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**The impact of education on sexual behavior in sub-Saharan Africa:
A review of the literature**

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Abstract

Many studies have attempted to determine the relationship between education and HIV status. However, a complete and causal understanding of this relationship requires analysis of its mediating pathways, focusing on sexual behaviors. We developed a series of hypotheses based on the differential effect of educational attainment on three sexual behaviors. We tested our predictions in a systematic literature review including 65 articles reporting associations between three specific sexual behaviors—sexual initiation, number of partners, and condom use—and educational attainment or school enrollment in Sub-Saharan Africa. The patterns of associations varied by behavior. The findings for condom use were particularly convergent; none of the 44 studies using educational attainment as a predictor reviewed found that more educated people were significantly less likely to use condoms. Findings for sexual initiation and number of partners were more complex. The contrast between findings for condom use on the one hand and sexual initiation and number of partners on the other supports predictions based on our theoretical framework.

The impact of education on sexual behavior in sub-Saharan Africa:

A review of the literature

I. Introduction

In 2009 68% of the world's 33 million HIV positive people lived in sub-Saharan Africa (UNAIDS, 2010). In most countries in this region the HIV/AIDS epidemic is generalized, and therefore prevention strategies must have a broad reach. Schools are one of the few institutions that reach most individuals, and are therefore an obvious option for the dissemination of HIV prevention messages. Additionally, and of critical importance in the era of Education for All, acquiring a general education appears to have an effect on HIV infection risk (Jukes, Simmons, & Bundy, 2008). Continued prioritization of the goals of universal education, especially among those outside of the education sector, may depend on clear evidence for the benefits of such policies in the fight against HIV. This article aims to contribute to this evidence base.

A consensus on the relationship between education and HIV status is yet to emerge, despite a number of studies that have investigated the subject at various levels. The time course of the relationship—over many years of schooling and subsequent risk of infection—makes longitudinal studies difficult to conduct and few ethically justifiable means of randomizing access to education exist. Despite these challenges, progress can be made in understanding this relationship by closely examining the linkages that connect education to HIV status. Breaking the relationship down into its constituent parts allows each component to be studied in detail and allows for progress in two ways. First, it interpolates one commonly measured variable – sexual behavior – between education and HIV infection. Second, consideration of the varying roles of

intention and control in this framework suggests new hypotheses about the relationship between education, sexual behavior and HIV infection, which we now develop.

Following social cognitive theories of sexual behavior (Fishbein, 2000; Fisher & Fisher, 1996), there are two proximal determinants of behavior: the *intention* one has to engage in that behavior and the *control* one is able to exert over oneself and others to put that intention into action. Educated individuals may have more control over their behavior due to higher incomes and self-efficacy, and therefore be more capable of acting on their intentions (Berkley et al., 1989; Blanc, 2000; Dallabetta et al., 1993; Quigley et al., 1997; Weiser et al., 2007). In the absence of HIV prevention messages, these intentions—for example to have multiple sexual partners—may increase risk. As the epidemic matures and prevention messages become widespread, educated individuals may be more likely to develop intentions to change their behavior, due to their better understanding of biological information and causality.

We now focus this discussion on three specific behaviors—number of sexual partnerships, sexual debut, and condom use. Data from around the world indicate that men and women desire more than one lifetime sexual partner (Schmitt, 2003). However, recent data from East and Southern Africa—where the epidemic is most mature—suggests that individuals may indeed be changing their partnership behaviors in response to information about the epidemic. Our hypothesis is that educated individuals do this more rapidly than less educated individuals. This would result in a pattern initially showing education as a risk factor for multiple partnerships, then as a protective factor in later studies. The situation for condom use differs. Recent reported rates of condom use at last sex in sub-Saharan Africa are low—less than 20% for men and 10% for women in most countries—but increasing (Mishra et al., 2009). Our hypothesis is that before information about HIV became widespread condom use was not

common in either educated or uneducated individuals. As information became available, educated individuals were more likely to protect themselves because they were more likely to develop positive intentions and to act on those intentions. The outcome for sexual debut is less clear. As discussed below, we hypothesize both risk and protective aspects of education, and particularly current enrollment, for youth.

