

## Circumcision Does Not Directly Reduce The Likelihood of Male-to-Female HIV Transmission

Circumcision is not associated with a reduced risk of HIV transmission from infected men to their uninfected female sex partners, according to results of a randomized trial conducted in the Rakai District of Uganda.<sup>1</sup> The cumulative 24-month probability of acquiring HIV did not differ significantly between the female partners of infected men who underwent circumcision and those of infected men who did not (22% vs. 13%). The findings were similar after other factors potentially affecting the risk of infection were taken into account. Moreover, at a six-month follow-up, the rate of HIV infection among female partners in couples who had resumed having intercourse before the surgical wound was fully healed was 3.5 times that among female partners of men who did not have the surgery.

Men were eligible for the trial if they were aged 15–49, uncircumcised, infected with HIV and showed no signs of immunosuppression. The men were assigned to be circumcised either immediately (within two weeks of enrollment) or after a delay of 24 months. Those having immediate surgery were instructed to abstain from sex until medical staff had certified that the surgical wound was completely healed; during visits in the first six weeks after surgery, the wound was examined and the men were asked whether they had resumed intercourse. If a man had a wife or permanent consensual partner who was uninfected, he was asked to invite her to enroll, and those who accepted were given the same instructions regarding resumption of intercourse. In total, 922 men and 163 women participated in the trial. At enrollment and at follow-up visits six, 12 and 24 months later, blood samples were collected from both partners and tested for HIV. At each visit, participants were offered their HIV results, and were told that the effects of circumcision on HIV transmission were unknown and that adherence to safe sexual practices was essential. In addition, at each visit, participants were interviewed and asked about social, demographic, behavioral and health factors; were given intensive education about STI/HIV pre-

vention; and were offered free condoms and voluntary HIV counseling and testing.

The study, conducted in parallel with a larger trial that examined whether circumcision reduces the risk of male infection, began in 2003 and was stopped early four years later because an interim analysis suggested that circumcision was highly unlikely to reduce the risk of male-to-female HIV transmission. Descriptive analyses were based on 93 couples in which the HIV-infected man was assigned to immediate circumcision and 70 couples in which the HIV-infected man was assigned to delayed circumcision. Efficacy analyses were restricted to the 92 couples in the former group and 67 couples in the latter group in which the female partner had had at least one follow-up visit.

Most of the men in the two groups (71–81%) and 31–51% of their female partners were 30–49 years old. Only 20–21% of the men and 6% of the women had more than a primary education. About four-fifths of participants were monogamous. Nearly all of the men—98% of those assigned to immediate circumcision and 94% of those assigned to delayed circumcision—opted to receive the results of their HIV test when they enrolled in the trial; somewhat smaller proportions of their female partners—69% and 74%, respectively—did so, but an additional 16% in each group already knew their HIV status. Roughly half of the men and more than two-thirds of the women said they had not used condoms at all in the past year.

During 12–24 months of follow-up, 18% of the female partners of men assigned to immediate circumcision and 12% of the partners of men assigned to delayed circumcision became infected with HIV. The cumulative 24-month probability of infection was 22% in the former group and 13% in the latter—a nonsignificant difference. The risk of acquiring HIV remained statistically indistinguishable between groups after the researchers adjusted for baseline differences in factors such as female age and condom use.

An unplanned secondary analysis revealed

that in the immediate circumcision group, female partners' rate of HIV infection within six months of starting the trial was markedly higher among couples who resumed intercourse more than five days before doctors certified that the man's surgical wound had completely healed than among couples in the delayed circumcision group (rate ratio, 3.5). By contrast, female partners of men in the immediate circumcision group were not at higher risk if the couple had resumed intercourse within five days prior to or any time after certification of wound healing.

At follow-up assessments, female partners in the immediate circumcision group did not differ from those in the delayed circumcision group with respect to number of sexual partners, condom use or alcohol use with sex. In addition, similar proportions of female partners in each group developed genital ulcers (16%), vaginal discharge (32–36%) and painful urination (15–16%). The incidence of bacterial vaginosis was statistically indistinguishable between groups as well (52–56%), although female partners in the immediate circumcision group had a slightly lower incidence of trichomoniasis than did those in the delayed circumcision group (7% vs. 15%), a difference of borderline statistical significance.

