FlexDx: Xpert Scale-Up
A user-friendly, open source transmission model of TB

http://flexdx2.modeltb.org
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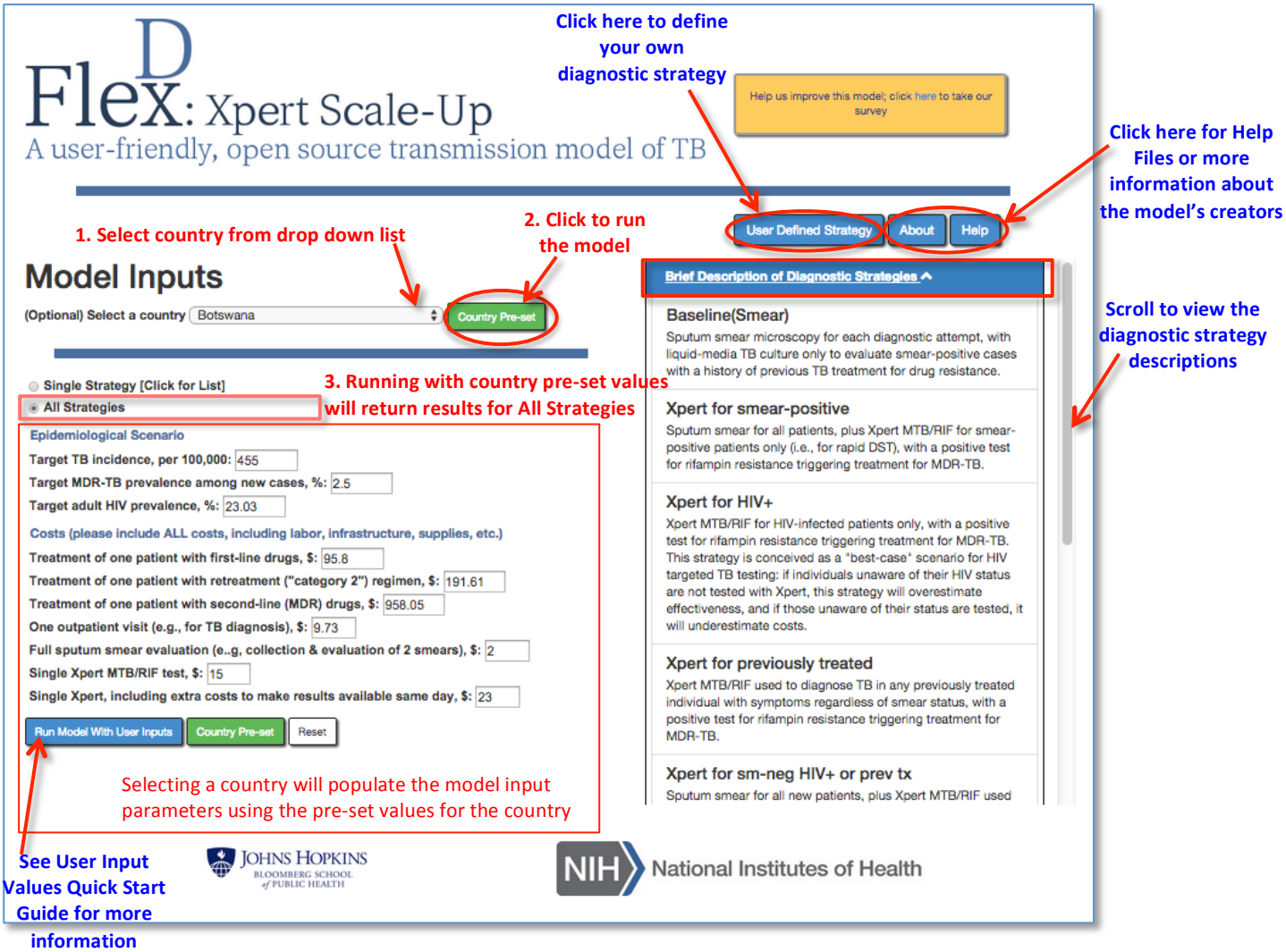
Quick Start Guide

Running the model with Country Pre-set Values

The Flexible Diagnostics (FlexDx) TB Model is a flexible, simple, transmission modeling tool that allows users without modeling expertise to generate evidence to aid decision-making for implementation of tuberculosis (TB) diagnostics under local conditions. Using a simple web-based interface, FlexDx incorporates estimates of TB incidence, MDR-TB, HIV, and costs into a combined decision analysis-transmission modeling framework to generate five-year projections of epidemiological impact and cost-effectiveness of nine diagnostic strategies in reducing TB transmission and mortality.

