Early Marriage and HIV Risks in Sub-Saharan Africa

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This article examines the effects of girls' early marriage on their risk of acquiring HIV/AIDS. By comparing several underlying HIV risk factors, it explores the counterintuitive finding that married adolescent girls in urban centers in Kenya and Zambia have higher rates of HIV infection than do sexually active unmarried girls. In both countries, we find that early marriage increases coital frequency, decreases condom use, and virtually eliminates girls' ability to abstain from sex. Moreover, husbands of married girls are about three times more likely to be HIV-positive than are boyfriends of single girls. Although married girls are less likely than single girls to have multiple partners, this protective behavior may be outweighed by their greater exposure via unprotected sex with partners who have higher rates of infection. These results challenge commonly held assumptions about sex within marriage. (STUDIES IN FAMILY PLANNING 2004; 35[3]: 149–160)

Marriage, as a fundamental social and cultural institution and as the most common milieu for bearing and rearing children, profoundly shapes sexual behaviors and practices (Caraël 1995). In countries where HIV is predominantly transmitted via heterosexual intercourse, these differences in sexual practices associated with marriage may substantially affect the likelihood of acquiring HIV infection by either increasing or decreasing certain HIV risk factors. Yet, surprisingly, the relationship between marriage, particularly the decision to marry at a younger age, and several key HIV risk factors has remained largely uninvestigated. This article presents an examination of how marriage before the age of 20 affects the risks of becoming infected with HIV for adolescent girls in Kenya and Zambia. Its focus is limited to adolescent girls for two reasons: First, in a growing number of countries in sub-Saharan Africa, adolescent girls bear the greatest burden of HIV infections. In some cities, the infection rate among sexually active females aged 15–19 is two to eight times higher than it is among their male counterparts (Glynn et al. 2001; Laga et al. 2001). Second, in contrast with adolescent boys, who are rarely married, girls are commonly married early in developing countries. In many places, 40–60 percent of girls are married before the age of 20. Consequently, sexual activity among adolescent girls occurs most frequently within marriage. Recent Demographic and Health Surveys (DHS) from 31 countries show that, on average across these countries, more than 80 percent of girls aged 15–19 who report being sexually active are married (Bruce and Clark 2003).

One reason potential HIV risks associated with early marriage have remained largely unexplored is the widespread perception that marriage is relatively "safe." Although marriage marks the sexual debut of many, and in some countries most, adolescent girls, generally sex within marriage is considered safer than sex outside of marriage, which is implicitly assumed to be the only alternative. Some researchers, policymakers, and parents may even actively encourage early marriage as a protective strategy to avoid the perceived dangers of premarital sex, including pregnancy and sexually transmitted infections (STIs). Parents in Malawi, for example, deliberately encourage early marriages to shield their daughters from such perceived risks (Bracher et al. 2003).

Another possible explanation for the lack of research on the possible risks of HIV associated with early marriage may be that aggregate correlations between the median age at marriage and HIV prevalence are positive at the country level of analysis. For example, some African countries facing crippling HIV epidemics, including South Africa and Zimbabwe, have relatively high median ages of first marriage. In comparison, other countries where the median age of first marriage is low, for example, Mali and Niger, have relatively low rates of HIV. Such country-level correlations may be important for un-

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derstanding epidemics at the population level; however, these analyses are susceptible to ecological fallacy and may lead to the faulty inference that early marriage offers the individual girl protection against HIV. Unlike much of the epidemiological and demographic literature, this study does not address the issue of how individual behaviors may affect HIV incidence and prevalence at the population level or how they may contribute to the spread of HIV in the population.[1] Instead it presents an evaluation of HIV risks to individual girls.

Empirical evidence of the HIV risks to individual girls associated with marriage, particularly early marriage, is scant, and the data are often misleading. Population-based epidemiological studies that report HIV prevalence among ever-married and never-married adolescent girls in various countries typically find higher infection rates among married than among unmarried girls (Nunn et al. 1994). The "never-married" category, however, includes virgins at little or no risk of exposure to HIV. In contrast, estimates of HIV prevalence drawn from surveillance of antenatal clinics' data suffer from another form of bias: In these clinical data, all the unmarried girls are sexually active, but because these girls are also pregnant, they overrepresent unmarried girls who are sexually active and least likely to use condoms (Fylkesnes et al. 1998; Zaba et al. 2000). Consequently, studies conducted in antenatal clinics usually report that being unmarried increases the probability of acquiring infection (Lindan et al. 1991; Kilian et al. 1999).

Only a few studies report data on HIV status from the general population (rather than from clinic attendees), limit their analyses to sexually active women, and disaggregate their findings by age and marital status. Two such studies cast doubt on the assumption that early marriage offers protection from HIV. One study in Uganda, limited to sexually active females aged 15–29, found an HIV prevalence of 18 percent among women in union and 15 percent among never-married women (results were statistically significant at $p < 0.001$). Among girls aged 15–19, married adolescents comprised a higher fraction of those infected (89 percent) than of those not infected (66 percent), suggesting that "many of the HIV-positive female adolescents were infected by older husbands" (Kelly et al. 2003:450). Similarly, a multicenter study that presents data from two cities (Kisumu, Kenya, and Ndola, Zambia), reports that among sexually active girls aged 15–19, HIV infection rates were about 10 percentage points higher for married than for unmarried girls (Kisumu: married 33 percent, unmarried 22 percent; Ndola: married 27 percent, unmarried 17 percent) (Glynn et al. 2001). Thus, the likelihood of being infected is 50 percent higher for married girls in Kisumu and 59 percent higher for married girls in Ndola than for their respective unmarried sexually active counterparts.

