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AIDS and the gender gap in life expectancy in Africa

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In sub-Saharan Africa, the majority of people living with HIV are women. Yet the number of AIDS-related deaths in this region is higher among men and the gender gap in life expectancy has expanded in recent years. Bruno Masquelier and Georges Reniers explain the reasons behind this paradox.

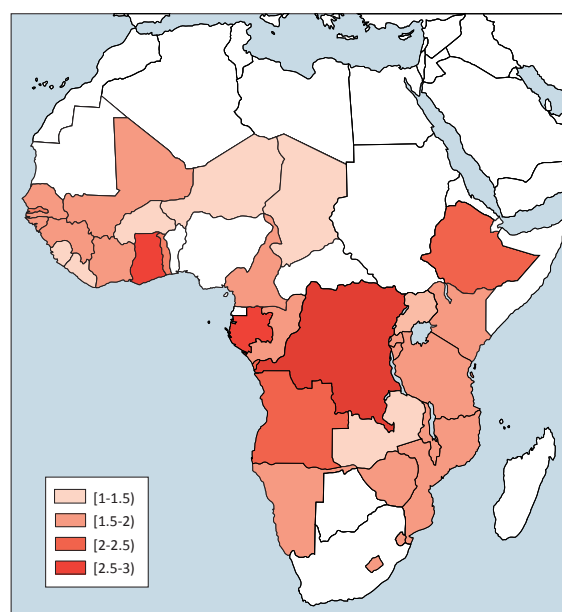
The HIV-AIDS epidemic is still taking many lives each year. In 2016, a million people died from the disease, and almost three-quarters of these deaths occurred in sub-Saharan Africa (73%) [1]. Recent trends are nonetheless encouraging; the number of AIDS related deaths in the region has halved since 2005. The expansion of antiretroviral treatment programs has been an important factor in these mortality declines, and women appear to have benefitted most from the treatment scale-up: the number of AIDS related deaths among women aged 15 and above declined by 58% between 2005 and 2016, and by 43% among men. As a result, women now account for the minority (47%) of AIDS deaths in Africa [1], yet remain overrepresented (59%) among people living with HIV in the region. Women also continue to lose more years of life expectancy to AIDS than men. This article explores explanations for these trends in HIV prevalence and AIDS mortality, and the apparent gender paradoxes that they entail.

HIV prevalence is everywhere higher among women

According to Demographic and Health Surveys (DHS) conducted between 2006 and 2016, HIV prevalence (the proportion or percentage of adults infected with HIV) is

higher among women than among men in all countries of sub-Saharan Africa. Based on data from the 30 surveys used to draw the map in Figure 1, the average female-to-male prevalence ratio is 1.7. Curiously, this ratio is highest in the countries of Central Africa, where HIV prevalence is relatively moderate.

Figure 1. Female-to-male prevalence ratio of HIV infection at ages 15-49



Source: Most recent DHS surveys. Interpretation: in Zimbabwe, according to the 2015 DHS survey, the female-to-male prevalence ratio is between 1.5 and 2.0 (it is in fact 1.6, female prevalence being 16.7% and male prevalence 10.5%).

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To understand why women are overrepresented in the HIV-infected population, three differences between men and women must be considered: gender differences in exposure to infected partners; gender differences in susceptibility to infection per coital act, and finally also gender differences in survival after infection. Gender differences in exposure are linked to differences in sexual behaviour and to the age gap between partners. In the early stages of the epidemic in Africa, transmission occurred mainly between prostitutes and their clients, so more men than women were infected [2]. As the epidemic became widespread, the female-to-male ratio of infections increased. This is because women tend to have sexual partners who are older than themselves, and older partners are more likely to have previously contracted HIV. Women's greater susceptibility to infection also plays a role. It is explained mainly by anatomical factors. During the sexual act, the risk of infection is higher for the partner who is penetrated. The viral load is higher in sperm than in vaginal secretions, and the surface area of the mucous membranes exposed to the virus is higher in women than men. Last, the female-to-male prevalence ratio depends on survival after infection. Without treatment, the risk of dying from AIDS increases with the age at infection, and women thus tend to live longer with the virus than men because they are infected at younger ages [3].