Users can run the FlexDx TB Model using country pre-set values from WHO estimates and other sources for their country of interest to return pre-calculated model results for all diagnostic strategies, including uncertainty ranges and exploration of key alternative scenarios in which important parameters are doubled. For users who have values other than the standard country values, we offer a User Input model (with slightly less functionality) in which users can input their own values using the country baseline values as a foundation. See the *Quick Start Guide for Running the model with User Input Values* for more information.

Using the FlexDx TB Web Interface



Interactive Incidence/Cost and MDR/Cost Tabs

The FlexDx TB Model will generate an interactive graph and summary table Tab for TB Incidence and MDR Incidence that allow the user to change the reference standard. The results for overall TB Incidence are shown below, but the corresponding results for MDR Incidence can by seen by clicking the Interactive MDR/Cost Tab. Note that the model projections using the Country Pre-set values are based on relative rather than absolute changes in costs and outcomes.

Click to return to model inputs page → Back to Inputs

Model options (Country: Botswana, GDP per capita: $7238.02)

TB Incidence: 455 per 100,000 (406 - 507) Adult HIV prevalence: 23% (21.8% - 24.4%) Percent of new TB that is MDR: 2.5% (1.5% - 3.5%)

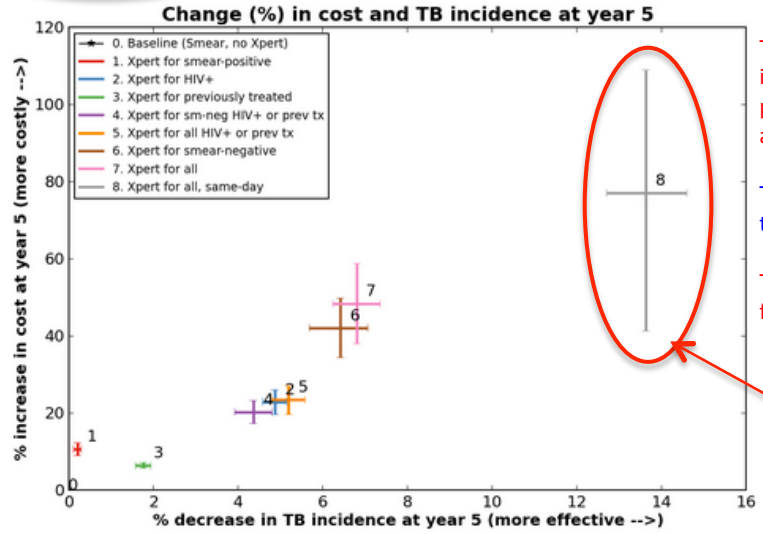
The percentage changes in cost reported below do not depend on the absolute costs. These costs can be taken as indicating the relative values of cost inputs, which do matter for the results below.

- Treatment of one patient with first-line drugs: $95.8
- Treatment of one patient with retreatment ("category 2") regimen: $191.61
- Treatment of one patient with second-line (MDR) drugs: $958.05
- One outpatient visit (e.g., for TB diagnosis): $9.73
- Full sputum smear evaluation (e..g, collection & evaluation of 2 smears): $2
- Single Xpert MTB/RIF test: $15
- Single Xpert, including extra costs to make results available on same day: $23

Epidemiological Scenario and Cost parameter values used to generate the model's results are displayed here.

***If the values for any of the parameters are not appropriate for your setting, users can click 'Back to Inputs' to return to the model inputs page and adjust the values as necessary.**

Interactive Cost/Incidence | Interactive Cost/MDR | Summary Data ← **Click to view the different results Tabs**



This graph displays the percent ***increase*** in cost for implementing the diagnostic strategy at year 5 [cost] vs. the percent ***decrease*** in TB incidence at year 5 [effectiveness] for all strategies compared to baseline (smear).

To interpret this graph, note that more effective strategies are to the right, and more costly strategies are toward the top.

The table below the graph reports the same data in numerical form.

