

Establishment of a predictor risk score for the prioritization of patients for testing for acute HIV infection



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Background

- Resource-poor settings rarely screen for acute HIV infection (AHI).
- AHI exists during the time period between HIV infection and HIV sero-conversion.
- **Not addressing AHI may jeopardize HIV epidemic control.**
- One barrier is the lack of contextualized screening algorithms that would allow prioritization of patients for more resource-intensive diagnostic viral load (VL) testing.

Objective

To develop a predictor risk score (PRS) algorithm that may assist health workers to select patients for AHI testing in Eswatini.

Methods

- Adult outpatients with a HIV-negative or discordant test result using serial Alere™ Determine and Uni-Gold™ testing algorithms underwent VL testing (Xpert®) for the diagnosis of AHI at Nhlanguano Health Centre, from March 2019 to March 2020.
- AHI definition: VL ≥40 copies/mL and HIV sero-negative/ discordant RDT.
- A nurse performed physical examination and administered questionnaires assessing AHI risk factors.

Statistics

- We used the least absolute shrinkage and selection operator (Lasso) method to determine factors for AHI prediction.
- Their beta-coefficients were rounded to the nearest integer to obtain predictor scores for each patient.
- Test characteristics of the PRS of the entire cohort for identification of AHI were described in comparison with Xpert testing results.
- Finally, the performance of four external PRS reported from Africa was assessed with receiver operating characteristic (ROC) curve statistics.

Ethical approval

Ethical approval was obtained from the Eswatini Health and Human Research Review Board, and the MSF Ethics Review Board.

Acknowledgements

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RESULTS

Study enrolment

- Of 795 patients tested, 30 (3.8%) presented with AHI.

Predictor risk score (PRS)

- The final PRS comprised the following factors with rounded beta-coefficients/risk scores: discordant rapid-diagnostic test result (4), female sex (1), feeling at risk of HIV (1), self-reported swollen glands (1), and fatigue (1); see Figure 1.

Factors included in risk score	Points
▪ HIV sero-discordant RDT	4
▪ Women	1
▪ Reported swollen glands	1
▪ Reported fatigue	1
▪ Feeling at risk of HIV infection	1

Sum of risk score points	N / % of patients per risk score level
0	152 / 19%
1	327 / 41%
2	238 / 30%
3	58 / 7%
4	6 / 1%
5	8 / 1%
6	5 / 1%
7	1 / 0.1%

Figure 1: Factors identified in for inclusion into the PRS, and number and proportion of patients falling into the different risk score categories.

- As identified with ROC statistics, the PRS performed best for patients with a risk-score cutoff at ≥2 or ≥3 points (Figure 2).

Performance of PRS at two cut-off points (Table 1)

- At the cut-off of ≥2 points, sensitivity and specificity were 86.7% and 62.1%.
- At the cut-off of ≥3 points, sensitivity decreased to 50.0% and specificity increased to 91.8%.
- While NPV was ≥97.9% for both cut-off points, the PPV remained at ≤19.2%.