In summary, we hypothesize that for multiple partnerships, educational attainment changes from a risk factor to a protective factor over time as the local HIV epidemic matures. For condom use, educational attainment is never a risk factor, but evolves to become a strongly protective factor over time. In the following sections, we will explain the literature review strategy used and then summarize and assess the bodies of literature surrounding education and the three sexual behaviors specified above.

II. Methodology

This literature review focuses on relationships between sexual behavior and general education—either being enrolled in school or having completed a certain level of education. Searches were conducted in the Academic Search Premier, PsycINFO and PubMed databases to capture the peer-reviewed educational and medical literature. Searches were limited to articles published from 1995 through 2010. Studies that did not adjust estimates as appropriate for that particular study to account for confounding variables were excluded. Gender, age, and socioeconomic status were common adjustment factors among the studies. The 65 studies included in this review present findings from 24 countries.

Randomized control trials (RCTs) and other designs that allow for causal attribution should be given greater weight in reviews of literature. However, as discussed above, such

studies are difficult to conduct with educational attainment and HIV and to our knowledge no such studies have been published in peer-reviewed journals. We do include several studies analyzing multiple waves of longitudinal data sets, which allows for the temporal order of educational attainment and sexual behavior to be established. The majority of the articles in this review, however, are cross-sectional studies. Though individually cross-sectional studies have their methodological weaknesses, when the studies' results are examined as a group we may have more confidence in the findings.

School enrollment is somewhat easier to manipulate and study in the short-term than educational attainment, and some limited evidence is available from RCTs. A recent evaluation of a conditional cash transfer (CCT) program in Malawi found that the program was successful in increasing enrollment rates among young women, and program beneficiaries who were not in school at baseline had lower number of lifetime partners and a lower rate of sexual debut than their peers (Baird, Chirwa, McIntosh, & Özler, 2010). The findings of an unpublished randomized experiment conducted in Kenya will also be presented below as an example of the kind of study that would provide us with further evidence in the future.

III. Reviewing the literature on education and sexual behaviors

Do educated people begin having sex later than those with less education?

Early sexual initiation can heighten HIV risk for several reasons. On average, people who begin having sex earlier in life will have more lifetime partners than those who begin later. Adolescents in relationships with older partners may have less power to insist on protective behaviors. Twenty-two studies link sexual initiation to educational attainment and/or enrollment.

Twenty studies used educational attainment (number of years or level completed) as a predictor of sexual initiation, while seven examined current enrollment, as summarized in Table 1.

For males, the results of the educational attainment studies are mixed. Five studies found that males with more education had greater odds of having had sex, while four studies found the opposite relationship. Nonsignificant relationships between educational attainment and sexual initiation were found for males in eight studies. The results from studies examining educational attainment and sexual initiation among females are more convergent—fourteen of the twenty-two studies found that education was a significant protective factor. For women, just two studies found that educational attainment is associated with higher risk of sexual debut, both in South Africa. Nonsignificant relationships were reported for females in six studies.

Three of the seven studies reporting on enrollment and sexual initiation for males found that enrollment was protective against sexual initiation, while the remainder found nonsignificant relationships. When considering the relationship between enrollment and sexual initiation for females, it is important to note that causality in any relationship could work in either direction. Education could lead girls to avoid sexual activity, or sexually active girls may drop out of school due to pregnancy. While it is impossible to prove directionality in cross-sectional data, five of the seven studies reporting on enrollment and sexual initiation for females found that enrollment was protective. Nonsignificant relationships were reported for females in South Africa in two studies.

To our knowledge, one randomized control study has been conducted in sub-Saharan Africa that allows for causal inference on the effect of enrollment on sexual initiation. As the results have not yet been published in a peer-reviewed journal, it is not included in Table 1. Duflo, Dupas, Kremer and Sinei (2006) evaluated an intervention in Kenya that reduced the cost

of girls' education by providing uniforms. This intervention reduced the likelihood of girls reporting having had sex by 13%. Schools where uniforms had been distributed saw on average a 10% decrease in student pregnancies. The authors suggest that the reason for the change in behavior is not directly related to what students learn at school but that girls typically plan to delay child-bearing and marriage until after completing schooling.

