Cost-Effectiveness of WHO-Recommended Algorithms for TB Case Finding at Ethiopian HIV Clinics

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Introduction

- Tuberculosis (TB) is the leading cause of death among people living with HIV (PLHIV)
- >200K new cases annually in Ethiopia; ≥10% are among PLHIV
- A symptom-based screen for TB (cough, fever, night sweats, weight loss) had a high negative predictive value for TB
- The WHO recommends active TB case finding using Xpert MTB/RIF for people living with HIV (PLHIV) in high burden settings
- **Purpose of Study: Determine the cost-effectiveness of combining a WHO-recommended symptom-based screen with Xpert MTB/RIF for TB case finding at an HIV clinic (ALERT) in Addis Ababa, Ethiopia**

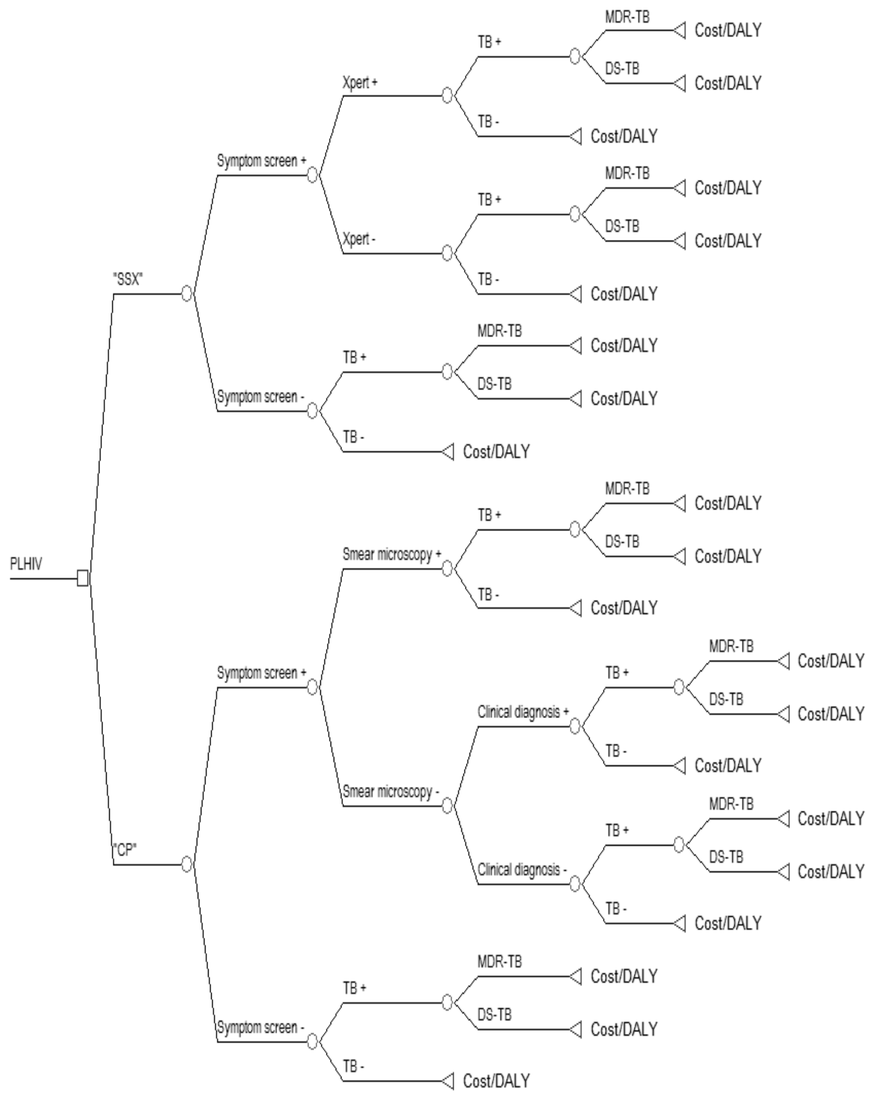
Methods

- Model-based simulated cohort study (N=15000 per arm)
- Cost analysis methods: Decision analysis algorithms (**Figure 1**)
  a. "WHO-recommended"—symptom screen plus Xpert (SSX)
  b. "Current practice (CP)"—symptom screen and AFB microscopy +/- clinical diagnosis
- Clinical inputs: derived from operational research study conducted at ALERT (7-10/2013), relevant literature from Sub-Saharan Africa (SSA)
- Cost inputs: base case from ALERT Hospital and Ethiopian data; ranges from SSA literature
- One-way sensitivity analyses for reasonable ranges
- Outcome: incremental cost-effectiveness ratio (ICER)

Table 1. Selected model parameters.

Parameter	Base case	Range
Laboratory costs (US$)		
AFB microscopy	1.20	0.60-2.40
Xpert cartridge	10	10-73
Xpert machine	1480	740-2960
Clinical characteristics (%)		
TB prevalence	6	4-17
Clinic volume (pts. per day, n)	135	50-250
Positive symptom screen	53	25-75
AFB smear sensitivity	30	19-33
AFB smear specificity	100	99-100
Xpert sensitivity	79	70-94
Xpert specificity	98	96-99

Decision Analysis Model



Abbreviations: CP=current practice algorithm; DS-TB=drug-susceptible TB; SSX=symptom screen/Xpert algorithm

Results

- **SSX highly cost effective (ICER=$21/DALY); cost-effectiveness robust to a range of model parameters**
- WHO-recommended algorithm (SSX) least cost-effective with high Xpert cartridge price of $73 (ICER=$403/DALY averted)
- WHO-recommended less cost-effective with high clinical TB diagnosis sensitivity of 67% (ICER=$39/DALY averted), high TB prevalence of 17% (ICER=$49/DALY averted)
- Current practice more costly than WHO-recommended algorithm (SSX) only with high smear microscopy cost of $2.40

Table 2. Primary and secondary outcomes.

Outcome	WHO-recommended, N (range)	Current practice, N (range)	ICER (range)
TB cases, actual	900 (600-2550)	900 (600-2550)	--
Cost, 1000 US$	252 (182-736)	225 (194-312)	--
DALYs, 1000s	29.3 (11.9-116)	30.6 (13.1-117)	21 (-534-403)
TP TB diagnoses	512 (11.9-116)	458 (305-1297)	500 (-4040-9500)
FN TB diagnoses	388 (253-1100)	442 (295-1250)	500 (-4040-9500)
FP TB diagnoses	141 (71-282)	2200 (1920-2930)	13 (-21-250)

Conclusions

- WHO-recommended practices (symptom screen, Xpert) highly cost effective (ICER=$21/DALY averted) compared to current practice (symptom screen, smear, clinical diagnosis)
- High clinic volume (135 patients per day) and high rate of symptom screen positivity (53%) could be cost-prohibitive; WHO recommendations possibly not feasible in resource limited settings
- Additional resource expenditure will be required to meet WHO recommendations in clinics such as ALERT
- Limitations: did not consider labor costs, downstream effects

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Selected references

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