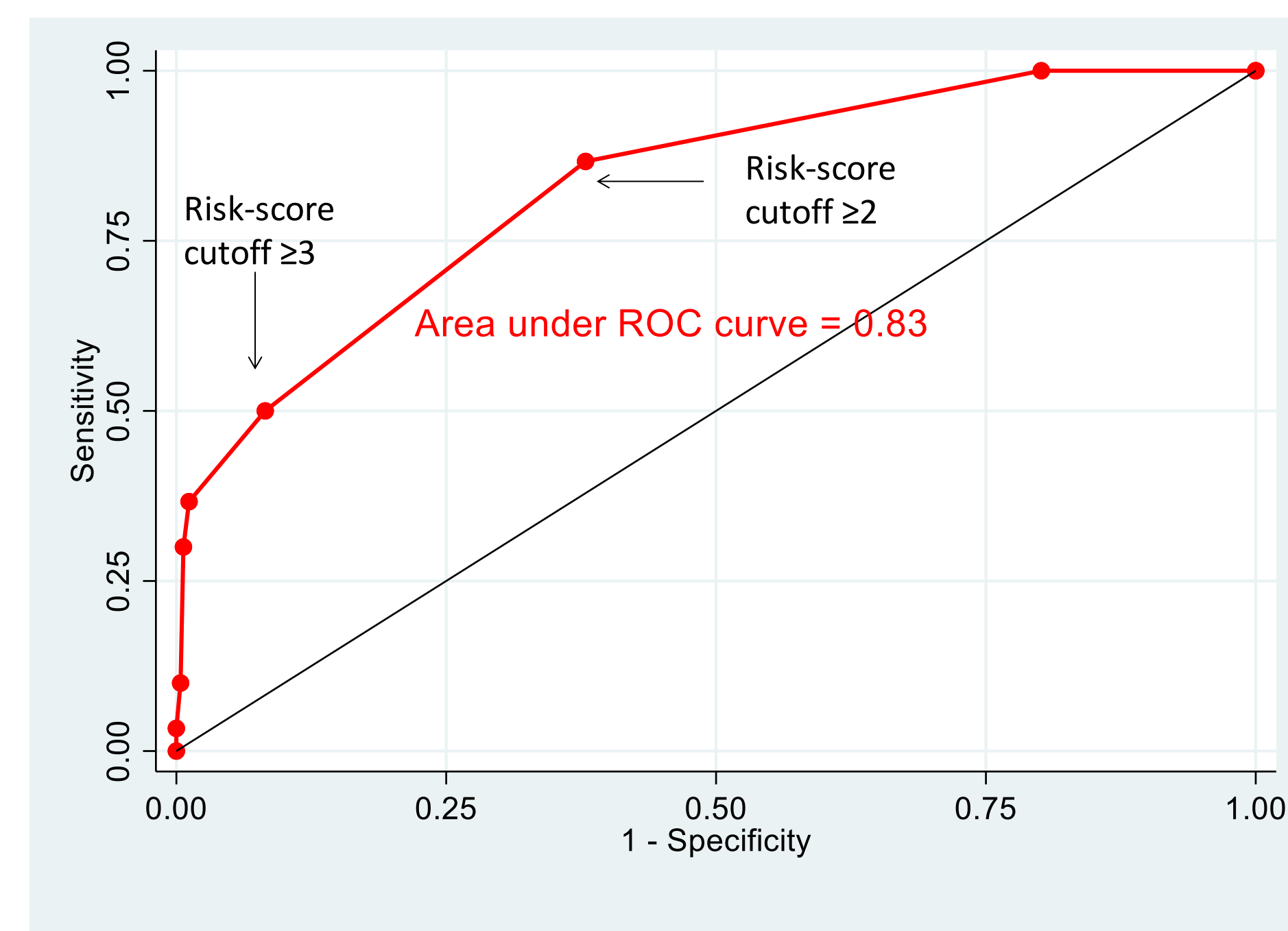


Figure 2: The best risk score cut-off levels were identified with ROC statistics. The cut-off ≥2 and ≥3 points were identified with most favorable sensitivity and specificity estimates for prediction of AHI.

Table 1: Performance indicators of the PRS at two cut-off levels for the identification of AHI patients. Point estimate and 95% CI presented.

	PRS cutoff ≥2 (n=795)		PRS cutoff ≥3 (n=795)	
Sensitivity	86.7%	(69.3% - 96.2%)	50.0%	(31.3% - 68.7%)
Specificity	62.1%	(58.5% - 65.5%)	91.8%	(89.6% - 93.6%)
ROC area	0.74	(0.68 - 0.81)	0.71	(0.62 - 0.80)
Positive predictive value	8.2%	(5.5% - 11.8%)	19.2%	(11.2% - 29.7%)
Negative predictive value	99.2%	(97.9% - 99.8%)	97.9%	(96.6% - 98.8%)

Comparison with other external PRS

- Based on ROC statistics, the study-specific PRS (ROC 0.83) had the highest ability to correctly classify AHI cases while ROC statistics for external PRS ranged from 0.50 to 0.74.

