HIV}$		NA	NA	0.12 (0–0.12)	[25]
Relative infectivity of ART eligible	$\nu_l$		NA	6.87 (1.00–3.33)	NA	Fitted to [1,2], Range from [26]
ART coverage (CD4+ < 350)	$\eta$		NA	50% (46–57%)	NA	[27]
Proportion of cases detected defaulting before HIV treatment initiation	$\phi_{HIV}$		NA	0.38 (0.16–0.61)	NA	[28,29]
Proportion retained in HIV treatment over 3 years	$d_{HIV}$		NA	NA	0.75 (0.64–0.87)	[30]
Rate of relapse from chemotherapeutic cure	$\nu$		0.001 (0–0.01)	0.001 (0–0.01)	0.001 (0–0.01)	[3]
Duration of HIV infection, CD4+ cell count >350 (years)	$\frac{1}{\gamma}$		NA	6 (5–7); 3 (2–4, active TB infx)	NA	[5–8]
Sensitivity of TB symptom screening	$sx$		69% (51.9–83.7%)	79% (58.3–90.9%)	79% (58.3–90.9%)	[31,32]
Sensitivity of TB sputum smear	$sm_i$	<i>Infectious</i>	83.3% (80–83.3%)	83.3% (80–83.3%)	83.3% (80–83.3%)	[3,33,34]
	$sm_n$	<i>Noninfectious</i>	0%	0%	0%	[3,33,34]
Sensitivity of TB sputum culture/DST	$c_i$	<i>Infectious</i>	100%	100%	100%	[4]
	$c_n$	<i>Noninfectious</i>	68%	68%	68%	[4]
Sensitivity of Xpert MTB/RIF for TB diagnosis	$sm_{XPTi}$	<i>Infectious</i>	98.3% (97–99%)	98.3% (97–99%)	98.3% (97–99%)	[35]
	$sm_{XPTn}$	<i>Noninfectious</i>	76.9% (72.4–80.8%)	76.9% (72.4–80.8%)	76.9% (72.4–80.8%)	[35]
Sensitivity of Xpert MTB/RIF for RIF resistance detection given MTB detected	$xpt$		94.4% (90.8–98.6%)	94.4% (90.8–98.6%)	94.4% (90.8–98.6%)	[35]
Sensitivity of rapid HIV antibody test	$r$		NA	100% (98.2–100%)	NA	[36]
Bacteriologic coverage rate	$rtx$		80% (73–94%)	80% (73–94%)	80% (73–94%)	[37]
Percentage of HIV+ individuals who are TST+	$tst$		NA	70% (64.3–74.5%)	70% (64.3–74.5%)	[38]
Effectiveness of ART in reversing effect of HIV on TB natural history	$treat$		NA	NA	0.7 (0.47–0.87)	[39–41]