Application of Antiseptic to Umbilical Stump Reduces Risk of Neonatal Infection and Mortality

In resource-poor rural areas where women often give birth at home, application of the topical antiseptic chlorhexidine to an infant's umbilical cord stump reduces the likelihood of infection and neonatal death, two recent clinical trials indicate.[1,2] In a study conducted in Pakistan, the risks of cord stump infection (omphalitis) and neonatal death were lower among infants whose cord had been cleansed with chlorhexidine for up to 14 days than among infants not receiving such care (risk ratios, 0.4–0.6); in contrast, a parallel intervention that promoted hand washing among family members provided little or no benefit. The second study, done in Bangladesh, found a reduced risk of severe cord infection among infants who received daily chlorhexidine cleansings during their first week (0.4–0.6), but not among those who received a single cleansing after birth. However, although mortality was reduced in the single-cleansing group, it was not reduced in the multiple-cleansing group.

Worldwide, infections cause a third of neonatal deaths, in part because the umbilical stump is an entry point for pathogens. In some cultures, the problem is exacerbated by traditional practices of applying ash, oil or other substances to the cord. To minimize infection risk, the World Health Organization recommends that the cord stump be kept clean and dry, an approach known as dry cord care. However, a 2006 study in rural Nepal found that applying chlorhexidine solution to the cord soon after delivery can reduce rates of infection and neonatal death. To further examine this approach in resource-poor settings, two teams conducted separate randomized trials in Asia.

In the first study, researchers divided Pakistan's rural Dadu district into 187 clusters (typically consisting of one or two villages) and randomly assigned to each cluster one of four cord care interventions. In all four, traditional birth attendants provided a birth kit to all pregnant women. In one intervention group, the kit included a supply of chlorhexidine solution and a bar of soap; after a woman gave birth, the attendant showed the family how to cleanse the infant's cord stump with the antiseptic and instructed them to do the same once a day for 14 days. Family members were also advised to wash their hands with soap before handling the infant. In the second intervention group, the kits contained soap but no chlorhexidine; in the third, chlorhexidine but no soap. The final group served as controls; families were advised to practice dry cord care but were not taught to cleanse the cord or wash their hands.

Community health workers supervised the birth attendants and assessed infants' health on days 1, 3, 5, 7, 14 and 28. Omphalitis was diagnosed if redness, swelling or pus was present on the cord or the surrounding skin; it was classified as mild if restricted to the stump, moderate if it extended no more than 2 cm from the base of the stump and severe if more extensive. Cases of neonatal mortality (death during first 28 days) were also noted. All birth attendants and community health workers received 3–5 days of training on relevant care practices and assessments.

Between January 2008 and June 2009, a total of 11,886 live births occurred in the study area. After exclusion of infants who were born in facilities, had obvious birth or cord abnormalities, or were delivered by providers not trained for the study, the final sample consisted of 9,741 infants. Mothers had a mean age of 30; only one in 10 was literate.

On average, infants in the two chlorhexidine groups received 2.4 applications per day for 11 days. Compared with infants in the control group, those whose cord had been cleansed were less likely to develop omphalitis, whether they were in the chlorhexidine-alone group (risk ratio, 0.4) or the chlorhexidine plus hand-washing group (0.5). No reduction in neonatal deaths was apparent, however. In another analysis, the researchers compared the two chlorhexidine groups with the other two groups; in this case, chlorhexidine cleansing was associated not only with a reduced risk of infection (0.6), but also with lower mortality (0.6).

Infants in the hand washing–alone group were less likely than those in the control group to develop omphalitis (relative risk, 0.7), though mortality rates did not differ. Moreover, neither infection risk nor mortality risk was reduced in analyses that compared the two hand-washing groups with the two other groups.

The researchers note that the study's limitations include the use of community health workers, rather than physicians, to identify omphalitis (although this compromise reflects reality in most developing countries), and the inability of health workers to attend most births (and hence to supervise birth attendants' cord cleansings and instructions to family members). They conclude that application of chlorhexidine can "reduce the incidence of neonatal omphalitis and neonatal mortality," but that promotion of hand washing alone, especially where water is scarce, "might not be enough" to prevent infection.

