

The Impact of Socio-economic Environment on HIV Prevalence Rate in Africa

Kebing Li, Linh Nguyen, Chrisbell (Jingwei) Ni, Rayne Wang

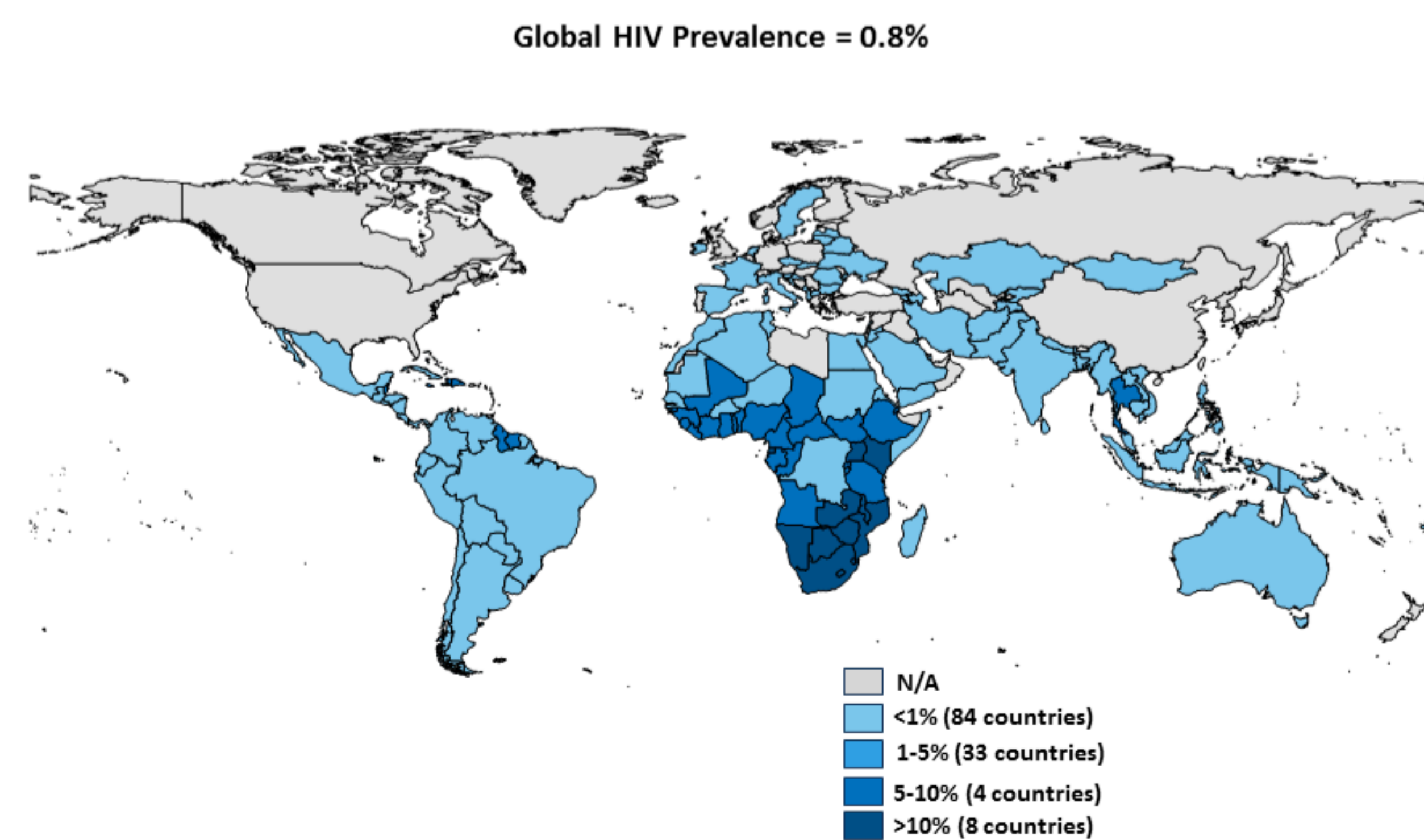
Economics Department, Colby College, Waterville, ME



