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HUMAN CAPITAL

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KEY POINTS

- **AIDS-related mortality among young adults results in an increase in the number of orphans, and orphanhood is associated with impaired access to education.**

- **Early mortality among working-age adults causes a loss of skills and experience and a drop in returns to investment in education.**

- **Educational outcomes have weakened in regions with higher HIV prevalence but investments in the HIV response are effectively mitigating HIV's negative impact on human capital.**

HIV/AIDS destroys human capital through early mortality among adults, but also affects the creation of new human capital.[1] Orphanhood is associated with worse educational outcomes. HIV also discourages investment in education through an increase in mortality among working adults, before the income benefits of education have been fully realised. Overall, education outcomes have weakened in regions where HIV prevalence has been high. Declining orphanhood rates, and a weakening of the link between HIV and education outcomes, suggest that the HIV response has mitigated the effects of HIV on human capital.

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1 Moreover HIV affects the ability to use human capital because of ill health. In this brief we focus on the accumulation of human capital in the form of education and other skills. The consequences of increased morbidity, or of changes in the composition of the population if the impact of HIV differs across skill categories, are addressed in brief #6.
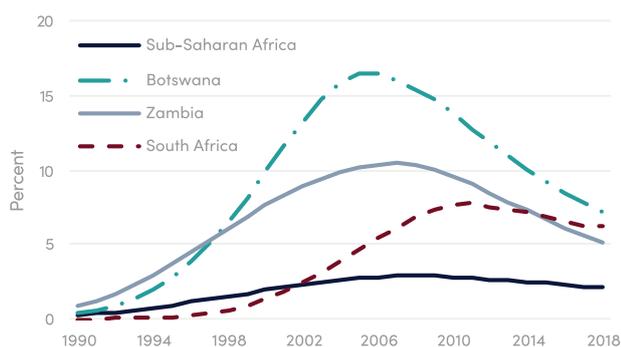

Orphans

HIV/AIDS has resulted in a steep increase in the number of orphans in high-burden regions. Among other adverse consequences, orphanhood affects economic growth by impairing access to education and the ability to benefit from it.

One of the effects of HIV/AIDS is the increase in the number of orphans resulting from increased mortality among young adults. The number of AIDS orphans increased steadily as the impact of the epidemic escalated (UNAIDS, 2019). By 2006, about 3 percent of children were orphaned by AIDS across sub-Saharan Africa (average HIV prevalence: 4.5 percent in that year), but the share of children who were

AIDS orphans reached up to 10 percent in countries like Zambia (HIV prevalence: 13.8 percent in 2006), and 16 percent in Botswana (HIV prevalence: 24.3 percent) (Figure 4.1). Of these children orphaned by AIDS, a disproportionate number were double orphans: UNICEF (2013) estimated that 31 percent of children orphaned by HIV were double orphans in 2006, compared with 9 percent of children orphaned for other causes. Since then, orphanhood rates have declined by nearly one-third across sub-Saharan Africa, largely as a consequence of improved survival owing to treatment scale-up, and by more than one-half in those countries (Botswana, Namibia, Zambia) that were most successful in extending treatment access (Figure 4.2).

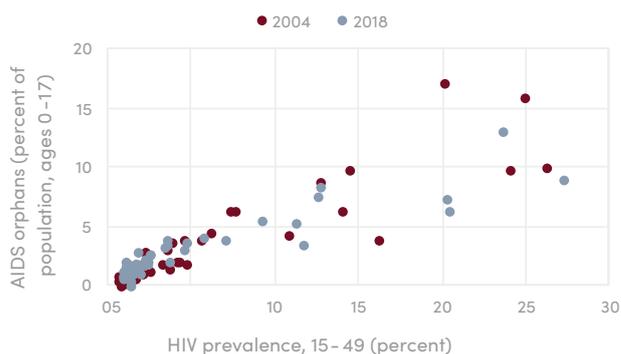**Figure 4.1: Children orphaned by AIDS (percent of population, ages 0-17)**

Figure 4.2: Share of AIDS orphans and HIV prevalence across countries

The increase in the number of children orphaned by AIDS gave rise to concerns about catastrophic social consequences as a result of parental loss and lack of childhood nurturing, such as reduced access to health and education on the one hand, and increased juvenile delinquency and a "crime time bomb" (Schönteich, 1999) on the other. In addition, there was concern about economic decline in countries most affected by HIV, notably through disruptions to the accumulation of human capital (Bell et al., 2006).