The cross bars represent 95% uncertainty ranges for the model's projected percent change estimate for TB incidence (vertical bar) and cost (horizontal bar). 95% uncertainty ranges result from varying the values of all parameters in the model simultaneously by +/- 10% of their original value (and thus may underestimate true uncertainty, if those values truly vary by more than 10%).

Alternative Scenarios
- (•) Baseline
- ( ) Empiric treatment doubled
- ( ) Pre-diagnostic delay doubled
- ( ) Reactivation doubled

Crossbars show baseline + uncertainty

Click to select one of the Alternative Scenarios *(see description on next page)*

Download Plot ← **Click to download plot**

Percent change in cost and TB incidence compared to Baseline (Smear) at year 5

Number	Name	Chg in Cost	95% Uncert.	Chg in TB Incidence	95% Uncert.	Ref. Std.
	Baseline Smear, No Xpert	0%		0%		(•)
1	Xpert for smear+	11%	9% - 12%	0%	0% - 0%	( )
2	Xpert for HIV+	23%	20% - 26%	5%	5% - 5%	( )
3	Xpert for prev-tx	6%	6% - 7%	2%	2% - 2%	( )
4	Xpert for sm-neg HIV+ or prev-tx	20%	17% - 23%	4%	4% - 5%	( )
5	Xpert for all HIV+ or prev-tx	23%	20% - 27%	5%	5% - 6%	( )
6	Xpert for smear negative	42%	34% - 50%	6%	6% - 7%	( )
7	Xpert for all	48%	38% - 59%	7%	6% - 7%	( )
8	Xpert for all, same-day	77%	41% - 109%	14%	13% - 15%	( )

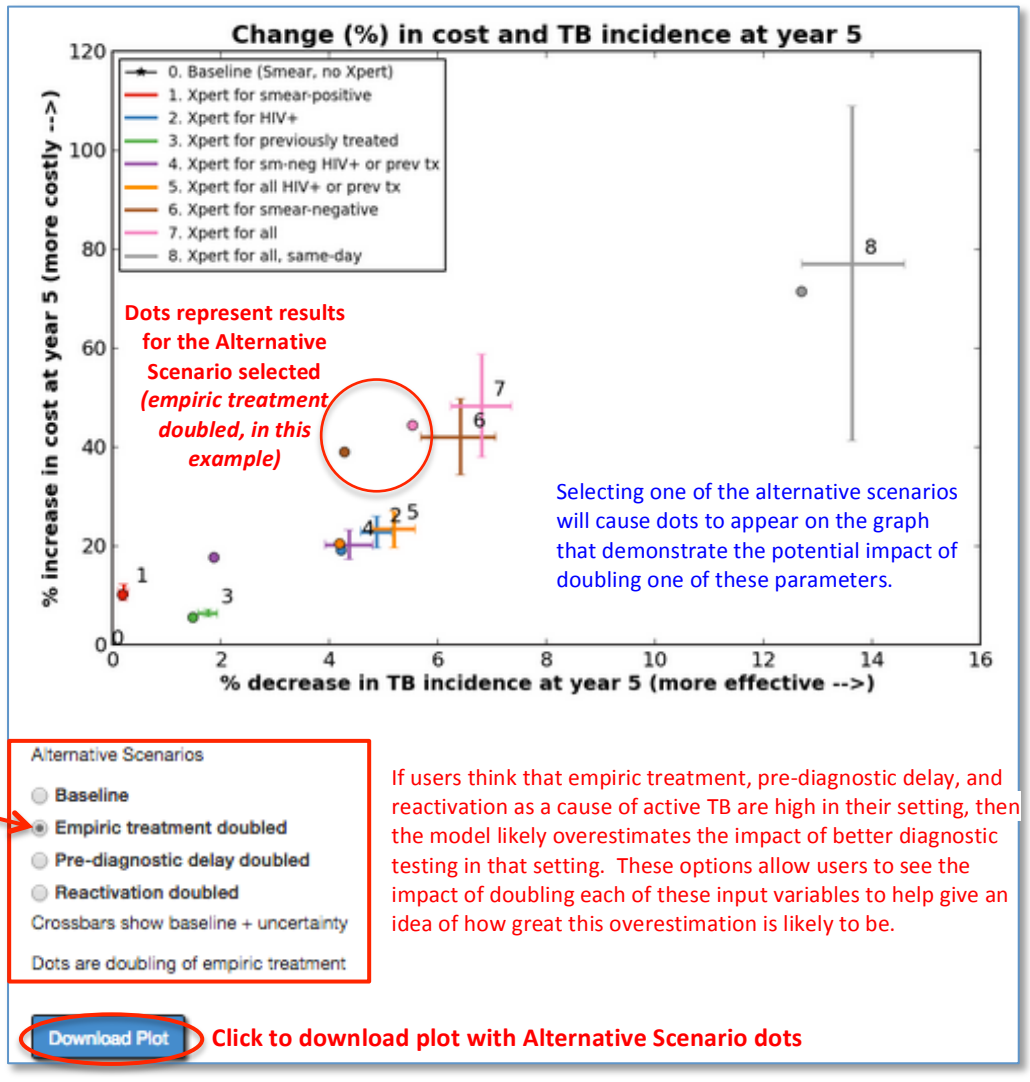
Click to change the reference standard (default is Smear)

