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**Educational access and HIV prevention:
Making the case for education as a health priority in sub-Saharan Africa**

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Table of Contents

Summary	3
Section One: The impact of education on HIV	4
<i>Mechanisms through which education influences individual behavior</i>	5
<i>Evidence linking education, sexual behavior, and HIV risk</i>	8
Section Two: General access and access for HIV and AIDS-affected children	13
<i>Access to education in HIV/AIDS-affected countries</i>	13
<i>Access to education for children affected by HIV and AIDS</i>	17
<i>Barriers to school enrollment and success faced by OVC</i>	19
<i>How is the education of OVC affected?</i>	20
Section Three: Expanded education access for HIV prevention	23
<i>Gender, education and HIV</i>	23
<i>Girls as caregivers</i>	25
<i>Safety in schools</i>	26
<i>Initiatives to promote universal access to education and related initiatives for HIV-affected children</i>	26
Conclusions and recommendations	30
Acknowledgements	32
References	33

Summary

Educational Access and HIV Prevention

Background: General education has a potentially important role to play in the fight against HIV, but researchers have found varying relationships between education and HIV prevalence. If enrolling children in school and keeping them there long enough to complete cycles can reduce their risk of attracting HIV later in life, then the international drive toward universal education access at the primary and secondary levels is no longer solely an issue of educational and economic equity, but a critical health priority as well.

Methods: This analysis combines the results of previous literature reviews and updates them with the results of recent randomized controlled trials and a discussion of possible mechanisms. Websites were also reviewed to gather information on initiatives to improve educational access for HIV- and AIDS-affected children.

Results: There is much evidence showing an association between sexual behavior and both attendance and attainment. Experimental evidence that school attendance leads to safer sexual behavior is currently under review. Studies suggest several pathways through which sexual behavior, and consequently the risk of HIV infection, may be influenced by schooling. Students attending school have a smaller sexual network and a stronger motivation to avoid the consequences of unprotected sex—both pregnancy and HIV infection—than their out-of-school peers.

The relationship between educational attainment and HIV prevalence appears to change as epidemics mature. As educated individuals tend to have more control over their sexual behavior, the association between education and HIV depends crucially on behavioral intentions. In the absence of information about HIV transmission, many individuals may intend to have several sexual partners, increasing their risk of HIV infection. However, educated individuals are more likely to be exposed to HIV prevention messages and more likely to understand them. Given that HIV prevention messages become more prevalent with epidemic maturity, this leads to a hypothesis about the changing relationship between HIV and education. In the early stages of an epidemic, education is a risk factor for HIV infection. As an epidemic matures and prevention messages become more common, education is a protective factor against HIV infection.

Policy/action implications: Research results increasingly support the use of general educational attainment and school enrollment as tools in the fight against HIV. Both simple enrollment and the cumulative benefits of educational attainment are associated with lower levels of risky behavior from early sexual initiation to unprotected sex. In order to maximize the potential impact of these related factors, access to education must become a priority for national health ministries as well as international organizations and funders. The elimination of school fees and other barriers to educational access, such as health and psychosocial problems, would be a major step forward in the fight against the spread of HIV.

Introduction

The relationship between HIV and education is complex. Increasingly, evidence shows that individuals with higher levels of education are better protected against HIV than those with lower levels. Educated people are more likely to understand transmission methods and to take protective action in response to public health information. However, the relationship is bi-directional and HIV also influences education levels. The pandemic reduces children's access to education in a number of micro and macro-level ways, impacting family incomes as well as national education budgets. While HIV-specific education programs receive much attention, increasing the ability of countries to provide high-quality general education to all children may be a more efficient way to reduce the impact of HIV and AIDS on this generation of young people.

This paper analyzes these relationships between general education and HIV in sub-Saharan Africa. In Section One, we review the evidence linking HIV risk to educational attainment and enrollment and discuss potential mechanisms. Section Two discusses educational access issues in the countries of sub-Saharan Africa, including the special barriers faced by orphans and vulnerable children. Section Three provides a number of models for increasing educational access in sub-Saharan Africa, with a special focus on gender. We conclude with a summary of key policy priorities.

Section One: The impact of education on HIV

In this section we first discuss the mechanisms that may underlie the relationship between education and risk of HIV infection. Understanding these mechanisms is important both for the interpretation of evidence on the relationship between HIV and education and for the design of

an education policy response to the HIV pandemic. We then move to a discussion of the cross-sectional and experimental evidence that sheds light on the role of education in HIV prevention.

Mechanisms through which education influences individual behavior

Any impact of education on HIV risk occurs through one of two channels: through influence on individual behavior and by influencing the groups of people the individual meets and how those people behave. We examine each of these pathways in turn.

In a direct way education may affect the behavior and thought processes of individuals themselves. Social cognitive models point to several key determinants of sexual behavior. In all theories, knowledge and understanding of a behavior and its consequences is a necessary but not sufficient condition for performing the behavior and underpins the perception of [1] and attitudes towards [2] that behavior. In the context of HIV, understanding transmission routes and methods of blocking them are essential for the adoption of safer sexual behavior.

More educated people are more likely to be exposed to prevention information as part of formal schooling and also through the media [3]. Greater levels of education may also provide a framework of biological knowledge and an understanding of causality into which HIV prevention messages can be assimilated. Thus education helps individuals understand the connection between a behavior (e.g. unprotected sex) and its outcome (HIV infection). Social cognition models [4] also suggest that the evaluation of this outcome is important. Individuals must be sufficiently motivated to avoid HIV infection and/or pregnancy in order to avoid unprotected sex. Evidence suggests that attending school influences the evaluation of this outcome [5].

Another key theoretical determinant of behavior is the perceived control one has over the behavior. This includes self-efficacy, one's belief in one's capabilities to perform a specific action required to attain a desired outcome [6], the perceived personal power one has over the behavior [2] and the actual personal power one has over a behavior [7]. Evidence suggests that education is associated with increased self-efficacy in general [6] and in the context of the HIV epidemic in sub-Saharan Africa in particular [8]. In addition, more educated people are more likely to believe they have control over their own behavior, rather than another individual or fate, and they are more likely to have actual control over their own behavior. For example, educated women are more able and likely to negotiate safer sex [9-11], discuss family planning with their partner [12], and feel a sense of control in their sexual relationships [13].

Increased education levels can affect the way a person's sexual partners think and behave. On an individual level the enhanced social status or wealth associated with increased education may affect a sexual partner's willingness to or effectiveness in negotiation about sexual behavior. On a broader scale, social networks are important not only because of who is in them, but because of the power of the normative beliefs that are held by groups of people. These norms influence individuals' behavior, especially for young people [14]. In South Africa, social norms surrounding men's dominance over women in sexual relationships are prevalent, and these norms are problematic in terms of HIV prevention efforts [15]. Social norms can influence protective behaviors as well as risk-taking behaviors. According to a study in Kenya, "the probability that women will favor sexual faithfulness depends significantly on the number of network partners who also favor this method of protective behavior" [16]. Social norms were a strong predictor of intention to use a condom in a South African study [17].

Social norms and education are interrelated in several ways. First, people of different education levels may have different sets of social norms. Case studies in South Africa found separate social group identities for adolescents who had different types and levels of education—those who went to school outside of the community, those who went to local schools, and those who had dropped out of school [18]. Second, in a reversal of the relationship, social norms may determine how interested an individual is in HIV/AIDS education. For university students in Ethiopia, perception of social norms regarding HIV and AIDS was a significant predictor of desire to learn about HIV and AIDS [19]. Admittedly, social norms are difficult to alter through interventions. However, “once altered the new norms tend to be perpetuated” [20] (p. S105).

In addition to the above mechanisms, education may also enhance the effectiveness of social support networks. For example, one study in Manicaland, Zimbabwe showed that more educated women are able to benefit more from other protective measures. This study looked at membership of social groups related to churches or political parties, among other organizations. Women who were members of a well-functioning social group were 1.3 times more likely to avoid HIV infection than those who were not in such groups or who were in groups with which they were dissatisfied. Women with secondary education were more likely to belong to such groups and among women with secondary education, those who were members of well-functioning groups were 1.5 times less likely to be infected with HIV, whereas women with no education received no such benefits from group membership [21]. Membership in a social group may provide support to individuals in making protective decisions that are contrary to local social norms [20]. Social networks may also be informal conduits of protective resources. For example, almost 50% of individuals obtaining condoms at 12 health clinics in South Africa had

given condoms to or received them from others in the previous month. This percentage rose with education level [22].