While the total number of studies linking educational attainment or enrollment to sexual initiation is too small to come to a firm answer to this question, the results of this review strongly suggest a protective relationship for women. This could be because students have a more structured schedule, supervision during the school day, and fewer free hours to spend time with a partner. Being enrolled in school may also lead to the ability to delay immediate gratification in exchange for a long-term educational or professional goal. These findings suggest that simply keeping adolescents in school may reduce their risk of contracting HIV by extending abstinence.

Do educated people have fewer sexual partners than those with less education?

Individuals who have sex with greater numbers of partners expose themselves to greater risk of HIV infection. As used here, the term “multiple partners” refers to the number of partners an individual has had over his or her lifetime or during a specified period of time rather than necessarily implying concurrency of partners. Four of the fifteen studies used current enrollment as a predictor of multiple partners, while thirteen used educational attainment. Table 2 summarizes these studies.

Educational attainment was associated with higher likelihood of men having multiple partners in three studies and with lower likelihood in four studies. Seven studies failed to find

statistically significant relationships.³ For women, higher educational attainment was linked to higher likelihood of having multiple partners in five studies, while five others found the opposite effect. The remaining studies found no significant relationships.

Fewer studies reported on relationships between enrollment and number of sexual partners—four for males and three for females. None report significantly higher risk of multiple partners for students compared to non-students. Two of the studies reported that enrolled males had significantly lower likelihood of having multiple partners than unenrolled males while two others presented nonsignificant results. All three studies that reported results for women found that enrolled females had lower odds of having multiple partners than unenrolled females.

A clear picture of the relationship between educational attainment and number of partners has yet to emerge. The results of the studies discussed here are mixed, and both positive and negative outcomes can be easily explained. More educated people are more likely to understand the health risks involved in having many sexual partners. Educated individuals would be also less likely to exchange sex for money or other needs. However, more educated people may also marry later, travel more, and have more disposable income than less-educated individuals, all increasing the likelihood of having multiple partners. Given the varying influences of education on number of partners, it is not surprising that the studies reviewed show mixed outcomes. As in the discussion of sexual initiation, enrollment thus far seems highly protective. Hargreaves and colleagues (2008) suggest that this may be in part due to smaller social networks among students as compared to non-students. While further work is needed to reinforce these findings, it appears

³ In cases where studies presented differing effects for multiple countries or groups (i.e. rural/urban or religious groups), the study was counted once for each relevant effect category—positive, negative, nonsignificant. Thus, in some cases the total number of studies is smaller than the sum of the three effect categories.

that keeping adolescents enrolled in school reduces the likelihood of having multiple sexual partners, at least while they are students.

Are educated people more likely to use condoms than those with less education?

For sexually active adults, correct condom use is the best protection against HIV. However, in many contexts condoms are unpopular and behavior change difficult to achieve. Education may influence condom usage because individuals with more education are better able to understand biological transmission processes than individuals with less education and have greater self-efficacy. In addition, they are likely better able to access and afford condoms. Table 3 summarizes the 46 studies discussing the relationship between education and condom use.

The vast majority of the studies linking education to condom use examine educational attainment. In the subset of eleven studies that do not separate results by gender, nine found protective relationships and two did not find significant relationships. The studies reporting results for males and females follow similar patterns. For males, thirteen found positive relationships and nine did not find significant relationships. For females, 23 studies found positive relationships, while eight reported nonsignificant findings. Only five of the 44 studies analyze the relationship between enrollment and condom use, and overall patterns are not yet evident, as can be seen in Table 3.

Taken as a whole, these studies strongly support the hypothesis that more educated individuals are more likely to use condoms than less educated individuals; the majority found a protective relationship while none found a negative relationship. Given the large number of studies investigating condom use and education, this summary finding is stronger than those presented above for sexual initiation and partnerships. These individual-level studies are echoed

by Greig and Koopman's study (2003), which found a positive correlation between female secondary enrollment and condom use at last sexual intercourse at the national level across sub-Saharan African countries. This supports the argument that, while education may be linked to risky sexual behavior in some contexts, educated people are also more able and willing to take risk-reduction measures. In addition, the reviewed articles show the influence of urbanicity, which is often correlated with education because of the tendency of more educated people to migrate to urban areas for employment as well as easier access to schools for urban residents. In studies covering both rural and urban areas and presenting results for both groups, urban residents were generally more likely to use condoms, possibly due to easier access in cities.

