Engineering New TB Diagnostics for Cost-Effectiveness: Customized Estimates on the Web

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OBJECTIVES

- To help test designers predict the cost-effectiveness of new tests for TB as a function of sensitivity, specificity, and target population

INTRODUCTIONS

- Developing a new diagnostic test for TB requires tradeoffs
  - Sensitivity is gained at the expense of specificity
  - Both sensitivity and specificity can be gained at higher cost
- Guidance on tradeoffs is often inaccessible
- Test designers want to understand how these tradeoffs affect test performance in various populations.
- A web interface now allows designers to predict how a new diagnostic test would compare to sputum gram stain and sputum culture in terms of cost effectiveness ($ per DALY averted)
  - INPUT: New test's sensitivity, specificty, cost, target population
  - OUTPUT: Cost per DALY averted

METHODS

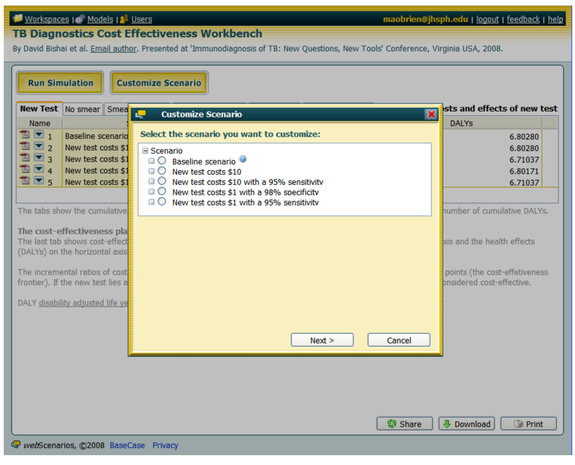
- Decision analytic cost-effectiveness model from Dowdy, D., M. O'Brien, D. Bishai. (2008). " Cost-effectiveness of novel tools for the diagnosis of tuberculosis." Int J Tuberc Lung Dis 12(9): 1021-1029
  - Published version applies data from Kenya, South Africa and Brazil
  - Web version allows users to input any population and any new test characteristic
- Model is for diagnostic tools for Active Tuberculosis
- Model does not apply for diagnostic tests for latent infection.

HOW IT WORKS

Step 1) Go to www.tbtools.org
Step 2) Input test characteristics and population on the data input screen
Step 3)Output will be cost-effectiveness relative to sputum microscopy

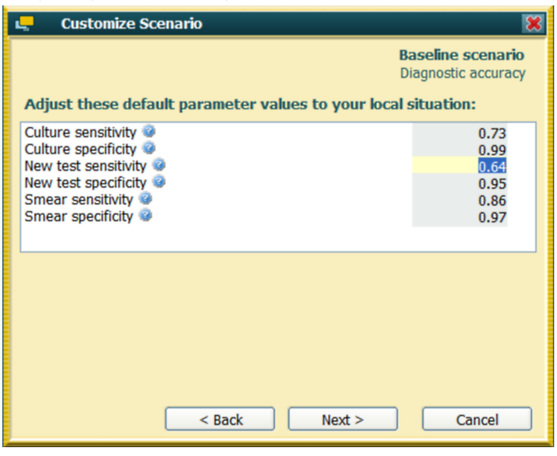
HOMEPAGE

Figure 1 Screenshot of the homepage



INPUT TEST SENSITIVITY/SPECIFICITY

Figure 2. Screenshot of data input screen for a test with 95% specificity and 64% sensitivity.



- Baseline model has cost of new test at $20
- Sensitivity of new test at 0.7
- Specificity of new test at 0.95

RESULTS

Figure 3 Screenshot of the table showing costs and DALYS of the new test.

Scenario	Cost	DALYs
Baseline scenario	121.68714	6.80280
New test costs $10	111.68714	6.80280
New test costs $10 with a 95% sensitivity	118.80812	6.71037
New test costs $1 with a 98% specificity	96.10865	6.80171
New test costs $1 with a 95% sensitivity	109.80812	6.71037

Figure 4. Screenshot of graph showing cost effectiveness of new test relative to sputum microscopy. Sensitivity 95% Cost $10

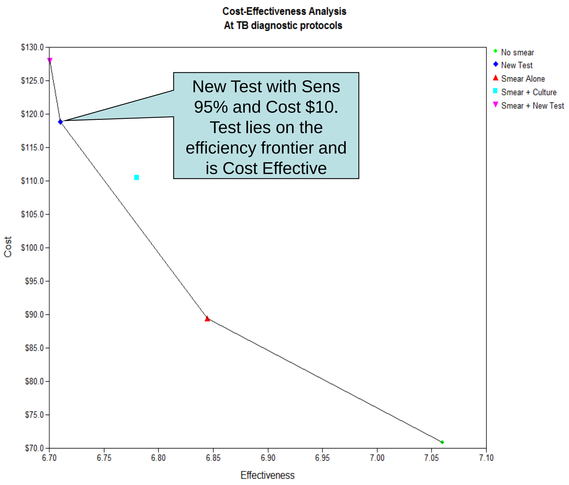
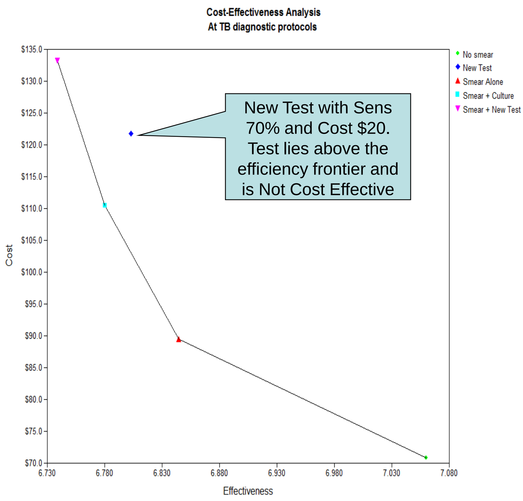


Figure 5. Screenshot of graph showing cost effectivness of new test relative to sputum microscopy. Sensitivity 70% Cost $20



ACCESS

- Access to website is open to the public via **www.tbtools.org**
- For more information write to Professor David Bishai dbishai@jhsph.edu

DISCUSSION

- One of the features that emerges when users compare their test to sputum microscopy is that despite it's low sensitivity, sputum smear testing has the property of detecting the most sick and most infectious patients. That improves its cost-effectiveness relative to a test that detects any TB case.
- Knowing the cost-effectiveness of a test in a given population can help engineers optimize test performance for efficiency.

SUMMARY

- Designers of TB diagnostic tests can go online and find out how cost effective a test will be in any population they wish to specify.
- Knowing how cost effective can help predict whether the test will be adopted by a ministry of health or by the Global Fund.
- Sputum smear has an auto-triage property because its positivity is correlated with advanced and transmissible disease

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WWW.TBTOOLS.ORG