Receiving an education can affect the potential sexual partners with whom an individual comes into contact. This suggests that more educated individuals have different sexual networks than poorly educated individuals. The implied impact on an individual's risk depends on the particular epidemiology of HIV in the individual's country and region. Assortative sexual mixing by education level is likely to reinforce the relationship between education and HIV, increasing the risk or bolstering the protection. It is difficult to discern whether education is a causal factor in this evidence. The nature of this impact is likely to be long-term and linked to social mobility. To our knowledge, little research has been done linking educational levels to sexual networks in sub-Saharan Africa. However, the concept that education may act as an HIV-prevention mechanism by sorting educated people into safer sexual networks deserves further inquiry.

Evidence linking education, sexual behavior, and HIV risk

The majority of studies investigating the relationship between education and HIV prevalence have found a positive relationship. That is, HIV prevalence is higher among educated individuals [23-32]. However, five population-based studies found the opposite trend [33-37] while several other studies found no significant relationship between education and HIV [33, 35, 38, 39]. These mixed findings represent the combination of two opposing trends: the initial increased vulnerability of educated individuals to HIV infection followed by their more rapid behavioral change once informed about the epidemic.

A number of factors explain the positive associations often found between HIV status and education, especially in the early stages of the epidemic. More educated individuals change

partners more rapidly, in part because they are more mobile and because they have greater control over their own sexual behavior [40]. The higher socioeconomic status of more educated men gives them greater disposable income, increased leisure time, and increased ability to travel and to use commercial sex partners [23, 41, 42]. In addition, more educated women start having sex later but delay marriage to an even greater extent. This leads to them being single and sexually active for a longer period of time and thus to having a greater number of sexual partners [43]. In the absence of any response to an epidemic, these factors may increase the vulnerability of more educated individuals to HIV infection in the early stages of an epidemic.

However, as analyzed in a recent review, the evidence on the HIV and education relationship supports the theory that the relationship is inverting and education is now more likely to be a protective factor against infection [44]. The authors use three strands of evidence to conclude that the association between educational attainment and HIV infection is changing over time. First, studies conducted from 1996 onwards were more likely to find a lower risk of HIV infection among the most educated. Second, where data over time were available, HIV prevalence fell more consistently among highly educated groups than among less educated groups, in which HIV prevalence sometimes rose while overall population prevalence was falling. Third, in several populations, associations suggesting greater HIV risk in the more educated groups at earlier time points were replaced by weaker associations later. These findings support the thesis that although demographic factors put them at greater risk of HIV infection more educated individuals are better able to mount a response to the HIV epidemic, especially in the context of an effective national campaign against HIV.

Evidence suggests that education leads to greater adoption of safer sexual behavior in response to the HIV epidemic. Evidence from a number of countries indicates that educated

people are more likely to change their behavior in response to HIV and health information. In Zambia, compared to those with primary education alone, those with secondary schooling or above were more than twice as likely to take positive actions after viewing HIV prevention messages. The disparity related to educational attainment was greater than those related to age, gender, or urban/rural residence [45]. Examining evidence from Uganda, de Walque also found that women's education is associated with greater responses to HIV information campaigns as well as with lower risk of HIV infection [46]. Knowledge and understanding of biological concepts is the first step toward making these behavior changes. A study in 32 countries found that literate women were three times more likely than illiterate women to know that a healthy looking person can have HIV, and four times more likely to know the main ways to avoid HIV [47]. Children with a deeper understanding of the biological mechanisms of viruses are more resistant to myths about HIV transmission [48].

In a number of countries in sub-Saharan Africa, it has been observed that individuals with more education are more likely to use condoms. In four major cities (Cotonou, Benin; Yaoundé, Cameroon; Kisumu, Kenya; and Ndola, Zambia), education was found to be a key determinant of condom use with non-spousal partners [49]. Data from Demographic and Health Surveys (DHS) in 11 countries showed that women with primary school education were more likely than those with no education to report using a condom at last sex [10]. In nine of these countries, secondary education was associated with a further increase in likelihood of using a condom at last sex. Similar associations between education and condom use have been found in single-country studies in South Africa [50-53] and Zambia [54].

In addition to the benefits that result from education, preliminary results from a recent experimental study indicate that simply keeping girls in school longer appears to be protective in

terms of sexual behavior. In Kenya, Duflo, Dupas and Kremer [55] recently compared three school-based HIV prevention programs using a randomized control design. One of the interventions aimed to lower the cost of education by providing school uniforms. The programs were evaluated using a survey covering knowledge, attitudes, and self-reported behaviors as well as pregnancy rates. The intervention that reduced educational costs seems to have been the most successful. Girls in schools where uniforms were distributed were 2.5% less likely to drop out, a 15% reduction in the dropout rate. Girls in schools where uniforms were distributed were 1.5% less likely to have had a child, which amounts to nearly a 10% decrease in the childbearing rate for teenagers. The authors suggest that the reason for the change in behavior is not related to what pupils learn at school but that girls typically plan to delay child-bearing and marriage until after they complete schooling. This may reduce the likelihood of their engaging in unprotected sex while they are at school and indicates that they believe that they have a future through education. This study is currently under peer review but if the results are confirmed they will provide the first experimental evidence to our knowledge demonstrating the attending school for a longer period of time leads to safer sexual behavior.

These preliminary experimental findings align with the results of a number of studies from across sub-Saharan Africa that indicate that school enrollment reduces early sexual debut and risky behavior. Young women in rural Zimbabwe who lacked a primary school education began having sex earlier than their more educated peers [56]. School enrollment decreased the likelihood that girls had begun sexual activity in KwaZulu-Natal, South Africa [57]. Secondary education was associated with later age at sexual debut in two studies analyzing DHS surveys from sub-Saharan African countries [58, 59]. For in-school youth who were already sexually

active, evidence from South Africa suggests that they were less likely to engage in risky sexual behaviors than youth who were not in school [60].

It is important to note the limitations of the existing evidence discussed above. Even with longitudinal data we cannot rule out the possibility that educational attainment is a proxy for some other characteristic, such as socioeconomic status. Indeed, the changes in the relationship between socioeconomic status and HIV infection are similar to the changes in the relationship between education and HIV—higher socioeconomic status is increasingly found to be protective against HIV in associational studies [52]. However, analyses from Uganda [61] and elsewhere [47] suggest that parental and individual income are not explanatory factors in the relationship between HIV and educational attainment. Several studies have attempted to determine whether economic status, mobility or education is most important in determining HIV vulnerability. A review of these studies finds mixed results [62].

The ecological nature of the evidence presented implies other limitations. It may be that participants in studies were not representative of the overall population. Although studies based in antenatal clinics report close to 100% response rates, such studies do not include men, sexually inactive women or those who do not use clinics. This latter group in particular may exhibit a different relationship between education and HIV, particularly as clinic use may be associated with education level.

Given the need for policy decisions to be based on clear evidence, it is of concern that all evidence addressing the relationship between HIV and educational attainment is observational in nature. Further evidence is required before it can be concluded that educational attainment is a causal factor in the reduction of HIV vulnerability. The long-term follow-up of randomized controlled trials to improve educational access, for example through conditional cash transfers,

and analyses of the long-term consequences of recent educational expansion policies in Africa offer the potential to examine the causal relationship between educational attainment and HIV.

Despite these limitations, as a whole this evidence suggests that there are benefits in terms of safer sexual behavior in having higher levels of education and, for girls, simply being enrolled in school. Education is associated with safer sexual practices and with a better understanding of how to change behavior in response to health information campaigns. Girls who are enrolled in school are less likely to have begun having sex than their peers who are not in school. The studies discussed above are a strong basis for advocating general education as a means of HIV prevention. However, education is yet to reach all children in the countries of sub-Saharan Africa, particularly at the secondary level and for disadvantaged groups. Expanding educational access requires an understanding of the constraints faced by individual children as well as by education systems.

