Trends in Knowledge of HIV Status and Efficiency of Testing Programs in Sub-Saharan Africa (2000-2018): a Modeling Study of Survey and HIV Testing Program Data

Katia Giguère,[1] Jeffrey W. Eaton,[2] Kimberley Marsh,[3] Leigh F. Johnson,[4] Andreas Jahn,[5,6] Francisco Mbofana,[7] and Mathieu Maheu-Giroux[1]

[1] Department of Epidemiology, biostatistics, and Occupational Health, McGill University, Montreal, QC, Canada; [2] Department of Infectious Disease Epidemiology, Imperial College London, St Mary's Hospital, London, United Kingdom; [3] The Joint United Nations Programme on HIV/AIDS (UNAIDS), Geneva, Switzerland; [4] Centre for Infectious Disease Epidemiology and Research, University of Cape Town, Cape Town, South Africa; [5] Department for HIV and AIDS, Ministry of Health and Population, Lilongwe, Malawi; [6] I-TECH, Department of Global Health, University of Washington, Seattle, WA, USA; [7] Ministry of Health, Maputo, Mozambique

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Background

✤ Knowledge of HIV status (KOS) among people living with HIV (PLHIV) can be an important bottleneck to an effective national HIV response. To end the AIDS epidemic, UNAIDS set the target of 90% KOS by 2020.

✤ As we reach this date, this study aims to comprehensively assess trends in KOS, diagnosis gaps, and efficiency of HIV testing services (HTS) in sub-Saharan Africa (SSA) where two thirds of all PLHIV live.

Methods

✤ We used *Shiny90*, a validated compartmental and deterministic mathematical model that was specifically developed to estimate KOS (Maheu-Giroux et al. 2019. AIDS(33):S255-S269).

✤ We triangulated data from 44 SSA countries
  → 177 population-based surveys (N=2.6 millions participants)
  → HTS program data (N=196 country-years)

✤ We calculated time trends (2000-2018) in
  → % of PLHIV with KOS by region (Western, Central, Eastern, Southern Africa), sex, and age group (15-24, 25-34, 35-49, 50+)
  → positivity : % of HIV+ tests among all tests
  → % of new diagnoses among positive tests

✤ Using period life table methods that account for the competing risk of AIDS-related death, we also estimated trends in
  → median time from HIV infection to diagnosis
  → probability of getting tested within one year of infection or before reaching a CD4 count threshold lower than 350 cells/μL.

✤ Uncertainty intervals were obtained by drawing 1,000 samples from the posterior distribution of the testing rates estimated by *Shiny90*.

Findings
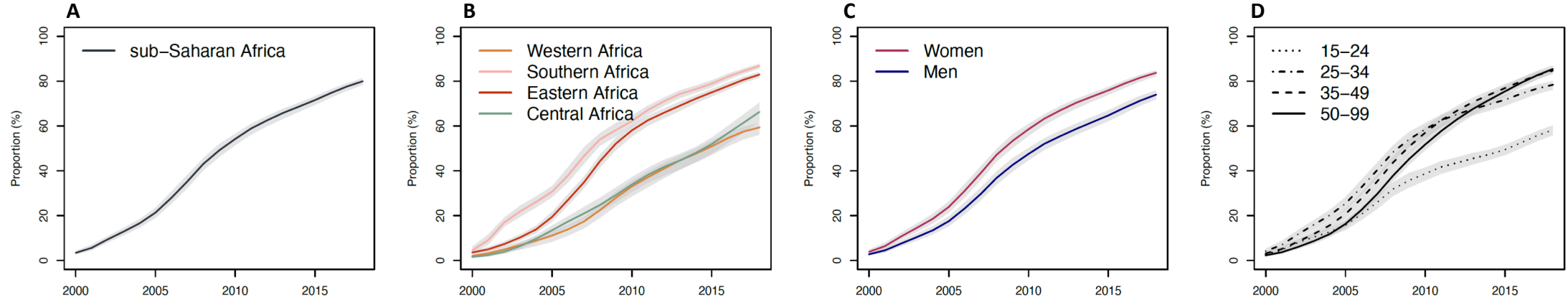
**Fig 1**: Progress and disparities in knowledge of HIV status in sub-Saharan Africa, 2000-2018
Panels A to D show trends in proportion of PLHIV who are aware of their HIV status in sub-Saharan Africa (A), by region (B), by sex (C), and by age group (C). Shaded areas correspond to the 95% credible intervals.
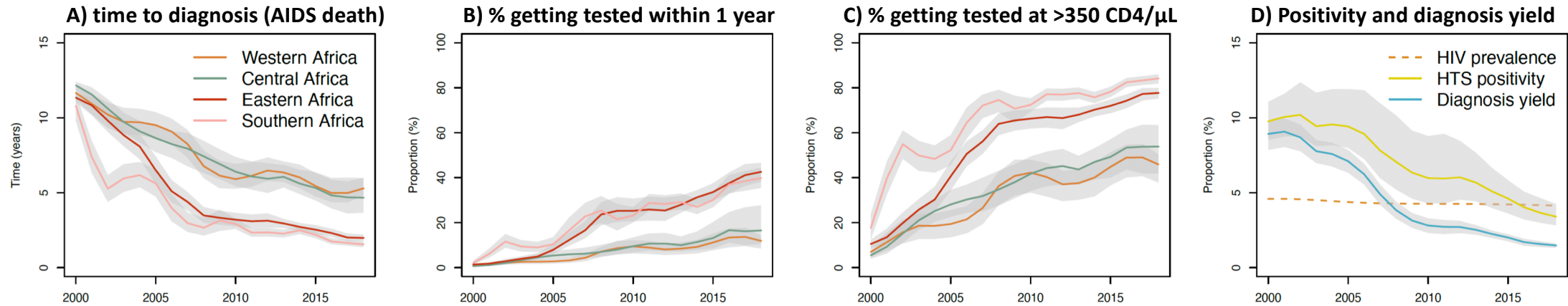
Fig 2: Progress in timeliness of HIV diagnosis, in positivity, and in diagnosis yield in sub-Saharan Africa, 2000-2018
Panels A to C show trends in median time to diagnosis (or AIDS-death)(A), probability of getting tested within 1 year of infection (B) or before reaching a CD4 count threshold of 350 cells/µL (C) by region. Panel D show trends in positivity and in diagnosis yield across SSA. Shaded areas correspond to the 95% credible intervals.