One issue not addressed by the study is whether a single application of chlorhexidine is sufficient to reduce infection risk. This question was examined in the second trial, conducted in 2007–2009 in rural areas of Bangladesh's Sylhet district. The trial compared the effectiveness of three approaches: dry cord care, a single chlorhexidine cleansing as soon as possible after birth and daily cleansing during the first week. Researchers divided the study area into 133 clusters of 2,100–5,600 residents and randomly assigned to the clusters one of the three treatments. In each cluster, a community health worker and four village health workers provided birth kits and neonatal care counseling to all pregnant women and asked the family to notify them at the onset of labor. Village health workers visited the mother and infant daily during the week after birth, and the community health worker made visits on days 1, 3, 6, 9, and 15 to assess the infant's health. Visits were identical in all three intervention groups, except that a village health worker applied chlorhexidine to the cords of infants in the two cleansing groups accord-

ing to the relevant schedule. The community health worker made a final visit between days 28 and 35 to ascertain the infant's survival; death within 28 days was the study's primary outcome. Secondary outcomes were the level of redness at the cord stump, classified in a similar fashion to the Pakistan trial, and the presence of pus.

The analytic sample consisted of 28,308 live-born infants who received at least one visit during the first seven days and whose vital status at day 28 was known. Fewer than half of the mothers received any formal antenatal care. Only 9% of infants were delivered by a skilled birth attendant, though in 93% of cases a sterile tool was used to cut the cord. Most infants (84–85%) in the three groups received all seven daily visits during their first week; an additional 7–8% received five or six visits.

During follow-up, the incidence of moderate redness, or of pus without redness, did not differ among groups. However, compared with infants who received dry cord care, those who received multiple cleansings had a lower risk of developing severe redness or redness with pus (relative risk, 0.6), or of having both severe redness and pus (0.4). No reduction in infection risk occurred among infants who received just a single cleansing.

Mortality data yielded a different pattern: The risk of death among infants who received multiple cleansings did not differ from that of infants in the dry cord group, whereas infants who received a single cleansing had a reduced risk of mortality (relative risk, 0.8).

The researchers suggest that the lack of a reduction in mortality risk in the multiple-cleansing group may have been due to chance and insufficient statistical power. Despite the mixed results, they conclude that chlorhexidine cleansing "can save lives" and, given its low cost, is "especially attractive for countries with restricted resources and high neonatal mortality." They recommend that future studies seek to "confirm that [a] single cleansing is effective, because this intervention would simplify programme logistics and aid the achievement of high intervention coverage in real-life settings."–*P. Doskoch*

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Prevalence of Female Genital Cutting Varies Greatly in Western Africa

Despite legislative and other efforts to reduce the prevalence of female genital cutting (often called female circumcision), the practice persists throughout western Africa, although its frequency varies widely among countries, a multinational study indicates.[1] From 2% to 94% of women in the 10 study countries had been circumcised, while 1–64% had had at least one daughter undergo the procedure. Women who were older, uneducated, currently or previously married, or Muslim were generally more likely than other women to have been circumcised and to have had their daughters circumcised. In most countries, more than 25% of women believed that the practice should continue.

A deeply rooted tradition that is often practiced in unsanitary conditions and without anesthesia, female genital cutting can lead to reproductive health problems, psychological trauma, and even maternal and infant death. To determine the frequency of the practice and identify the populations most at risk, investigators examined data from countries that participated in the third round of the Multiple Indicator Cluster Survey between 2005 and 2007. Using a two-stage, stratified design, the survey systematically sampled households in urban and rural areas of Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea-Bissau, Mauritania, Niger, Nigeria, Sierra Leone and Togo; sample sizes ranged from 5,890 to 24,566. The survey asked all women aged 15–49 in each household whether they had been circumcised, had had any of their living daughters circumcised and thought the practice should continue. Analyses were performed separately for each country and controlled for age, educational level, marital status, household wealth and religion.

A total of 106,016 women were interviewed. More than half of the women from each country were 15–29 years old (53–62%), and most respondents from Burkina Faso, Côte d'Ivoire, The Gambia, Guinea-Bissau, Niger and Sierra Leone had never attended school (53–84%). In every country but Côte d'Ivoire, the majority of women were married (59–86%); the proportion of Muslims ranged from 14% to 99%.