These intriguing findings prompt the question of why, at least under some circumstances, early marriage may actually increase the risk of HIV infection. Drawing on two sources of data about the sexual practices of adolescents in Kenya and Zambia, this study examines the underlying sexual behaviors and risks associated with early marriage and evaluates ways in which they might either increase or decrease the risk of acquiring the AIDS virus.

Data and Methods

The analyses performed for this study employ two sources of data for both Kenya and Zambia. The first data set was collected by the Study Group on the Heterogeneity of HIV Epidemics in African Cities, with support from the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) (Auvert et al. 2001). This study was conducted in 1997–98 in the two cities mentioned above with high HIV prevalence (Kisumu, Kenya, and Ndola, Zambia). Households were selected by two-stage cluster sampling based on census lists. About 1,000 men and 1,000 women aged 15–49 were randomly selected from the general population and interviewed in each city. In addition to being questioned about sexual behaviors and practices, men and women who consented were tested for several STIs including HIV, herpes simplex virus type 2 (HSV-2), syphilis, gonorrhea, chlamydia, and trichomoniasis. Serum samples were tested for HIV by enzyme-linked immunosorbent assay and confirmed by a rapid test. A full description of these data and the collection methods, as well as summaries of the main findings, are reported in a special supplement to the journal *AIDS* published in 2001.

In this study, all analyses are limited to data for sexually active girls aged 15–19 from Kisumu and Ndola, excluding the 30 percent and 40 percent, respectively, who reported never having had penetrative sexual intercourse.[2] Within this age group, a total of 197 girls from Kisumu and 150 girls from Ndola were interviewed, and 85 percent and 90 percent, respectively, agreed to be tested for HIV infection. Although the sample sizes in this age group are small and the data are restricted to respondents living in urban areas, the study collected useful information about sexual behaviors, marital status, and characteristics of partners as well as biomarkers for HIV infection.

Other data from males aged 15–49 in this multicenter survey are used to estimate HIV prevalence among the

male partners of these adolescent girls. In the first calculation, the HIV status of all men in the survey is used to calculate HIV prevalence rates by five-year age cohorts and by marital status for each city. These prevalence rates are then matched with those for adolescent girls who report having a main partner of a given age and marital status living in their respective cities. Because men who have sexual relations with adolescent girls (either married or unmarried) may represent a select group, the second calculation of male HIV prevalence rates limits the estimates to men who report having had intercourse with an adolescent girl within the last year. Separate age-cohort prevalence rates are estimated for men who report having sexual relationships with married adolescent girls (mainly their wives) and those involved with single girls (comprising both married and unmarried men).[3] Although this second approach relies on a smaller sample of men, thus making the estimates of HIV prevalence less precise, it addresses the concern that adolescent girls may not draw their partners from a random sample of married and unmarried men. These alternative prevalence rates are matched to specific adolescent girls in a manner similar to the first estimates.

To supplement these data from the two cities in the multicenter study, data from the nationally representative 1996 Zambia Demographic and Health Survey (CSO and MI 1997) and the 1998 Kenya DHS (NCPD, CBS, and MI 1999) are used.[4] For the purposes of these analyses, this sample is restricted to sexually active girls aged 15–19 in each country, resulting in 762 girls in Kenya and 1,137 girls in Zambia. Data were omitted for 57 percent of the Kenyan girls and 40 percent of the Zambian girls who reported no sexual activity, and for a small number of girls who were formerly married (fewer than 4 percent in each country).

Although the DHS data lack biomarkers for STIs, they provide more detailed information than the multicenter study about sociodemographic characteristics, marital status, sexual behaviors, pregnancy intentions, knowledge of HIV/AIDS, perception of personal risk of acquiring HIV infection, and behavior modifications in response to concerns about HIV/AIDS. Specifically, they ask respondents about the number of partners they had in the past 12 months, about their use of condoms during last sex, and whether they have ever received money or gifts in exchange for sex during the past year. The DHS data provide large, nationally representative samples of girls from urban and rural areas in each country, thereby serving as a useful complement to the multicenter data.

In the bivariate analyses, chi-squared statistics and t-tests are used to test for significant differences in percentages and means, respectively, between married and unmarried sexually active girls with respect to sociodemographic characteristics, sexual behaviors, and knowledge of HIV/AIDS and protective strategies used to prevent infection. Multivariate ordinary least squares and logistic regression models are employed to examine the effects of marital status on HIV status and on selected sexual behaviors; some of the sociodemographic factors that may affect selection into marriage are controlled. Probability weights are used in all bivariate and multivariate analyses of DHS data.

Results

Table 1 compares sociodemographic characteristics of married and unmarried sexually active girls in both countries from both sources of data. From the nationally representative DHS data, we find that girls who marry early differ considerably from those who become sexually active but remain unmarried. On average, married girls are older, less educated, and more likely to live in rural areas. In the multicenter data, limited to urban girls, we find nearly identical age differences as those found in the DHS samples, whereas both married and unmarried urban girls report higher levels of education than do those in the DHS samples.