The trial's findings suggest that circumcision does not reduce the risk of HIV transmission from infected men to uninfected women in the short term, according to the investigators. The findings contrast sharply with those of trials showing that male circumcision roughly halves the risk of HIV transmission from infected women to uninfected men. Nonetheless, the investigators recommend that circumcision be offered to all men regardless of their HIV status, to minimize any stigma associated with being circumcised or uncircumcised and to reduce the risks of genital ulcers and human papillomavirus infection in HIV-infected men, among other reasons. They stress, however, that it is imperative that men who undergo this surgery strictly abstain from sex during wound healing and consistently use condoms thereafter. In the broader context, the investigators

note, although male circumcision does not appear to directly reduce women's risk of HIV acquisition, it may ultimately decrease women's exposure to infected men by reducing male infection. "Male circumcision programmes are thus likely to confer an overall benefit to women," they conclude.—*S. London*

#### REFERENCE

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## Reproductive Outcomes Are Suboptimal Among Women Who Marry Early in India

Women in India who marry before age 18 are more likely than those who marry later to have high parity and inadequate birth spacing, according to a nationally representative study.<sup>1</sup> Despite being outlawed in 1978, child marriage remains common in India: Nearly half of ever-married 20–24-year-olds in the study had married before reaching the legal age of 18. Even when duration of marriage was taken into account, such women were more likely than same-aged peers who married later to have not practiced contraception before their first birth (odds ratio, 1.4); to have had at least three births (1.3), short intervals between births (1.4) and multiple unintended pregnancies (1.4); and to have undergone sterilization (2.1).

The researchers analyzed data on 22,807 20–24-year-old women from the 2005–2006 India National Family Health Survey, a nationally representative, household-based study. Two-thirds of the sample (14,813 women) had ever been married; this subgroup formed the basis for most calculations. The researchers analyzed demographic data (including women's age, education level, marital status, age at marriage, area of residence and household wealth, and husband's age and education level), as well as information on the following reproductive characteristics: contraceptive use before first childbirth, childbirth in the first year of marriage, high lifetime fertility (three or more births), closely spaced births (<24 months apart), unintended pregnancy, pregnancy termination (by abortion, miscarriage or stillbirth) and sterilization.

The sample had a mean age of 22. Most women lived in rural areas (67%) and were

Hindu (80%); one-third (31%) had no formal education, and three-quarters had ever been married. Some 45% of all respondents had married before age 18, 23% before age 16 and 3% before age 13. About one in seven ever-married women (14%) were at least 10 years younger than their husband.

Although women who had married before age 18 made up slightly less than half of the sample, they accounted for 72% of respondents with no education, 53% of those in rural areas and 70% of those in the lowest wealth quintile. Among ever-married women, child marriage was more common among those who were 10 or more years younger than their husband than among those whose husband was closer in age (66% vs. 57%); it was also more prevalent among women whose husband had no education than among those whose husband had some education (77% vs. 34%).

Nearly every reproductive health outcome—many of them adverse—was more prevalent among women who had married early than among their counterparts who had married later. For instance, 31% of women who had married early had had two closely spaced births, compared with 12% of those who had married as adults; 27% of respondents who had married before age 18 had had at least three children, compared with 4% of those who had married later. Nearly 20% of women who had married before age 18 reported having been sterilized (compared with 5% of women married later), and 10% of those who had both married early and undergone sterilization had had the procedure before age 18.

In a multivariate analysis that adjusted for demographic characteristics, women who had married before age 18 were more likely than those who had married in adulthood to report not having used contraceptives prior to their first birth (odds ratio, 1.4). In addition, even after the researchers controlled for both demographic variables and duration of marriage, women who had married before age 18 were more likely than those who had married later to have given birth three or more times (1.3) and to have had closely spaced births (1.4), multiple unwanted pregnancies (1.4) and a pregnancy termination (1.2). In addition, the odds of having undergone sterilization among women who had married before age 18 were twice those of women who had married later (2.1).

