

The rapidly shrinking burden of HIV on adult mortality in KwaZulu-Natal, South Africa

G. Reniers,^{1,2} S. Blom,¹ C. Calvert,¹ A. Martin-Onraet,¹ K. Herbst,³ J.W. Eaton,⁴ J. Bor,⁵ E. Slaymaker,¹ Z.R. Li,⁶ S. Clark,^{2,6} T. Bärnighausen,^{3,7} B. Zaba,¹ and V. Hosegood^{3,8}

¹ London School of Hygiene and Tropical Medicine, ² University of the Witwatersrand, ³ Africa Centre for Population Health, ⁴ Imperial College, ⁵ Boston University, ⁶ University of Washington, ⁷ Harvard University, ⁸ University of Southampton

Introduction

The rollout of antiretroviral therapy (ART) in populations with generalized epidemics has greatly improved the survival of people living with HIV (PLHIV), and that has been documented in both clinical cohorts and population-based studies. Many studies report changes in all-cause mortality, but do not quantify how much of the overall mortality decline is due to a reduction in HIV associated deaths. In addition, most studies are not in a position to estimate the residual burden of HIV on adult mortality. We seek to remedy both shortcomings.

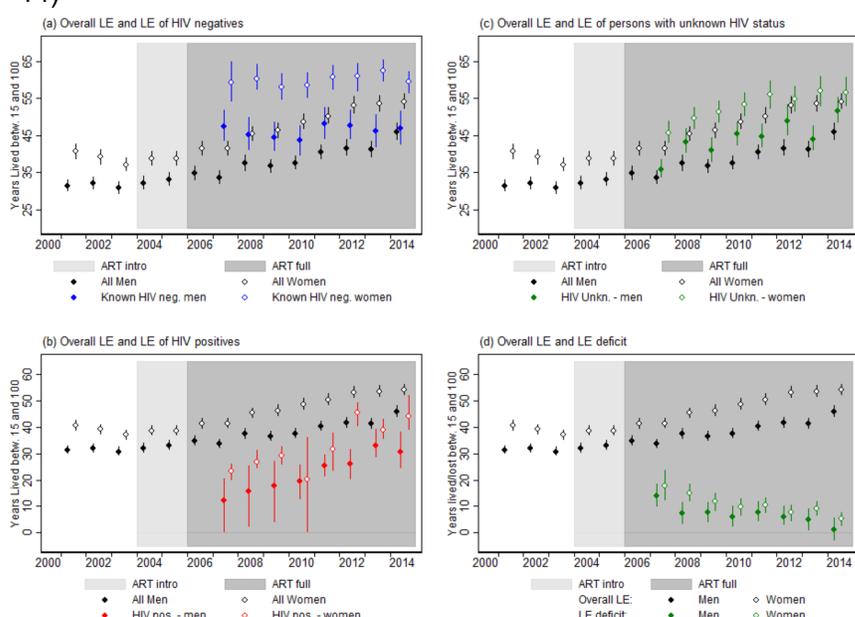
Results

Table 1: Characteristics of the study population, and death rates before and after the introduction of the ART (2001-'14).

	Individuals ^a	Person-Years	Deaths	2001-2004 Rate (95%-CI)	2011-2014 Rate (95%-CI)
All	93,903	535,428	9,992	23.1 (22.3-23.9)	13.6 (13.0-14.2)
Men					
15-19	20,887	62,552	129	2 (1.5-2.8)	1.3 (0.9-2.0)
20-24	16,836	38,642	186	6.4 (5.0-8.1)	3.1 (2.2-4.3)
25-34	14,507	44,791	929	30.3 (27.3-33.6)	12.7 (11.0-14.6)
35-44	8,171	28,863	969	45.4 (41.1-50.2)	21.5 (18.6-24.9)
45+	7,799	46,576	2,432	59.2 (55.1-63.5)	43.2 (39.8-46.8)
All men	42,262	221,424	4,645	26 (24.8-27.3)	15.6 (14.6-16.5)
Women					
15-19	21,736	61,327	136	2.7 (2.0-3.5)	1.5 (1.0-2.2)
20-24	19,158	44,946	353	11.1 (9.4-13.1)	4.4 (3.4-5.7)
25-34	18,809	63,162	1,160	28.7 (26.3-31.3)	8.5 (7.2-9.9)
35-44	11,336	47,542	835	22.9 (20.5-25.5)	10.1 (8.5-12.0)
45+	12,812	97,029	2,863	32.8 (30.6-35.1)	24.6 (22.9-26.5)
All women	51,641	314,005	5,347	21.0 (20.1-22.0)	12.2 (11.5-13.0)
HIV status^b					
Negative	31,520	132,482	1,530	-	13.9 (12.9-14.9) ^c
Positive	15,148	59,576	2,142	-	23.4 (21.8-25.2)
Unknown	93,253	343,370	6,320	23.4 (22.7-24.2)	9.2 (8.5-9.9)

Notes: ^a Individuals can contribute to more than one category as they age or their HIV status changes during follow-up. ^b We report the HIV status information as it is known to the study and may not be the same as people's knowledge of their own HIV status. Unknown HIV status includes all the person-years of exposure before the start of the HIV surveillance as well as time prior to the first HIV test, and exposure time more than five years after the last HIV negative test. ^c The death rate for adult HIV negatives is higher than for the population as a whole, which is due to the older age distribution of the population with a known HIV negative status.