Changing the reference standard will cause the number and cross bars corresponding the selected reference strategy to turn black in the graph. The Cost and Incidence estimates in the table will change to reflect the selected reference standard.

Alternative Scenario Options and Output

The Alternative Scenarios are designed to show the effect of doubling key parameters (empiric treatment, reactivation, pre-diagnostic period) on model outputs. Importantly, these three variables have strong influence on the model's results and likely vary by more than +/-10% from one setting to the next. These parameters are key to the model's impact estimates, and the effect of varying these parameters is not fully captured within the uncertainty ranges provided. Thus, the 95% uncertainty cross bars for the range of diagnostic strategy outputs represent the range that might be expected if inputs are varied to a certain pre-specified extent (here, +/-10% of the underlying value). *They are not 95% confidence intervals in the statistical sense.*

- **Baseline:** No change to input values
- **Empiric treatment doubled:** Double the probability of empiric treatment in someone who tests negative for active TB (but actually has TB) from 25% to 50%.
- **Pre-diagnostic delay doubled:** Double the period of infectiousness before seeking care from 9 months to 18 months
- **Reactivation doubles:** Double the rate of reactivation, which likewise increases the probability that a case of active TB is due to reactivation vs. recent infection



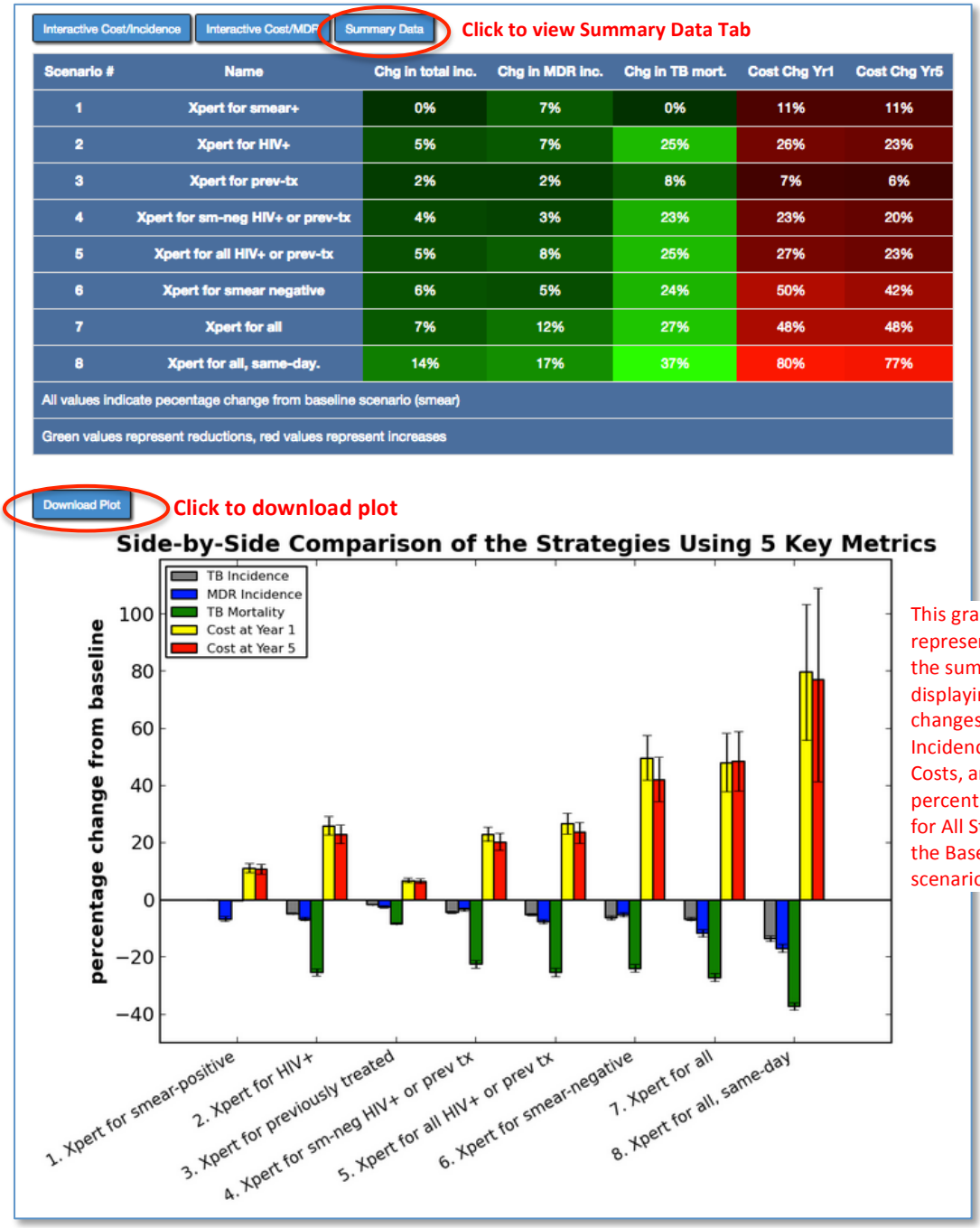
Alternative Scenario selected

If users think that empiric treatment, pre-diagnostic delay, and reactivation as a cause of active TB are high in their setting, then the model likely overestimates the impact of better diagnostic testing in that setting. These options allow users to see the impact of doubling each of these input variables to help give an idea of how great this overestimation is likely to be.

Click to download plot with Alternative Scenario dots

Summary Tab