These findings "strongly indicate that the

social context of child marriage reduces women's control of their reproduction in adulthood, possibly because of less contraception knowledge, poor access to family-planning services, reduced control of family-planning decisions in marriages to older men, and heightened control by in-laws," according to the researchers, who add that the ill effects of early marriage also include heightened risks of maternal and infant mortality. They suggest addressing the problem of underage marriage and its association with poor fertility control by expanding "family planning programs tailored to married adolescents," and ensuring that interventions target men who might marry adolescents, women already in early marriages, and the husbands and in-laws of women who married as adolescents. The researchers also posit that programs to address gender inequality will help improve the position of girls in India, "such that child marriage is not the only economically feasible and socially acceptable option for many impoverished families."—*H. Ball*

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## HPV Testing Is Effective For Cervical Cancer Screening In Low-Resource Settings

A single round of screening for human papillomavirus (HPV) among women in India's Osmanabad district substantially reduced the risk of death from cervical cancer during eight years of follow-up, according to a randomized trial that examined three screening methods.<sup>1</sup> Compared with women who lived in villages where cervical cancer screening was rarely performed, those who lived in areas where HPV screening was offered were half as likely to develop advanced cervical lesions or to die from cervical cancer (hazard ratios, 0.5 for each). Two alternative detection strategies—cytologic testing (Pap smear) and visual inspection of the cervix with acetic acid—did not reduce the incidence of advanced disease or cervical cancer mortality.

The study was conducted in 52 clusters of villages in Osmanabad. During visits by female health workers, all healthy, nonpregnant women aged 30–59 who had ever been mar-

ried and had an intact uterus were invited to participate. Women completed a questionnaire and received information about the causes, prevention, detection and treatment of cervical cancer. In addition, women in 39 of the clusters received an appointment card for a screening (HPV testing, cytologic testing or visual inspection with acetic acid); to simplify the process, all women in a particular cluster were assigned to receive the same type of screening. Women in the remaining 13 clusters served as a control group: They were given information about how to obtain screening at local hospitals, but were not given appointments.

All screenings were conducted by trained nurse-midwives under the supervision of physicians. The screening process differed according to the nature of the test. For HPV or cytologic screening, the nurse-midwives collected cervical cells for testing; women received results within two weeks, and those who tested positive were given appointments for colposcopy, biopsy and treatment. Women in the visual inspection group who screened positive underwent immediate colposcopy and biopsies, and received an appointment for treatment. In general, after colposcopy, women with low- or high-grade precancerous lesions were offered immediate treatment; those with probable invasive cancers were referred to the hospital.

The study was launched in January 2000, and women were followed through December 2007. To identify cases of cervical cancer and deaths from the disease during the follow-up period, the researchers used a cancer registry, hospital records, death certificates, house visits and interviews with relatives and friends.

The HPV-testing, cytologic-testing, visual inspection and control groups each included 31,000–34,000 women. About 80% of women in the first three groups were screened; however, because the trial used a cluster design, all eligible women in each of these clusters were included in the analyses, regardless of whether they had participated in the interviews or screenings. Overall, the analyses included 131,746 women, only eight of whom had ever undergone previous cervical screening. (Because so few women in the region ever receive screening, the study's inclusion of an unscreened control group was ethically justified, the researchers note.) Adverse effects from screening and treatment were rare: Among the nearly 80,000 women who participated, 123 had mild events and

one developed uncontrolled bleeding.

The proportion of women with positive screening results ranged from 7% in the cytologic-testing group to 14% in the visual inspection group. The vast majority of women with positive results underwent colposcopy (more than 88% in all three intervention groups); the proportion of women with low-grade lesions was highest in the visual inspection group, but the proportion with high-grade lesions or invasive cancers did not differ among the three screening groups. The proportion of women with low-grade lesions who underwent treatment ranged from 33% in the HPV group to 45% in the cytologic-testing group; among those with high-grade lesions, about 90% of women in each intervention group underwent treatment. Six percent of women in the control group requested screening, which was done by colposcopy.