IV. Conclusion

Analyzing the individual study results gathered in this literature review within the framework of intention and control allows for a fuller understanding of the conflicting influences that education can have on sexual behavior. We hypothesized that the impact of education on HIV risk is mediated through *intention* to engage in a sexual behavior and an individual's *control* over that behavior. Educated individuals' risk of HIV infection is characterized by changes in intention in response to HIV prevention information combined with a greater capability to act on this intention. Though studies in sub-Saharan Africa do not frequently collect data on intention and control beliefs, sexual behaviors may be seen as a proxy. This theoretical framework produced different predictions for the relationship between educational attainment and three different sexual behaviors. The results of the review broadly confirmed these hypotheses.

The strongest support for our hypotheses came from the review of condom use. We argued that before HIV prevention information became widespread, intentions to use condoms

were not prevalent. However, educated individuals are more likely to act on information about HIV prevention. A few studies did not find statistically significant relationships, but the majority found that higher levels of education led to greater likelihood of condom use. Results for multiple sexual partnerships were also aligned with our hypotheses. We argued that the intention to engage in multiple partnerships was relatively common before HIV prevention information became widespread, and educated individuals were more able to act on their intentions. As information about HIV prevention becomes available, educated individuals change their intentions and become less likely to have multiple sexual partners. Our review was consistent with this hypothesis. The literature identified varying relationships between education and number of sexual partnerships. Hypotheses for age of sexual debut were less clear but we identified multiple influences – negative and positive - of educational attainment on this behavior. Indeed, findings indicated contradictory effects with some studies showing positive relationships and others negative relationships.

There are a number of limitations to this review which inhibit the strength of the conclusions. As discussed above, cross-sectional studies do not allow for causal inference to be made between education and sexual behavior. The lack of causal evidence is problematic because competing explanations for the relationships cannot be ruled out. There is potential to improve the causal evidence base by collecting sexual behavior data from existing randomized trials focused on improving educational access or by exploiting variability in national programs to expand schooling.

These limitations are indicative of the complexity of this relationship. However, this article has made progress in clarifying this complexity by identifying two different sociocognitive pathways for this relationship (intention and control), by developing hypotheses

implied by these pathways relating to the relationship between educational attainment and different sexual behaviors and by testing these hypotheses through a systematic review of the literature. The evidence points towards the protective effect of school enrollment on HIV risk and suggests that researchers and practitioners focusing on HIV prevention and those advocating educational expansion have much common ground. Although the HIV epidemic threatens to undermine the delivery of education services, it is also a major motivation to redouble efforts towards achieving Education for All.

Table 1. Overview of studies associating educational attainment or school enrollment with age at sexual debut/risk of having had sex

Authors	Year	Data source	Population	N	Country(ies)/groups	Findings	
						Males	Females
<i>Educational attainment</i>							
Agha	2009	Nigeria Demographic and Health Surveys (1990 and 2003)	females 15-19 years old	3,319	Christians		n.s.
Agha, Hutchinson & Kusanthan	2006	Multi-Round Survey of Zambian Youth (2001-2003)	females 13-20 years in Lusaka province	5,534	Muslims Zambia		- -
Clark, Poulin, & Kohler	2009	Malawi Diffusion and Ideational Change Project (2004)	married and unmarried 15-24-year-olds in rural Malawi	1,087	Malawi	n.s.	n.s.
Cooper & colleagues	2007	case-control study (1998-2001)	Women under 60 years in the Cape Town region	2,065	South Africa		-