Section Two: General access and access for HIV and AIDS-affected children

Access to education in HIV/AIDS-affected countries

Poverty is one of the greatest barriers to educational access worldwide. Children in pandemic countries whose families are not personally affected by HIV and AIDS are still affected through the pandemic's effect on national budgets and priorities. Money that might have gone to support education systems is siphoned away to HIV/AIDS programs, inhibiting the ability of countries to counteract the effect of poverty on school participation at the individual level. HIV/AIDS also has a human capital cost to education systems through its effects on teachers and administrators. One study finds that children in regions with HIV prevalence rates

greater than 10% do more poorly on a number of educational indicators, including enrollment, timely progression, primary school completion, and total years completed, than children in regions without HIV [63]. In this section we focus on the eight hyper-endemic African countries—Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe—as well as Malawi, where the HIV prevalence approaches the hyper-endemic level. These countries, heavily impacted by HIV/AIDS, also face significant challenges in terms of educational access and performance.

Despite the challenges faced, enrollment in primary school has greatly improved over the last generation. Table 1 shows the primary school gross and net enrollment ratios for the eight hyper-endemic countries and Malawi. Some countries are far closer to achieving universal primary education than others. Gross enrollment rates over 100% could be a positive sign that children who were not previously enrolled in school have done so or could be the negative sign of significant grade repetition. It is also important to note that national-level statistics can be misleading; within countries there is often large regional variation. In a number of countries, including Zambia and Zimbabwe, internal geographic variation in net enrollment ratios has increased since the Dakar World Education Forum meeting in 2000 [64]. Achieving universal access is not just about meeting national goals, but about focusing on regions within countries that are falling behind.

While these enrollment numbers may seem promising it is important to consider them alongside other figures, such as the survival rate to the final year of primary education (see Table 2 below). In each of these countries at least 15% of those who enroll in primary school will drop out before completing, and in Malawi almost two-thirds of students do so. Repetition rates in these countries are also concerning, as repetition indicates poor student learning and results in

less-than-efficient use of scarce resources. In Lesotho and Malawi approximately one out of every five primary school students is repeating a grade, and in Mozambique, Namibia, and Swaziland 10% or more. While the Education for All campaign (EFA) has resulted in progress on initial enrollment in primary schools, much remains to be done in order to ensure that all students have access to a high-quality and complete primary school experience.

Table 1. Primary gross and net enrollment ratios in nine southern African countries, 2005

Country	Primary gross enrollment ratio	Primary net enrollment ratio
Botswana	106	85
Lesotho	132	87
Malawi	122	95
Mozambique	103	77
Namibia	99	72
South Africa	104 ^a	87 ^a
Swaziland	107 ^a	80 ^a
Zambia	111	89
Zimbabwe	96 ^b	82 ^b

Source: [64]

^a 2004

^b 2003

Table 2. Survival rates to last grade of primary education and primary repetition rates in nine southern African countries

Country	Survival rate to last grade, 2004	Primary repetition rate, 2005
Botswana	85 ^a	4.8
Lesotho	61	19
Malawi	34	20
Mozambique	46	10
Namibia	76	15
South Africa	77	8 ^c
Swaziland	61	16
Zambia	---	6
Zimbabwe	62 ^b	--

Source: [64]

^a 2003

^b 2002

^c 2004

While EFA is a necessary first step toward fighting HIV through education, EFA and the EFA Fast Track Initiative (EFA-FTI) focus solely on basic education. The nine countries we focus on here due to their high HIV prevalence are far further from universal secondary enrollment than from universal primary net enrollment, as shown in Table 3. Secondary net enrollment ratios range from a low of 7% in Mozambique to a high of 60% in Botswana. While gross enrollment rates are higher, the difference between the gross and net ratios implies that overage students are enrolled in secondary school. As discussed in Section One, achieving secondary education for all would be disproportionately advantageous for HIV prevention, and therefore an especially beneficial policy option for the hyper-endemic countries of southern Africa.

Table 3. Secondary gross and net enrollment ratios in nine southern African countries, 2005

Country	Secondary gross enrollment ratio	Secondary net enrollment ratio
Botswana	75 ^a	60
Lesotho	39	25
Malawi	28	24
Mozambique	13	7
Namibia	56	39
South Africa	93 ^a	---
Swaziland	45 ^a	33 ^a
Zambia	28	26
Zimbabwe	36 ^b	34 ^b

Source: [64]

a 2004

b 2003

In the countries of sub-Saharan Africa a number of reasons may explain why children are not attending school, from gender norms to overcrowded classrooms to the school's distance from the child's home. However, across these countries, poverty is likely the most common reason that children are not enrolled. Depending on the country, children may have to pay school fees and buy uniforms and books. Several sub-Saharan African countries have official fees for

children to attend school, including Botswana and Tanzania at the secondary level and South Africa at all educational levels. Many more countries have unofficial fees at the local level that prevent poor children from attending. In Uganda and Zambia, which have abolished school fees, education expenses comprise 33% of household discretionary spending [65]. Though in these countries school uniforms are not required, parents and children report that many teachers require them [65]. In addition, children's school attendance has opportunity costs in terms of children's labor, whether at home, in the fields, or in an income-generating capacity. Combined with the direct costs of attending school, opportunity costs may result in families making a rational decision to not enroll some or all of their children.

In sub-Saharan Africa poverty and HIV are now intertwined. Associations have been found between African countries' HIV prevalence and national poverty rates [66]. In a South African community, the average income of households where at least one person was HIV-infected was less than half of the average income of households where no one was infected [67]. Programs that intend to fight the spread of HIV must consider the two issues together, and educational access is no exception. Focusing EFA efforts on the poor, who are the least likely to attend school, is likely to be disproportionately advantageous in preventing HIV. For children whose families are already affected by HIV and AIDS, fighting poverty becomes even more critical to ensuring their continued school access, as discussed in the next section [64].

Access to education for children affected by HIV and AIDS

Children and youth may be affected by HIV and AIDS in a number of ways, only one of which is orphaning when a parent dies from an AIDS-related illness. Parents may be infected but still living, or children may themselves be infected. Children whose families take in orphans may

suffer if increased financial strain reduces the amount of food each household member gets, or if it means that not all children can attend school. As a group, these children can be referred to as orphans and vulnerable children (OVC). Skinner and colleagues, through a series of community focus groups in Botswana, South Africa, and Zimbabwe, defined a series of characteristics that indicated vulnerability beyond orphaning: “severe chronic illness of a parent or caregiver, poverty, hunger, lack of access to services, inadequate clothing or shelter, overcrowding, deficient caretakers, and factors specific to the child, including disability, direct experience of physical or sexual violence, or severe chronic illness” [68] (p. 619).

In some countries, very high percentages of children may be categorized as vulnerable. However, due to the difficulty of measuring vulnerability, statistics tend to focus on orphans. UNAIDS estimates that there are 11.4 million AIDS orphans age 17 or younger living in sub-Saharan Africa [69]. Household surveys from 40 countries in sub-Saharan Africa indicate that 9% of children younger than 15 have lost one or both parents [70]. Eleven percent of those under age 15 in Kenya have lost one or both parents [71]. Ten percent of South African children have lost a parent or caregiver by the age of nine and nearly 25% by age 15 to 18 [72]. The risk of orphaning was not evenly distributed among South African youth; the poor and those residing in informal settlements were more likely to experience such a loss. While increasing access to antiretroviral treatment (ART) has the potential to extend infected caregivers’ healthy life span and thus reduce orphaning, in a number of sub-Saharan countries the majority of those in need are not receiving the drugs. In 2007, coverage rates for those with advanced HIV were only 26% in Lesotho, 24% in Mozambique, 28% in South Africa, and 18% in Zimbabwe [73].