Background

- HIV/AIDS is a major public health problem and it has killed more than 35 million people so far.
- Our study focuses on the HIV prevalence rate in Africa because:
 - According to the WHO, although the HIV prevalence among adults (aged 15-49) in Africa has steadily decreased since its peak in 2000 of 5.876 % to 4.264% in 2016, Africa is still battling with this disease because its rate is still much higher than the global rate of 0.8%.
 - As of 2016, the HIV prevalence rate varied within different regions of Africa. For example, Comoros' HIV prevalence rate is around 0.1% while Botswana's HIV prevalence rate is around 23%.

Adult HIV Prevalence, 2016



NOTES: Data are estimates. Prevalence includes adults ages 15-49.
SOURCES: Kaiser Family Foundation, based on UNAIDS, AIDSinfo, Accessed July 2017



Data Summary

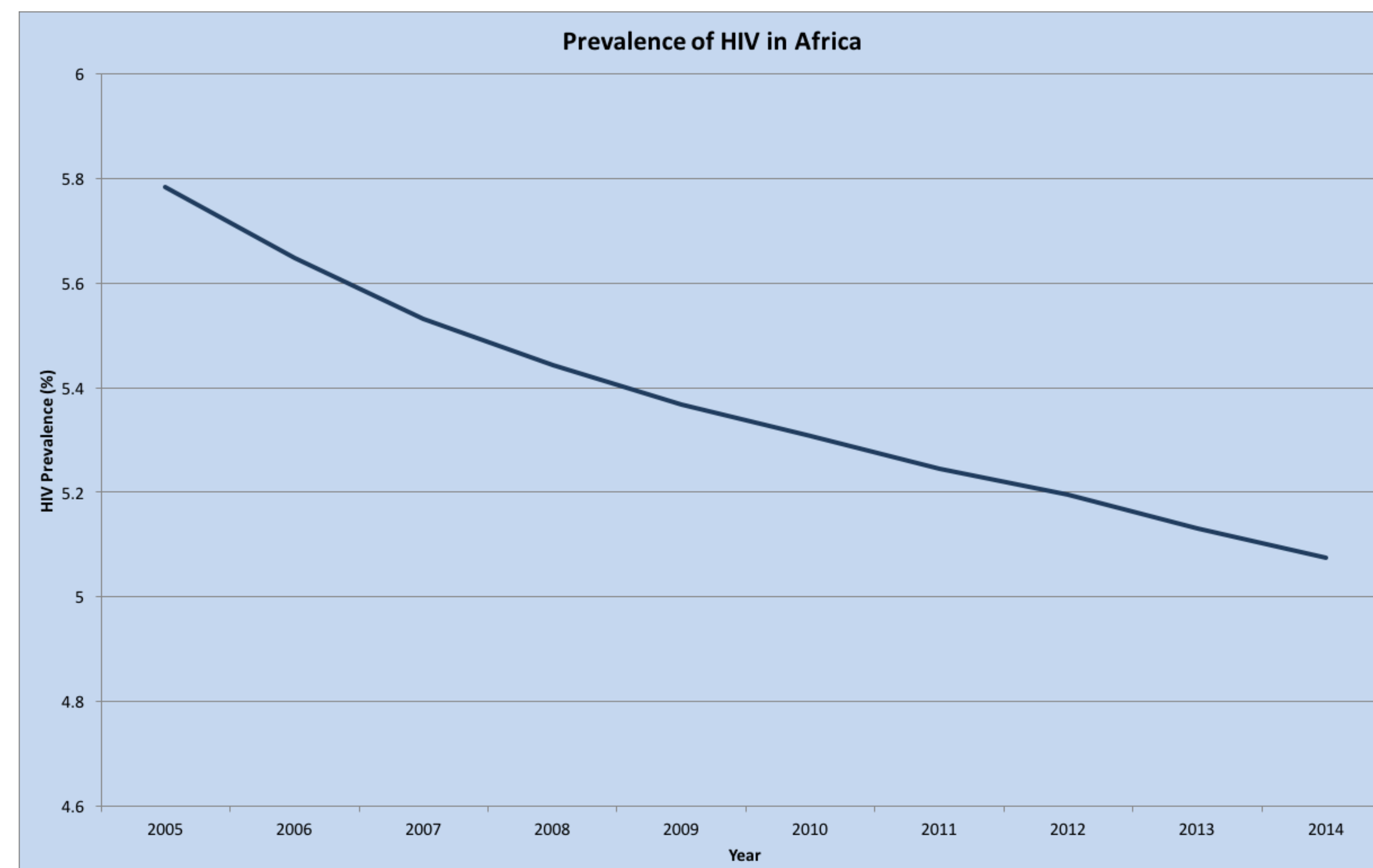
Variable	Observations	Mean	Standard Deviation	Min	Max
HIV prevalence rate (adult 15-49 years old), %	460	5.37	6.83	0.10	28.30
Net FDI inflows, % of GDP	459	5.02	7.44	-5.98	84.95
GDP growth, annual %	460	5.02	4.38	-36.70	22.59
GDP per capita, US\$	459	2092.55	3089.46	150.51	22742.38
Unemployment rate, %	460	10.10	7.59	0.70	36.00
Health expenditure, % of GDP	460	5.93	2.25	1.63	14.39
Inflation (consumer prices), annual %	457	63.52	1142.66	-35.84	24411.03
Inflation (GDP deflator), annual %	460	8.35	11.12	-20.83	103.82
Duration of secondary education, years	460	6.23	0.74	5.00	7.00
GDP per capita (lag 1 year), US\$	459	1968.95	2959.60	127.43	22742.38
Gender ratio (male/female)	460	0.99	0.04	0.93	1.22