During the initial screening and follow-up, 127 cancers were detected in the HPV group, 152 each in the cytologic-testing and visual inspection groups, and 118 in the control group. The number of advanced cancers—i.e., those that had spread beyond the cervix and uterus—ranged from 39 in the HPV-testing group to 86 in the visual inspection group. Deaths from cervical cancer were lowest in the HPV-testing group (34), intermediate in the other two screening groups (54–56) and highest in the control group (64). Overall, HPV testing was the only screening procedure that reduced the risk of advanced cervi-

cal cancer (hazard ratio, 0.5) and deaths from cervical cancer (0.5) relative to not screening. Because the results encompass all women in each study area, regardless of whether they chose to participate, many of the advanced cancers and deaths occurred among women who were not screened. For example, nearly two-thirds of the cervical cancer deaths in the HPV-testing group and half of those in the cytologic-testing group occurred among women who had not been screened.

The findings indicate that “a single round of HPV testing” can produce “a significant decline in the rate of advanced cervical cancers and associated deaths,” the researchers note. Moreover, compared with the other two methods, HPV testing is “less demanding in terms of training and quality assurance.” The cost of HPV testing (US\$20–30 per test) and the need for laboratory facilities to analyze samples remain obstacles to utilizing this approach in developing countries, but “a simple, affordable and accurate HPV test that provides results within three hours” is expected to become commercially available “in the near future.” This development, together with the findings from Osmanabad, suggests that HPV testing is “appropriate as a primary screening approach in low-resource settings for women who are at least 30 years of age.”—*P. Doskoch*

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## Researchers Suspect Prechewed Food May Have Transmitted HIV from Caregivers to Children

Infants who eat food that has been prechewed by an HIV-positive caregiver may be at risk for HIV infection, a series of U.S. case reports suggests.<sup>1</sup> Researchers identified three cases in which young, HIV-negative children were infected with the virus after frequent feedings of pre-masticated food; in each case, no other likely routes of transmission were present. Although the investigators believe that such transmission is likely rare, the findings raise concerns because prechewing food is a common practice in many developed and developing countries.

The investigators studied two cases in Miami, Florida, and one in Memphis, Tennessee. In all three instances, health care providers had interviewed parents and rela-

tives, reviewed medical histories and collected blood samples to establish that an infant born HIV-negative who was given prechewed food by an HIV-infected family member eventually tested positive for the virus.

The first case concerned a 15-month-old Miami boy who had been fed prechewed food by his HIV-positive great-aunt for about five months. The boy's mother had not known that her aunt had HIV, although she had noticed that her aunt's gums sometimes bled into the food she gave the boy. The infant was tested for HIV following a pediatrician visit for recurrent diarrhea and ear infection. Because the test was positive, the boy and his mother, both previously HIV-negative, were subsequently tested multiple times using HIV-1 an-

tibody tests and Western blots; on each occasion, he tested positive for the virus, while she remained negative.

Because the great-aunt had died and no blood samples from her were available, the researchers were unable to confirm that her strain of HIV was genetically identical to the boy's. Researchers did test a sample from the great-aunt's sexual partner, an HIV-infected intravenous drug user, and found that his HIV strain was not related to the boy's; this did not exclude the great-aunt as the source of infection, however, as she could have become infected from some other source.

The second case, which occurred in 1995 in the same city, involved a child born to an HIV-positive mother. Despite a lack of perinatal prophylactic treatment, the child had tested negative for the virus at 20 and 21 months of age, and showed no signs of immunosuppression. By 39 months, however, the child had developed medical problems consistent with possible HIV infection: Tests revealed the presence of HIV and severe immunosuppression. A phylogenetic analysis of virus samples confirmed that mother-to-child transmission had likely occurred. The mother reported that she had fed the child pre-masticated food but did not remember the child's age at the time or whether she herself had good oral health.