Dinkelman, Lam & Leibbrandt	2007	Cape Area Panel Study (2002-2005)	14-22 year-olds in 2002 in the Cape Town region	4,752	South Africa	n.s.	+
Erulkar & Ferede	2009	Population-based surveys (2008)	Urban out-of-school females ages 10-19 years	1,837	Ethiopia		-
Fatusi & Blum	2008	National HIV/AIDS and Reproductive Health Survey (2005)	Never-married adolescents 15-19 years old, nationally-representative	2,070	Nigeria	+	n.s.
Glynn & colleagues	2004	cross-sectional population studies (1997-1998)	urban populations in Cotonou, Kisumu, Ndola, and Yaounde	~8,000	Cameroon	+	-
					Zambia	-	-
					Benin, Kenya	n.s.	-
Gupta & Mahy	2003	DHS surveys (1987-1999)	Men ages 20-29 years old and women	37,249	Tanzania	-	-
					Mali, Senegal, Cote d'Ivoire	+	-

			18-24 years old		Burkina Faso, Ghana, Kenya, Zimbabwe	n.s.	-
Hallett & colleagues	2007	population-based surveys, interviews (1998-2000)	Men ages 17-54 and women ages 15-44, rural Manicaland	9,086	Zimbabwe	n.s.	-
Magadi & Agwanda	2009	WHO Adolescent Safe Motherhood Survey (2002)	Female adolescents ages 12-19, south Nyanza	1,247	Kenya		-
Magnani & colleagues	2002	interviews with a community-based sample	10-24 year-olds in the Lusaka region	2,328	Zambia	-	-
Marteletto, Lam, & Ranchhod	2008	Cape Area Panel Study (Waves 1& 4)	14-22 year-olds in 2002 in the Cape Town region	4,751	South Africa	+	+

Meekers & Ahmed	2000	Adolescent Reproductive Health Survey (1995)	13-18 year-olds living in the townships of Lobatse and Francistown	2,410	Botswana	+	n.s.
Palermo & Peterman	2009	Demographic and Health Surveys	15-17 year-old females	11,975	Chad, Mozambique, Tanzania, Zimbabwe	-	
					Benin, Congo, Cote d'Ivoire, Lesotho, Malawi, Uganda	n.s.	
Sauvain-Dugerdil & colleagues	2008	Survey (2002)	Females ages 12-24, males ages 15-29 in the Bamako region	1,819	Mali	n.s.	-
Tenkorang, Rajulton & Maticka-Tyndale	2009	Cape Area Panel Study (Waves 1&3)	14-22 year-olds in 2002 in the Cape Town region	1,417	South Africa	n.s.	n.s.

Uthman	2008	DHS (2003)	Ever or currently married women	5,531	Nigeria		-
van Rossem & Gage	2009	DHS (1999)	Women ages 15-49	6,364	Guinea		-
Wouhabe	2007	DHS (2000)	Unmarried youth 15-24 years old	4,878	Ethiopia	n.s.	-
<i>School enrollment</i>							
Anderson, Beutel & Maughan-Brown	2007	Cape Area Panel Study (Waves 1&3)	14-22 year-olds in 2002 in the Cape Town region	3,017	South Africa	-	n.s.
Clark, Poulin, & Kohler	2009		see above		Malawi	n.s.	-
Hallett & colleagues	2007		see above		Zimbabwe	-	-
Hargreaves & colleagues	2008	interviews, random population-based sample (2001)	unmarried 15-24 year-olds, Limpopo province	1,919	South Africa	n.s.	-
Magnani & colleagues	2002		see above		Zambia	-	-

Marteletto, Lam, & Ranchhod	2008	see above	South Africa	n.s.	n.s.
Meekers & Ahmed	2000	see above	Botswana	n.s.	-

Notes:

+ : Statistically significant association between education and greater risk of sexual debut

- : Statistically significant association between education and lower risk of sexual debut

n.s. : No statistically significant findings for this group

Table 2. Overview of studies associating educational attainment or school enrollment with number of sexual partners