Empirical Model

$$\text{HIVrate}_{ct} = \beta_0 + \beta_1 \log \text{GDPPC}_{ct} + \beta_2 \text{Health_Exp}_{ct} + \beta_3 \text{Sec_Education}_{ct} + \beta_4 \text{Gender_ratio}_{ct} + \beta_5 \text{Unemployment}_{ct} + \beta_6 \text{Inflation_CPI}_{ct} + \beta_7 \text{FDI}_{ct} + \beta_8 \text{Lagged_GDPPC}_{ct} + \beta_9 \text{Unemployment} * \text{Sec_Education}_{ct} + \beta_{10} \text{Gender_ratio} * \text{Sec_Education}_{ct} + \alpha_t + \lambda_c + \varepsilon_{ct}$$

Results

- 1 % increase in GDP per capita relates to a 0.0094 percentage points decrease in the predicted HIV prevalence rate, holding all other variables in the model fixed.
- 1 percentage point increase in health expenditure relates to a 0.259 percentage points increase in predicted HIV prevalence rate, holding all other variables in the model fixed.
- 1 percentage point increase in unemployment rate relates to a 0.46 percentage points increase in the predicted HIV prevalence rate when secondary education duration is 5, or a 0.31 percentage points decrease in the predicted HIV prevalence rate when secondary education duration is 7, holding all other variables in model fixed.
- High gender ratio relates to a higher predicted HIV rate for one more year of secondary education duration, holding other variables in the model fixed.
- Adding time fixed effect leaves the estimated coefficients nearly the same.
- Adding country fixed effect leaves the estimated coefficients dramatically changed, shifting the signs of some variables. This is probably due to the lack of variation within country over years.