Married and single girls differ dramatically with respect to two other important characteristics: pregnancy intentions and likelihood of having engaged in transactional sexual activity within the last year. Married adolescents often face considerable pressure to become pregnant shortly after they are wed; we find that between a little more than one-fifth and one-third of all married adolescent girls are currently pregnant, and that an additional 20 percent to 25 percent are hoping to become pregnant in the next year. Pregnancy may also hasten a marriage. In contrast, single girls are more likely to accept gifts or money in exchange for sex, although some married girls do so as well. The DHS data show that more than 20 percent of unmarried girls in Kenya and nearly 40 percent in Zambia report having engaged in some transactional sexual activity.

HIV Prevalence and Individual Status

Figures 1 and 2 show the HIV prevalence rates among sexually active men and women by five-year age group and marital status based on the multicenter study data from Kisumu, Kenya, and Ndola, Zambia, respectively. Consistent with expectations, we find that the HIV infection rates rise sharply among females aged 15–24 and then gradually decline. For men, these rates peak later,

Table 1 Percentage of married and unmarried sexually active girls aged 15–19, by selected sociodemographic characteristics, according to survey, Kenya and Zambia

	Demographic and Health Surveys				Multicenter study (1997–98)			
	Kenya (1998)		Zambia (1996)		Kisumu, Kenya		Ndola, Zambia	
Characteristic	Unmarried	Married[a]	Unmarried	Married[a]	Unmarried	Married	Unmarried	Married
Age (mean years)	17.4	18.1***	17.2	17.9***	17.1	18.1***	17.4	17.9*
Education								
Completed primary school	45.5	36.8*	55.0	34.4***	52.7	48.3	62.1	46.0*
Residence								
Urban	29.2	22.2	48.4	35.9***	100.0	100.0	100.0	100.0
Pregnancy intentions								
Wants pregnancy in <12 months	3.5	20.2***	7.5	25.0***	na	na	na	na
Currently pregnant	6.2	22.2***	7.4	28.7***	na	na	na	na
Had at least one child	23.5	65.2***	18.8	64.8***	na	46.5	na	62.5
Transactional sexual activity								
Receives cash/gifts for sex	21.1	4.2***	39.9	8.2***	35.5	3.5***	23.0	4.8***
(N)	(478)	(284)	(636)	(501)	(110)	(87)	(87)	(63)

* Significant at p<0.05; **p<0.01; ***p<0.001. na = Not available.
[a] Married women include women in formal marriages as well as women who live with their partners. Virgins and girls aged 15–19 who are divorced, widowed, or separated are excluded.

in the 30–34 age group, in both cities. Less expected, however, are the notable prevalence gaps in HIV infection by marital status for both men and women over the decade in which they are most likely to be married (ages 15–24 for women and ages 20–29 for men).[5] During these years, married men and women experience significantly higher rates of HIV infection than do those who remain single and sexually active. In light of the definition of early marriage used here as unions occurring before the age of 20, and given the rarity of marriage among men younger than 20, this study focuses exclusively on the marital gap in HIV infection rates among adolescent and young women. Similar analyses assessing the larger marital gap found among slightly older men (aged 24–29) potentially would yield additional important insights into the relationship between marriage and the risk of HIV infection, but are beyond the scope of this study.

According to the UNAIDS report (2000), national rates of HIV infection for girls and young women aged 15–24 in Kenya and Zambia are high. Between 17 percent and 19 percent of girls in Zambia and between 11 percent and 15 percent of girls in Kenya are infected with HIV. Rates are typically higher in urban settings. Moreover, HIV prevalence in the western province of Nyanza,

Figure 1 HIV prevalence among sexually active men and women, by marital status and age, Kisumu, Kenya, 1997–98

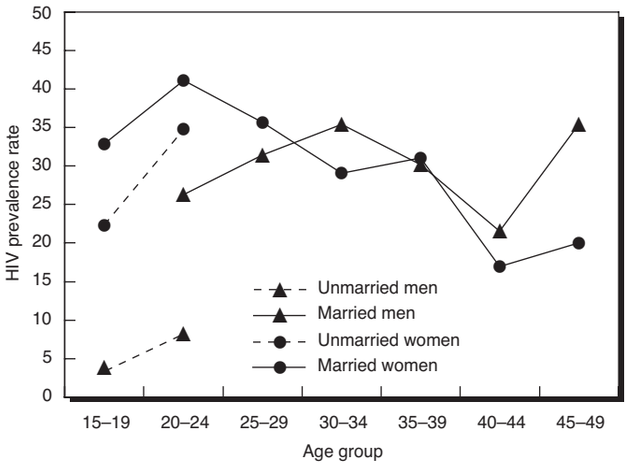
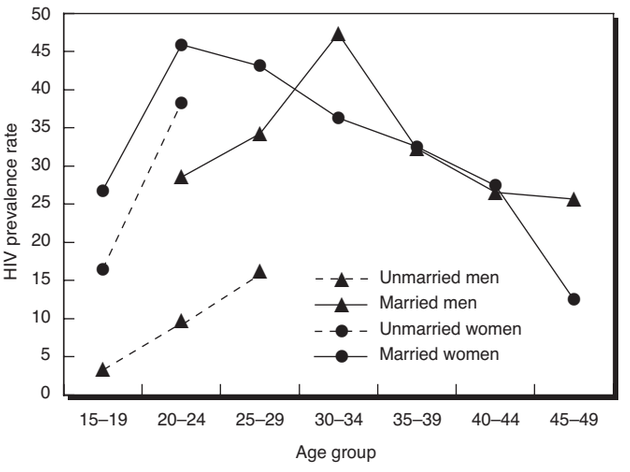


Figure 2 HIV prevalence among sexually active men and women, by marital status and age, Ndola, Zambia, 1997–98



where Kisumu is located, is higher than it is in the rest of Kenya. Glynn et al. (2001) report, as is shown here in Figures 1 and 2, in both Kisumu and Ndola, that ever-married girls aged 15–19 have a higher prevalence of HIV than their never-married counterparts (Kisumu: 33 percent versus 22 percent; Ndola: 27 percent versus 17 percent). Higher rates among married young women are also found in the 20–24 age group (Kisumu: 41 percent versus 35 percent; Ndola: 46 percent versus 38 percent).