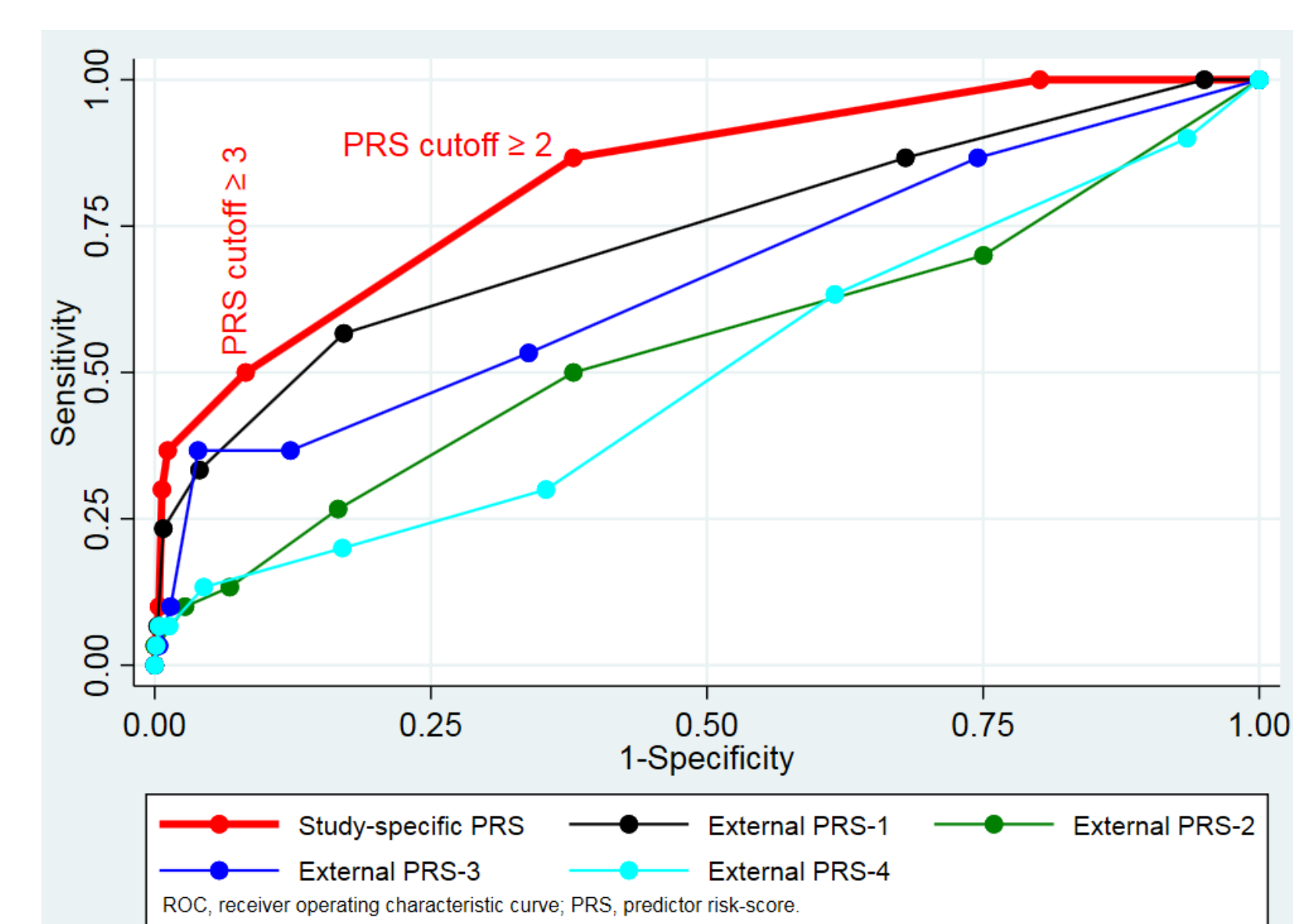


Figure 3: Performance of the study-specific PRS compared with PRS from other settings in Sub-Saharan Africa.

Conclusions

- PRS can identify patients at risk of AHI, enabling prioritization for diagnostic viral load testing.
- Further studies should evaluate the routine use of PRS in public sector settings and validate external PRS before local use.