The prevalence of female genital cutting varied widely among countries: It was very high in Sierra Leone (94%), The Gambia (79%), Burkina Faso (74%) and Mauritania (72%), but low in Togo, Ghana and Niger (2–6%). Among daughters, genital cutting was most prevalent in The Gambia and Mauritania (64% each), and least prevalent in Togo, Ghana and Niger (1% each). In only three countries—Mauritania, The Gambia and Sierra Leone—did the majority of women support the continuation of female genital cutting (59–88%). The lowest rates of support (4–11%) occurred in the three countries where genital cutting was least common: Ghana, Niger and Togo. Nevertheless, in six of the 10 countries, more than 25% of women believed that female circumcision should continue.

In every country, the proportion of women who had undergone genital cutting was greater than the proportion who had had their daughters circumcised, suggesting that the prevalence of genital cutting may be waning. However, in most countries, the proportion of women who thought that the practice of female genital cutting should continue exceeded that of women who had had their daughters circumcised; the exceptions were Burkina Faso and Mauritania, both of which have banned the practice.

In multivariate analyses, women who were older, had no formal education, were currently or formerly married, or were Muslim tended to have elevated odds of having been circumcised or of having had a daughter circumcised. For example, in about half of the countries, women aged 35–39 were more likely than those aged 15–19 to have been circumcised (odds ratios, 2.1–4.3), or to have had their daughters circumcised (2.5–20.0); in nine countries, women with some degree of education were generally less likely than uneducated women to have been circumcised, to have had their daughters circumcised, or both (0.2–0.7). The main exception to these trends was The Gambia, where older women were less likely than 15–19-year-olds to have been circumcised (0.6–0.8), and where (along with Burkina Faso) education was not linked with mothers' circumcision. However, in Nigeria, education was positively linked with circumcision among both women and daughters (2.1–3.9). Wealth was inconsistently associated with genital cutting. For example, the risk for both women and daughters was greater in the wealthiest households than in the poorest

ones in Burkina Faso (1.7 for each) and Nigeria (2.8–3.1), but in six countries the risk for mothers, daughters or both was lower in the wealthiest households than in the poorest. Finally, in most countries, women who were older, educated, married and wealthy tended to be less likely than others to believe that female genital cutting should continue.

The investigators acknowledge several limitations to their study. The multivariate analyses included only characteristics for which data were available for all countries, which limited the researchers' ability to identify factors associated with female genital cutting. Social desirability or recall bias may have influenced participants' responses; for example, women may have underreported circumcision and their support for it, especially in countries where the practice is illegal. Moreover, practices and beliefs may have changed since the data were collected. Finally, analyses did not consider the types of genital cutting that participants had experienced.

As the investigators conclude, however, understanding national variations in female genital cutting practices and attitudes "is particularly important" for tailoring interventions to curb the procedure. They suggest a multifaceted strategy that combines community education and awareness, support from prominent groups and practitioners, and enforced legislation to help reduce the practice while preserving communities' cultural identities and social values. "Such concerted societal commitments are necessary for the benefit of future generations of women and girls," they note.–*A. Kott*

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Male Circumcision Reduces Risk of HIV Acquisition For as Long as Seven Years

Circumcision reduces men's HIV risk for up to seven years, according to follow-up data from a randomized trial conducted in Rakai, Uganda.[1] In analyses that combined data from the two-year trial with nearly five years of posttrial surveillance data, the incidence of HIV among circumcised men—including those who had the procedure after the trial ended—was 0.5 per 100 person-years, compared with 1.9 per 100 among those who were uncircumcised. This corresponds to a circumcision effectiveness of 74%. In a survival analysis that controlled for men's background characteristics and sexual behaviors, the adjusted hazard ratio of HIV acquisition among circumcised men was 0.3, and the circumcision effectiveness was 73%.

Although circumcision has been shown to be effective in HIV prevention among men, its long-term effectiveness has not been established. When the Rakai randomized trial was halted in 2006, after analysis demonstrated the efficacy of circumcision in preventing HIV acquisition in a sample of 4,996 men aged 15–49, all trial participants were enrolled in a posttrial surveillance study, and circumcision was offered to uncircumcised participants. Of the 1,602 HIV-negative men who were not circumcised during the trial but attended at least one posttrial follow-up visit, 79% had been circumcised by December 2010 (the cutoff for the present analysis). At each posttrial visit, men were tested for HIV, examined for circumcision status and asked about their sexual behaviors in the preceding year (number of partners, whether they had had a nonmarital partner, consistency of condom use and alcohol use before sex). The posttrial analysis used data from visits over 4.8 years; incidence rate ratios were estimated using Poisson regression, and Kaplan-Meier survival analysis and Cox regression were used to calculate hazard ratios of HIV acquisition. These analyses controlled for men's social and demographic characteristics (age, marital status and education) at the end of the initial trial interval, allowing the researchers to assess whether self-selection bias occurred.