Nonetheless, as is evident from the data shown in Table 1, even within a five-year age group, married girls tend to be older and less educated, circumstances that could confound the effect of marriage on HIV prevalence. Unfortunately, in the multicenter study data, some variables that may affect selection into or out of marriage, such as the desire to become pregnant or current pregnancy status, are not reported and, therefore, cannot be included in the model. Some other relevant variables such as having received payment in exchange for sex, however, are reported in these data. Due to sample-size constraints, data from Kisumu and Ndola are combined in the models shown in Table 2, and a dummy variable for the city of residence is included in all models. Seven girls who were formerly married but are not currently married are included in the ever-married sample examining HIV prevalence.

Model 1 in Table 2 examines the effects of marital status among sexually active girls, controlling only for city of residence. Among girls aged 15–19, being married is associated with an increase greater than 75 percent in the odds of being HIV-positive compared with the odds for sexually active unmarried girls. The odds of being married are also elevated for young women aged 20–24, but this effect is insignificant. In Model 2, age, education, and receiving payment for sex are controlled. These variables have an insignificant effect on HIV status in most models, except for age, which is a significant positive predictor of HIV infection among those in the combined 15–24 age group. The coefficient for marital status within the 15–19 age group remains virtually constant, although the standard error increases.

HIV Risk Factors

In examining several underlying sexual behaviors and characteristics of partners that affect the risk of becoming infected with HIV, despite a remarkable lack of consensus concerning their relative importance, we can identify three factors that largely determine (in some combination) an individual's probability of acquiring HIV infection via heterosexual intercourse. These three factors are: (1) frequency and duration of unprotected in-

Table 2 Odds ratios for predictors of effects of marital status on HIV status among sexually active girls aged 15–24, Kisumu, Kenya, and Ndola, Zambia, 1997–98

	Model 1		Model 2	
Variable	Odds ratio	p-value	Odds ratio	p-value
Ages 15–19				
Marital status				
Never married (r)	1.00	—	1.00	—
Ever married	1.76	0.036	1.74	0.072
Residence				
Kisumu (r)	1.00	—	1.00	—
Ndola	0.72	0.224	0.72	0.240
Age				
15–16 (r)			1.00	—
17–18			1.58	0.243
19			1.87	0.150
Education				
< Primary (r)			1.00	—
Completed primary			1.08	0.781
Ever received payment for sex			1.34	0.435
(N)	(305)		(305)	
Ages 20–24				
Marital status				
Never married (r)	1.00	—	1.00	—
Ever married	1.34	0.233	1.45	0.159
Residence				
Kisumu (r)	1.00	—	1.00	—
Ndola	1.20	0.361	1.23	0.325
Age				
20 (r)			1.00	—
21–22			0.83	0.478
23–24			0.90	0.701
Education				
< Primary (r)			1.00	—
Completed primary			1.03	0.892
Ever received payment for sex			1.59	0.304
(N)	(398)		(398)	
Ages 15–24				
Marital status				
Never married (r)	1.00	—	1.00	—
Ever married	1.91	0.000	1.58	0.020
Residence				
Kisumu (r)	1.00	—	1.00	—
Ndola	1.04	0.168	1.01	0.951
Age				
15–16 (r)			1.00	—
17–18			1.63	0.202
19–20			2.78	0.007
21–22			2.93	0.006
23–24			3.24	0.003
Education				
< Primary (r)			1.00	—
Completed primary			1.06	0.757
Ever received payment for sex			1.43	0.209
(N)	(703)		(703)	

(r) = Reference category. — = Not applicable.
Note: Formerly married girls (who comprise less than 2 percent of this sample) are included among the ever-married girls.

tercourse; (2) number of partners; and (3) HIV prevalence among partners.[6]

Frequency and Duration of Unprotected Intercourse

The level of a girl's possible exposure to the human immunodeficiency virus via unprotected heterosexual intercourse is a function of how long she has been sexually active, the frequency with which she has had intercourse, her use of condoms or other STI-protective methods, and whether any of her partners is infected. The bivariate analysis presented in Table 3 uses data from the DHS and from the multicenter study and shows that compared with unmarried girls, married girls have unprotected sex much more often and have been engaged in sexual activity for a longer period of their lives. Data from both studies show that married girls have been sexually active for as much as 1.4 years longer than single girls (mainly because they are, on average, older). Single girls have engaged in sexual intercourse much less frequently and, unlike married girls, sometimes suspend or entirely stop sexual activity for a year or longer. One-fourth of nonvirginal unmarried adolescent girls in Kisumu and half in Ndola report that they have had no penetrative intercourse within the past year. More than half of the married girls surveyed in each city had had sex within the past week, whereas among single girls, only 11 percent in Kisumu and 2 percent in Ndola had done so. When single girls had sex, they were significantly more likely than married girls to use condoms.

Because these two groups of girls have different characteristics, it is unclear whether the correlation between marital status and these sexual behaviors is driven by the institution of marriage per se or by the types of girls who marry early. For example, married girls are more likely to want (or be under pressure) to become pregnant and, therefore, have sex frequently and rarely use condoms.