A temporary reduction in the female mortality advantage

The AIDS epidemic has produced a sharp increase in mortality, especially at adult ages. However, it is difficult to monitor detailed mortality trends in most African countries because only a small fraction of deaths are officially registered. Here, we use estimates based on information on the survival of siblings reported by women interviewed in the DHS surveys [4]. Figure 2 shows the probability of dying between ages 15 and 60 ($_{45}q_{15}$) for four African countries, and compares it with estimates from the United Nations Population Division [5]. Major differences between these sources exist, which reflects the uncertainty around adult mortality estimation in African populations (Box 1).

All four countries in Figure 2 are characterised by generalised HIV epidemics (i.e. more than 1% of the adult population infected with HIV). HIV prevalence peaked in Kenya in 1996 (at 11%), in Zambia in 1997 (16%), in Namibia in 2002 (16%) and in Zimbabwe in 1997 (23%) [1]. Meanwhile, prevalence has fallen to 5% in Kenya, but remains between 12% and 14% in the three other countries. As a result of its high prevalence, the mortality increase has been especially pronounced in Zimbabwe where the risk of dying between ages 15 and 60 more than doubled between 1985-1990 and 2000-2005.

Box 1. The challenge of estimating AIDS-related mortality in sub-Saharan Africa

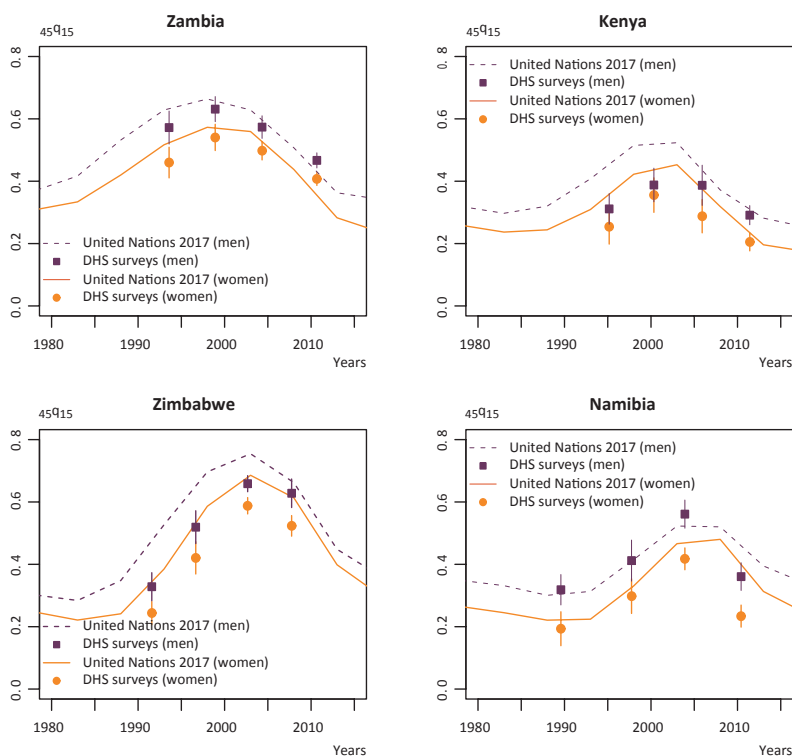
Surveys and censuses provide direct estimates of adult mortality in sub-Saharan Africa, but these data are affected by various sampling and non-sampling biases. For this reason, the United Nations estimates are often based on models. At present, mortality is estimated in two stages for sub-Saharan African countries with a high prevalence of HIV [5]. First, the mortality levels of the uninfected population are obtained by combining child mortality trends with an age pattern of mortality that is expected in the absence of HIV. Excess mortality from AIDS is estimated using Spectrum, an epidemiological and demographic model developed in collaboration with UNAIDS [3], and subsequently added to the estimated non-HIV mortality. As can be seen in Figure 2, the UN estimates are generally higher than those obtained from survey data, since the latter are often plagued by under-reporting of deaths, misreporting of ages at death, and other errors. Note, however, that the difference between sources varies from one country to another: it is, for example, smaller in Namibia and larger in Kenya. When the model-based mortality levels significantly deviate from those deduced from surveys and censuses, adjustments are made to obtain a reasonable fit. However, there are still large uncertainties about some of the parameters that play a key role in these models, such as the age pattern and sex ratio of infections, or, the age pattern of mortality in the uninfected population.