Barriers to school enrollment and success faced by OVC

The greatest barrier keeping OVC from school is likely the same as for children in developing countries as a whole—poverty. In Free State province, South Africa, households affected by HIV/AIDS were larger and had lower monthly incomes than households not affected [74]. When parents are ill, they may not be able to work as much and may lose jobs due to absenteeism or stigma. The costs of medical treatments and care may stress family finances. Children may need to leave school and begin working to help support their families. Double orphans lose their direct source of financial support, and must rely on extended family or friends. Their presence likely increases financial difficulties in their new household. In a rural region of South Africa, the presence of an AIDS orphan decreases the odds of the household being food secure by 12% [75].

Children in families affected by HIV and AIDS face stigma and discrimination from community members [76, 77]. The internal or felt stigma as well as the experienced stigma can make children feel different from their peers and isolated from their communities. Anecdotal evidence suggests that stigma and discrimination in schools may result in dropout among children affected by HIV and AIDS [78]. These children may be explicitly barred from schools or they may be treated so poorly by teachers, administrators, and other students that they drop out [79].

Orphans and vulnerable children may also face a host of psychosocial problems, including fear, anxiety, depression, and anger [80-82]. Orphans in Tanzania scored more poorly on an internalizing problem scale than non-orphans, and this score was significantly associated with school attendance and mathematics test performance [83]. These problems are not only the result of parental death, but of a range of possible traumatic experiences faced by children

affected by HIV and AIDS—watching a family member fall ill, having less to eat when a caregiver can no longer work, or facing stigma from peers or other community members. Psychosocial problems may be exacerbated by the separation from siblings that often occurs following orphaning. In a survey conducted in Uganda, 64% of 13- to 17-year-old orphans reported that they had been separated from siblings following their parents' death [82]. Depression and other psychosocial problems may impact cognitive functioning and affect children's school performance.

How is the education of OVC affected?

Considerable evidence indicates that orphans are less likely to be enrolled in school than non-orphans.¹ Across 40 countries in sub-Saharan Africa, orphans were 13% less likely to be attending school than non-orphans [70]. Similar patterns were found in Kenya [71, 84], Zimbabwe [85], and Ethiopia, Mozambique, and Tanzania [86]. Across 10 countries in Eastern and Southern Africa, all categories of orphans were less likely to be enrolled in school than non-orphans in the same households, implying that orphans are discriminated in their foster homes [87]. Across 17 countries in Sub-Saharan Africa, being an orphan makes a child less likely to be at the grade corresponding to their age [88]. In some countries only maternal orphans are disadvantaged in terms of school enrollment. In Tanzania, longitudinal data shows that young adults who lost their mothers between the ages of 7 and 15 attained one less year of education than those who were not maternally orphaned during that period [89]. Maternal orphans were also disadvantaged in South Africa, where longitudinal data from KwaZulu-Natal showed that

¹ Due to the challenges in defining which children are “vulnerable,” most research on school enrollment focuses on orphans rather than OVC.

they were less likely to be in school and completed fewer years of education than youth of the same age who were not maternal orphans [90], and in Rwanda [86].

However, not all research has found a clear relationship between orphan status and education. Ainsworth, Beegle, and Koda [91] discuss several challenges faced by researchers attempting to determine the relationship between orphaning and educational status. First, estimates may be biased as parental education level and family socioeconomic status are associated with children's enrollment status and parents' risk of HIV infection. Second, sample sizes must be quite large in order to capture sufficient numbers of maternal, paternal, and double orphans to have reasonable statistical power. Third, many past studies have used non-representative samples, reducing the generalizability of the findings.

Given these challenges, it is unsurprising that a number of studies have obtained results contrary to those presented above. A recent study in South Africa found that orphans were not significantly less likely to be in school than non-orphans in the same household, nor were there significant differences in educational expenditures [92]. In Namibia, paternal orphans were more likely to be enrolled in school than non-orphans, as were maternal orphans in Mozambique and Nigeria [86]. In Malawi, the differences between the mean grade levels of orphans and non-orphans aged 19-28 were not statistically significant [93]. Several studies found that enrollment impacts were different for different groups, varying by the child's age, socioeconomic status, the child's relationship to the household head, and the mother's education [91, 94]. Others argue that the "orphan gap" is not large enough to be of primary concern for policymakers. In most of the 51 countries included in an analysis by Ainsworth and Filmer [95], the poverty gap in enrollment between the lowest and highest quintiles is greater than the gaps between non-orphans and any

category of orphan. Their findings also vary greatly by country, and thus the authors warn against sweeping statements regarding orphans and enrollment deficits.

While orphans are generally the focus of school enrollment research as linked to HIV/AIDS, school access problems are certainly not limited to orphans. Children whose parents are infected with HIV but still living may also face obstacles that prevent them from enrolling in school, succeeding, and completing cycles. In the Kagera region of Tanzania, children who lost a parent spent fewer hours in school in the months preceding the death [91]. Similarly, in Western Kenya, many children dropped out of school in months before a parental death [84]. Controlling for a number of background variables, Kenyan children whose parents were HIV-infected were less likely to be attending school than children whose parents were not HIV-infected [71]. In the Karonga district of Malawi, study participants whose parents were HIV positive were less likely to have attended secondary school [93]. Twenty-six percent of children in a study conducted in Uganda whose parents were HIV positive said their attendance worsened and 28% said their performance in school worsened because of their parents' illness and the consequent responsibilities and stresses placed upon them [82].

It is clear that millions of children are adversely affected by HIV and AIDS in sub-Saharan Africa and also that children do not need to be orphaned in order to be significantly affected. While the outcomes for OVCs are context-specific and closely related to family socioeconomic level, the barriers they face in accessing education are real and wide-ranging, from the psychological effects of stigma and discrimination to increased poverty. These challenges put OVC at increased risk of contracting HIV themselves [96]. In the countries of sub-Saharan Africa educational access issues stretch far beyond OVCs. While enrollment and equity figures vary, no country has managed to offer free, high-quality primary and secondary education to all

children. This is a critical problem given the increasingly important role of general education as a tool for HIV prevention.

Section Three: Expanded education access for HIV prevention

Gender, education and HIV

Sub-Saharan Africa bears the highest burden of the HIV epidemic, accounting for 68% of all cases worldwide [69]. Approximately 12 million sub-Saharan African children have been orphaned by AIDS—an overwhelming share of the global total [97]. Education is important to HIV prevention, but access is limited in many high-burden countries, particularly at the secondary school level; net secondary school attendance in sub-Saharan Africa is less than one quarter of eligible youths [98]. Girls in many countries are less likely to enroll, and less likely to complete school when they do enroll. As shown in Table 1, while the gender gap in gross enrollment has begun to close in some countries, it often remains large at the secondary level.

Table 1. Illustrative HIV Prevalence and Primary and Secondary School Gross Enrollment Ratios

	Adult HIV Prevalence (%)	Gross Enrolment Rate (Male/Female)	
		Primary	Secondary
<i>Zambia</i>	17.0	118/111	33/27
<i>Mozambique</i>	16.1	111/93	16/11
<i>Tanzania</i>	6.5	109/105	9/7 (1999)
<i>Uganda</i>	6.4	118/118	20/16
<i>Nigeria</i>	3.9	105/87	36/29

Source: [99]

The shortfall in educational attainment holds particularly serious consequences for girls and women. According to UNAIDS, in 2007 women comprised nearly 61% of HIV-positive

adults in sub-Saharan Africa, and this proportion has been growing at varying paces across regions [69]. Women and girls are at an increased risk of contracting HIV both biologically and socially, especially in settings where they are unable to control when and with whom they have sex. Beyond the importance of primary school for HIV prevention, evidence from recent studies demonstrates the additional protective effect of completing secondary school for adolescent girls [62]. Further, Gupta and Mahy [58] examined demographic and health survey (DHS) data in eight countries using logistic regression analyses to model the probability of having first intercourse during adolescence. They found that secondary education was the *only* variable that was consistently and statistically significantly associated with lower probability of first intercourse before age 18 in all countries considered.

In many circumstances, women's control over their sexual health is compromised by physical and sexual violence. The 2005 WHO multi-country study on violence against women found that in most sites studied, between 10 and 50 percent of women reported experiencing sexual violence by an intimate partner in their lifetimes. In all sites, except Ethiopia, women who reported experiencing violence from an intimate partner were significantly more likely to report that they knew their partner had had sexual partnerships with other women during their relationship [100]. In another study, 71% of female schoolgirls in South Africa reported that they had been forced to have sex [101].

