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Modeling and Cost-Effectiveness:
Synthesis



Protecting Health, Saving Lives—*Millions at a Time*

Modeling: Summary Points

- **1. The purpose of modeling is to inform decision-making, not tell the future.**
- Models serve as the link between epi data (usually individual-level) and population-level decision-making.
 - Without a quantitative structure for this, the process is subjective.
- Projections of future impact are the means, not the end.
 - Decision-makers generally can't process model results without projections.
 - But an appropriate decision-making process involves the modelers discussing strengths and weaknesses of the approach.



Modeling: Summary Points

- **2. Modeling of TB is an uncertain business.**
- Much of our data is weak, and can strongly influence results.
 - For example, we estimate natural history from pre-chemotherapy era.
- Model structure introduces as much uncertainty as the parameters.
 - Example of including a “pre-clinical infectious” stage for diagnostics
- Uncertainty is difficult to convey appropriately.
 - Do you want a confidence interval that includes every possibility?
 - Is the goal to provide precise projections in the first place?



Modeling: Summary Points

- **3. Lessons from Models of TB Diagnostics**
- It's not just about sensitivity & specificity, but rather:
 - Duration of infectious period that can be averted
 - Existing quality of diagnosis
 - Healthcare system into which a diagnostic is deployed
 - Speed at which scale-up can occur
- Impact on mortality is likely greater than on incidence.
- To have transformative impact, diagnostics should be considered as part of a combined approach.



Modeling: Summary Points

- **4. Needs and Future Directions**
- Models of other diagnostic strategies, in other settings
 - DST, active case finding, pediatric/extrapulmonary, same-day dx, etc.
- Evaluation of more flexible approaches
 - In addition to “user-friendly” approach, there is also the “adaptive” approach
 - Need to balance importance of “global” findings with known local heterogeneity
- Better incorporation of health systems
 - Need more data



Cost-Effectiveness: Summary Points

- **1. Importance of Basic Economic Concepts**
- Opportunity costs, not financial costs
- Unit costs (fixed & variable) – not straightforward
- Discounting, inflation, currency conversion
 - \$1 is not always \$1
- Perspective of the analysis
 - Costs from one perspective may not be important from another



Cost-Effectiveness: Summary Points

- **1. Tenets of Cost-Effectiveness Analysis**
- Measure effectiveness in a fashion that allows for appropriate comparison.
 - Health utility (QALYs/DALYs) designed for this purpose
- Incremental analysis: always comparing interventions to something else



Cost-Effectiveness: Summary Points

- **2. Challenges of CEA for TB Diagnostics**
- TB treatment is so effective that even bad diagnostics can look very cost-effective.
- Assumptions that more sensitive diagnosis = more people treated and more lives saved may not be accurate.
- Difficult to incorporate transmission effects and impacts on the health system
 - Though we are improving in this regard



Cost-Effectiveness: Summary Points

- **3. CEA Case Studies**
- Triage testing: cost-effectiveness depends on cost, prevalence of TB among the population screened, and test characteristics
 - Can help to identify where a triage test can be implemented in the most cost-effective fashion
- Diagnostics for HIV-associated TB: cost-effectiveness is challenging.
 - Difficult to quantify clinical benefits
 - ART drives cost considerations
 - Need to consider affordability & budget impact, not just C-E.



Cost-Effectiveness: Summary Points

- **4. Integrating Cost-Effectiveness and Transmission into a Flexible Framework**
- Users want to be able to adapt results to their settings but may not have the expertise to use models appropriately.
- Transmission and economic models are increasingly being integrated, but the fields have traditionally been separate.
- User-friendly modeling as one approach, but not the solution to all problems
 - Need to develop a priority listing, given limited modeling resources