As a consequence, life expectancy at age 15 fell by 17 years (from 52 to 35 years [5]). In all four countries, women's all-cause mortality levels remained below those of men throughout the period, although the gender gap narrowed as mortality from HIV increased. In Zimbabwe, for example, the male-to-female ratio of the probability of dying between ages 15 and 60 fell from 1.4 in 1985-1990 to 1.1 in 2000-2005. Zimbabwean women aged 15 could expect to live 6 years longer than men in 1990-1995. By 2005-2010, when the impact of AIDS on adult mortality was most severe, women's life expectancy advantage had shrunk to just over two years. This situation was temporary, however, and the gender gap has widened again in recent years as life expectancy resumed its upward trend.

The effect of treatment scale-up

Antiretroviral therapy (ART) prevents the replication of the virus, improves survival and reduces the risk of onwards transmission. Until 2004-2005, the provision of ART was largely restricted to high and middle income countries. Since then, they have been increasingly provided free of charge across the world, including sub-Saharan Africa. The latest WHO recommendations, issued in 2015, state that anyone infected with HIV should

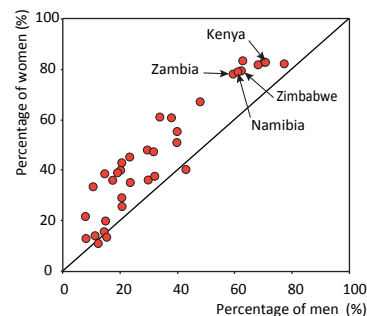
Figure 2. Adult mortality at ages 15-60 in four countries



Note: $45q_{15}$ is the probability that a person aged 15 dies before age 60.
Sources: Demographic and Health surveys (authors' calculations) and United Nations (2017) [5].

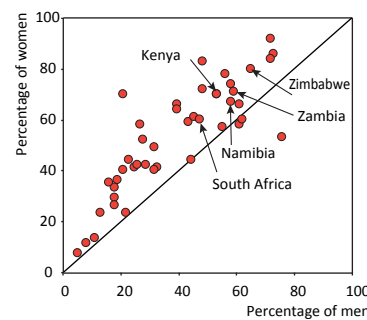
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Figure 3. Percentage of men and women who have tested for HIV and received the result



Sources: Most recent DHS surveys (2006-2016).

Figure 4. Percentage of men and women infected with HIV and receiving treatment (in 2016)



Source: UNAIDS [1].

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start treatment as soon as possible after diagnosis. The sooner treatment is initiated, the greater its efficacy. In 2016, around 53% of HIV-infected individuals in the world – around 20 million people in total – were receiving treatment [1].

AIDS-related mortality has fallen substantially following the rollout of ART. This mortality decline is, however, more pronounced for women than for men, which in turn is linked to women's better uptake of HIV diagnosis and care services. Figure 3 shows the proportions of men and women who reported having ever been tested (in latest DHS surveys). For example, in the 2015 DHS survey in Zimbabwe, 80% of women aged 15-49 reported having been tested, versus just 62% of men. Thanks to the integration of antenatal and HIV care (under programmes for the prevention of mother-to-child transmission, PMTCT), women are more effectively engaged with HIV services [6], and HIV positive women tend to begin treatment earlier and adhere more closely to the treatment regimens.