Study

- We use data from the World Bank's World Development Indicators.
- We have country-year level of statistics on 10 selected socio-economic indicators, covering 46 countries in Africa. We also chose 2005-2014 as our focusing years to do panel analysis.
- We exclude 8 countries Libya, Mauritius, Seychelles, Sao Tome and Principe, South Sudan, Eritrea, Somalia, and Niger because their HIV prevalence rate is not available.

Literature Review

- The HIV/AIDS pandemic in Africa is unique in comparison to all other low-income countries around the world because it relates to the unique traditions and culture in Africa such as sharing of wives, widow inheritance, sexual cleansing, and early marriages (Luboobi and Mugisha 2005)
- Another cross-sectional study determined the HIV status and demographic and socio-economics information. The result showed that while no significant difference in the HIV prevalence between two districts, there is a statistical significance between gender and HIV-status as well as a strong correlation between education and the HIV prevalence and unemployment and the HIV prevalence (Steenkamp et al. 2013)

Regression Results

Baseline Regression					
Dependent Variable: HIV Prevalence Rate					
	(1)	(2)	(3)	(4)	(5)
	OLS	LAD	OLS	OLS	OLS
logGDPPC	0.938*** (0.224)	0.643 (0.000)	-0.874*** (0.183)	1.029*** (0.080)	-0.085 (0.290)
Health_expenditure	0.259*** (0.083)	0.233 (0.000)	0.009 (0.040)	0.284*** (0.037)	0.048 (0.035)
Education	-63.790*** (10.480)	-32.870 (0.000)	3.456 (4.184)	-62.836*** (5.259)	2.704 (3.915)
Gender_ratio	-411.636*** (67.225)	-198.886 (0.000)	27.547 (19.912)	-406.423*** (28.297)	28.676 (17.919)
Unemployment	2.362*** (0.197)	2.456 (0.000)	-0.196 (0.223)	2.355*** (0.089)	-0.241 (0.234)
Inflation	0.001*** (0.000)	0.001*** (0.000)	0.000*** (0.000)	0.001*** (0.000)	0.000*** (0.000)
UnemploymentXEducation	-0.380*** (0.031)	-0.379*** (0.000)	0.023 (0.034)	-0.380*** (0.014)	0.030 (0.036)
GenderRatioXEducation	64.966*** (10.613)	33.896 (0.000)	-3.915 (4.063)	64.032*** (5.215)	-3.082 (3.836)
FDI	-0.061*** (0.017)	-0.060*** (0.006)	-0.007*** (0.003)	-0.059*** (0.015)	-0.007*** (0.002)
Constant	400.171*** (66.537)	189.554 (0.000)	-12.548 (20.711)	394.064*** (29.215)	-19.394 (18.502)
Observations	460	460	460	460	460
R-squared	0.699		0.304	0.700	0.396
Country Fixed Effect	No	No	Yes	No	Yes
Time Fixed Effect	No	No	No	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Discussion

Our main research goal is to estimate the relationship between HIV prevalence and GDP per capita and secondary education duration. Inconsistent with our assumption, there exists a positive relationship between GDP per capita and HIV prevalence.

Secondary education duration has a negative relationship with HIV prevalence, which implies that higher secondary education duration is related to a lower HIV prevalence.

From our model, HIV prevalence is also correlated with health expenditure, gender ratio, unemployment, inflation consumer prices, foreign direct investment, unemployment*secondary education duration, and gender ratio*secondary education duration. We also observed that secondary education duration, gender ratio, and unemployment rate have the highest coefficient; thus, they have the highest magnitude of influence on HIV prevalence.

Besides the common measurements of economy such as GDP per capita, health expenditure, and foreign direct investment, our research provides a new angle towards the HIV problem by focusing more on gender ratio and secondary education duration.

As a result, we would suggest that policy makers should devote more to balancing gender inequality and improving overall education level. This is because according to do our model, more educated males is related to a lower HIV prevalence rate; therefore, by encouraging females to receive more education, it will relate to a lower predicted HIV prevalence rate as well.