Authors	Year	Data source	Population	N	Country(ies)	Findings	
						Males	Females
<i>Educational attainment</i>							
Bing and colleagues	2008	interviews, stratified random sampling (2003-2004)	male Angolan Armed Forces members	1,710	Angola	+	
Clark, Poulin, & Kohler	2009	Malawi Diffusion and Ideational Change Project (2004)	married and unmarried 15-24-year-olds in rural Malawi	1,087	Malawi	n.s.	n.s.
Cooper & colleagues	2007	case-control study (1998-2001)	Women under 60 years in the Cape Town region	2,065	South Africa		+
Dinkelman, Lam & Leibbrandt	2007	Cape Area Panel Study (2002-2005)	14-22 year-olds in 2002 in the Cape Town region	4,752	South Africa	+	+

Glynn & colleagues	2004	cross-sectional population studies (1997-1998)	urban populations in Cotonou, Kisumu, Ndola, and Yaounde	~8,000	Cameroon	+	+
					Zambia	-	n.s.
					Kenya	+	-
					Benin	n.s.	n.s.
Gregson, Waddell, & Chandiwana	2001	population-based survey (1998-2000)	adults in rural Manicaland	9,826	Zimbabwe	n.s.	n.s.
Hargreaves and colleagues	2007	cohort study (2001-2004)	14-35 year-olds in rural Limpopo province	1,967	South Africa	n.s.	n.s.
Magnani & colleagues	2002	interviews with a community-based sample	10-24 year-olds in the Lusaka region	2,328	Zambia	-	-
Mmbaga and colleagues	2007	cross-sectional surveys (1991, 2005)	rural 15-44 year-olds in the Kilimanjaro region	1,152/ 1,528	Tanzania	-	-

Mnyika and colleagues	1997	population-based survey (1993-1994)	15-54 year-olds in urban, semi-urban, and rural areas in the Arusha region	1,551	Tanzania	n.s.	-
Sandøy and colleagues	2007	stratified random cluster sampled population survey (1995, 1999, 2003)	15-24 year-olds	1,720/ 1,946/ 2,637	Zambia (rural)	-	+
Weiser and colleagues	2006	cross-sectional population-based survey (2004)	Adults ages 18-49 living in the 5 highest HIV prev. districts	1,268	Zambia (urban) Botswana	n.s.	n.s.
Wouhabe	2007	DHS (2000)	Unmarried youth 15-24 years old	4,878	Ethiopia	n.s.	+

School enrollment

Clark, Poulin, & Kohler	2009		see above		Malawi	n.s.	-
Hargreaves & colleagues	2008	interviews, random population-based sample (2001)	unmarried 15-24 year-olds, Limpopo province	1,919	South Africa	-	-
Harrison and colleagues	2005	representative cross-sectional survey	males ages 15-24 in rural KwaZulu-Natal province	314	South Africa	n.s.	
Magnani & colleagues	2002		see above		Zambia	-	-

Notes:

+ : Statistically significant association between education and greater number of partners

- : Statistically significant association between education and fewer partners

n.s. : No statistically significant findings for this group

Table 3. Overview of studies associating educational attainment or school enrollment with condom usage

Authors	Year	Data source	Population	N	Country (ies)	Type of condom use	Findings	
							Males	Females
<i>Educational attainment</i>								
Adetunji & Meekers	2001	Zimbabwe Sexual Behaviour and Condom Use Survey (1997)	males 15-54 and females 15-49	1,615	Zimbabwe	consistent use in non-marital relationships		+
Adu-Oppong and colleagues	2007	surveys	sex workers in three cities	450	Ghana	consistent use		+
Agha, Hutchinson & Kusanthan	2006	Multi-Round Survey of Zambian Youth (2001-2003)	females 13-20 years in Lusaka province	5,534	Zambia	use at first sex		+
Akarro	2009	interviews and participant observation (2004-2005)	bar maids in Dar es Salaam, Mbeya and Zanzibar	2,820	Tanzania	general use		+
Ali, Cleland & Carael	2001	surveys (1994-1995)	urban adults 15-49	12,869	Ethiopia, Sudan, Djibouti	use at most recent nonregular sexual contact		+
Boulle and colleagues	2008	survey (2003-2004)	men and women 14-49 years old,	1,576	South Africa	use at last sexual intercourse	n.s.	+