Although education, particularly beyond the primary level, has been shown to be protective against both HIV and violence, gender gaps in enrolment and completion increase with the level of attainment, further constraining women's abilities to safeguard their own health [102]. While education alone is insufficient in enabling many women to protect themselves from HIV due to other socio-cultural risks, including violence, it provides a foundation to give women

the skills needed to address their risk of HIV. It has been argued that education of girls can have a significant impact on the HIV epidemic and can empower girls to pursue options that can keep them safe from HIV infection [97].

Socio-cultural factors that decrease girls' enrollment in and completion of secondary school include early age at marriage, traditional gender roles in many settings, and pregnancy during adolescence [103]. These factors are compounded by limited economic opportunities for young women, which result from and contribute to the perception that secondary education is not necessary for girls. Persistent gender inequality at home (e.g. primary responsibility for child care, household responsibilities) and discrimination in the workplace (preventing employment and/or promotion) diminishes opportunities for young women, perpetuates this cycle, and further fuels the HIV epidemic.

Girls as caregivers

In the context of HIV, those of reproductive age bear a significant burden of the disease, resulting in greater morbidity and premature mortality in the absence of antiretroviral therapy in this group. For parents who are sick and home-bound, girls often become caregivers. In addition, for those girls who have been orphaned by HIV, increased responsibility for the care of younger siblings is common [104, 105]. These increased home responsibilities often result in girls dropping out of school and serve to perpetuate the gender inequalities in high HIV burden settings. With a lower level of education, girls and young women have fewer choices and opportunities and are more likely to become dependent upon their male partners for economic support in the future. [106-108].

Safety in schools

The UNAIDS Inter-Agency Task Team (IATT) on Education has issued a series of specific recommendations for continuing to expand access to girls' education for HIV prevention. They include: abolishing school fees, improving the quality and relevance of education, conditional cash transfers, school feeding programs, life skills integration, and addressing teenage pregnancy, among others. They also emphasize the importance of creating "child-friendly schools", which address negative gender stereotypes, seek to provide positive role models, adopt zero tolerance policies for gender-based violence, as well as offer flexible schedules to accommodate competing family responsibilities [64].

Initiatives to promote universal access to education and related initiatives for HIV-affected children

In 1990, at the World Conference on Education for All (EFA), the goal for universal primary education by the year 2015 was set. While assessments have shown that many countries, the majority of which are located in sub-Saharan Africa, are unlikely to reach this goal, there has been progress towards reaching universal access to primary education [102]. However, a recent UNESCO report anticipates that 55 countries will not attain universal enrollment in primary education by 2015 and that 28 of these are among the 45 highest HIV-affected countries [109]. Given the importance of education in preventing HIV infection, increasing knowledge, and advancing life skills, several global, regional, and national initiatives are specifically working to improve access to education for children in high HIV burden settings.

One global initiative focusing on education and HIV is EDUCAIDS, a program led by UNESCO in collaboration with UNAIDS cosponsors, which has two primary goals. First, EDUCAIDS aims to use education to prevent the spread of HIV. Secondly, the program aims to

protect the primary elements of educational systems from the impacts of HIV/AIDS. These primary elements include quality education, curricula and learning materials, educator training and support, as well as policy and management. EDUCAIDS works worldwide, recognizing that countries may choose to manage their HIV epidemics differently. Thus, the initiative encourages key stakeholders within countries (such as ministries of education and teachers unions) to help determine the most appropriate way to bolster the educational response to HIV [110].

In another global effort, the UNAIDS Inter-Agency Task Team (IATT) on Education (in partnership with several other organizations) recently released a “toolkit” for incorporating HIV/AIDS education into the education sector. The toolkit focuses on “mainstreaming” HIV/AIDS education in an effort to ensure HIV/AIDS is comprehensively addressed within the education sector. Additionally, the toolkit makes recommendations which include promoting holistic HIV prevention teaching, ensuring educators are aware of how to address HIV/AIDS, and outlining the critical steps an educational ministry can take to work towards a more effective model, which includes an analysis of stakeholders and building partnerships [111].

The Help At Risk Orphans and Vulnerable Children (HERO) program is a school-based initiative that raises awareness and funds for HIV/AIDS-affected orphans and vulnerable children (OVCs). In partnership with USAID, the United Nations Association of the United States of America, HERO is active in Ethiopia, Namibia, South Africa, and Zambia. Although education is important for all children, HERO recognizes that schools are particularly important in the lives of OVCs because, more so than other children, they rely on schools to meet their needs for basic care and services. HERO addresses these special needs through a two-step “HERO Package” of interventions, delivered by local partners to schools serving children from pre-school through the 12th grade. Stage one supports feeding schemes, infrastructure

improvements, crisis support, and water and sanitation projects. Stage two delivers more school resources, child health interventions, capacity building programs, and psycho-social support [112].

Also needed are complementary, non-school-based programs because OVCs are often unable to attend school because of increased household responsibilities and economic pressures related to HIV/AIDS. This has been demonstrated by a decline in children enrolled in school in high HIV-burden settings [113]. Economic pressures are intensified for OVCs, which increases the likelihood that they and their families will be unable to afford school fees. A recent longitudinal study in Kenya quantified the impact of parental death on the likelihood of primary school attendance as a 9 percentage point reduction for maternal death and a 4 percentage point reduction for paternal deaths. Especially affected were lower-performing students, which suggests that families were forced to apply their limited resources to only the best students in the household [84].

Another regional initiative, the Africa Education Initiative (AEI) is a \$600 million plan funded by USAID which aims to improve access to education in 30 sub-Saharan African countries. The initiative focuses on offering scholarships to female students in an attempt to lessen gender gaps in education achievement (the Ambassadors Girls' Scholarship Program), providing textbook and learning materials to primary and secondary schools, and training teachers to improve the quality of education. Within the training teachers initiatives funded by AEI, there is a focus on giving teachers information about HIV/AIDS and training teachers how to incorporate HIV prevention and education messages into their curriculum [114].

On the national level, HIV/AIDS is a priority within Ministries of Education throughout sub-Saharan Africa. There are a number of aspects of the education sector at the local or

regional level which can have an impact on HIV prevention. School teachers and administrative personnel can play an active role in preventing youths from dropping out of school. In addition, a multisectoral approach can offer benefits. For example, members of community-based organizations (CBOs) can encourage young people who have dropped out to re-enroll in school [97].

Country-specific studies have shown that eliminating user fees has increased access to education, especially among the poor. After Malawi began abolishing school fees in the early and mid-1990s, enrollments increased sharply. Comparing enrollments before the fees were eliminated (1990-91) with those several years later (1997-8), Al-Samarrai and Zaman found that the net primary rate had increased from 51% to 77%. The increase came disproportionately from the poorest families. While enrollment from the richest 20% rose from 75% to 80%, enrollments from the poorest 20% more than doubled from 33% to 76% [115]. Similarly, Deininger found that when Uganda eliminated fees for primary enrollment and launched a mobilization program, attendance rose sharply, especially in the lower quintiles of the per capita expenditure distribution. The overall attendance rate in 1992, when fees were in effect, was 62.1%. In 1997, when fees were eliminated, the rate was 83.8%. Over the same period, attendance rates for the richest quintile increased from 81.7% to 89%, and rates for the poorest quintile rose from 45.7% to 77.7%. Disparities in attendance by gender, income, and region were all reduced. At the secondary level, where fees were maintained, no changes were observed over the same period [116].

Clearly, countries attempting to increase demand for education must address the direct and indirect costs of education, particularly in the context of poverty exacerbated by the HIV pandemic. Gender issues are also vital; schools need to provide a safe learning environment that

respects children's responsibilities outside of the classroom. While no one model will solve the educational access problems of every country in sub-Saharan Africa, the programs discussed above are promising directions for future efforts to ensure access for all children.

