National South African HIV prevalence estimates robust despite substantial test non-participation

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Objective

To determine whether existing estimates of South African HIV prevalence are affected by selective survey non-response.

Background

HIV prevalence estimates rely on incomplete data

- Most HIV prevalence estimates use nationally-representative survey data, which often have high levels of missingness
- South Africa is no exception: 22% of respondents in the most recent South African national HIV survey declined to test for HIV

Missing data increases uncertainty and can create bias

- At a minimum, missingness reduces the precision of HIV estimates.
- If declining to test is associated with HIV status after adjustment for known respondent characteristics, prevalence estimates will be biased.

Standard methods do not fully manage these problems

- Weighting and imputation methods do not incorporate the ***uncertainty*** associated with estimating relationship between testing & HIV status
- Weighting and imputation methods ***biased*** when the decision to test is based on unobserved characteristics correlated with HIV status

Selection models can account for these problems

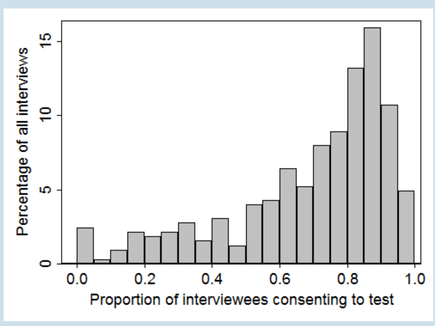
- Uses a variable that predicts test participation, but cannot predict HIV status, to adjust for Missingness Not At Random (MNAR) and thus recover a valid estimate of HIV prevalence and a confidence interval.

Methods

Dataset for analysis

- Adults (aged ≥15) in the 2012 South African National HIV Prevalence, Incidence and Behaviour Survey
- 26,708 participants were interviewed and invited to test for HIV
- 21.3% of females, 24.3% of males declined to test

Fig 1. Interviewer s varied widely in ability to gain consent to test for HIV



Selection instrument

- Interviewer identity as instrument
- Interviewers were randomly assigned to potential respondents, so identity should not be associated with HIV status (untestable assumption)
- Interviewer identity definitely predicted consent to an HIV test (Fig 1).

Analytic methods

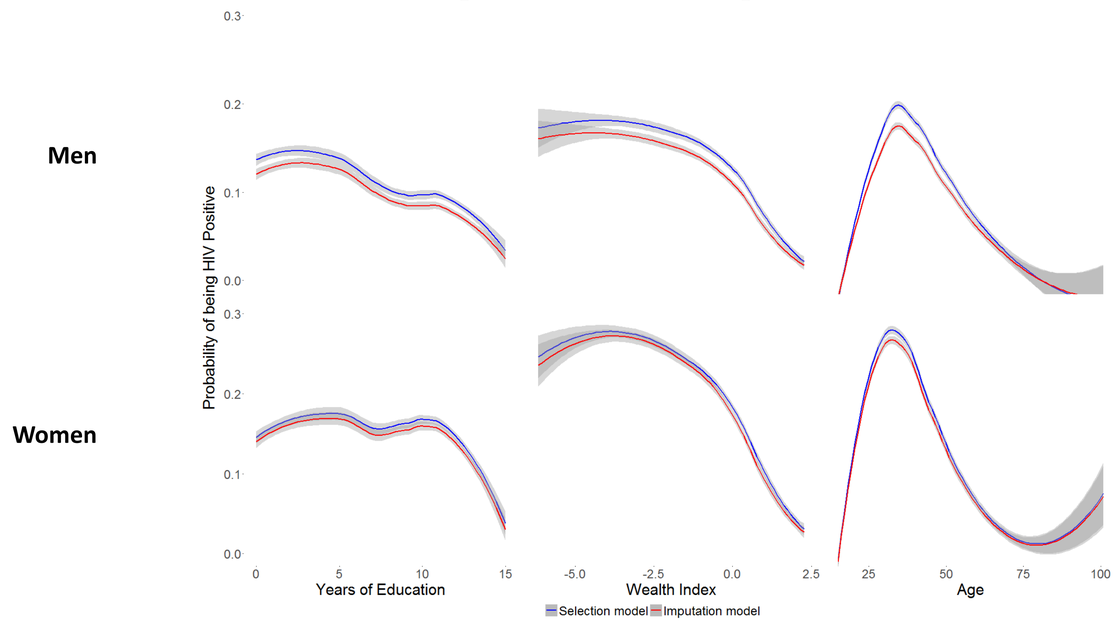
- Jointly estimated ***bivariate binary copula models*** containing :
  - a ***selection*** equation to predict consent to HIV testing, and
  - an ***outcome*** equation to predict HIV status
- Both equations contained all predictors of either consent or HIV status; selection equation also included assigned interviewer identity
- Regression splines for continuous variables; smoothed spatial effects
- National HIV prevalence estimates used existing non-response weights
- Compared results to those from standard multiple-imputation approaches
- All models estimated separately for men and women
- Analyses conducted in the SemiParBIVProbit package in R