Khayelitsha

Brou and colleagues	2008	surveys (2001-2003)	women 18 and older, pregnant at recruitment, from 2 clinics in the Abidjan suburbs	939	Cote d'Ivoire	consistent condom use after resumption of sexual activity following birth		+
Callegari and colleagues	2008	surveys (2000-2001)	married women 17-47 years old attending Harare clinics	394	Zimbabwe	consistent condom use with spouses		n.s.
Camlin & Chimbwete	2003	South Africa Demographic Health Survey (1998)	women 15-49	11,735	South Africa	use at last sexual intercourse		+
Cherutich and colleagues	2008	cross-sectional survey (2005-2006)	females 15-19 years old presenting at Nairobi health clinics for repro. treatment	734	Kenya	ever having used a condom		+
Clark, Poulin, & Kohler	2009	Malawi Diffusion and Ideational Change Project (2004)	married and unmarried 15-24-year-olds in rural Malawi	1,087	Malawi	usually use condoms	n.s.	+

deWalque and colleagues	2005	surveys (1989-2000)	adults in rural Masaka district		Uganda	ever having used a condom		+
Dia & colleagues	2010	EVAL national survey (2006-2007)	HIV positive adults with HIV-negative or unknown status sexual partners	907	Cameroon	inconsistent use with steady partner		+
Dinkelman, Lam & Leibbrandt	2007	Cape Area Panel Study (2002-2005)	14-22 year-olds in 2002 in the Cape Town region	4,752	South Africa	use at last sexual intercourse	n.s.	n.s.
Eisele and colleagues	2008	surveys (2006)	HIV+ clinic attendees in the Cape Town area, 18 years and older	924	South Africa	risk of unprotected sex at last intercourse	n.s.	n.s.
Fylkesnes and colleagues	2001	Population-based surveys (1995-96 and 1998-99); stratified random cluster sampling	15-49 year-olds in Chelston, Lusaka, and Kapiri Mposhi	1996: urban men/women 948/1495, rural 436/540; 1999: urban 934/1458, rural 418/546	Zambia	use at last sexual intercourse		+
Gregson, Waddell, & Chandiwana	2001	population-based survey (1998-2000)	adults in rural Manicaland	9,826	Zimbabwe	unprotected sex with casual partner	n.s.	n.s.

Hargreaves and colleagues	2007	Cohort study (2001-2004)	14-35 year-olds in rural Limpopo province	1,967	South Africa	non-spousal partner	+		+
Kapiga and colleagues	1995	interviews	Women attending 3 family planning clinics in Dar es Salaam	2,285	Tanzania	usually use			+
Katz	2006	South Africa Demographic Health Survey (1998)	Sexually-active 15-24 year-old females	2,362	South Africa	use at last sexual intercourse			+
Lagarde and colleagues	2001	cross-sectional population surveys (1997-1998)	15-49 year-olds	~8,000	Cameroon	frequent use with non-spousal partner	+		
Lugoe, Klepp, & Skutle	1996	cross-sectional surveys (1993)	secondary students attending 7 schools in the Arusha region	852	Kenya Zambia Tanzania	use at last sexual intercourse	+	+	+
Lurie and colleagues	2008	surveys (2003-2006)	HIV+ wellness clinic attendees, rural and urban	3,819	South Africa	consistently with regular partners	+		+
MacLachlan & colleagues	2009	survey (2005)	Women in HIV/AIDS treatment programs	377	Uganda	use at last sexual intercourse			n.s.

Magnani & colleagues	2002	interviews with a community-based sample	10-24 year-olds in the Lusaka region	2,328	Zambia	consistent use with last partner		+	
Maharaj	2005	surveys, focus groups, in-depth interviews	survey participants: 20-49 year-olds in urban and rural KwaZulu-Natal	511	South Africa	regular and non-regular partners		+	
Maharaj & Cleland	2004	surveys, focus groups, in-depth interviews	married and cohabitating men and women in KwaZulu-Natal	537	South Africa	consistently or occasionally in married or cohabitating relationships	+		+
Mmbaga and colleagues	2007	Cross-sectional surveys (1991, 2005)	rural 15-44 year-olds in the Kilimanjaro region	1,152/1,528	Tanzania	ever having used a condom	n.s.		+
Mnyika and colleagues	1997	population-based survey (1993-1994)	15-54 year-olds in urban, semi-urban, and rural areas in the Arusha region	1,551	Tanzania	ever having used a condom	+		+
Morris and colleagues	2000	cross-sectional survey (1993-1994)	15-49 year-olds in Rakai district	1,627	Uganda	use with a non-spousal partner		n.s.	