Conclusions and recommendations

Research results increasingly support educational attainment and school enrollment as tools in the fight against HIV. As discussed above, educational level and enrollment affect HIV risk factors from condom use to multiple partnerships. In order to maximize the potential impact of these related factors, access to education must become a priority for national health ministries as well as international organizations and funders. School fees are an area of particular concern in sub-Saharan Africa, where millions of children are not in school. Beyond issues related to school fees and indirect costs of education, children who are affected by HIV and AIDS likely require more specific interventions in order to allow them to overcome barriers to enrollment. Children who have advanced HIV may need antiretroviral treatment in order to remain healthy enough to attend regularly. Those who have been orphaned or separated from family members may need psychological support from trained teachers, health workers, or other community members. Children who are affected by HIV and AIDS are particularly vulnerable to becoming infected themselves, and thus may particularly benefit from enrolling in school and persisting through secondary school.

Aggregate national-level data on school enrollment is not the only indicator of success in improving educational access. It is also critical to analyze the equity of access in countries affected by HIV. Where certain groups, such as the poor, orphans and vulnerable children, or those living in rural areas are excluded from education, they are also placed at increased risk for

HIV infection. It may be particularly beneficial to focus on getting girls into school and keeping them enrolled. Experimental evidence suggests that for girls, simply being enrolled in school is protective against HIV. Girls who are attending school are less likely to begin having sex at an early age, which is a risk factor for HIV infection. Thus school enrollment has an immediate protective effect as well as a long-term effect through improved educational attainment. These two distinct mechanisms for the effect of schooling on HIV transmission carry with them a hopeful message. Even where challenges to improve school quality and barriers to school completion remain, taking action now to enroll girls in school can have a big impact on the HIV epidemic. Increasing the chances that children complete primary, and then secondary school, will further enhance the impact on the HIV transmission and realizes the potential of schooling to tackle the epidemic.

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References

1. Rosenstock IM, Glanz K, Lewis FM, Rimer BK. **The Health Belief Model: Explaining health behavior through expectancies.** In: *Health Behaviour and Health Education.* Edited by Glanz K, Lewis FM, Rimer BK. San Francisco: Jossey-Bass; 1990:39-62.
2. Ajzen I. **From intention to actions: A theory of planned behavior.** In: *Action Control: From cognitions to behavior.* Edited by Kuhl J, Beckman J. New York: Springer-Verlag; 1985:11-39.
3. Gregson S, Zhuwau T, Anderson RM, Chandiwana SK. **Is there evidence for behaviour change in response to AIDS in rural Zimbabwe?** *Social Science & Medicine* 1998,46:321-330.
4. Fishbein M. **The role of theory in HIV prevention.** *AIDS Care* 2000,12:273-278.
5. Were M. **Determinants of teenage pregnancies: The case of Busia District in Kenya.** *Economics & Human Biology* 2007,5:322-339.
6. Bandura A. **Social Learning Theory.** Englewood Cliffs, NJ: Prentice Hall; 1977.
7. Ajzen I. **Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior.** *Journal of Applied Social Psychology* 2002,32:665-683.
8. Lindan C, Allen S, Carael M, Nsengumuremyi F, Vandepierre P, Serufulira A, *et al.* **Knowledge, attitudes, and perceived risk of AIDS among urban Rwandan women: Relationship to HIV-Infection and behavior change.** *AIDS* 1991,5:993-1002.
9. Jewkes RK, Levin JB, Penn-Kekana LA. **Gender inequalities, intimate partner violence and HIV preventive practices: findings of a South African cross-sectional study.** *Social Science & Medicine* 2003,56:125-134.
10. Global Campaign for Education. **Learning to survive: How education for all would save millions of young from HIV/AIDS.** Brussels, Belgium: Global Campaign for Education; 2004.
11. Wolff B, Blanc AK, Gage AJ. **Who decides? Women's status and negotiation of sex in Uganda.** *Culture, Health & Sexuality* 2000,2:303-322.
12. Beekle AT, McCabe C. **Awareness and determinants of family planning practice in Jimma, Ethiopia.** *International Nursing Review* 2006,53:269-276.
13. Weiser SD, Leiter K, Bangsberg DR, Butler LM, Percy-de Korte F, Hlanze Z, *et al.* **Food insufficiency is associated with high-risk sexual behavior among women in Botswana and Swaziland.** *PLoS Medicine* 2007,4:e260.
14. Albarracin D, Kumkale GT, Johnson BT. **Influences of social power and normative support on condom use decisions: a research synthesis.** *AIDS Care-Psychological and Socio-Medical Aspects of AIDS/HIV* 2004,16:700-723.
15. Eaton L, Flisher AJ, Aaro LE. **Unsafe sexual behaviour in South African youth.** *Social Science & Medicine* 2003,56:149-165.
16. Buhler C, Kohler H-P. **Talking about AIDS: The influence of communication networks on individual risk perceptions of HIV/AIDS infection and favored protective behaviors in South Nyanza District, Kenya.** *Demographic Research* 2003,S1:397.
17. Giles M, Liddell C, Bydowell M. **Condom use in African adolescents: The role of individual and group factors.** *AIDS Care* 2005,17:729-739.

18. Campbell C, Foulis CA, Maimane S, Sibiyi Z. **The impact of social environments on the effectiveness of youth HIV prevention: A South African case study.** *AIDS Care* 2005,17:471-478.
19. Hadera HG, Boer H, Kuiper WAJM. **Using the theory of planned behaviour to understand the motivation to learn about HIV/AIDS prevention among adolescents in Tigray, Ethiopia.** *AIDS Care* 2007,19:895-900.
20. Latkin CA, Knowlton AR. **Micro-social structural approaches to HIV prevention: a social ecological perspective.** *AIDS Care* 2005,17:102-113.
21. Gregson S, Terceira N, Mushati P, Nyamukapa C, Campbell C. **Community group participation: Can it help young women to avoid HIV? An exploratory study of social capital and school education in rural Zimbabwe.** *Social Science & Medicine* 2004,58:2119-2132.
22. Myer L, Mathews C, Little F. **Improving the accessibility of condoms in South Africa: the role of informal distribution.** *AIDS Care* 2002,14:773-778.
23. Quigley M, Munguti K, Grosskurth H, Todd J, Mosha F, Senkoro K, *et al.* **Sexual behaviour patterns and other risk factors for HIV infection in rural Tanzania: A case-control study.** *AIDS* 1997,11:237-248.
24. Kirunga CT, Ntozi JP. **Socio-economic determinants of HIV serostatus: a study in Rakai District, Uganda.** *Health Transition Review* 1997,7 (Supplement):175-188.
25. Smith J, Nalagoda F, Wawer MJ, Serwadda D, Sewankambo N, Konde-Lule J, *et al.* **Education attainment as a predictor of HIV risk in rural Uganda: results from a population-based study.** *International Journal of STD & AIDS* 1999,10:452-459.
26. Grosskurth H, Mosha F, Todd J, Senkoro K, Newell J, Klokke A, *et al.* **A Community Trial of the Impact of Improved Sexually- Transmitted Disease Treatment on the HIV Epidemic in Rural Tanzania. 2. Base-Line Survey Results.** *AIDS* 1995,9:927-934.
27. Senkoro KP, Boerma JT, Klokke AH, Ng'weshemi JZL, Muro AS, Gabone R, Borgdorff MW. **HIV incidence and HIV-associated mortality in a cohort of factory workers and their spouses in Tanzania, 1991 through 1996.** *Journal of Acquired Immune Deficiency Syndromes* 2000,23:194-202.
28. Kilian AHD, Gregson S, Ndyabangi B, Walusaga K, Kipp W, Sahlmuller G, *et al.* **Reductions in risk behaviour provide the most consistent explanation for declining HIV-1 prevalence in Uganda.** *AIDS* 1999,13:391-398.
29. Fylkesnes K, Musonda RM, Sichone M, Ndhlovu Z, Tembo F, Monze M. **Declining HIV prevalence and risk behaviours in Zambia: evidence from surveillance and population-based surveys.** *AIDS* 2001,15:907-916.
30. Fylkesnes K, Ndhlovu Z, Kasumba K, Musonda RM, Sichone M. **Studying dynamics of the HIV epidemic: population-based data compared with sentinel surveillance in Zambia.** *AIDS* 1998,12:1227-1234.
31. Fortson JG. **The gradient in sub-Saharan Africa: Socioeconomic status and HIV/AIDS.** *Demography* 2008,45:303-322.
32. Abebe Y, Ab S, Mamo G, Negussie A, Darimo B, Wolday D, Sanders EJ. **HIV prevalence in 72,000 urban and rural male army recruits, Ethiopia.** *AIDS* 2003,17:1835-1840.