During the initial two-year trial period, HIV incidence was 0.5 per 100 person-years among circumcised men and 1.1 per 100 among those who were uncircumcised. In the posttrial period, HIV incidence was 0.5 and 1.9 per 100 person-years, respectively, among circumcised and uncircumcised men. The corresponding effectiveness levels for the two periods—59% during the trial and 74% during follow-up—were not significantly different from each other. When background characteristics and sexual behavior were controlled for in the survival analysis, the adjusted hazard ratio of HIV acquisition during the posttrial period was 0.3, and the effectiveness of circumcision was 73%.

In an analysis of participants assigned to the original study's control arm, HIV incidence during the posttrial period was 0.5 per 100 person-years among circumcised men and 1.7 per 100 among the uncircumcised. These rates translate to a circumcision effectiveness of 68%. In the survival analysis, the adjusted hazard ratio of HIV acquisition during the posttrial period was 0.3, while the circumcision effectiveness was 67%. The background characteristics and sexual behavior of participants who were circumcised during the posttrial period did not differ from those of men who remained uncircumcised, at either the last trial visit or the first posttrial visit, suggesting that self-selection bias was minimal.

The researchers note that the elevated HIV incidence among uncircumcised men in the posttrial period may be attributed in part to some unmeasured high-risk behavior or to reduced exposure to preventive education. They caution against generalizing their findings to other populations or programs because of several study limitations: Participants were self-selected; they received voluntary counseling and treatment at enrollment and after seroconversion, as well as health education at each visit; the timing of HIV infection within a follow-up interval was unknown; and behavioral differences between circumcised and uncircumcised men may emerge only after longer time intervals. Nonetheless, the researchers note that during the posttrial period, "the effectiveness of male circumcision for HIV prevention ... was comparable to or higher than" that observed during the initial randomized trial, which "suggests that male circumcision confers long-term protection from HIV infection in men."–*J. Thomas*

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Prevalence of Cesarean Delivery Rising Sharply Among Poor, Rural Women

The cesarean section rate rose from 3% to 39% in China from 1988 to 2008, and it was especially high among urban, wealthy and highly educated women, according to analyses of data from four cross-sectional surveys.[1] However, the prevalence of cesarean delivery increased fastest among rural, poor and less educated women. For example, while the rate and relative risk of cesarean delivery more

than tripled among urban women during the 20-year span, they increased by a factor of 15 among women living in rural areas.

Prior studies have found that China's rate of nonmedically indicated cesareans has risen dramatically and is the highest in Asia. To explore factors associated with this increase, investigators analyzed data on 34,482 live births obtained from National Health Service surveys conducted in 1993, 1998, 2003 and 2008. The surveys used a four-stage sampling design that stratified regions by socioeconomic status (rural areas, for example, were divided into four subregions) to obtain a random sample of households throughout the country. Using a structured questionnaire, trained interviewers collected information on characteristics of all pregnancies and deliveries (e.g., number of antenatal visits, place and mode of delivery) that women aged 15 or older had had in the past 2–6 years (the interval varied across surveys). Data were weighted to ensure that findings were nationally representative. The investigators used modified Poisson regression analyses to calculate crude and adjusted relative risks for cesarean deliveries over time, controlling for household income (categorized into quartiles), access to health insurance, mother's educational attainment, parity, maternal age and number of antenatal visits. Separate analyses were conducted for urban and rural areas.

Nationally, the cesarean section rate spiked from 3% in 1988 to 39% in 2008. The rate increased by more than 50 percentage points among urban women (from 10% to 64%), and by 11–36 percentage points among women in the four rural regions (e.g., from 0% to 11% in the poorest areas and from 3% to 39% in the wealthiest).

During the study period as a whole, rates of cesarean deliveries were elevated among women who were wealthy, were insured, had at least a college education and were having their first birth. For example, among urban women, cesarean deliveries accounted for 50% of births to those in the wealthiest quartile, compared with 16% of births to women in the poorest quartile; 34% of births to women with insurance, compared with 26% of those to uninsured women; and 48% of births to college-educated women, compared with 5% of those to women with no education.

