

Risk of HIV Transmission from Breast-Feeding Is Elevated if Mother Is Newly Infected

The risk of mother-to-child HIV transmission associated with breast-feeding may be especially high if the woman has only recently become infected, according to a prospective cohort study conducted in Zimbabwe.¹ Among women who had been HIV-negative at delivery but became infected while breast-feeding, the transmission rate was 35 per 100 child-years of breast-feeding during the first nine months after infection—substantially higher than the rate among mothers who had been HIV-positive prior to delivery (nine infections per 100 child-years of breast-feeding). The transmission rate eventually plummeted among newly infected women: None of their infants became infected 12–24 months after their mothers had. Overall, 24% of mothers who had become infected while breast-feeding and 14% of those who had been infected at delivery transmitted the virus to their infants during the 24-month study.

The data come from a trial conducted in clinics and hospitals in Harare, Zimbabwe, from November 1997 to January 2000. The trial was designed to examine whether vitamin A supplements reduced the risk of mother-to-child HIV transmission during breast-feeding (they did not); the investigators subsequently performed this secondary analysis because few data are available on the risk of transmission during breast-feeding among mothers who become infected after delivery. Researchers have suspected that the risk of transmission through breast-feeding is particularly high in the period following infection but prior to seroconversion (when the individual has developed antibodies against the virus), because blood levels of HIV are extremely high during this interval.

Women who gave birth in the participating facilities were eligible for the trial if they resided in the city and did not have an acutely life-threatening illness, and if their infants were singletons who weighed at least 1.5 kg. At enrollment, women provided information about their social and demographic characteristics; in addition, the investigators collected blood samples from mothers and infants,

along with breast milk samples, for HIV testing. Further samples were taken at follow-up visits at six weeks and three months and then every three months afterward, for up to two years. Mothers who had not been infected with HIV at enrollment but tested positive at three months or later were classified as having been infected postpartum; infection was assumed to have occurred halfway between the mother's last negative and first positive tests. The researchers used Kaplan-Meier analyses to compare transmission rates between the 334 mothers whose infections had occurred postpartum and the 2,870 mothers who had been HIV-positive at delivery. In both groups, all infants were HIV-negative six weeks after birth.

Mean age at enrollment was 26 for women who were HIV-positive at delivery and 23 for those who seroconverted during the study. Both groups had an average of 10 years of schooling and a median monthly household income of about US\$75. Almost all women were married or in union. The vast majority (>90%) did not exclusively breast-feed their infant beyond the first three months.

During the first two years after delivery, the rate of mother-to-child HIV transmission was higher among mothers who acquired the virus during the breast-feeding period than among those who tested positive at delivery (26 vs. nine infections per 100 child-years of breast-feeding). Among mothers who had been HIV-positive at baseline, the transmission rate hovered around 8–9 infections per 100 child-years of breast-feeding throughout the study. However, among mothers who seroconverted after giving birth, the rate varied substantially: It was very high during the first nine months after infection (35 per 100 child-years), then declined substantially during the next three months (10 per 100 child-years); no infections occurred during the second year. Overall, the odds of mother-to-infant transmission were about three times as high among mothers who had been infected postnatally as among those who had been HIV-positive at delivery (rate ratio, 2.9); by the end

of the study, 24% of infants whose mothers seroconverted during breast-feeding had tested positive, compared with 14% of those whose mothers had been infected at baseline.

Among women who became infected during the breast-feeding period, the interval between their last negative test and first positive test ranged from a few weeks to nearly a year. Because the timing of the maternal infection could be estimated more precisely for mothers with shorter intervals than for those with longer intervals, the researchers conducted a subgroup analysis of the 51 women for whom the timing of seroconversion could be determined with relative precision (i.e., the interval between the last negative and first positive tests was less than 90 days). Among these women, the rate of breast-feeding-related transmission was strikingly high during the first three months after infection (78 infections per 100 child-years of breast-feeding); it was about half as high during the next six months (38 per 100), and no infections occurred after the ninth month following infection. By the study's end, 30% of infants born to these mothers were infected; nearly two-thirds of these transmissions occurred within three months of the mother's infection, a period when the mother may have tested negative on an antibody-based HIV test.