Findings
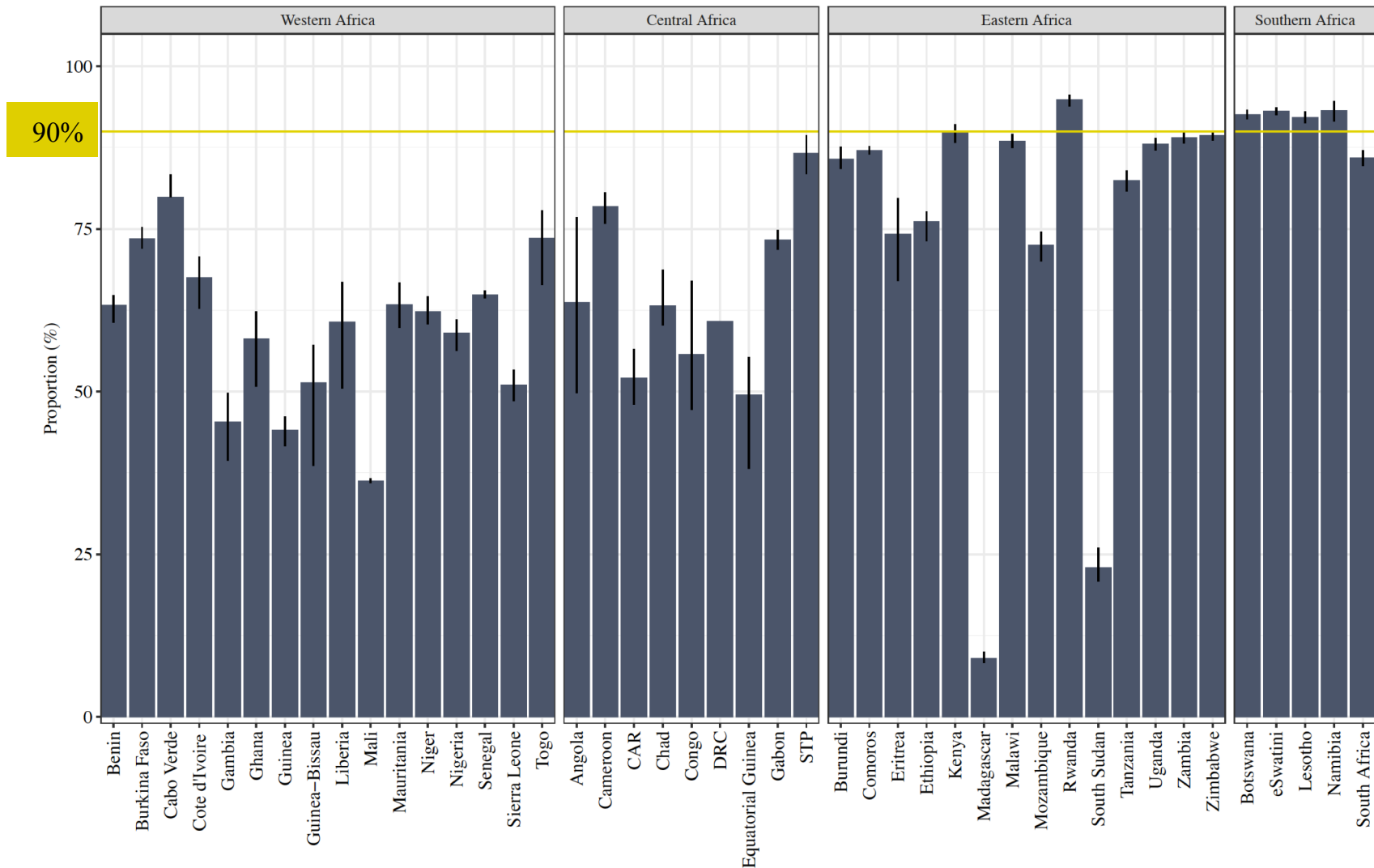
Fig 3: National estimates of knowledge of HIV status in sub-Saharan Africa, 2018
Proportion of PLHIV who know their HIV status. Vertical lines correspond to the 95% credible intervals. CAR: Central African Republic, DRC: Democratic Republic of the Congo, STP: Sao Tome & Principe
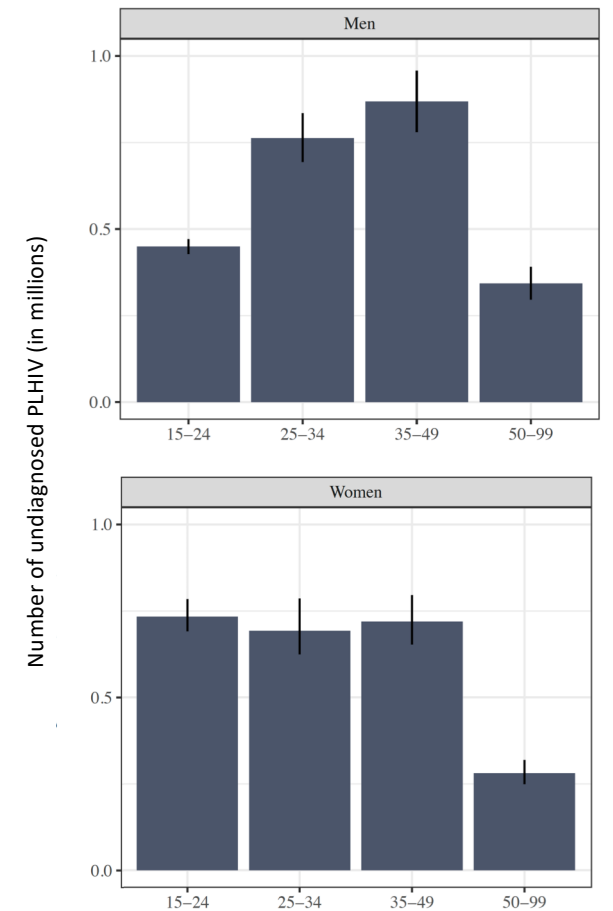
Fig 4: Absolute diagnosis gaps in sub-Saharan Africa, 2018
Each bar shows the total number of undiagnosed PLHIV by sex- and age-stratification. Vertical lines correspond to the 95% credible intervals.