Similar patterns occurred among rural women, though prevalence levels were lower. For example, cesarean deliveries accounted for 23% of births to women in the wealthiest quartile, but only 2% of those to women in the poorest; 19% of those to women with health insurance, but just 5% of those to uninsured women; and 30% of births to college-educated women, compared with only 3% of those to women who had no education. In addition, 16% of deliveries in the wealthiest rural region, but just 2% of those in the poorest, were by cesarean section.

Between the 1993 and 2008 surveys, urban women's risk of having a cesarean more than tripled (crude relative risk, 3.6). The increase in risk was only slightly lower in multivariate analyses that adjusted for women's characteristics (3.1), which suggests that in urban areas, population-level changes in education, income and health insurance explain only a small portion of the increase in cesarean deliveries. In rural regions, the unadjusted relative risk of cesarean delivery in the years preceding the 2008 survey was more than 15 times that in the years before the 1993 survey (15.5); in this case, the relative risk was notably lower when such factors as household income, health insurance and education were taken into account (7.2), suggesting that these characteristics partly explain the increased use of cesarean.

However, trend analyses examining interactions between women's characteristics and survey year found that the likelihood of cesarean deliveries rose fastest among uninsured women, both in urban areas (8.3) and in rural ones (28.7), a finding that stands at odds with the hypothesis that the increased use of cesarean deliveries has been driven by providers seeking higher insurance reimbursements. Increases in rural areas were also especially high among the poorest women (12.1) and those who were uneducated (16.6).

The investigators note several study limitations. Births may have been underreported, especially those that had not been approved by the family planning system or that occurred among rural migrants who were temporarily away from home. Furthermore, the investigators' definition of health insurance may not have captured the variation in coverage among insurance schemes; therefore, the analyses may have underestimated the strength of the association between health insurance and cesarean deliveries.

Nevertheless, the researchers conclude that a woman's likelihood of having a cesarean delivery depends more on whether she lives in a wealthy or urban region, where appropriately trained providers and equipped hospitals are more accessible, than on her individual socioeconomic characteristics. "Hence," they write, "supply side factors may be a more important determinant of caesarean section than [are] ability to pay or educational level." In addition, the increase in the cesarean rate may reflect a "societal consensus about the safety and benefits of cesarean." However, they note that information on the procedure's safety—actual or otherwise—is scant in China and "urgently needed."–*A. Kott*

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Giving Misoprostol Before Vacuum Aspiration Lowers Risk of Complications

Cervical preparation with misoprostol reduces a woman's risk of complications from a first-trimester vacuum aspiration abortion, according to a multicountry, randomized controlled trial.[1] Although women receiving misoprostol reported more abdominal pain, vaginal bleeding, nausea and other side effects before the abortion than those who received a placebo, they were less likely to report any complications after the procedure (relative risk, 0.7), notably incomplete abortion and incomplete abortion requiring uterine reevacuation. Overall, 2% of misoprostol recipients had a serious complication, compared with 3% of placebo recipients.

The researchers sought to assess whether cervical preparation with misoprostol for first-trimester abortion is associated with greater cervical dilation and reduced rates of complications. The trial was conducted from October 2002 to September 2005 at 14 hospitals in Armenia, China, Cuba, Hungary, India, Mongolia, Romania, Slovenia and Vietnam. Women requesting first-trimester pregnancy termination were eligible if they were in the first 84 days of pregnancy and were willing to return for follow-up; they were excluded if they had a known allergy to misoprostol, low hemoglobin levels, or a medical disorder that precluded routine vacuum aspiration or use of misoprostol or similar drugs.

Clinic staff recorded women's demographic information and medical histories, and also measured hemoglobin concentrations. Length

of pregnancy was determined by ultrasound. Three hours before their abortion, participants received either two 200-mg misoprostol tablets or two placebo tablets, administered vaginally; shortly before the procedure, the women were asked whether they had experienced any side effects from the drug. Study sites varied in the type of surgical equipment used (manual vs. electric aspiration pump; soft vs. metal tubes) and analgesic provided (paracervical block, general anesthesia, none). Women returned for follow-up visits 7–14 days after the abortion. The primary outcome of interest was any immediate or delayed complication following the procedure, including cervical tear, uterine perforation, incomplete abortion, incomplete abortion with uterine reevacuation, or pelvic inflammatory disease. P values were calculated for binary outcomes, and relative risks for continuous measures. Logistic regression and general linear models were used to test interactions.