In the analysis of the DHS data, some of these selection effects can be minimized by including controls for age, educational level, urban residence, desire to become pregnant in the next year, and transactional sex. Table 4 presents the coefficients or odds ratios (and p-values) of marital status for selected sexual behaviors. The difference between married and unmarried girls' duration of sexual activity disappears once age is controlled, suggesting that age of sexual debut does not differ significantly between these two groups. Among sexually active girls in Kenya and Zambia, married adolescent girls have eight to 12 times higher odds of having had sex in the past week compared with sexually active unmarried girls. Condom use in both Kenya and Zambia is signifi-

Table 3 Unmarried and married sexually active girls aged 15–19, by HIV risk factors, Kenya and Zambia

	Demographic and Health Surveys				Multicenter study (1997–98)			
	Kenya (1998)		Zambia (1996)		Kisumu, Kenya		Ndola, Zambia	
HIV risk factor	Unmarried	Married	Unmarried	Married	Unmarried	Married	Unmarried	Married
Exposure to risk via unprotected sex								
Duration sexually active								
Age of sexual debut (mean years)	14.9	15.1	14.6	15.0***	15.1	14.7	15.9	15.2**
Number of years sexually active (mean)	2.5	3.1***	2.6	2.9***	2.0	3.4***	1.5	2.7***
Frequency of intercourse (percent)								
Had sex in past year	81.1	100.0***	78.2	98.1***	75.5	100.0***	50.6	100.0***
Had sex in past week	17.2	67.9***	17.7	62.8***	10.9	64.4***	2.3	52.4***
Condom use (percent)								
Use condoms often/always[a]	na	na	na	na	19.5	3.5***	25.6	6.8***
Used condom at last sex	14.2	3.6***	18.8	7.6***	22.9	na	31.8	na
Number of partners								
Girl's partners in past 12 months								
None (percent)	22.7	0.0***	23.0	0.0***	24.6	0.0***	50.0	0.0***
>1 (percent)	10.3	5.0*	14.5	1.4***	15.5	6.9	5.8	4.8
Range of number of partners	0–21	1–4	0–11	1–12	0–3	1–3	0–2	1–3
Average number of partners	1.0	1.1	1.0	1.0	0.9	1.1	0.6	1.1***
Age and HIV prevalence among partners[a]								
Age of partner (mean years)	na	na	na	na	20.7	26.9***	22.7	25.5***
Prevalence (all men)	na	na	na	na	9.2	29.3***	10.5	32.9***
Prevalence (men with adolescent partners)	na	na	na	na	12.3	31.1***	13.7	32.2***
(N)	(478)	(284)	(636)	(501)	(110)	(87)	(87)	(63)

Note: Because this table reports recent sexual behaviors, formerly married girls (who comprise between 3 percent and 4 percent of the samples) are excluded from the analyses.

* Significant at p<0.05; **p<0.01; ***p<0.001. na = Not available.

[a] Data missing for 80 unmarried respondents who did not have sex in the past year.

Table 4 Odds ratios and coefficients for predictors of effects of marital status on selected HIV risks among sexually active girls aged 15–19, Kenya and Zambia

	Demographic and Health Surveys[a]				Multicenter study (1997–98)[b]	
	Kenya (1998)		Zambia (1996)		Kisumu and Ndola	
Variable	Married girls	p-value	Married girls	p-value	Married girls	p-value
Exposure to risk via unprotected sex						
Duration sexually active (coefficient)	0.18	0.265	–0.06	0.636	0.94	0.000
Had sex in past week (OR)	11.90	0.000	7.65	0.000	28.67	0.000
Used condom at last sex (OR)	0.23	0.000	0.50	0.003	na	
Use condoms often/always[c] (OR)	na		na		0.14	0.000
Had unprotected sex in past week (OR)	13.07	0.000	7.58	0.000	29.41	0.000
Number of partners						
>1 in past year (OR)	0.54	0.292	0.10	0.000	3.41	0.054
(not controlling for transactional sex)	0.35	0.045	0.07	0.000	0.62	0.278
Age and HIV prevalence among partners[c] (coefficient)						
Age of partner	na	na	na	na	4.47	0.000
Prevalence (all men)	na	na	na	na	21.45	0.000
Prevalence (men with adolescent partners)	na	na	na	na	17.05	0.000
(N)	(757)		(1,135)		(347)	

Note: Because this table reports recent sexual behaviors, formerly married girls (who comprise between 3 percent and 4 percent of the samples) are excluded from the analyses.
na = Not available. OR = Odds ratio.
[a] Models using DHS data use multivariate logistic regression to control for urban–rural residence, age, education, receiving payment in exchange for sex, and desire to become pregnant in next year. [b] Multicenter models control for city of residence, age, education, and receiving payment in exchange for sex. [c] Data missing for 80 unmarried respondents who did not have sex in the past year.

cantly decreased with marriage. Similar (though not identical) analyses that employ combined data from the two cities included in the multicenter study show an even greater difference between married and unmarried adolescents in the probability of their having had sex or unprotected sex in the past week. The multicenter study model also shows that girls who are married have been sexually active for longer than unmarried girls. Because these models control for age, this finding suggests that married girls became sexually active at a younger age than did sexually active unmarried girls.

