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# Estimating effect of non response on HIV prevalence estimates from Demographic and Health Surveys

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Institut de recherche  
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# Context

- Since 2001, several national population-based surveys with HIV testing in sub-Saharan Africa.
  - in particular, Demographic and Health Surveys (DHS) and AIDS Impact Surveys (AIS)
- Significant non response rates were often cited to explain differences between DHS results and estimations from sentinel surveillance in antenatal clinics.
- How can we estimate the bias due to non-response in DHS and AIS ?



# DHS and AIS design

- Two-stage stratified sample design.
  - At the first sampling, clusters are selected.
  - Then, households are selected.
- Household response rates are relatively good (>95%).
- For people living in a household not surveyed (absence or refusal), we don't have any information. So, it is impossible to estimate their HIV prevalence.



# Eligibility for HIV test

- In selected households, all eligible women (usually 15-49) are selected for the individual questionnaire.
- Only a part of these households are selected for the men questionnaire and the HIV test.
- All eligible men (usually 15-59) and women are tested for HIV after consent.
- All results presented hereafter concern only 15-49 years old men and women, recorded in households database, from 8 DHS and 1 AIS, for which data were available and HIV results linkable to individual questionnaires.



# Non-tested persons

| Country              | Year | Sex   | Neither HIV testing nor individual survey | Individual survey without HIV testing | HIV testing without individual survey | HIV testing and individual survey | No. eligible for HIV testing |
|----------------------|------|-------|---|---------------------------------------|---------------------------------------|-----------------------------------|------------------------------|
| Burkina Faso         | 2003 | Men   | 6.9                                       | 6.4                                   | 2.1                                   | 84.6                              | 3501                         |
|                      |      | Women | 2.6                                       | 5.3                                   | 0.7                                   | 91.4                              | 4607                         |
| Cameroon             | 2004 | Men   | 6.4                                       | 4.7                                   | 1.0                                   | 87.9                              | 5146                         |
|                      |      | Women | 3.8                                       | 4.6                                   | 1.7                                   | 89.8                              | 5759                         |
| Ethiopia             | 2005 | Men   | 8.6                                       | 9.1                                   | 0.1                                   | 82.2                              | 6139                         |
|                      |      | Women | 3.4                                       | 9.2                                   | 0.2                                   | 87.3                              | 6963                         |
| Ghana                | 2003 | Men   | 6.2                                       | 14.3                                  | 0.1                                   | 79.4                              | 4636                         |
|                      |      | Women | 4.2                                       | 6.5                                   | 0.2                                   | 89.1                              | 5845                         |
| Kenya                | 2003 | Men   | 12.9                                      | 15.0                                  | 0.5                                   | 71.6                              | 3970                         |
|                      |      | Women | 5.0                                       | 16.3                                  | 0.3                                   | 78.5                              | 4293                         |
| Lesotho              | 2004 | Men   | 16.0                                      | 18.2                                  | 0.4                                   | 65.4                              | 2926                         |
|                      |      | Women | 6.0                                       | 15.0                                  | 0.3                                   | 78.7                              | 3672                         |
| Malawi               | 2004 | Men   | 13.7                                      | 25.6                                  | 0.0                                   | 60.7                              | 3663                         |
|                      |      | Women | 5.6                                       | 27.3                                  | 0.0                                   | 67.1                              | 4057                         |
| Senegal              | 2005 | Men   | 12.6                                      | 12.0                                  | 1.0                                   | 74.5                              | 3997                         |
|                      |      | Women | 5.6                                       | 10.9                                  | 0.9                                   | 82.6                              | 5342                         |
| Un. Rep. of Tanzania | 2003 | Men   | 9.0                                       | 15.7                                  | 0.0                                   | 75.3                              | 6282                         |
|                      |      | Women | 4.2                                       | 13.6                                  | 0.0                                   | 82.2                              | 7231                         |

# Estimation of HIV prevalence of non-tested

- Logistic regression were used to estimate the probability for each non-tested person to be HIV positive.
- For non-tested and non-interviewed persons, a model was calculated on all tested persons with several variables from the household questionnaire.
- For non-tested and interviewed persons, a second model was calculated on tested and interviewed persons with variables from the household and the individual questionnaire.
- Adjusted prevalence was calculated by using observed HIV status for tested persons and probability to be HIV positive, estimated by the models, for non-tested persons.