A total of 4,972 women were randomized to either the misoprostol or the placebo group. Participants' mean age was 27 years. Most women were married or cohabiting (70–71%), and 44% in each group had never given birth. The mean length of gestation was 7.9 weeks. For both groups, the average time between misoprostol administration and the abortion was 3.3 hours. During this time, higher proportions of women in the misoprostol group than in the placebo group reported abdominal pain (55% vs. 22%), vaginal bleeding (37% vs. 7%), nausea (7% vs. 4%), diarrhea (2% vs. 0%) and chills (3% vs. 1%); rates of vomiting, fever, dizziness, headache and rash were similar in the two groups (0–4%).

Cervical dilation before surgery was significantly greater in the misoprostol group than in the placebo group—7.0 vs. 5.9 mm, on average. As a result, the proportion of women who required additional dilation was smaller among misoprostol recipients than among those who received placebo (60% vs. 78%; risk ratio, 0.8); among women who required extra dilation, those who were in the misoprostol group needed less. The additional dilation in the misoprostol group allowed a wider suction tube to be used for uterine evacuation (means, 7.7 vs. 7.4 mm) and the vacuum aspiration procedure to be finished more quickly (3.6 vs. 3.9 minutes).

Before leaving the clinic on the day of the abortion, 71–75% of women in the two groups reported lower abdominal pain, 5% received analgesics and 0–1% reported diarrhea. Among the 98% of participants who returned for follow-up, a smaller proportion of women who had received misoprostol than of those who had received placebo reported one or more immediate or delayed complications from the abortion surgery (2% vs. 3%; risk ratio, 0.7). Few cases of cervical tearing or uterine perforation occurred, and rates did not differ between groups. However, compared with women in the placebo group, those in the misoprostol group were less likely to have had an incomplete abortion (1% vs. 2%; risk ratio, 0.4) or an incomplete abortion requiring uterine reevacuation (1% vs. 2%; risk ratio, 0.3). Analyses that stratified women by parity revealed that misoprostol reduced the risk of incomplete abortion (0.3) and incomplete abortion requiring uterine reevacuation (0.2) among parous women, but not among nulliparous women. There were no significant differences between the misoprostol and control groups in reports of pelvic inflammatory disease or other complications.

The researchers note that this is the first study with sufficient power to assess whether administering misoprostol before a first-trimester surgical abortion reduces the risk of complications. They acknowledge several limitations: The study may not have been fully blinded (because of small differences in the appearance of the misoprostol and placebo tablets); monitoring of the study sites was only occasional; and a misunderstanding in the method for determining the length of gestation led to enrollment of few women in the 12th week of pregnancy. However, the investigators note that their results are applicable to vacuum aspiration abortions up to 11 completed weeks of gestation. In a comment on the study, Templeton suggests that the range of surgical techniques used at participating centers may increase the generalizability of the study's findings.[2] Given that surgically induced abortion is the only procedure available in many parts of the world, Templeton underscores the importance of this study and suggests that "routine pharmaceutical dilation of the cervix should be recommended as an integral part of surgical abortion in all women."*–L. Melhado*

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Remarriage, HIV Infection Linked Among Women In Sub-Saharan Africa

In Sub-Saharan Africa, divorced, separated and widowed individuals who have remarried are more likely than those who are single or married for the first time to be HIV-positive, especially if they are female, according to an analysis of nationally representative data for 13 countries.[1] Compared with those in their first marriage, remarried women had higher odds of being HIV-positive in all but one country (odds ratios, 2.0–8.3). Individuals who were formerly but not currently married were also at risk; for example, in the three countries where HIV prevalence was highest, the odds of being infected were elevated at least twofold among formerly married men (2.4–5.3) and women (3.0–3.9).

Although prior studies have found high rates of HIV infection among divorced and widowed individuals in Africa, most of those studies used nonrepresentative samples or did not focus on the remarried population. To address these issues, investigators analyzed data from Demographic and Health Surveys and AIDS Indicator Surveys in which the majority of respondents (70–97% of women and 63–96% of men) had been tested for HIV. Women were eligible for the surveys, which were conducted between 2003 and 2006, if they were aged 15–49; the age range for men varied across countries but was generally 15–54 or 15–59. Data for Ethiopia were available only for women, as male respondents were not tested for HIV. Respondents who had never been married (or in a marriage-like union) were classified as single; those with a history of marriage were categorized as either married for the first time, remarried or formerly married (if they were separated, divorced or widowed but not currently married). To assess the relationship between remarriage and HIV status, the researchers performed descriptive analyses, as well as logistic regression analyses that adjusted for social and demographic characteristics (including the practice of polygyny).

