Modeled Estimates of Disease Burden Attributable to Interactions Between HIV and Depression in Kenya

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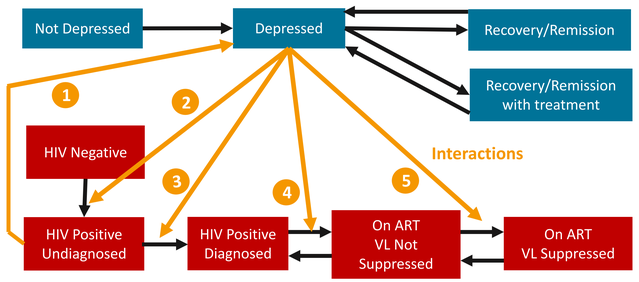
BACKGROUND

- Depression is a leading cause of morbidity in SSA
- Populations at risk for HIV also face depression vulnerabilities, with high prevalence (2-3x) among people living with HIV in SSA
- Depression is associated with worse HIV care outcomes
  - Increased relative risk of HIV incidence
  - Delays to testing, diagnosis, HIV treatment
  - Less effective HIV treatment outcomes
- Our goal is to estimate how the HIV pandemic has impacted depression and how the depression epidemic has impacted the HIV pandemic in Nyanza, Kenya, a geography where both conditions are present.

METHODS

- Agent-based network transmission model (EMOD-HIV) to simulate both HIV and major depression
- Calibrated simulation to match age- and sex-specific prevalence estimates for HIV (DHS, PHIA) and depression (WHO) in Kenya
- Simulated two scenarios, one which accounted for interactions between HIV and depression which lead to worse outcomes, and one which modeled HIV and depression separately without interactions

Compartmental representation of HIV and depression

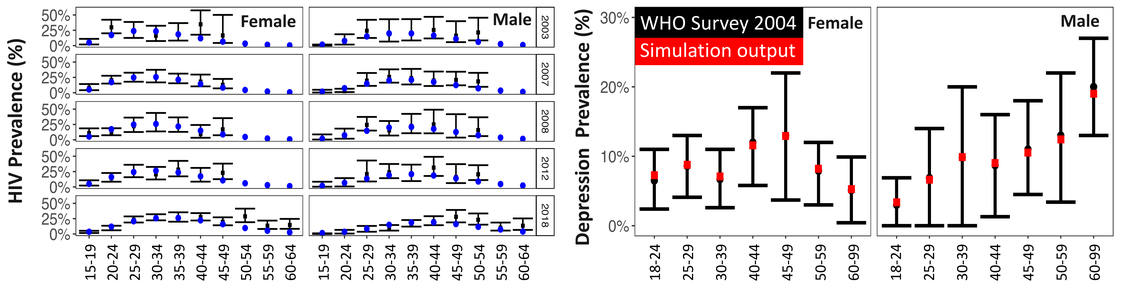


HIV associated with
1. Higher depression prevalence (2x)

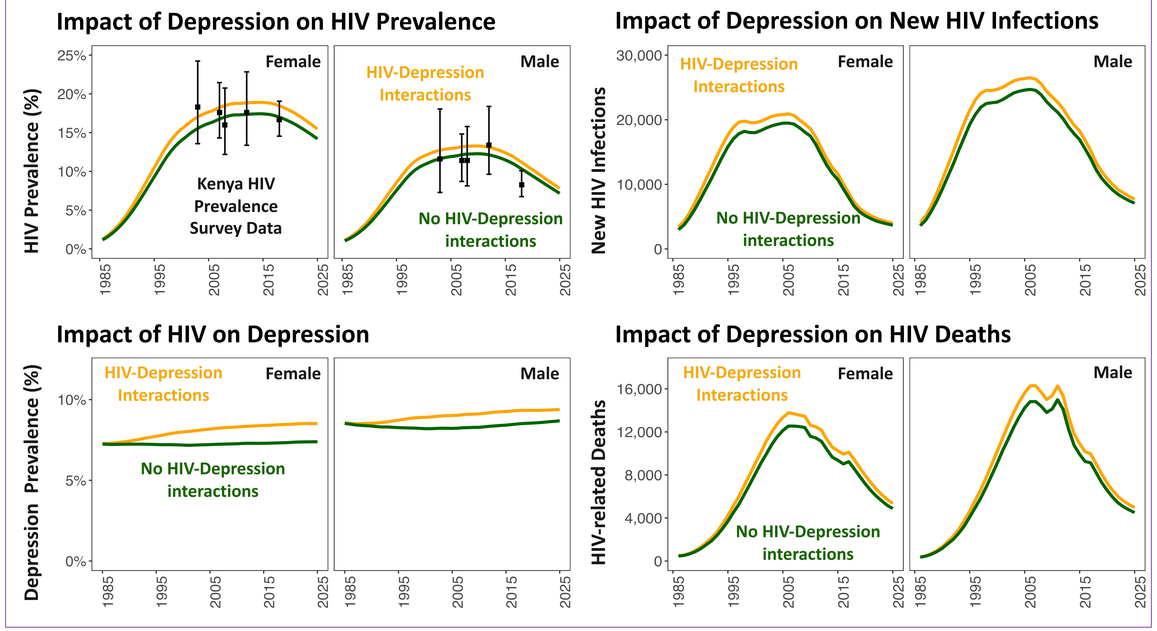
Depression associated with
2. Higher HIV acquisition and transmission (1.6x)
3. Longer delays to HIV diagnosis (2x)
4. Higher rate of dropout from ART (2x)
5. Lower adherence to ART (1.2x reduction)

Interactions between HIV and major depression have increased HIV infections by 11.5%, HIV deaths by 10.3% and episodes of depression by 9.3% in western Kenya (1984-2024).

RESULTS: Model Calibration to HIV and Depression by Age and Sex



RESULTS: Scenarios with and without interactions



RESULTS

Cumulative HIV and depression outcomes, 1985-2025

Scenario	HIV Infections	HIV Deaths	Depression Episodes
No Interactions	1,114,000	598,000	16,100,000
HIV-Depression Interactions	1,243,000	660,000	17,600,000
Difference	+129,000	+62,000	+1,500,000
% Difference	+11.5%	+10.3%	+9.3%

DISCUSSION

We developed a simulation model of HIV, depression, and the bi-directional interactions between the two conditions. Our findings suggest interactions between depression and HIV have substantially exacerbated both epidemics.

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