Findings and interpretation

✤ Impressive gains in KOS → steady increase from 3% (3-4%) in 2000 to 80% (78-81%) in 2018 across SSA (Fig 1A)
   → 5 countries reached the 90% KOS target (Fig 3)

✤ Substantial regional, sex, and age disparities in KOS in 2018
   → Higher KOS in Eastern (83%) and Southern (87%) than in Western (59%) and Central Africa (66%)(Fig 1B), where HIV prevalence is lower but key populations account for a higher HIV burden. Stigma and discrimination towards key populations are common in many health facilities, which may lead to delayed HIV testing.
   → Men (74%) less likely to know their status compared to women (84%)(Fig 1C)
   → 15-24 year-old (58%) less likely to know their status compared to older PLHIV (Fig 1D)

✤ KOS proportionally the lowest among men aged 15-24 years. However, in absolute numbers, the largest group of undiagnosed PLHIV was among men aged 35-49 years, with around 870 thousand left undiagnosed across SSA (Fig 4). Lower uptake of HIV testing amongst men may be explained by harmful gender norms and health systems that are inaccessible or uninviting to men.

✤ From 2000 to 2018 across SSA, and suggesting that PLHIV are getting diagnosed sooner than before
   → Median time to diagnosis decreased from 11 to 3 years (Fig 2A)
   → Probability of getting tested with 1 year increased from 2% to 34% (Fig 2B)
   → Probability of getting tested before reaching 350 CD4/µL increased from 12% to 72% (Fig 2C)

✤ Positivity declined from 10% to 3% (Fig. 2D) and the proportion of new diagnoses among all positive tests dropped from 91% to 44% over the study period. Such declining yields are an inevitable consequence of reaching saturation in testing programs — as long as testing rates are lower in previously-diagnosed individuals than in undiagnosed, we can expect yields to decline as KOS increases.

✤ On the path towards the next UNAIDS target of 95% diagnostic coverage by 2030, we need to focus on addressing disparities in KOS. An increase in HIV KOS and of treatment coverage among older men could be critical to reduce HIV acquisition rates among women, and by extension, reducing mother-to-child transmission.