Overall, the prevalence of HIV was relatively low in Senegal, Burkina Faso, Côte d'Ivoire, Guinea and Ethiopia (less than 2% for both sexes); moderate in Ghana, Rwanda, Cameroon, Tanzania and Kenya (3–9% among women and 2–6% among men); and high

in Malawi, Zimbabwe and Lesotho (13–26% among women and 10–19% among men). Some 2–9% of men and 4–16% of women had been in a marriage that ended. Among those who were currently married or in union, 6–44% of men and 3–26% of women had previously been married.

In 10 of the 13 countries, the prevalence of HIV was higher among remarried women than among other women. For example, in Côte d'Ivoire, 13% of remarried women were infected, compared with 6% of other women; similar trends were apparent in Kenya (17% vs. 8%) and Lesotho (46% vs. 26%). The pattern was essentially the same for formerly married women, who were more likely than other women to be infected in 10 countries, including Ethiopia (6% vs. 1%), Rwanda (12% vs. 2%) and Zimbabwe (46% vs. 17%).

The relationship between marital history and HIV was less consistent among men. HIV prevalence was greater among remarried men than other men in six countries, including Kenya (10% vs. 4%) and Malawi (20% vs. 7%), and greater among formerly married men than other men in eight countries, including Côte d'Ivoire (11% vs. 2%), Rwanda (8% vs. 2%) and Zimbabwe (44% vs. 13%).

Logistic regression analyses revealed that the odds of HIV infection were generally elevated among formerly married and remarried men and women, especially where the prevalence of infection is high. In all three high-prevalence countries (Malawi, Zimbabwe and Lesotho), divorced, separated and widowed individuals who had not remarried had higher odds of HIV infection than those who were single (odds ratios, 2.4–5.3 among men and 3.0–3.9 among women). Findings were similar among remarried men in these countries (2.6–9.0), though remarried women had increased odds of infection only in Zimbabwe (2.3).

In countries where HIV prevalence was low to moderate, the likelihood of being HIV positive was elevated among previously married women in seven countries (odds ratios, 4.1–12.4) and among previously married men in three countries (2.5–9.4). HIV infection was associated with remarriage in five countries among women (2.2–16.2) and in six countries among men (2.2–9.0).

In multivariate analyses that focused on married respondents, the odds of being HIV-positive were higher among remarried women than among those married for the first time in every country but Lesotho (odds ratios, 2.0–8.3). Among men, remarriage was associated with HIV in Rwanda, Malawi and Zimbabwe (2.1–3.0).

Finally, the researchers assessed HIV discordancy among married couples in which at least one partner had been married before. In the vast majority of cases, both partners were HIV-negative. However, in five countries, at least 10% of couples were serodiscordant, and in two countries, both partners were infected in at least 20% of couples. Partners were generally more likely to be serodiscordant than to both be HIV-positive; the primary exceptions were in Zimbabwe and Lesotho.

The investigators acknowledge that the timing and source of formerly married and remarried respondents' HIV infections cannot be established. Nonetheless, the elevated HIV prevalence among formerly married and remarried women and the high rates of serodiscordance among remarried couples in many countries are of concern, they note. Current HIV prevention programs in Africa, which typically emphasize abstinence and condom use, are most likely "largely irrelevant" to remarried men and women. To help reduce HIV transmission within couples, the researchers recommend that alternative approaches "address gender discrimination and violence" and include testing for both partners.–*S. Ramashwar*

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Young Malawi Women Who Get Payments for Schooling Are Less Likely to Get HIV

In a cluster randomized trial that assessed a cash transfer program in Malawi, young women who received monthly payments were less likely than others to become infected with HIV or herpes simplex virus type 2 (HSV-2)—but only if they had been attending school at the start of the trial.[1] Among young women who had been enrolled in school at baseline, the prevalence of HIV at the 18-month follow-up was lower among those receiving payments than among those in an unpaid control group (1.2% vs. 3.0%); findings were similar for infection with HSV-2 (0.7% vs. 3.0%). However, among participants who had dropped out of school by baseline, the intervention and control groups had similar levels of HIV (8–10%) and HSV-2 (8% each) at follow-up.