Number of Partners

The risk of acquiring HIV infection depends not only on the frequency of unprotected sex but also with whom a girl is having it. Specifically, we need to know how many partners girls have and the prevalence of HIV infection among those partners. Although single girls might be expected to have more partners than married girls have, the empirical data do not entirely support this supposition. Table 3 shows that single girls have much greater variance in their number of partners, ranging from 0 to 21, whereas married girls have at least one partner. On average, married and sexually active unmarried girls have the same number of partners. The table also shows that although in Kisumu single girls are more than two times more likely than married girls to have had more than one partner in the past year (16 percent versus 7 percent), they are also much more likely to have had no partners in the past year (25 percent versus 0 percent). In Ndola, no statistically significant differences are found between the proportions who had more than one partner in the past year, but because half of single girls had no partners that year, single girls had, on average, significantly fewer partners than married girls had (even though girls who report never having had sex are excluded altogether). Results from the DHS data reiterate the finding that single girls have greater variation in their number of partners but, on average, had about the same number of partners as married girls had over the past year.

In the multivariate model, the results are mixed. As shown in Table 4, we find that being married lowers the probability of having more than one partner in the past year in Zambia, has no effect in Kenya, and, surprisingly, raises that probability according to the multicenter study data. This relationship, however, is strongly mitigated by the likelihood of having ever been paid in exchange for sex, which is positively correlated with having had more than one partner and negatively correlated with being married. If the dummy variable for transactional sex is excluded, we find that being married is associated with having fewer partners according to both of the DHS surveys and has no effect according to the multicenter study, findings that are consistent with expectations.

HIV Prevalence Among Partners

At least two previous studies, Gregson et al. (2002) and Kelly et al. (2003), point to the age of adolescent girls' partners as a major risk factor, whereby having older partners substantially elevates HIV rates among adolescent girls. Although much of the work on intergenerational sex focuses mainly on unmarried girls (Gregson et al. 2002; Luke and Kurz 2002), large age differences may be even more common and dangerous within the context of marriage. Table 3 shows that although boyfriends are, on average, in their early twenties, husbands are typically in their mid-twenties.[7] The multivariate analysis in Table 4 indicates that the partners of married girls are about four and a half years older than the partners of single girls. To the extent that age of partner can serve as a proxy for their prevalence rates, such large age differences are notable.

Ideally, the HIV prevalence among partners of adolescent girls could be obtained directly from matched studies of their husbands and boyfriends. In the absence of such data, two estimates of HIV prevalence among partners are presented here as described above. In the first estimate, male prevalence rates are calculated for all men by age cohort, marital status, and city. In the second estimate, prevalence calculations are limited to men who report having had sexual relations with a married or unmarried adolescent girl in the past year. These prevalence estimates are then matched with those for adolescent girls who report having partners in the same age cohorts, of the same marital status, and residing in the same city. As shown in Table 3, these two approaches yield similar but surprising results. Contrary to the author's initial assumption, prevalence rates for HIV were two to three times higher among the partners of married girls than among those of single girls.[8] About 30 percent of the partners of married girls in both cities were HIV-positive, whereas only 9 –14 percent of men who had had sex with unmarried girls were infected. Note that limiting the estimates to men who report having had adolescent partners raises their average HIV rates slightly.[9]

The multivariate models presented in Table 4 suggest a strong association between marital status and the HIV prevalence of partners. The HIV prevalence rate among the partners of married adolescent girls is 17–21 percentage points higher than it is among the partners of unmarried girls. This association does not indicate whether these men begin their marriages with higher rates of infection or whether they are more likely to become infected by their wives. Sorting out the direction of infection is not possible with these cross-sectional data. Adolescent girls who marry may be more likely to be infected and/or more likely to transmit the virus to their partners than single sexually active girls, but given the girls' relative youth and their sexual exposure, the older husbands are more likely, typically, to infect their wives. Detailed analyses of the incidence of HIV transmission also suggest that men, especially older men, are the predominant source of HIV infection within stable unions (Serwadda et al. 1995; Kelly et al. 2003).

In sum, these results indicate that married girls are much more likely than sexually active single girls to engage in frequent unprotected sex and to have infected partners. Counterbalancing these increased risks is the evidence that married girls are less likely to have had two or more partners within the past year. From an epidemiological perspective, multiple partnerships play a crucial role in continuing to fuel the spread of the disease, but the relative importance of this factor at the individual level is less well known. In light of the low transmission probability of HIV, which has been estimated at between 0.001 and 0.003 (Bouvet et al. 1989; Gray et al. 2001), having regular unprotected sex with a partner drawn from a pool with a higher prevalence of infection is likely to be riskier than having infrequent protected sex with a few partners drawn from a pool with a low prevalence rate.[10] Such differences in the types of HIV risks may help to explain the elevated rates of HIV found among married adolescent girls.

Knowledge, Perceived Risk, and Protection Strategies

Because of their contrasting HIV risks and sexual experiences, a comparison is useful of married and unmarried girls' level of knowledge about HIV/AIDS, their level and sources of perceived risk, and behavioral changes they have adopted to minimize the risk of acquiring HIV, based on DHS data (see Table 5). Nearly all girls (more than 99 percent), both married and single, had heard of HIV/AIDS (not shown). The vast majority could name at least one way to avoid HIV infection, although married adolescents appear to be slightly less well informed about ways to protect themselves. Unmarried girls were significantly more likely to mention using condoms, whereas married women in Zambia were more likely to mention having only one sex partner.

