Rapidly Changing Socio-economic Patterns of HIV Incidence in Rural KwaZulu-Natal, South Africa

1024

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BACKGROUND

Despite a decline in HIV incidence in South Africa associated with the increased provision of HIV prevention services, there remains a lack of evidence on whether this progress has been experienced equitably by those most economically disadvantaged. We assessed whether the risk of acquiring HIV has changed over time for those in different socio-economic strata.

METHODS

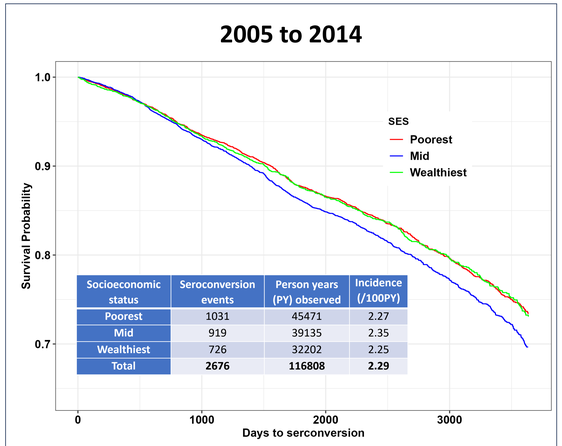
- The study used data from a population-based HIV surveillance platform run by the Africa Health Research Institute (AHRI) in KwaZulu-Natal, South Africa.
- Socio-economic status (SES) stratified into three equal wealth quantiles was derived using a Principal Components Analysis (PCA), with input variables representing household asset ownership and services used.
- Cox Proportional Hazard (PH) regression models using open cohorts were developed to test statistical significance.
- For period 1 (2005 to 2014) the criteria for ART initiation was CD4 count <= 350 cells/ml.
- For period 2 (2015 to 2021) the criteria was CD4 count <= 500 cells/ml until 2016 and then ART initiation at any CD4 count starting in 2017

RESULTS

Period 1 - open cohort initially HIV negative from 2005 to 2014 (Figures 1a and 1b)

- 2676 seroconversion events over 116808 person years (PY), overall incidence = 2.29/100PY.
- Marginally higher incidence for those in the mid SES strata (2.35/100PY).
- Univariable model indicated that differences were not statistically significant.
- Multivariable Cox PH model controlling for age and sex confirmed the results for the univariable model.

In this rural South African cohort from 2005 to 2014 there was no evidence for differences in HIV incidence by SES strata.
From 2015 to 2021 there was a higher incidence for those of medium wealth and lower incidence for the wealthiest compared to the poorest.
This change was associated temporally with the roll-out of universal ART.



Socioeconomic status	Seroconversion events	Person years (PY) observed	Incidence (/100PY)
Poorest	1031	45471	2.27
Mid	919	39135	2.35
Wealthiest	726	32202	2.25
Total	**2676**	**116808**	**2.29**

Fig 1a Kaplan-Meier survival curves and HIV incidence stratified by SES strata (2005 to 2014)

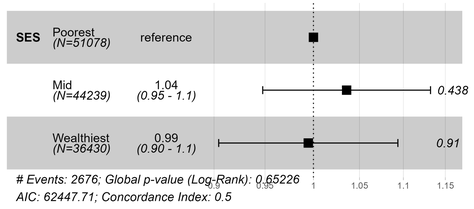
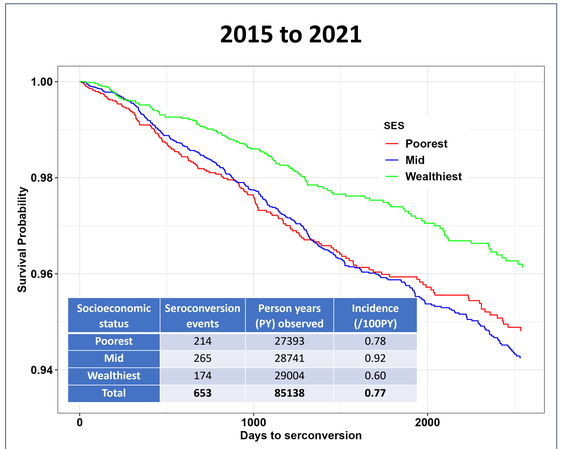


Fig 1b Univariable Cox Proportional Hazard Regression model stratified by SES strata (2005 to 2014)



Socioeconomic status	Seroconversion events	Person years (PY) observed	Incidence (/100PY)
Poorest	214	27393	0.78
Mid	265	28741	0.92
Wealthiest	174	29004	0.60
Total	**653**	**85138**	**0.77**

Fig 2a Kaplan-Meier survival curves and HIV incidence stratified by SES strata (2015 to 2021)

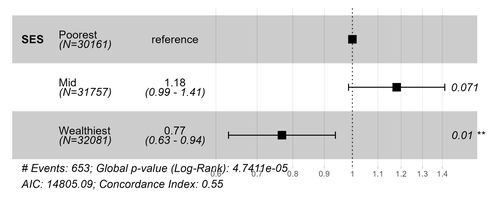


Fig 2b Univariable Cox Proportional Hazard Regression model stratified by SES strata (2015 to 2021)

RESULTS (continued)

Period 2 - open cohort initially HIV negative from 2015 to 2021 (Figures 2a and 2b)

- 653 seroconversion events over 85138 PY, overall incidence = 0.77/100PY.
- Lower incidence for those in the wealthiest SES strata (0.60/100PY) and higher incidence for those in the mid-wealth strata (0.92/100PY) compared to the poorest compared (0.78/100PY).
- A univariable Cox PH model showed evidence that the differences were statistically significant. HR for the mid SES strata compared to the poorest = 1.18(95%CI:0.99-1.41). HR for wealthiest SES strata compared to the poorest = 0.77(95%CI:0.63-0.94).
- A multivariable Cox PH model controlling for age and sex confirmed differences with minor attenuation of HR for those in mid wealth SES strata HR=1.16(95%CI:0.95-1.42).

CONCLUSIONS

- From 2005 to 2014 there was no evidence for wealth associated differences in HIV incidence.
- From 2015 to 2021 the highest incidence shifted to those in the middle wealth strata and lower incidence was seen for the wealthiest strata.
- This change was associated temporally with the roll-out of universal ART.
- This provides evidence for wealth-related differences in the impact of the changes in ART initiation criteria.

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