The third case, which prompted the researchers' investigation, took place in Memphis in 2004. A nine-month-old girl born to an HIV-infected mother developed a variety of health issues and tested positive for HIV. Because of the mother's HIV status, the infant had received prophylactic antiretroviral medication for six weeks following delivery and had been tested for HIV several times during her first four months. All of these tests had been negative. The girl had not been breast-fed; however, the mother, who occasionally had bleeding gums and had taken her HIV medication inconsistently during and after the pregnancy, had begun giving her daughter prechewed food when the child was about four months old. Phylogenetic analysis provided strong evidence that the mother had passed HIV on to her infant.

In this case, as in the previous two, interviews with caregivers and physical examinations failed to uncover any other likely means of transmission, such as injury, transfusion or sexual abuse, leading the investigators to conclude that the infants, who were teething or suffering oral illness, were infected via

prechewed food containing blood from an HIV-positive parent or relative.

The researchers note that prechewing food may be more common than health care providers realize. Although data on this topic are limited, 11% of mothers in a U.S. survey reported having fed prechewed food to their 10-month-old infant; three-fifths of respondents in a Chinese study said they had fed their child prechewed food, and one-fifth had done so regularly.

Although mother-to-child transmission of other infectious microorganisms has been associated with prechewed food in some parts of the developing world, such transmission of HIV is "probably rare," the researchers contend, as it requires "a convergence of risk factors affecting both the caregiver and the child." Detecting any cases that do occur is difficult, particularly in developing countries, because such transmission may be attributed to breast-feeding. They caution health care providers to take cultural beliefs and available resources into consideration before counseling HIV-positive parents and relatives against prechewing food, but emphasize that "it is crucial to educate caregivers who are infected with HIV about prechewing"—especially those who have active bleeding in the mouth—"because they may be unaware of its potential health risks."—*S. Ramashwar*

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## Female Orphans in Africa Are No More Likely to Marry Early Than Nonorphans

Female adolescents in Sub-Saharan Africa who have lost one or both parents are generally no more likely than their non-orphaned counterparts to marry before age 18, according to a study using population-based data from 10 countries.<sup>1</sup> However, in four of the countries, female orphans have increased odds of early sexual debut (odds ratios, 1.4–2.1), and in two countries they have increased odds of early pregnancy (1.7 in each). The risks associated with different types of orphanhood—having lost a mother, a father or both parents—vary across countries. In addition, adolescents who are more socio-economically disadvantaged or have no for-

mal education have elevated odds of some or all of the outcomes studied.

Researchers analyzed data on females aged 15–17 from Demographic and Health Surveys and related household surveys conducted in 2003–2006 in Benin, Chad, Congo (Brazzaville), Côte d'Ivoire, Lesotho, Malawi, Mozambique, Tanzania, Uganda and Zimbabwe. Young women were considered orphans if either or both of their parents had died or if the status of either or both parents was unknown. The researchers examined associations among a variety of variables—including orphan status, education, religious affiliation, wealth quintile, and urban or rural residence—and three sexual and reproductive outcomes: early marriage (defined as having ever been married), early sexual debut (defined as having ever had sex) and early pregnancy (defined as having ever been pregnant).

The number of female adolescents in the sample ranged from 711 in Côte d'Ivoire to 1,801 in Benin. Overall, 16–40% of the adolescents in the 10 countries were orphans; most were paternal orphans (i.e., they had lost their father). In addition, 7–29% had ever married, 17–61% had ever had sex and 8–28% had ever been pregnant. Levels of all three outcomes were particularly high in Chad, Côte d'Ivoire and Mozambique.

In multivariate analyses, orphan status was not associated with early marriage in any of the countries studied. However, several other social and demographic factors were associated with this outcome. Compared with adolescents with an incomplete primary education, those with no education had elevated odds of early marriage in Benin, Mozambique and Tanzania (odds ratios, 2.4–4.1), and adolescents in Chad, Malawi, Mozambique and Zimbabwe had reduced odds if they had at least some secondary education (0.2–0.4). The odds of early marriage were increased among young women in two or more of the four lowest wealth quintiles (relative to those in the most well-off quintile) in seven countries: Benin, Côte d'Ivoire, Lesotho, Malawi, Mozambique, Uganda and Zimbabwe (1.8–11.8). Compared with their Protestant peers, Muslim women had elevated odds of early marriage in Chad and Uganda (2.7–3.7), but reduced odds in Benin (0.3). Urban residence was associated with a decreased likelihood of early marriage in Benin (0.5) and with increased odds in Malawi (1.9).