33. Gregson S, Mason PR, Garnett GP, Zhuwau T, Nyamukapa CA, Anderson RM, Chandiwana SK. **A rural HIV epidemic in Zimbabwe? Findings from a population-based survey.** *International Journal of STD & AIDS* 2001,12:189-196.
34. de Walque D, Nakiyingi-Miiró JS, Busingye J, Whitworth JA. **Changing association between schooling levels and HIV-1 infection over 11 years in a rural population cohort in south-west Uganda.** *Tropical Medicine & International Health* 2005,10:993-1001.
35. Glynn JR, Caraël M, Suvé A, Anagonou S, Zekeng L, Kahindo M, Musonda R. **Does increased general schooling protect against HIV infection? A study in four African cities.** *Tropical Medicine & International Health* 2004,9:4-14.
36. Wilkins A, Hayes R, Alonso P, Baldeh S, Berry N, Cham K, *et al.* **Risk-Factors for HIV-2 Infection in the Gambia.** *AIDS* 1991,5:1127-1132.
37. Fontanet AL, Woldemichael T, Sahlú T, van Dam GJ, Messele T, de Wit TR, *et al.* **Epidemiology of HIV and Schistosoma mansoni infections among sugar-estate residents in Ethiopia.** *Annals of Tropical Medicine and Parasitology* 2000,94:145-155.
38. Hargreaves JR, Glynn JR. **Educational attainment and HIV-1 infection in developing countries: a systematic review.** *Tropical Medicine & International Health* 2002,7:489-498.
39. De Walque D. **Who gets AIDS and how? The determinants of HIV infection and sexual behaviors in Burkina Faso, Cameroon, Ghana, Kenya, and Tanzania.** Washington, D.C.: World Bank; 2006.
40. Blanc A. **The relationship between sexual behaviour and level of education in developing countries.** Geneva: UNAIDS; 2000.
41. Berkley SF, Widywirski R, Okware SI, Downing R, Linnan MJ, White KE, Sempala S. **Risk-Factors Associated with HIV Infection in Uganda.** *Journal of Infectious Diseases* 1989,160:22-30.
42. Dallabetta GA, Miotti PG, Chiphangwi JD, Saah AJ, Liomba G, Odaka N, *et al.* **High socioeconomic-status is a risk factor for Human-Immunodeficiency-Virus Type-1 (HIV-1) infection but not for sexually-transmitted diseases in women in Malawi - Implications for HIV-1 control.** *Journal of Infectious Diseases* 1993,167:36-42.
43. Blanc AK, Way AA. **Sexual behavior and contraceptive knowledge and use among adolescents in developing countries.** *Studies in Family Planning* 1998,29:106-116.
44. Hargreaves JR, Bonell CP, Boler T, Boccia D, Birdthistle I, Fletcher A, *et al.* **Systematic review exploring time trends in the association between educational attainment and risk of HIV infection in sub-Saharan Africa.** *AIDS* 2008,22:403-414.
45. Underwood C, Hachonda H, Serlemitsos E, Bharath-Kumar U. **Reducing the risk of HIV transmission among adolescents in Zambia: psychosocial and behavioral correlates of viewing a risk-reduction media campaign.** *Journal of Adolescent Health* 2006,38:55.
46. de Walque D. **How does the impact of an HIV/AIDS information campaign vary with educational attainment? Evidence from rural Uganda.** *Journal of Development Economics* 2007,84:686-714.
47. Vandemoortele J, Delamonica E. **Education "vaccine" against HIV/AIDS.** *Current Issues in Comparative Education* 2000,3.

48. Keselman A, Kaufman DR, Patel VL. **"You can exercise your way out of HIV" and other stories: The role of biological knowledge in adolescents' evaluation of myths.** *Science Education* 2004,88:548-573.
49. Lagarde E, Carael M, Glynn JR, Kanhonou L, Abega SC, Kahindo M, *et al.* **Educational level is associated with condom use within non- spousal partnerships in four cities of sub-Saharan Africa.** *AIDS* 2001,15:1399-1408.
50. Lane T. **In South Africa, Wives' HIV Prevention Beliefs Affect Condom Use with Spouse.** *International Family Planning Perspectives* 2004,30:150-151.
51. Maharaj P, Cleland J. **Condom Use Within Marital and Cohabiting Partnerships in KwaZulu-Natal, South Africa.** *Studies in family planning* 2004,35:116-124.
52. Maharaj P. **Patterns of condom use: Perspectives of men in KwaZulu-Natal, South Africa.** *Development Southern Africa* 2005,22:187-197.
53. Katz I. **Explaining the Increase in Condom Use Among South African Young Females.** *Journal of health communication* 2006,11:737-753.
54. Magnani RJ, Karim AM, Weiss LA, Bond KC, Lemba M, Morgan GT. **Reproductive health risk and protective factors among youth in Lusaka, Zambia.** *Journal of Adolescent Health* 2002,30:76-86.
55. Duflo E, Dupas P, Kremer M, Sinei S. **Education and HIV/AIDS Prevention: Evidence from a randomized evaluation in Western Kenya.** In: *World Bank Policy Research Working Paper Series No. 4024*; 2006.
56. Hallett TB, Lewis JJC, Lopman BA, Nyamukapa CA, Mushati P, Wambe M, *et al.* **Age at First Sex and HIV Infection in Rural Zimbabwe.** *Studies in family planning* 2007,38:1-10.
57. Kaufman CE, Clark S, Manzini N, May J. **Communities, Opportunities, and Adolescents' Sexual Behavior in KwaZulu-Natal, South Africa.** *Studies in family planning* 2004,35:261-274.
58. Gupta N, Mahy M. **Sexual Initiation Among Adolescent Girls and Boys: Trends and Differentials in Sub-Saharan Africa.** *Archives of Sexual Behavior* 2003,32:41.
59. Zaba B, Pisani E, Slaymaker E, Boerma JT. **Age at first sex: understanding recent trends in African demographic surveys.** *Sexually transmitted infections* 2004,80 Suppl 2:ii28-35.
60. Zambuko O, Mturi AJ. **Sexual risk behaviour among the youth in the era of HIV/AIDS in South Africa.** *Journal of Biosocial Science* 2005,37:569-584.
61. De Walque D. **How does the impact of an HIV/AIDS Information Campaign Vary with Educational Attainment? Evidence from Rural Uganda.** Washington, D. C.: World Bank, Development Research Group; 2002.
62. Hargreaves J, Boler T. **Girl power: The impact of girls' education on HIV and sexual behaviour.** Johannesburg, South Africa: ActionAid International; 2006.
63. Fortson JG. **Mortality risk and human capital investment: The impact of HIV/AIDS in sub-Saharan Africa;** 2008.
64. UNESCO. **Education For All Global Monitoring Report 2008: Education For All by 2015: Will we make it?** Paris: UNESCO; 2008.
65. Boyle S, Brock A, Mace J, Sibbons M. **Reaching the poor: The 'costs' of sending children to school.** London: Department for International Development; 2002.
66. Arimah B. **Poverty Reduction and Human Development in Africa.** *Journal of Human Development* 2004,5:399-415.