Figure 1: Adult LE trends by sex and HIV status, and the LE deficit (2001-'14)



Conclusions

- The increases in adult LE in this population are among the largest in modern history, and testify to the success of ART in reducing HIV associated mortality.
- The residual burden of HIV mortality remains sizable for women, despite their better engagement with HIV services. Women, who have to date gained more adult life-years than men, continue to bear the highest burden of HIV mortality, which is a finding that adds nuance to the literature wherein men are often portrayed as the 'losers of the ART scale-up.'

Methods

Data come from adults aged 15 and above who are regular residents in the area covered by the Africa Centre Demographic Information System in KwaZulu-Natal (2001 to 2014). We estimate population-wide life expectancy (LE) trends since the introduction of ART in 2004, and the shortfall of the population-wide LE compared to that of the HIV negative population (i.e., the LE deficit). LE gains and deficits are decomposed by age and cause of death. Cause of death attribution is done with the InSilico Verbal Autopsy interpretation tool.

Figure 2a: Age and cause-group contributions to the LE gains between 2001-'04 and 2011-'14, by sex

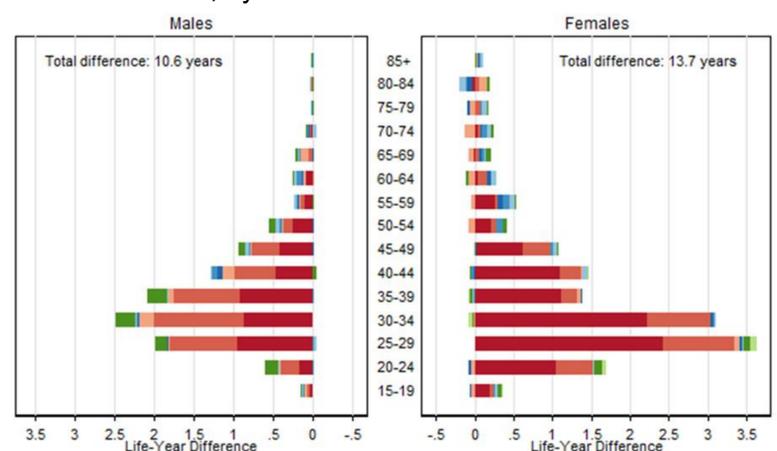
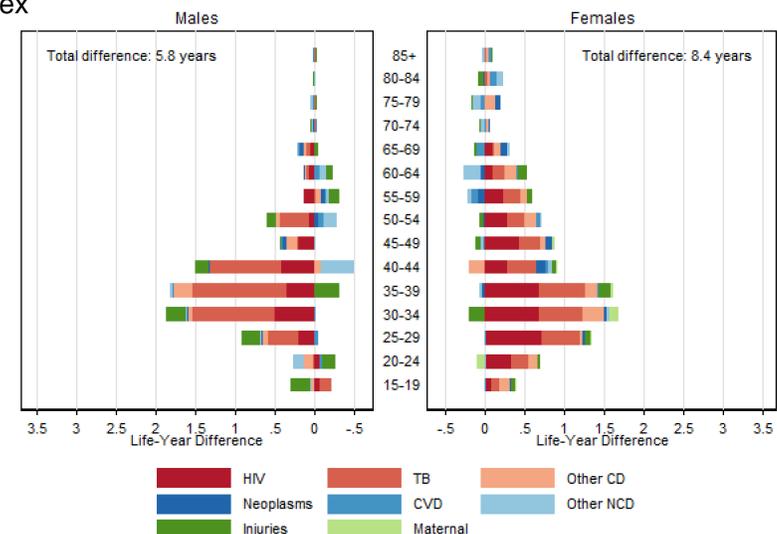


Figure 2b: Age and cause-group contributions to the LE deficit in 2011-'14, by sex



- Adult LE increased by 1.38 (men) and 1.58 (women) years per annum, for a total gain of 15.2 years for men and 17.2 years for women since the rollout of ART in 2004 (Figure 1).
- The LE deficit in 2014 is 1.2 years for men and 5.3 years for women (Figure 1d).
- Pulmonary TB and HIV account for over 80 percent of the LE gains and the remaining LE deficit (Figure 2)