The Summary Data Tab provides the user with a summary of the FlexDx TB Model results for TB and MDR Incidence, Mortality, Year 1 Cost, and Year 5 Cost projections.



Scenario #	Name	Chg in total inc.	Chg in MDR inc.	Chg in TB mort.	Cost Chg Yr1	Cost Chg Yr5
1	Xpert for smear+	0%	7%	0%	11%	11%
2	Xpert for HIV+	5%	7%	25%	26%	23%
3	Xpert for prev-tx	2%	2%	8%	7%	6%
4	Xpert for sm-neg HIV+ or prev-tx	4%	3%	23%	23%	20%
5	Xpert for all HIV+ or prev-tx	5%	8%	25%	27%	23%
6	Xpert for smear negative	6%	5%	24%	50%	42%
7	Xpert for all	7%	12%	27%	48%	48%
8	Xpert for all, same-day.	14%	17%	37%	80%	77%

All values indicate pecentage change from baseline scenario (smear)

Green values represent reductions, red values represent increases

This table displays the projected changes in TB Incidence, MDR Incidence, TB Mortality, Year 1 Costs, and Year 5 Costs as a percent *decrease* (***green***) or *increase* (***red***) for All Strategies compared to the Baseline (smear) diagnostic scenario.

To extract the data in this table, users may take a screen shot of the table or manually extract and copy the data into a program of their choice. The next version of FlexDx will offer the option to download the table.

This graph provides a visual representation of the data in the summary table above, displaying the projected changes in TB Incidence, MDR Incidence, TB Mortality, Year 1 Costs, and Year 5 Costs as a percent *decrease* or *increase* for All Strategies compared to the Baseline (smear) diagnostic scenario.

Limitations of the FlexDx TB Model

As with any modeling analysis, the FlexDx TB Model and the user generated results from the model have important limitations. Thus, while FlexDx can be a very useful tool to provide access to "first-pass" estimates in epidemiological settings (e.g., sub-district level data) that will never be captured by more detailed and closely-calibrated TB transmission models, it does not eliminate the necessity for more detailed models.

For more information or to access the help files for the FlexDx Model, users can click on the 'About' and 'Help' buttons on the model input page. See the full ***FlexDx TB Model User's Manual*** for more details on using the model.