67. Booyesen J, Bachman M. **HIV/AIDS, poverty, and growth: Evidence from a household impact study conducted in the Free State province, South Africa.** *Annual Conference of the Centre for Study of African Economies.* St. Catherine's College, Oxford, March 18-19 2002.
68. Skinner D, Tsheko NM-MS, Segwabe M, Chibatamoto P, Mfecane S, Chandiwana B, *et al.* **Towards a Definition of Orphaned and Vulnerable Children.** *AIDS and Behavior* 2006,10:619-626.
69. UNAIDS. **AIDS Epidemic Update 2007.** Geneva: UNAIDS; 2007.
70. Monasch R, Boerma JT. **Orphanhood and childcare patterns in sub-Saharan Africa: An analysis of national surveys from 40 countries.** *AIDS* 2004,18:S55-S65.
71. Mishra V, Arnold F, Cross A, Hong R. **Education and nutritional status of orphans and children of HIV-infected parents in Kenya.** Calverton, Maryland: USAID; 2005.
72. Brookes H, Shisana O, Richter L. **The national household HIV prevalence and risk survey of South African children.** Cape Town: HSRC; 2004.
73. UNAIDS. **2008 Report on the Global AIDS Epidemic.** Geneva: UNAIDS; 2008.
74. Bachmann MO, Booyesen FLR. **Relationships between HIV/AIDS, income and expenditure over time in deprived South African households.** *AIDS Care* 2004,16:817-826.
75. Schroeder E-A, Nichola T. **The adoption of HIV/AIDS orphans and food security in rural Ingwavuma, South Africa.** *International Journal of Technology Management & Sustainable Development* 2006,5:173-187.
76. Pridmore P. **Access to conventional schooling for children and young people affected by HIV and AIDS in sub-Saharan Africa: A cross-national review of recent research evidence.** London: SOFIE, Institute of Education, University of London; 2008.
77. UNICEF. **Africa's orphaned and vulnerable generations: Children affected by AIDS.** New York: UNICEF; 2006.
78. Robson S, Sylvester KB. **Orphaned and vulnerable children in Zambia: the impact of the HIV/AIDS epidemic on basic education for children at risk.** *Educational Research* 2007,49:259-272.
79. Boler T, Carroll K. **Addressing the educational needs of orphans and vulnerable children.** London: ActionAid International and Save the Children Fund; 2005.
80. Atwine B, Cantor-Graae E, Bajunirwe F. **Psychological distress among AIDS orphans in rural Uganda.** *Social Science & Medicine* 2005,61:555-564.
81. Cluver L, Gardner F, Operario D. **Psychological distress amongst AIDS-orphaned children in urban South Africa.** *Journal of Child Psychology & Psychiatry* 2007,48:755-763.
82. Gilborn LZ, Nyonyintono R, Kabumbuli R, Jagwe-Wadda G. **Making a difference for children affected by AIDS: baseline findings from operations research in Uganda.** Washington, D.C.: The Population Council & Horizons; 2001.
83. Makame V, Ani C, Grantham-McGregor S. **Psychological well-being of orphans in Dar Es Salaam, Tanzania.** *Acta Paediatrica* 2002,91:459-465.
84. Evans DK, Miguel E. **Orphans and Schooling in Africa: a Longitudinal Analysis.** *Demography* 2007,44:35-57.
85. Nyamukapa C, Gregson S. **Extended family's and women's roles in safeguarding orphans' education in AIDS-afflicted rural Zimbabwe.** *Social Science & Medicine* 2005,60:2155-2167.

86. Nyangara F. **Sub-national distribution and situation of orphans: An analysis of the President's Emergency Plan for AIDS Relief Focus Countries.** Washington, D.C.: USAID; 2004.
87. Case A, Paxson C, Ableidinger J. **Orphans in Africa: Parental death, poverty, and school enrollment.** *Demography* 2004,41:483-508.
88. Bicego G, Rutstein S, Johnson K. **Dimensions of the emerging orphan crisis in sub-Saharan Africa.** *Social Science & Medicine* 2003,56:1235.
89. Beegle K, De Weerd J, Dercon S. **The long-run impact of orphanhood.** In. Washington, D.C.: The World Bank; 2007.
90. Case A, Ardington C. **The impact of parental death on school outcomes: Longitudinal evidence from South Africa.** *Demography* 2006,43:401-420.
91. Ainsworth M, Beegle K, Koda G. **The Impact of Adult Mortality and Parental Deaths on Primary Schooling in North-Western Tanzania.** *Journal of Development Studies* 2005,41:412-439.
92. Parikh A, DeSilva MB, Cakwe M, Quinlan T, Simon JL, Skalicky A, Zhuwau T. **Exploring the Cinderella myth: intrahousehold differences in child wellbeing between orphans and non-orphans in Amajuba District, South Africa.** *AIDS* 2007,21:S95-S103.
93. Floyd S, Crampin AC, Glynn JR, Madise N, Mwenebabu M, Mnkondia S, *et al.* **The social and economic impact of parental HIV on children in northern Malawi: Retrospective population-based cohort study.** *AIDS Care* 2007,19:781-790.
94. Yamano T, Jayne TS. **Working-age adult mortality and primary school attendance in rural Kenya.** *Economic Development and Cultural Change* 2005,53:619-654.
95. Ainsworth M, Filmer D. **Inequalities in children's schooling: AIDS, orphanhood, poverty, and gender.** *World Development* 2006,34:1099-1128.
96. Birdthistle IJ, Floyd S, Machingura A, Mudziwapasi N, Gregson S, Glynn JR. **From affected to infected? Orphanhood and HIV risk among female adolescents in urban Zimbabwe.** *AIDS* 2008,22:759-766.
97. Rispel L, Letlape L, Metcalf C. **Education sector responses to HIV and AIDS: Learning from good practices in Africa.** London: Commonwealth Secretariat, Association for the Development of Education in Africa, Human Sciences Research Council; 2006.
98. UNICEF. **The State of The World's Children 2008: Child Survival.** New York: UNICEF; 2007.
99. UNESCO. **Institute for Statistics** 2008.
100. World Health Organization. **WHO multi-country study on women's health and domestic violence against women: summary report of initial results on prevalence, health outcomes and women's responses.** Geneva: World Health Organization; 2005.
101. Andersson N, Ho-Foster A, Matthis J, Marokoane N, Mashiane V, Mhatre S, *et al.* **National cross sectional study of views on sexual violence and risk of HIV infection and AIDS among South African school pupils.** *British Medical Journal* 2004,329:952-954A.
102. UNESCO. **EFA Global Monitoring Report 2002: Is the world on track?** Paris: UNESCO; 2002.
103. Blum RW. **Youth in sub-Saharan Africa.** *Journal of Adolescent Health* 2007,41:230-238.

104. Smith Kamal M. **Gender, poverty, and intergenerational vulnerability to HIV/AIDS.** *Gender Dev* 2002,10.
105. UNICEF. **Children on the Brink 2004: A Joint Report of New Orphan Estimates and a Framework for Action.** New York: UNICEF; 2004.
106. Sa Z, Larsen U. **Gender inequality increases women's risk of HIV infection in Moshi, Tanzania.** *J Biosoc Sci* 2007,40.
107. Gupta GR. **How men's power over women fuels the HIV epidemic.** *BMJ: British Medical Journal* 2002,324.
108. Nakuti J, Musaka G. **Children-headed households; vulnerability of the young orphaned girls in S. W. Uganda.** In: *11th International AIDS Conference.* Vancouver, Canada; 1996.
109. UNESCO. **UNESCO's response to HIV and AIDS.** Paris: UNESCO HIV/AIDS Coordination Unit; 2005.
110. UNESCO, UNAIDS. **EDUCAIDS: Towards a comprehensive education sector response.** Paris: UNESCO; 2007.
111. UNAIDS Inter-Agency Task Team on Education. **Toolkit For Mainstreaming HIV and AIDS in the Education Sector: Guidelines for Development Cooperation Agencies.** Paris: UNESCO; 2008.
112. HERO. **HERO, a UNA-USA Campaign: About us;** 2008.
113. UNICEF. **Progress for Children: A Report Card on Gender Parity and Primary Education.** New York: UNICEF; 2005.
114. USAID. **Africa Education Initiative.** Washington, D.C.: USAID; 2008.
115. Al-Samarrai S, Zaman H. **Abolishing school fees in Malawi: The impact on education access and equity.** *Education Economics* 2007,15:359-375.
116. Deininger K. **Does cost of schooling affect enrollment by the poor? Universal primary education in Uganda.** *Economics of Education Review* 2003,22:291-305.