What is the truth? A comparison of HIV results from VCT rapid test with those from a standard ELISA from a population cohort in Tanzania

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ALPHA NETWORK
Analysing Longitudinal Population-based HIV/AIDS data on Africa

Introduction

Since 1994, the TAZAMA project has studied the population of part of Magu district, north-western Tanzania. During this time we have conducted eight serological surveys, to determine prevalence and incidence of HIV infection in the age 15+ years population. For the first seven surveys, HIV status for research purposes was determined using ELISA tests. Almost all routine HIV testing in Africa is now done with rapid tests (RDTs), as is much testing for research. For the eighth survey, we adopted the standard Ministry of Health, Community Development, Gender, Elderly and Children (MoH) voluntary counselling and testing (VCT) regime, and compared the results for a sub-sample with ELISA testing, for quality control and to investigate the overall concordance between RDT and ELISA results. Previous work[1,2,3] has shown that highly sensitive HIV immunoassays may produce false positive results when other infections are present, and this affects the interpretation of testing results.

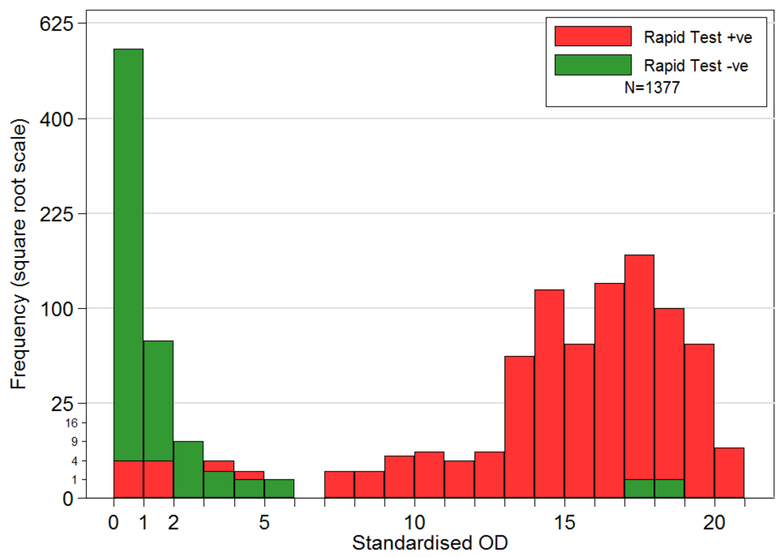
Methods

Between September 2015 and February 2016, we attempted to enrol all residents of the study area aged ≥15 years into our survey. A questionnaire was administered to participants to elicit information on HIV risk factors and use of HIV services. Participants were able to consult a study clinician. Participants were asked to provide a finger prick blood sample, to be tested with Determine (screening) and Unigold (confirmatory) RDTs, and to make a dried blood spot (DBS). Participants were given the opportunity of knowing their RDT results and being counselled. RDT, DBS collection and counselling were performed by trained VCT counsellors. Further handling of the DBS was done by lab technicians from the National Institute for Medical Research, Mwanza Centre (NIMR). Samples that were positive on Determine and negative on Unigold were considered to be indeterminate. DBS from all positive RDTs and 6% of negative RDTs were tested on ELISA (Vironostika HIV Ag/Ab) at the NIMR laboratory. In order to compare the optical density (OD) from different test runs, we calculated a standardised OD (OD / manufacturer's cut-off for the test run) for each result. Standardised OD in the range [1,2) were considered indeterminate1. Samples with discrepant RDT and ELISA results (positive on RDT, but not positive on ELISA, or negative on RDT but not negative on ELISA), together with a subset of the remaining samples, were retested using the same ELISA test.

Results

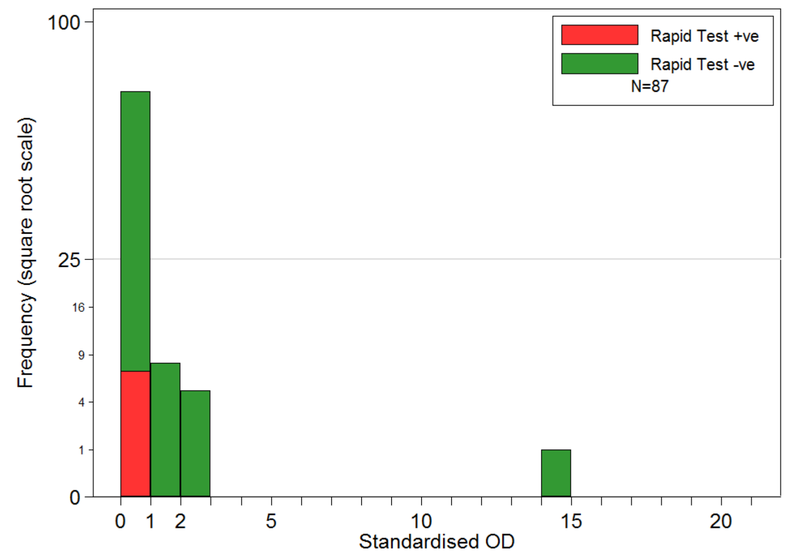
10935 participants were recruited into the survey, of which 10761 (>98%) received VCT results. 10844 (>99%) provided an RDT result, of which 743 (6.9%) were positive on both rapid tests and 34 (0.3%) were positive on the screening test but negative on the confirmatory test. 1377 samples (13%) were tested on ELISA. 88 samples (6.4%) gave different results on ELISA. 78 (89%) of these discrepancies were samples that tested negative on RDT, but indeterminate or positive with low standardised ODs on ELISA (Fig.1).

Fig.1: Distribution of standardised OD on first ELISA test.



295 samples were tested for a second time on ELISA, 108 randomly selected samples with non-discrepant RDT and ELISA results, 87 with discrepant results (one was accidentally not retested). All the non-discrepant samples produced the same results on retest. 13 of the discrepant samples produced the same result as the first ELISA, but the remaining 74 gave different results. All but one of the samples negative on RDT and positive on second ELISA had low standardised ODs (Fig. 2).

Fig. 2: Distribution of standardised ODs of ELISA retest results samples with discrepant RDT and first ELISA results).



Discussion

The retest results are much more consistent with the RDT results, and show that very different results can be obtained by repeat testing, using the same assay, even in very experienced laboratory teams.

Two of the samples positive on rapid test but negative on ELISA are known to have come from participants who attend HIV Care and Treatment Clinic. Are these participants negative, or has treatment caused the ELISA test to report them as such?

We suspect that the samples with negative RDT and reproducible low, but ≥1, standardised ODs may be from patients with other infections – schistosomiasis and malaria are common in the study area.

Conclusions

- It may be appropriate to treat standardised ODs in the range [1,3) as indeterminate.
- RDTs are at least as good as ELISA for research testing.
- Repeat testing on ELISA – especially in samples with low standardised OD - may be necessary to obtain a reliable result.

Acknowledgement
We are grateful for inputs from Pieter Smit, Mahidol Oxford Tropical Medicine Research Unit

This study was made possible with support from:
The Wellcome Trust (085477/Z/08/Z)
The Bill and Melinda Gates Foundation (OPP1082114)

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