Orphanhood has consistently been shown to result in lower educational attainment. One study found a one-year loss in years of schooling for children who have lost their mother (maternal orphans) and a weaker effect for paternal orphans (Beegle et al., 2010). Mishra & Bignami-Van Assche (2008) showed that school attendance for adolescent orphans (ages 15-17) is 11 percentage points lower than the average. Additionally, living with a parent

who is HIV-positive has been shown to have a negative effect on education, although the effect is smaller than the consequences of orphanhood (Evans and Miguel, 2007; Mishra & Bignami-Van Assche, 2008). This finding, though, precedes the scaling-up of treatment, which plausibly has mitigated such adverse effects.

Notably, not all concerns about some of the consequences of orphanhood have been realised. The number of child-headed households has not obviously increased because of AIDS (Hosegood et al., 2007), suggesting that societies have coped in terms of looking after orphaned children, for example by incorporating them into extended families. Also, there is little evidence suggesting that orphans are disadvantaged in terms of health or nutrition outcomes, or household wealth (Mishra and Bignami-Van Assche, 2008), let alone some of the more dramatic projections of the impact of high rates of orphanhood on society.

Mortality and experience

Early mortality among adults results in losses of human capital in the form of experience and education, and diminishes the incentives to invest in education.

HIV resulted in a steep increase in early mortality among adults in the early 2000s, but much of this increase has been reversed by the scaling-up of treatment. The probability of a 15-year-old dying before reaching the age of 50 rose to 45 percent in Zambia (HIV prevalence at ages 15-49 of 14.1

percent in 2005) from 21 percent in the 1980s, to 36 percent in Kenya (HIV prevalence of 6.6 percent in 2005) compared with just 16 percent in 1980-85), and to over 50 percent in some countries with very high HIV prevalence (Eswatini, Lesotho and Zimbabwe) (Figure 4.3). These trends of course mirror the escalation of the HIV epidemic and the subsequent scaling-up of treatment over time, against an underlying trend of health improvements in other areas.

Figure 4.3: Probaility of dying before reaching age 50 for a 15-year old
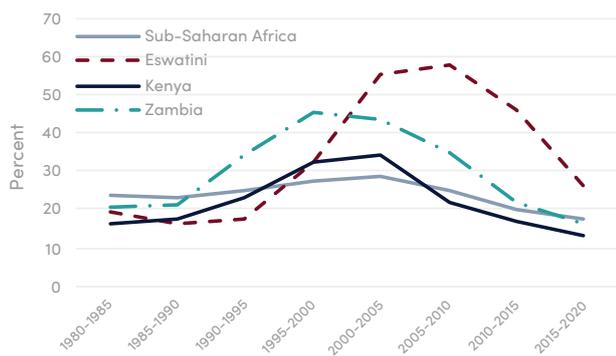
Figure 4.4: Average age of working-age population (ages 15-64)
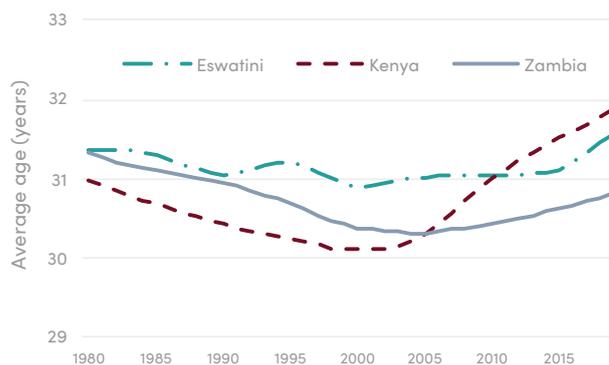
In addition to education, another dimension of human capital is experience – skills acquired through professional experience and learning on the job. Age and years of work experience have been found to play an important role in explaining labour productivity (Heckman et al., 2006; Bigsten et al., 2000). On the macroeconomic level, early mortality – by destroying experience – could thus reduce the average labour productivity of the workforce overall, a factor that has been incorporated in some macroeconomic analyses of the impact of HIV (e.g., BIDPA, 2000).