# Observed, non-tested and adjusted prevalence

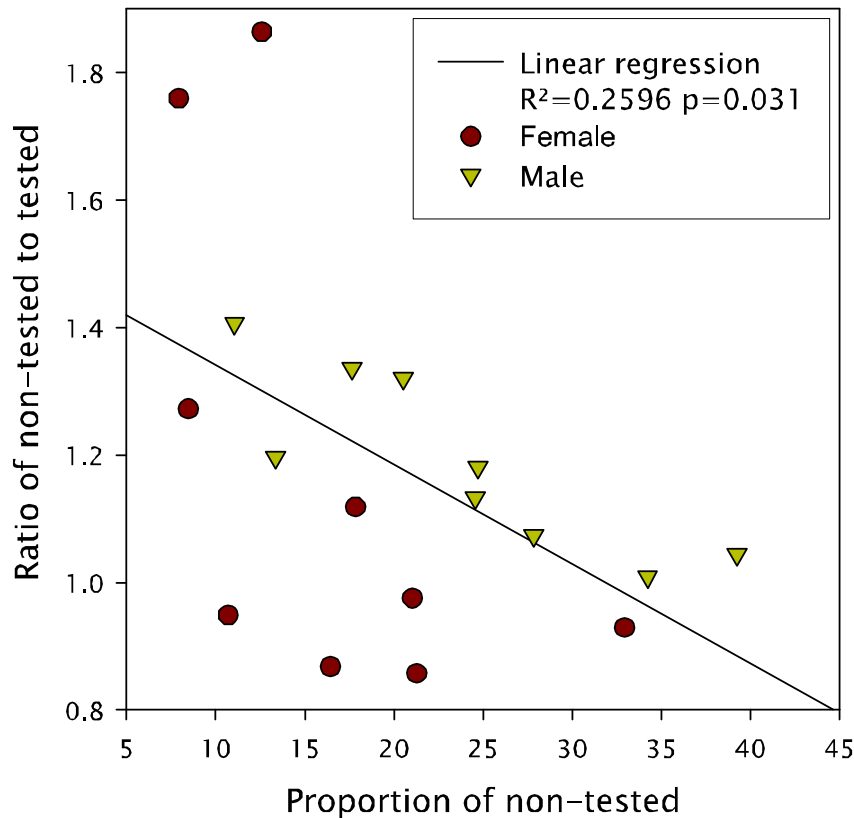
| Country              | Sex   | Observed prevalence         | Predicted prevalence | Ratio of non-    | Adjusted prevalence | Ratio of           | Proport. of non-tested |
|----------------------|-------|-----------------------------|----------------------|------------------|---------------------|--------------------|------------------------|
|                      |       | among those tested (95% CI) |                      | tested to tested |                     | adjusted to tested |                        |
| Burkina Faso         | Men   | 1.8 (1.3-2.2)               | 2.1                  | 1.196            | 1.8                 | 1.026              | 13.4                   |
|                      | Women | 1.8 (1.4-2.2)               | 3.1                  | 1.760            | 1.9                 | 1.060              | 7.9                    |
| Cameroon             | Men   | 4.1 (3.5-4.6)               | 5.7                  | 1.406*           | 4.2                 | 1.045              | 11.1                   |
|                      | Women | 6.6 (6.0-7.3)               | 8.4                  | 1.272            | 6.8                 | 1.023              | 8.5                    |
| Ethiopia             | Men   | 0.9 (0.6-1.2)               | 1.2                  | 1.336            | 1.0                 | 1.059              | 17.7                   |
|                      | Women | 1.7 (1.4-2.0)               | 3.2                  | 1.864*           | 1.9                 | 1.109              | 12.6                   |
| Ghana                | Men   | 1.4 (1.0-1.8)               | 1.9                  | 1.320            | 1.5                 | 1.066              | 20.5                   |
|                      | Women | 2.7 (2.3-3.1)               | 2.6                  | 0.949            | 2.7                 | 0.995              | 10.7                   |
| Kenya                | Men   | 4.7 (3.9-5.5)               | 5.0                  | 1.074            | 4.8                 | 1.021              | 27.9                   |
|                      | Women | 8.7 (7.8-9.7)               | 7.5                  | 0.857            | 8.5                 | 0.970              | 21.3                   |
| Lesotho              | Men   | 19.0 (17.3-20.8)            | 19.2                 | 1.009            | 19.1                | 1.003              | 34.2                   |
|                      | Women | 26.0 (24.4-27.5)            | 25.3                 | 0.976            | 25.8                | 0.995              | 21.0                   |
| Malawi               | Men   | 10.1 (8.8-11.3)             | 10.5                 | 1.044            | 10.2                | 1.017              | 39.3                   |
|                      | Women | 13.9 (12.6-15.2)            | 12.9                 | 0.929            | 13.6                | 0.977              | 32.9                   |
| Senegal              | Men   | 0.5 (0.2-0.7)               | 0.5                  | 1.133            | 0.5                 | 1.033              | 24.6                   |
|                      | Women | 0.9 (0.6-1.2)               | 0.8                  | 0.868            | 0.9                 | 0.978              | 16.4                   |
| Un. Rep. of Tanzania | Men   | 6.0 (5.3-6.7)               | 7.1                  | 1.181            | 6.3                 | 1.045              | 24.7                   |
|                      | Women | 7.5 (6.9-8.2)               | 8.4                  | 1.119            | 7.7                 | 1.021              | 17.8                   |