Figure 4 presents the male and female ART coverage rates (based on UNAIDS estimates [1]). In a large majority

of countries, they are higher for women, by 15% on average. These treatment differences are an important factor in the renewed increase in the female survival advantage (Box 2), and therefore also explain why women are still overrepresented in the HIV-positive population.

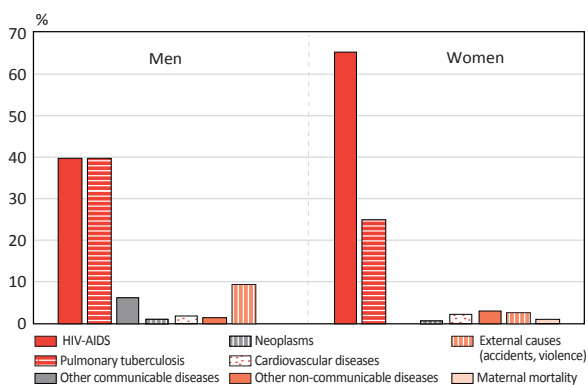
In sum, women generally live about five years longer than men, but the massive increase in AIDS-related mortality temporarily reduced the female survival advantage in eastern and southern African populations that are worst affected by HIV. Women lost more years of life expectancy to HIV as the epidemic spread, but also regained more years following the expansion of treatment. This phenomenon is reinforced by the fact that PMTCT programs have facilitated the earlier diagnosis of HIV among women, which improves the prognosis for survival. Women also adhere better to their treatment regimens. Nonetheless, the burden of HIV mortality in terms of the per capita life-years lost to HIV/AIDS, remains higher for women than for men because of continuing gender inequalities in exposure and

Box 2. The impact of antiretroviral therapy (ART) on survival in KwaZulu-Natal, South Africa

As of 2012, between a quarter and one-third of all adults of reproductive age were HIV-positive in KwaZulu-Natal, a coastal province of South Africa with one of the most severe HIV epidemics in the world (South African National HIV Prevalence, Incidence and Behaviour Survey, 2012). However, thanks to treatment scale-up, the impact of HIV on mortality has reversed in dramatic fashion. Based on data from the uMkhanyakude Health and Demographic Surveillance System, life expectancy at age 20 between 2003 and 2014 rose by 1.3 years per annum, for a total gain in adult life expectancy of over 15 years [7]. No other human population in modern history has experienced such large mortality reductions over a sustained period of time.

Figure 5 shows that these life expectancy gains in KwaZulu-Natal are almost exclusively driven by a reduction in mortality from tuberculosis and HIV. The bars on the graph represent the percentage contribution of each cause of death to the overall adult life expectancy gains since ART became available. Due to high levels of comorbidity, it is difficult to distinguish between tuberculosis and HIV/AIDS in generalized epidemics, and they jointly explain over 80% of the mortality reductions. As a result of the treatment scale-up, the female life expectancy advantage has again increased by two years. This does not mean, however, that the female disadvantage in the remaining burden of HIV mortality has been fully rectified because women still lose more adult life-years to HIV/AIDS than men.

Figure 5. Contribution of groups of causes of death to life expectancy gains at age 15 since the roll-out of antiretroviral treatments (uMkhanyakude, 2001-2014)



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Sources: Reniers et al. [7].

susceptibility, but also because women are infected at younger ages and face fewer competing mortality risks in early adulthood. In other words, one female HIV death will incur a greater loss in life-years lived than is the case for a male HIV death.

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Abstract

In sub-Saharan Africa, women account for 59% of people infected with HIV, but only 47% of HIV-related adult deaths. To understand why women are overrepresented in the HIV-infected population, differences between men and women must be considered in terms of exposure to infected partners, susceptibility to infection per coital act, and survival after infection. The female life expectancy advantage, which contracted as the AIDS epidemic spread, is now increasing again since the roll-out of antiretroviral treatments. The burden of HIV mortality in terms of the per capita life-years years lost to HIV remains, however, larger for women than for men.

Keywords

Africa, AIDS epidemic, mortality, life expectancy, antiretroviral treatments, gender differences.