The prevalence of HIV in Malawi is 9% among female and 2% among male 15–24-year-olds. Prevalence is especially high in Zomba district (site of the current study), where rates of poverty are substantial and school enrollment is low. Because lack of education and economic dependence on men are believed to put women at increased risk for HIV infection, many countries have implemented cash transfer programs in an attempt to reduce poverty and promote education. However, to date, no randomized controlled studies have found a causal relationship between increased schooling or income levels and reduction in HIV risk.

In this study, investigators randomly selected households from 176 enumeration areas in urban and rural areas of Zomba, and interviewed 3,796 never-married females aged 13–22 who were enrolled in school or had dropped out; 1,706 of these young women underwent STI testing and were included in the current analysis. During the two-year trial, which began in 2008, young women in the intervention group received monthly payments of US$1–5, and their household received an additional US$4–10 per month. Payments to participants who were enrolled in school at baseline were either conditional (requiring at least 80% school attendance in the previous month) or unconditional (no attendance required); payments to participants who had dropped out of school at baseline were always conditional (i.e., dropouts had to resume their schooling and meet the attendance requirement). Young women assigned to the control group received no payments. To reduce possible interactions between women in the intervention group and those in the control group, all participants from a given area were assigned to the same treatment arm. Behavioral outcomes were assessed at baseline and 12 months, and infection with HIV or HSV-2 was determined at 18 months. Logistic regression was used to identify associations between outcomes and the different trial groups.

Baseline characteristics of the intervention and control groups were similar within each of the enrolled and dropout cohorts. Among females enrolled in school, the average age was 15, some 19–22% were sexually experienced and 3% had ever been pregnant. Young women who had dropped out of school by baseline had an average age of 17–18; two-

thirds (68%) were sexually experienced and two-fifths (40–44%) had been pregnant.

Among participants who had been enrolled in school at baseline, the weighted HIV prevalence at the 18-month follow-up was 1.2% in the intervention group and 3.0% in the control group; in a regression analysis that adjusted for background characteristics, young women who had received cash transfers had reduced odds of being HIV-infected (odds ratio, 0.4). The prevalence of HSV-2 at follow-up was 0.7% and 3.0%, respectively, in the intervention and control groups, and those in the intervention group again had reduced odds of testing positive (0.2). At the 12-month follow-up, intervention participants were less likely than control participants to report having had intercourse at least once a week (3% vs. 7%) or a sexual partner who was 25 or older (0.5% vs. 3%) in the past year; in multivariate analyses, the odds of these risk behaviors were reduced among young women who had received cash transfers (0.5 and 0.2, respectively). Finally, a higher proportion of payment recipients than of controls remained enrolled in school during the first year of the intervention (90% vs. 84%).

Among young women who had dropped out of school at baseline, the cash transfer intervention was not effective in reducing STI levels: The intervention and control groups had similar levels of HIV (8–10%) and HSV-2 (8% each) at the 18-month follow-up. However, these intervention participants were far more likely than their control counterparts to have enrolled in school during the first year of the trial (57% vs. 12%; odds ratio, 8.8), and they were less likely to have married (17% vs. 29%; odds ratio, 0.5). As in the analysis of nondropouts, a smaller proportion of intervention participants than of control participants reported having had intercourse at least once a week (19% vs. 30%).

In general, among participants who were enrolled at baseline, outcomes in the conditional cash transfer group did not differ from those in the unconditional cash transfer group; the only exception was pregnancy, which was more common in the conditional group (4% vs. 1%). In regression analyses, young women in the conditional-payment group were more likely than those in the control group to have enrolled in school (odds ratio, 2.1), and less likely to be HIV-positive (0.3) or to have had a partner who was 25 or older (0.1). Participants who received unconditional payments, meanwhile, were less likely than control participants to be pregnant, to report having had intercourse at least once per week and to be infected with HSV-2 (0.1–0.4). Notably, the amount of the cash transfers did not affect the various outcomes.

The investigators note several study limitations, including the absence of baseline data on the prevalence of HIV and HSV-2 among study participants, and the short, two-year intervention period. Yet they believe that this simple intervention showed promise in the effort to reduce rates of risky sexual activity and, in turn, the likelihood of infection with either of these viruses. On the basis of their findings, the authors "suggest that financially empowering school-aged girls might have beneficial effects on their sexual and reproductive health [and] that cash transfer programmes could be attractive to policy makers in Sub-Saharan Africa."–*J. Thomas*

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