Key Findings

Who declined an HIV test?

- Several sociodemographic characteristics predicted declining a test:
  - Male gender; 30-50 years old; White/Asian; Afrikaans/English-speaker; married; more educated; wealthier; Gauteng/Western Cape resident
- So did some behavioural characteristics:
  - Older at sexual debut; fewer lifetime partners; higher perceived future risk of HIV infection

Fig 2. Selection models estimate non-significantly higher HIV prevalence for both men and women in South Africa, compared to standard imputation-based methods

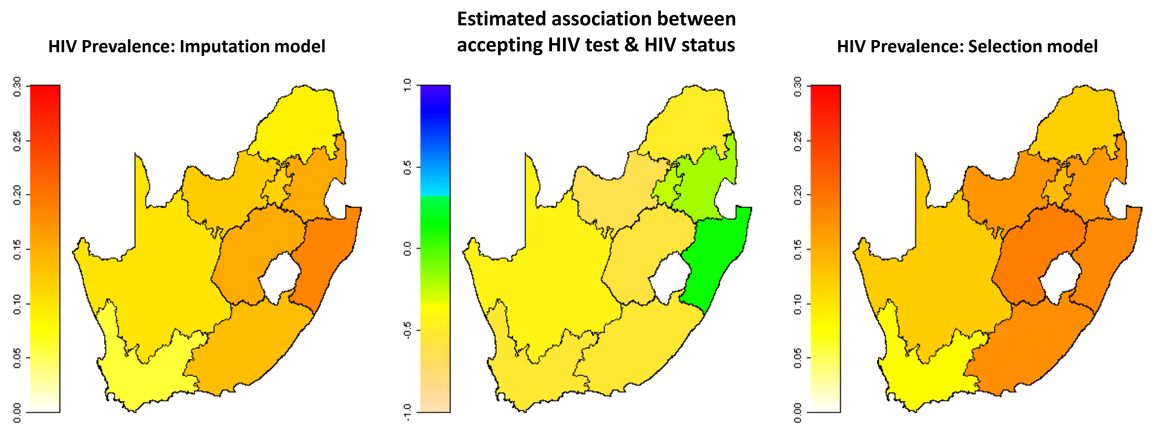


What impact did selection have on HIV estimates?

- Men: 15.1% (95%CI: 12.1%,18.6%) vs. 14.5% (95%CI: 12.8%,16.3%)
- Women: 23.3% (95%CI: 21.7%,25.8%) vs. 23.2% (95%CI: 21.3%,25.1%)

- The point estimates for HIV prevalence remained close to those found in the national survey (from imputation-based models)
- But uncertainty rose substantially: confidence intervals were 21% wider for women, 86% wider for men

Fig 3. The impact of selection on HIV estimates varies across provinces reflecting differences in the association between HIV test acceptance and predicted HIV status



Conclusions

- The most recent HIV prevalence estimates in South Africa are robust under the strongest available test for missingness
- Our findings provide support to the reliability of inferences drawn from these national survey estimates

Acknowledgements

The 2012 survey was funded by PEPFAR, UN Children's Fund, SANAC & BMGF.
This analysis was supported by NIH grants R01-HD084233 & R01-AI124389.

Further information

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