VALIDATION OF A PAEDIATRIC SCREENING TOOL TO IDENTIFY HIV-POSITIVE CHILDREN IN ZAMBIA

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BACKGROUND

- Despite a policy of universal HIV testing for all individuals including children presenting at public health facilities in Zambia in 2017, testing coverage remains low in high-volume wards.
- A targeted screening approach has been shown to improve testing efficiencies and increase case findings by testing at-risk children.
- While some HIV screening tools are in use among the paediatric population in Zambia, there is no validated screening tool.
- This study aimed to develop and validate a screening tool to improve case finding of HIV-positive children.

METHODS

- A screening tool comprised of 14 questions was created by combining questions from both non-validated screening tools in use in Zambia and validated pediatric HIV screening tools from other countries in Sub-Saharan Africa.
- Between November 2020 and September 2021, all children (ages 18 months to 14 years) presenting at outpatient departments in 30 health facilities in two provinces of Zambia were eligible; those whose guardians provided consent were screened and tested for HIV, regardless of their responses to the screening questions.
- Data analysis used a randomly extracted 'validation' dataset (80% of all records) and cluster-adjusted multivariable logistic regression to determine the highest performing screening questions.
- Receiver Operating Characteristic (ROC) curve examined different cut-off points and determined the optimal number and combination of questions to include in a final screening tool.
- The final screening questions selected were then evaluated in the 'test' dataset (remaining 20% of records). Sensitivity and specificity were calculated for both datasets.
- Simulations were run to ensure that the 80/20 split results were robust.

RESULTS

- Out of 11,018 children screened and tested, 1,116 were excluded for being ineligible or not responding to all 14 screening questions (Figure 1).
- Among the remaining 9,902, HIV prevalence was 1.3%.
- The median age was 4 years (IQR: 2-8), with HIV-positive children being slightly older at 7 years (IQR: 4-10).
- Six questions were found to be significantly associated with HIV-positivity. It was determined that the optimal screening cutoff score was to answer 'yes' to one or more of the six questions (Figure 2); using this cutoff sensitivity was 93% and specificity was 63% (Table 1).
- In the test dataset, the same tool had a sensitivity of 85% and specificity of 65%.
- Adopting this screening tool would decrease the number needed to test to find one HIV-positive child from 76 to 32; however, the screening tool would also misclassify one HIV-positive child as not at HIV risk for every 317 children screened.

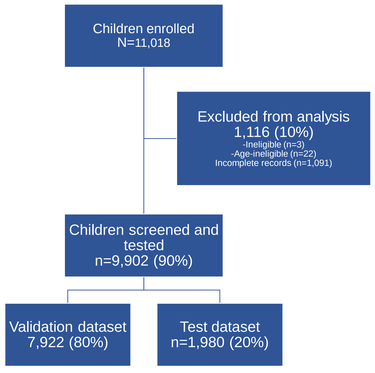

Figure 1: Flowchart of study enrolment

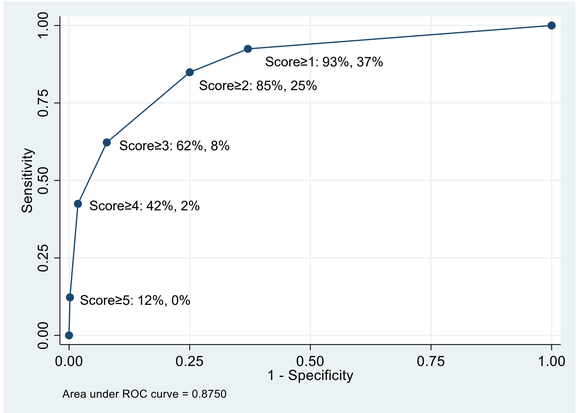

Figure 2: ROC curve to identify the optimal cut-off score in the validation dataset

	Validation dataset (N=7922)		Test dataset (N=1980)	
	Sensitivity (95% CI)	Specificity (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
Screening question				
Biological mother HIV+ or unknown status	74% (64%-82%)	82% (81%-82%)	69% (48%-86%)	82% (80%-83%)
1 or more biological parents deceased	24% (16%-33%)	95% (95%-96%)	23% (9%-44%)	95% (94%-96%)
Child in poor health in last 3 months	36% (27%-46%)	95% (94%-95%)	27% (12%-48%)	95% (94%-96%)
Child has TB symptoms	41% (31%-51%)	86% (86%-87%)	27% (12%-48%)	87% (85%-88%)
Child has skin problems	26% (18%-35%)	95% (94%-95%)	23% (9%-44%)	95% (94%-96%)
Child is short or light for age	27% (19%-37%)	98% (98%-99%)	23% (9%-44%)	98% (98%-99%)
Screening tool score ≥ 1	93% (86%-97%)	63% (62%-64%)	85% (65%-96%)	65% (62%-67%)

Table 1: Sensitivity and specificity for validation and test datasets among 9,902 children screened and tested for HIV in 30 public health facilities in Zambia

CONCLUSIONS

- The results of this study show that in a validated screening tool, asking six questions to screen children for HIV testing is expected to find 85% of all true positive children.
- Implementing this screening tool should more efficiently accelerate identifications of HIV-positive children.
- Findings will be disseminated to Ministry of Health and cooperating partners to help inform policy.

ACKNOWLEDGMENTS

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A 6-question HIV-testing screening tool was **validated** and should optimize and improve case-findings of HIV-positive children

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