Perceptions of risks, as well as accurate knowledge of ways to avoid risks, play a crucial role in HIV/AIDS prevention. Respondents were asked whether they considered their chances of becoming infected with the AIDS virus to be none, small, moderate, or great. Those who reported being at moderate or great risk were queried about their perceived sources of risks. Surprisingly, married girls in Zambia considered themselves to be at much higher risk than sexually active, single girls (30 percent versus 18 percent). Both categories of girls most

Table 5 Percentage of sexually active unmarried and married girls aged 15–19 who reported knowledge, perceived risks, and behavioral changes in response to HIV, Kenya and Zambia

	Kenya (1998)		Zambia (1996)	
	Unmarried	Married	Unmarried	Married
Respondents' knowledge of HIV (N)	(478)	(284)	(636)	(501)
Know ways to avoid AIDS (percent)	82.3	76.5	80.2	75.1
(N)	(389)	(219)	(499)	(371)
Abstain from sex	28.5	14.3***	29.2	22.9*
Condom during sex	48.7	41.1	47.6***	32.8
Only one sex partner	na	na	31.9	44.2***
Avoid prostitutes	5.2	6.7	2.4	4.5
Avoid multiple partners	27.3	29.9	na	na
Respondents' perceived risks of HIV (N)	(478)	(284)	(636)	(501)
At moderate or great risk (percent)	31.0	28.8	17.5	29.7***
Those with moderate or great risk (N)	(145)	(78)	(119)	(157)
Fail to use condom	28.9	14.8***	19.4	6.8**
Have more than one partner	19.6	5.5*	23.1	4.8***
Have many partners	7.9	1.0	8.1	5.7
Are infected by spouse or other partner	32.5	63.0***	51.0	90.2***
Are infected during blood transfusions	15.4	12.8***	6.5	3.2***
Are infected during injections	27.9	17.2*	1.9	1.0*
Doubt faithfulness of partner(s)	10.8	17.4**	na	na
Behavioral changes (N)	(478)	(284)	(636)	(501)
Stopped having sex	17.9	2.5***	26.5	1.3***
Started using condoms	7.9	2.1**	7.5	0.8***
Limited contact to only one partner	47.9	62.1***	48.1	76.0***
Reduced number of partners	15.0	5.5***	7.3	1.7***
Asked spouse/partner to be faithful	9.9	18.3***	2.0	11.6***

* Significant at p<0.05; **p<0.01; ***p<0.001. na = Not available.

often reported that their partners represented their greatest source of risk, although married adolescents were significantly more likely to believe that their husbands' behaviors placed them at greatest risk of acquiring HIV/AIDS (Kenya, 63 percent; Zambia, 90 percent). In Kenya, married girls were more likely than single girls to suspect their partners of infidelity.

The DHS data also include information about changes in sexual behaviors in response to HIV, which allow us to examine not only current sexual practices but also the protective strategies most likely to be employed by single and married girls. Specifically, women were asked, "Has your knowledge of AIDS influenced or changed your decisions about having sex or your sexual behavior? If yes, in what way?" Unmarried girls were much more likely to report ceasing to have sex (18 percent in Kenya and 27 percent in Zambia); married girls hardly ever reported this strategy. Surprisingly few unmarried girls (8 percent) reported that they had started to use condoms. Even fewer married girls (<2.5 percent) increased their use of condoms (not shown). Limiting oneself to one partner represented the most common behavioral change among both married and unmarried girls; married girls used this strategy more often than did unmarried girls. In contrast, unmarried girls in both countries were more likely than married girls to reduce their number of partners. Clearly, for married girls, who typically have only one partner, reducing their number of partners is unlikely. Finally, married girls reported being more willing than unmarried girls to ask their partners to be faithful.

Discussion and Limitations

Although data containing biomarkers for HIV coupled with nationally representative data concerning sexual behaviors and sociodemographic characteristics allow us to examine the relative risks of HIV from several perspectives, these data are fraught with limitations. First, the multicenter study sample of adolescent girls is small and restricted to a particular city within each country, a city not necessarily representative of other urban centers. In Kenya, for instance, Kisumu is much smaller, poorer, and carries a higher burden of disease, including HIV, than either Nairobi or Mombasa. Its location on Lake Victoria ties its economy to fishing and facilitates greater trading with neighboring Uganda and Tanzania.

Second, both sources of information on sexual behaviors rely on self-reports. If married and unmarried girls differ systematically in the accuracy or veracity of their

responses to questions about sexual behavior, the differences between them might be smaller than those reported here. (Selective misreporting might lead to either understating or overstating these differences.) Nonetheless, even substantial misreporting is unlikely to account entirely for the magnitude of the differences reported and the sharply divergent sexual profiles that emerge from the data.

Most important, because these data are cross-sectional, whether early marriage causes or is merely associated with riskier sexual behaviors and selection of riskier partners cannot be determined satisfactorily. Although the findings indicate that marital status remains correlated with a variety of HIV risks and sexual behaviors, even after controlling for some observable characteristics, married girls also may differ from their unmarried counterparts with respect to a variety of unobservable characteristics. Moreover, girls who marry early may be prone to engage in unprotected sex more regularly, prefer older men (who are more likely to be infected), or desire fewer sexual partners, preferences that may produce these pronounced differences rather than marriage per se.