In four countries—Côte d'Ivoire, Lesotho, Mozambique and Tanzania—orphans female

adolescents had greater odds of early sexual debut than did their nonorphaned peers (odds ratios, 1.4–2.1). In Mozambique and Tanzania, young women with no education had elevated odds of having ever had sex relative to those with an incomplete primary education (1.7–2.2); in Chad, Mozambique, Tanzania and Zimbabwe, young women who had at least some secondary education had reduced odds (0.3–0.6). In Côte d'Ivoire, Lesotho, Malawi and Zimbabwe, the likelihood of early sexual debut was elevated among young women in at least two of the four lowest wealth quintiles (1.8–3.8). The odds of being sexually experienced were also elevated among Muslim women in Chad relative to their Protestant peers (3.1) and among urban residents in Tanzania relative to rural women (1.6).

In two countries—Chad and Côte d'Ivoire—orphans had elevated odds of early pregnancy (odds ratio, 1.7 in each country). Early pregnancy was positively associated with a lack of formal education in Benin, Chad, Mozambique and Tanzania (1.9–2.6) and negatively associated with having at least some secondary education in Mozambique, Tanzania and Zimbabwe (0.04–0.5). The odds of early pregnancy were elevated among Muslim women in Chad (3.8), and reduced among Catholic women in Côte d'Ivoire (0.5), relative to their Protestant peers. In addition, the likelihood of early pregnancy was elevated among young women in at least three of the four lowest wealth quintiles in Benin, Congo, Côte d'Ivoire, Lesotho, Mozambique and Zimbabwe. Urban residents in Benin were less likely than their rural peers to have ever been pregnant (0.6).

A final set of analyses examined the importance of the type of orphanhood (maternal, paternal or double) to sexual health outcomes. Early marriage was associated with one or more orphan types in four countries, notably Benin, where young women who had lost both parents had sharply elevated odds of early marriage relative to their nonorphaned counterparts (odds ratio, 7.3). Early pregnancy was associated with one or more orphan types in only three countries: double orphans in Benin (2.6), maternal orphans in Côte d'Ivoire (2.6) and paternal orphans in Chad (1.8).

However, the odds of early sexual debut were elevated among at least one type of orphan in seven of the 10 countries. Those at risk included maternal orphans in Tanzania

and Uganda (odds ratios, 1.9–2.2), paternal orphans in Côte d'Ivoire, Lesotho and Mozambique (1.5–2.1) and double orphans in Benin, Lesotho and Malawi (1.8–3.8).

In general, the study's findings provide little evidence that losing one or both parents influences the risks of early marriage and early pregnancy, but they do suggest that it is associated with a higher likelihood of early sexual debut, the investigators contend. The investigators recommend research to ascertain the reasons for the observed differences by type of orphanhood and by country, including any influence that ongoing programs have on sexual and reproductive outcomes,

with the aim of informing programmatic efforts and social policy. "Orphanhood status alone may not be a sufficient targeting mechanism for addressing these [adverse sexual and reproductive] outcomes in many countries; a broader, multidimensional targeting scheme including orphan type, schooling, and poverty measures would be more robust in identifying and aiding young women at risk," they conclude.—S. London

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## Lack of Education Does Not Account for Heightened Sexual Risk Found Among African Orphans

Because adolescents in Sub-Saharan Africa who have lost one or both parents are more likely than nonorphans to drop out of school, some researchers have suggested that differences in educational attainment and school attendance may explain excess sexual risk among orphans. However, in a cross-sectional study of female adolescents in urban Zimbabwe,<sup>1</sup> disparities in schooling explained only a small portion of the excess sexual risk found among youth who had lost both parents, and did not explain high levels of sexual risk among those who had lost only one parent.