CI = confidence interval \* Predicted HIV prevalence among non-tested is statistically different at 5% from observed prevalence (t test).



# Selection bias and proportion of non-tested

Ratio of non-tested to tested  
by proportion of non-tested

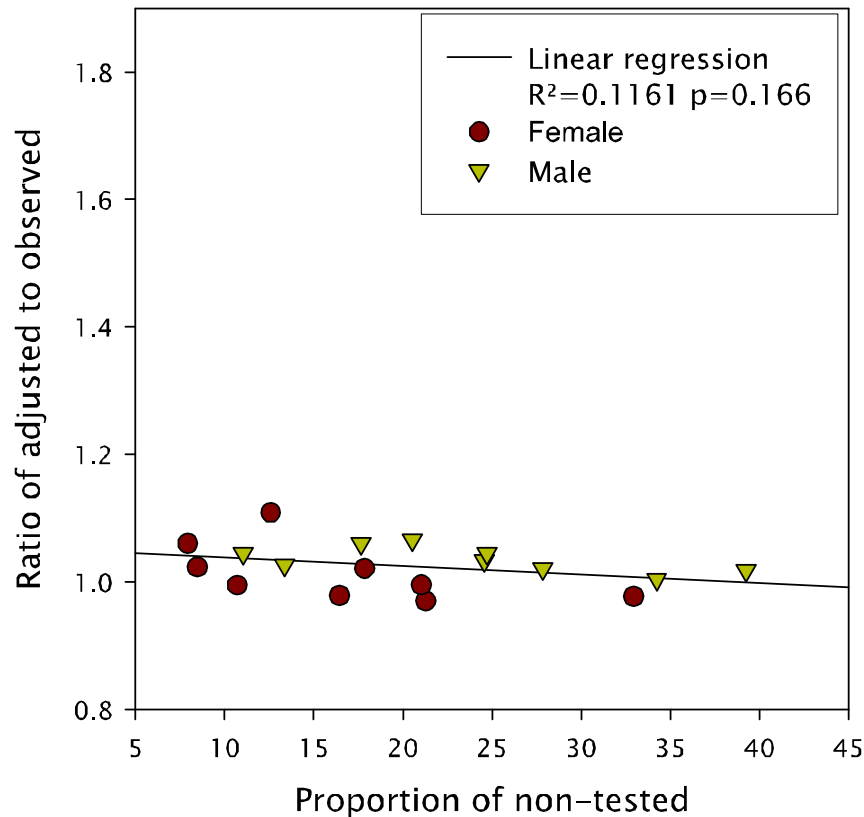


- When the proportion of non-tested persons increases, the selection effect decreases.



# Two effects compensating themselves

Ratio of adjusted to observed  
by proportion of non-tested



- There is no correlation between ratio of adjusted to observed and proportion of non-tested.



# DHS prevalence are a good indicator of national level

| Country              | Sex   | Observed prevalence         | Predicted prevalence | Ratio of non-    | Adjusted prevalence | Ratio of           | Proport. of non-tested |
|----------------------|-------|-----------------------------|----------------------|------------------|---------------------|--------------------|------------------------|
|                      |       | among those tested (95% CI) |                      | tested to tested |                     | adjusted to tested |                        |
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|                      | Women | 1.7 (1.4-2.0)               | 3.2                  | 1.864*           | 1.9                 | 1.109              | 12.6                   |
| Ghana                | Men   | 1.4 (1.0-1.8)               | 1.9                  | 1.320            | 1.5                 | 1.066              | 20.5                   |
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CI = confidence interval

\* Predicted HIV prevalence among non-tested is statistically different at 5% from observed prevalence (t test).

# Discussion

- Variables included in the models are not direct determinants of HIV prevalence but remain statistically discriminant and so useful for estimation.
- Although this approach doesn't take in account some populations (not surveyed households and people not living in a household), we can conclude that biases due to non-response are small.
- National population-based surveys can provide representative and quality national estimates of HIV prevalence level in countries with a generalized epidemic.





# Thank you

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