At the population level, the evidence regarding such a loss in experience and skills is mixed. Figure 4.4 illustrates the experience of some countries facing severe HIV epidemics, where the average age – and thus experience – of the working-age population declined as AIDS-related mortality escalated, followed by a rebound during the period in which treatment became increasingly available. With regard to skills and education, the evidence is less clear. While increased mortality destroys skills, the epidemic may result in increases or decreases in the average education level, depending on the socio-economic gradient of HIV and of access to treatment. Data from Demographic and Health Surveys do not give a consistent picture on this: Asiedu et al. (2012) observe that the link between HIV prevalence and education differs between countries, and Hargreaves et al. (2013) suggest that the burden of HIV is shifting to populations with lower educational attainment.

The average age of the working-age population declined by about 1 year in Kenya and Zambia between 1980 and about 2000, but by much less in Eswatini (Figure 4.4). These discrepancies between countries likely reflect demographic factors in addition to HIV. In each country, average working-population age rebounded after 2000 – closely associated with the scaling-up of treatment.

Investment in human capital

The risk of dying early reduces public and private incentives to invest in human capital. Empirical evidence suggests that HIV has been associated with a decline in educational outcomes.

Increased mortality among young adults not only destroys human capital directly – including a reduction in the available teaching workforce – but also affects the incentives of both governments and individuals to invest in education and skills for the future. To the extent that these reduced incentives result in lower investment in human capital (schooling, training), this would compound the direct losses in human capital through increased mortality.

In countries facing high AIDS-related mortality, the economic returns to education may decline steeply. According to our simple illustration (Figure 4.5), in which the return to education is measured by the value of a lifetime income stream, these returns have declined by up to one-sixth in Kenya, one-fifth in Zambia, and one-third in Eswatini.

Figure 4.5: Effect of changing mortality on returns to education

Source: Authors' calculations, based on UNPD (2019). Figure shows returns to education estimated based on age-specific mortality prevailing in the respective period, relative to the level that would have been attained if mortality patterns had remained the same as in 1980–85. Calculation assumes returns to education are proportional to present discounted value of lifetime income (i.e., from age 15 to 64), assuming a discount rate of 3 percent and annual growth of individual income of 5 percent.

Figure 4.6: HIV prevalence and change in years of schooling
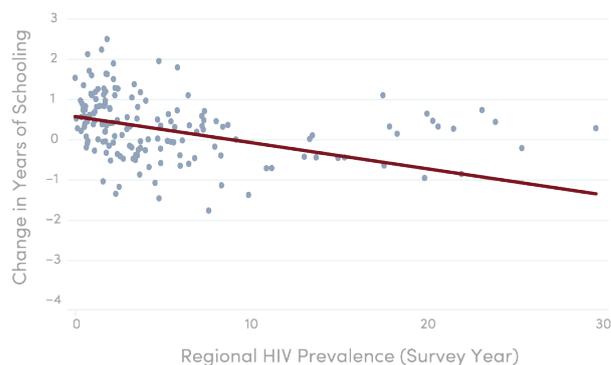
Source: Fortson (2011, reprinted with permission). For regressions underlying trend line, data points were weighted by underlying number of observations.