The data come from a randomized, household-based study conducted in 2004 in Highfield, a densely populated suburb of Harare. All 15–19-year-old women in the sampled households were invited to be interviewed about their living situations and sexual experiences (a small number of 14- and 20-year-olds completed interviews and were retained in the sample); consenting participants were also tested for HIV and HSV-2. About two-thirds of eligible young women completed an interview, and 97% of interviewees provided a sample for STI testing. These data were matched with survey data from parents on the adolescents' coresidents and dwellings. Most analyses focused on the 743 young women who were unmarried, since associations between orphan status and sexual risk were evident among the unmarried young women but not those who were or had been married; the only exception was the initial analysis of HIV and HSV-2 prevalence, which

also included 110 married adolescents.

Participants were classified as paternal, maternal or double orphans (depending on whether they had lost their father or mother only, or both parents, respectively) or as nonorphans. Paternal orphans accounted for 26% of the sample, maternal orphans for 9%, double orphans for 15% and nonorphans for 49%; the remaining participants (about 2%) did not know if their parents were alive and were excluded from the study. The key educational variable took into account both attendance (whether participants were in or out of school) and attainment (whether they had completed secondary school). The researchers also collected information on possible correlates of sexual risk and orphanhood, including poverty (whether the adolescent ate fewer than three meals per day), residential mobility (whether she had lived in Highfield for less than a year) and church attendance (whether she attended church at least once per week).

Overall, 45% of married adolescents tested positive for HSV-2, HIV or both; prevalence did not vary by orphan status. However, the proportion of unmarried participants who tested positive for one or both infections varied greatly: While 6% of nonorphans tested positive for HIV or HSV-2, 20% of maternal orphans (odds ratio, 3.4), 14% of double orphans (2.3) and 11% of those who lost their father before age 12 (2.3) did so.

Sixty percent of unmarried adolescents were enrolled in school, and 93% had attended some secondary school. Double or-

phans had the lowest attendance of any group (47%) and were more likely than nonorphans to have left before completing secondary school, among both 14–17-year-olds (23% vs. 13%) and 18–20-year-olds (34% vs. 15%). The proportion of maternal orphans who had left before completing secondary school was elevated among 18–20-year-olds (38%) but not 14–17-year-olds (19%). Most respondents who had left school early (86%) said they had done so because they had been unable to pay for school fees, books or uniforms.

Twenty percent of unmarried adolescents reported having received assistance with school fees. Double and paternal orphans were more likely than nonorphans to have received such assistance (odds ratios, 2.8 and 2.3, respectively). Twenty-nine percent of maternal and double orphans reported that they had ever needed assistance with school fees, compared with 19% of nonorphans.

The prevalence of HIV or HSV-2 was higher among out-of-school adolescents (15–16%, depending on whether they had completed secondary school) than among those still attending secondary school (5%), even when potential confounders (age, poverty, residential mobility and church attendance) were taken into account (odds ratios, 3.2 for both types of out-of-school youth). Among 18–20-year-olds, only 2% of those in school were infected, compared with 26% of those who had left before completing secondary school (14.3). Infection with HIV or HSV-2 was not associated with

poverty or residential mobility and was negatively associated with church attendance (0.3).

When the researchers adjusted for respondents' education status, the association between orphan status and sexual risk showed relatively little change: The odds of having HIV or HSV-2 increased slightly among maternal orphans (from 3.4 to 3.6) and paternal orphans (from 2.3 to 2.5), and declined by only 8% among double orphans (from 2.3 to 2.2). Potential confounders reduced the association among double orphans by another 11%, leaving most of the association between education and sexual risk unexplained.

These findings, the researchers note, suggest that “education might not play a strong role in orphans' HIV/HSV-2 infection in this particular setting,” perhaps because of Zimbabwe's high rates of school completion. Alternatively, assistance with school expenses may have lessened the impact of orphanhood on education. They stress that, in the absence of a strong connection between orphans' schooling and sexual risk, or of data on whether leaving school early precedes or follows HIV or HSV-2 infection, “longitudinal research may help to understand the timing of events, like school drop-out and marriage, in relation to parent loss, and better trace the causal pathways of orphans' risk.”—*H. Ball*

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