Moyo and colleagues	2008	national household survey (2003)	sexually-active 15-24 year-olds	6,649	South Africa	inconsistent condom use with most recent sexual partner	+	+
Norman	2003	Voluntary HIV Counseling and Testing Efficacy Study (1995-1997)	18 years and older or married, sexually experienced, not known to be HIV+, Nairobi and Dar es Salaam	4,293	Kenya, Tanzania	consistent use	n.s.	
Nuwaha, Faxelid, & Höjer	1999	Semi-structured interviews	58 men and 80 women with STD symptoms in Kampala and Mbarara	138	Uganda	ever having used a condom		+
Oyediran	2003	interviews	18-55 year-old men in their first marriage who reported monogamy, Ondo state	394	Nigeria	ever having used a condom	+	
Prata, Vahidnia & Fraser	2005	survey (2001)	Sexually-experienced 15-24 year-olds in Luanda	1,995	Angola	consistent use	+	+

Sandøy and colleagues	2007	stratified random cluster sampled population survey (1995, 1999, 2003)	15-24 year-olds	1,720/ 1,946/ 2,637	Zambia	use at last sexual intercourse	+	+
Hendriksen and colleagues	2007	Reproductive Health and HIV Research Unit National Youth Survey (2003)	Sexually-experienced 15-24 year-olds	7,686	South Africa	use at last sexual intercourse	n.s.	n.s.
Sunmola	2005	interviews, participants recruited at truck stops	Long-distance truck drivers	412	Nigeria	consistent use	+	
Trinitapoli	2009	Malawi Diffusion and Ideational Change Project, wave 3 (2004)	households in Rumphi, Mchinji, and Balaka districts	3,386	Malawi	ever having used a condom		+
van Rossem, Meekers, & Akinyemi	2001	Nigerian Sexual Behavior and Condom Use surveys (1998)	ages 15 and older	11,357	Nigeria	consistent use	+	+
Weiser and colleagues	2006	cross-sectional population-based survey (2004)	Adults ages 18-49 living in the 5 highest HIV prev. districts	1,268	Botswana	unprotected sex with a non-primary partner	n.s.	n.s.

Weiser and colleagues	2007	cross-sectional population-based survey (2004-2005)	Adults 18-49 in the 5 highest HIV prev. districts in Botswana, adults in all four districts in Swaziland	2,051	Botswana, Swaziland	inconsistent use with nonprimary partner	n.s.	+
Wouhabe	2007	DHS (2000)	Unmarried youth 15-24 years old	4,878	Ethiopia	use at last sexual intercourse	+	n.s.
Zellner	2003	DHS (1994)	Sexually-active people who had heard of AIDS	5,653	Cote d'Ivoire	use at last sexual intercourse	+	+
<i>School enrollment</i>								
Clark, Poulin, & Kohler	2009		see above		Malawi	usually use condoms	n.s.	n.s.
Hargreaves and colleagues	2008	interviews, random population-based sample (2001)	unmarried 15-24 year-olds, Limpopo province	1,919	South Africa	Use at last sexual intercourse, use during last year	n.s.	+
Kaufman and colleagues	2004	Transitions to Adulthood in the Context of AIDS in South Africa	14-22 year-olds in Durban and Mtunzini	2,992	South Africa	use at last sexual intercourse	n.s.	n.s.

Lagarde and colleagues	2001	see above	Benin	use with non-spousal partner		+
Magnani and colleagues	2002	see above	Cameroon Zambia	use at last sexual intercourse, consistent use with last partner	+	+

Notes:

+ : Statistically significant association between education and greater condom use

- : Statistically significant association between education and less condom use

n.s. : No statistically significant findings for this group

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