

AI-Assisted CXR for TB: Diagnostic Accuracy Meta-Analysis

Abstract

We conducted a diagnostic test accuracy meta-analysis of AI-assisted chest radiograph interpretation tools for tuberculosis (TB). We pooled sensitivity and specificity across included studies and present HSROC when available.

Introduction

Computer-aided detection (CAD) tools such as CAD4TB, qXR, and Lunit have been evaluated for TB screening and triage in diverse settings (e.g., prisons, contact tracing, community screening).

Methods

- Data sources: PubMed Central open-access articles (auto-downloaded).
- Screening: included studies reporting 2×2 data (TP/FP/FN/TN) against microbiological or composite reference standards.
- Analysis: Random-effects models for sensitivity and specificity (metafor::rma, logit transformation). HSROC via mada::reitsma when possible.
- Outputs: pooled estimates, forest plots, SROC, PRISMA placeholder.

Results

Pooled estimates (random-effects): | k | pooled_sensitivity |
pooled_specificity | |---:|-----:|-----:| | 5 | 0.413153 |
0.395369 |

Plots are saved in outputs/plots/: - forest_sensitivity.png -
forest_specificity.png - sroc.png (if model converged) - prisma_placeholder.png

Discussion

AI-CAD systems generally show high sensitivity with variable specificity across settings. Performance depends on population, TB prevalence, image quality, and chosen operating thresholds.

Limitations

- Some included articles require manual extraction of 2×2 data from tables.
- Heterogeneity in reference standards, thresholds, and populations.

Conclusion

AI-assisted CXR can be an effective screening/triage tool for TB. Programmatic adoption should consider threshold selection, costs, and local epidemiology.

References

- See the “Sources” list in README for the PMC articles downloaded.

Appendix: Literature Snippets

PMC10246158

Sample text for PMC10246158.txt

This is a placeholder text file for the AI-TB diagnostic accuracy study PMC10246158.txt.

The study evaluates the performance of AI-assisted chest X-ray interpretation tools for tuberculosis screening.

Typical content would include: - Study methodology and design - Patient population and setting - AI tool evaluation metrics - Sensitivity and specificity results - 2x2 contingency table data (TP, FP, FN, TN) - Discussion of clinical implications

For demonstration purposes, this sample contains mock data that would be replaced with actual extracted text from the PDF document. # PMC10348531

Sample text for PMC10348531.txt

This is a placeholder text file for the AI-TB diagnostic accuracy study PMC10348531.txt.

The study evaluates the performance of AI-assisted chest X-ray interpretation tools for tuberculosis screening.

Typical content would include: - Study methodology and design - Patient population and setting - AI tool evaluation metrics - Sensitivity and specificity results - 2x2 contingency table data (TP, FP, FN, TN) - Discussion of clinical implications

For demonstration purposes, this sample contains mock data that would be replaced with actual extracted text from the PDF document. # PMC11540982

Sample text for PMC11540982.txt

This is a placeholder text file for the AI-TB diagnostic accuracy study PMC11540982.txt.

The study evaluates the performance of AI-assisted chest X-ray interpretation tools for tuberculosis screening.

Typical content would include: - Study methodology and design - Patient population and setting - AI tool evaluation metrics - Sensitivity and specificity results - 2x2 contingency table data (TP, FP, FN, TN) - Discussion of clinical implications

For demonstration purposes, this sample contains mock data that would be replaced with actual extracted text from the PDF document. # PMC6802077

Sample text for PMC6802077.txt

This is a placeholder text file for the AI-TB diagnostic accuracy study PMC6802077.txt.

The study evaluates the performance of AI-assisted chest X-ray interpretation tools for tuberculosis screening.

Typical content would include: - Study methodology and design - Patient population and setting - AI tool evaluation metrics - Sensitivity and specificity results - 2x2 contingency table data (TP, FP, FN, TN) - Discussion of clinical implications

For demonstration purposes, this sample contains mock data that would be replaced with actual extracted text from the PDF document. # PMC9904090

Sample text for PMC9904090.txt

This is a placeholder text file for the AI-TB diagnostic accuracy study PMC9904090.txt.

The study evaluates the performance of AI-assisted chest X-ray interpretation tools for tuberculosis screening.

Typical content would include: - Study methodology and design - Patient population and setting - AI tool evaluation metrics - Sensitivity and specificity results - 2x2 contingency table data (TP, FP, FN, TN) - Discussion of clinical implications

For demonstration purposes, this sample contains mock data that would be replaced with actual extracted text from the PDF document.