Cross-sectional data also prevent our taking a longitudinal or "life-cycle" approach to understanding adolescent girls' risks of acquiring HIV infection. Although cross-sectional analyses can shed considerable light on which types of girls are most likely to be HIV-positive by the age of 20 and which girls currently engage in risky sexual behaviors, they can explain little about the process that leads some girls to marry young or how their sexual behaviors evolve over time. In the African context, this drawback is an important one because the transition to marriage is usually a long and gradual process. It may involve not only premarital sexual activity but also cohabitation and childbearing before the couple is formally recognized as married (Bledsoe and Pison 1997). In light of these practices, searching for a husband may be as dangerous as finding one, as sexual contacts become more frequent and condom use with a regular partner declines.

Additional questions about the effect of marriage on the risk of HIV infection remain. For example, the type of marriage, either monogamous or polygamous, may affect married girls' relative risk. Despite small sample sizes, the data from Kisumu (where 18 percent of the unions of girls aged 15–24 are polygamous) suggest that girls in polygamous unions have higher rates of HIV infection than do girls in monogamous marriages. Moreover, although findings from these cross-sectional data clearly show that girls who delay marriage are less likely to be infected with HIV by their twentieth birthdays, we know little about the longer-term consequences of delaying marriage. Almost all of these unmarried adolescent girls, whether virgins or sexually active, will eventually become wives and face the concomitant risks. In other words, delaying marriage may simply delay the inevitable. Some even speculate that delaying marriage and, therefore, delaying childbearing may increase the probability that a woman will be infected at the time of her first birth because she will be, on average, older. No evidence was found in this study to support this concern. Indeed, although protecting young women from HIV infection is an important policy objective in itself, their role as future mothers adds a strong impetus to making their safety a policy priority.

Conclusions

This study builds upon previously reported epidemiological findings that married adolescent girls and young women in Kenya and Zambia have higher rates of HIV prevalence than do their sexually active unmarried counterparts. Given commonly expressed views about the dangers of premarital sex and deeply held beliefs about the relative safety of marriage, these findings may initially seem counterintuitive. Yet the most plausible explanations for these differences are straightforward, even obvious.

In these two countries, marriage increases frequency of sexual intercourse, decreases condom use, and virtually eliminates girls' ability to abstain from sex. Furthermore, because husbands tend to be older than the partners of single girls, HIV prevalence rates found among husbands are much higher than those found among unmarried girls' partners. Marriage offers one significant protection, however: It reduces the number of girls' partners. Unfortunately, from the perspective of risk to the individual, the benefits of having fewer partners may be outweighed by the risks associated with the lack of condom use, increased frequency of sex, and high HIV prevalence among partners.

The findings from comparing and contrasting the relative risks of acquiring HIV infection among married and sexually active unmarried adolescent girls, indicating some elevated risks for the former, in no way contradict or diminish the well-established high risk of infection associated with unprotected premarital sex in settings where HIV prevalence is high. Neither do they imply that all sex within marriage is risky. Rather, they identify married adolescent girls as a large population at risk whose needs are typically ignored by HIV-prevention programs and educational messages. Many such programs focus primarily on unmarried adolescent girls and

either exclude married girls or treat marital status as irrelevant. Common HIV-prevention messages encourage young girls to abstain from sex, reduce their number of partners, or use condoms, although for most married girls, these strategies are impractical if not impossible.

Identifying specific policies and programs appropriate for married adolescent girls is beyond the scope of this study (see Bruce and Clark 2003). Yet such policies are needed. By highlighting the divergent risks faced by single and married adolescent girls and demonstrating the acute vulnerabilities of the latter, this research challenges us to rethink common assumptions about the associations of sex and early marriage with HIV infection.

Notes

1 Prevalence is the proportion of the population that is infected at a specific point in time, whereas incidence is the number of new cases of infection that develop in a population during a specific time period. Therefore, incidence measures the probability that an uninfected person will become infected.

2 A small proportion of girls who claimed to be sexually inexperienced tested positive for some STIs, including HIV.

3 These two groups are not mutually exclusive, but the overlap is minimal and does not affect the results presented.

4 A full description of the DHS findings is provided at http://www.measuredhs.com.

5 Figures 1 and 2 exclude estimates of HIV prevalence by sex, age, and marital status if the cell contains fewer than 30 observations. Thus, the estimate for married men aged 45–49 in Kisumu, Kenya, which group contains only 31 respondents, is included.

6 Biological transmission probabilities, particularly those dependent on the partner's viral load, circumcision status of the male, or physical maturity of the female, arguably may constitute a fourth risk factor. Whether and in which way such characteristics may differ between married and unmarried adolescent girls, however, is unknown.

7 Age of partner, calculated from the girl's responses, uses the age of the girl's most recent partner. Using, instead, the average age of all of her partners in the past year generates nearly identical results.

8 This result is consistent with previous findings that marriage is a risk factor for HIV infections among men as well (Auvert et al. 2001).

9 Calculations of partners' age and HIV status exclude about 80 unmarried respondents who did not have partners in the past year and whose data are missing information about their partners' ages. If mean partners' ages and modal marital status for these missing girls are used, the results remain unchanged.

10 Simple cumulative-risk models of the probability of acquiring HIV infection demonstrate this outcome. In the equation for HIV risk of infection from one partner (R), R can be defined as a function of the transmission probability (I), the effective use of condoms (C), and the number of sexual acts (n) such that $R = P(1 - (1 - I*C)^n)$. Given the low infection rate of HIV, note that per sexual partner, married girls are likely to have much greater risk (R) based on their frequency of intercourse, condom use, and HIV prevalence among their partners. If the cumulative probability of becoming infected equals $1 - (1 - R)^q$, where q equals the number of partners, the effect of additional partners is likely to be outweighed by large differences in R.

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