To the extent that these changes in actual mortality are realised and reflected in expected life prospects, such declines in the returns on investment in human capital could affect decisions on schooling and other forms of investment in human capital. This capital could have large implications for economic outcomes. One study calibrating the economic impacts of HIV through this channel projects that "the most [HIV] affected countries in Sub-Saharan Africa will be in future, on average, 20 percent poorer," and that "schooling will decline in some cases [...] by more than 40 percent" because of higher mortality (Ferreira, 2013). This projection, though, did not yet factor in the steep increase in access to treatment and the associated reversals of the negative impacts of HIV on the returns on human capital.

Such modelled projections of the effects of HIV on the accumulation of human capital, however, assume that individuals' subjective expectations of life expectancy align with the actual changes caused by HIV/AIDS. If the impact of HIV on subjective expectations regarding life expectancy is tempered by lags in the perception of the impacts of the epidemic, or by a mis-appreciation of the individual risk of contracting HIV, then the link between increased population-level mortality and individual decisions to invest in human capital is weakened or broken.

Empirical evidence suggests that HIV has been associated with a decline in educational outcomes, beyond the effects on orphans discussed earlier. Fortson (2011), comparing cohorts born before and after 1980 (i.e., passing through school before or while the impacts of HIV escalated) across 15 African countries finds that there were fewer completed years of education where HIV prevalence was high: "relative to areas without HIV, post-1980 birth cohorts in areas with HIV prevalence of 10% (today) completed about 0.5 fewer years of schooling than pre-1980 cohorts." These findings were reaffirmed by Chicoine et al. (2019), but their larger and more recent dataset also found that this adverse effect may be fraying as a consequence of treatment scale-up. This finding is consistent with evidence showing that treatment initiation is associated with an improvement in school attendance of children in households of adults living with HIV (Graff Zivin et al., 2009; d'Adda et al., 2009). Baranov & Kohler (2018) suggest that household expenditures on education and children's schooling have improved in areas where antiretroviral therapy has become available, including among households not affected by HIV, suggesting that expectations of mortality are an important channel through which HIV and the HIV response affect educational outcomes and thus human capital accumulation and growth.

Conclusion: Impact of HIV on human capital

Overall, the evidence suggests that HIV has affected human capital in several ways. Most directly, HIV destroys human capital through early mortality – and as a consequence, the economy benefits less from investments in education. At the same time, HIV affects the accumulation of new human capital. Orphanhood results in lower educational attainments, and anticipated early mortality also reduces individuals' incentives to invest in acquiring skills and education. Empirical evidence suggests that educational outcomes have deteriorated relatively in areas with high HIV prevalence, suggesting that the effects of HIV have extended beyond households directly affected. The scaling-up of treatment has obviously mitigated the destruction of human capital through early mortality, and appears to have an effect in terms of mitigating the adverse consequences of HIV on education outcomes.

Summary table: HIV/AIDS and the accumulation (and destruction) of human capital

Direct impact	Macroeconomic implications	Impact of HIV response
Early mortality among adults.	Destroys human capital and reduces the economic benefits of past public and private investments in education.	Directly mitigates the adverse impacts by reducing AIDS-related mortality.
Anticipated early mortality among adults.	Reduces the expected returns to current public and private investments in education, and may therefore reduce such investments.	Not yet known. This effect of AIDS and the HIV response works through perceptions, and thus depends on the extent to which increased mortality has been a factor in decisions on education, and to what extent this belief has been changed through the HIV response.
AIDS causes orphanhood, which is associated with impaired access to education.	Reduces the supply of more educated workers once cohorts affected by high rates of orphanhood enter and age through the working-age population.	Directly mitigates the adverse impacts by reducing AIDS-related mortality. However, the impact on education outcomes among working-age adults occurs with long lag.
Increased mortality among teachers.	Disruptions in the supply of education, reducing educational attainments.	Directly mitigates the adverse impacts by reducing AIDS-related mortality.

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