Finally, analyses of breast milk from seroconverters revealed that 50% of samples collected within 31 days of infection had detectable levels of HIV RNA; the proportion declined to 35–38% during months 2–9 and 25% during months 10–12. Among samples with detectable HIV levels, virus loads during the month after infection were more than 100 times those during the ensuing 11 months, indicating that HIV levels spiked following infection and then declined sharply.

The study's limitations, according to the researchers, include the small sample sizes for the breast milk analyses (ranging from 56 to as few as eight during the year following infection) and the study's inability to identify breast-feeding-related HIV transmissions that occurred before infants were six weeks

old. Nonetheless, they note that the findings suggest that the risk of passing on the virus is “very high” if a mother is newly infected with HIV, “but only for a relatively brief period of time.” Because the majority of transmissions occurred before newly infected mothers were likely to test positive, the researchers believe that offering women multiple postnatal HIV tests “would have only a modest effect” on reducing transmission during breast-feeding; instead, the investigators recommend a “renewed focus on prevention of primary HIV, particularly among pregnant and breast-feeding women.”—*S. Ramashwar*

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Rates of Unintended Pregnancy Remain High In Developing Regions

Despite a drop in global rates of pregnancy and unintended pregnancy, the proportion of pregnancies that are unintended remains high, especially in the developing world, according to a study of worldwide trends in pregnancy levels.¹ The study, the first to evaluate global pregnancy levels by intention and outcome, found that from 1995 to 2008, the global pregnancy rate declined by 17% in both developed and developing regions. The unintended pregnancy rate dropped to an even greater degree—by 29% and 20%, respectively—in developed and developing areas. Yet, roughly four in 10 pregnancies worldwide were unintended in 2008, and the proportion was substantially higher in South America and southern Africa, where six in 10 were unintended.

Unintended pregnancy and unplanned birth can endanger the health of women and their families, and reflect, among other factors, barriers to contraceptive access and use. To identify the regions most in need of improved contraceptive services, investigators estimated global, regional and subregional levels of pregnancies, unintended pregnancies, unplanned births, induced abortions and miscarriages. Estimates of unplanned births were calculated by combining United Nations estimates of numbers of live births in 2008 with findings on the intention status of

births from more than 70 national demographic, health and population surveys, most of which were conducted between 2000 and 2007. For countries that lacked data on unplanned births, the researchers used the weighted averages of findings for countries with available data in their subregion.

Abortion estimates for 2008 were derived by projecting trends between 1995 and 2003 for all regions except eastern Europe, where the decline in abortion incidence from 1995 to 2003 was extremely rapid and not expected to continue at the same pace; the researchers assumed that the rate of decline in the region in 2003–2008 was half of the earlier rate. The number of miscarriages was estimated using a standard formula.

Nearly 90% (185 million) of the estimated 208 million pregnancies in 2008 occurred in the developing world. Globally, 86 million pregnancies were unintended; of these, 41 million ended in abortion, 33 million in unplanned birth and 11 million in miscarriage.

Overall, pregnancy rates were higher in the developing world than in developed countries, for both intended pregnancies (85 vs. 48 pregnancies per 1,000 women aged 15–44) and unintended ones (57 vs. 42 per 1,000). Regionally, Africa had the highest rates of intended and unintended pregnancy (136 and 86, respectively), and Europe had the lowest (49 and 38). Rates were intermediate in North America (53 and 48), Oceania (74 and 44), Asia (78 and 49), and Latin America and the Caribbean (52 and 72); the last was the only region with a higher unintended than intended pregnancy rate.

Subregional variation was greater in Africa and Asia than in Latin America and Europe. For example, overall pregnancy rates in northern and southern Africa were 147 and 140, respectively, compared with rates of 243–263 in eastern, central and western Africa. Similarly, the rate in East Asia (93)—which mainly reflects the situation in China—was considerably lower than the rates in south central, southeastern and western Asia (136–150). Subregional rates covered a narrower span in Europe (75–97) and Latin America and the Caribbean (122–127).

Between 1995 and 2008, pregnancy rates declined by 17% in both developed regions (from 108 to 90 per 1,000) and developing areas (from 173 to 143). The rate of unintended pregnancy fell to a greater extent in the developed world (29%) than in the developing world (20%), while the reverse was

true for intended pregnancies (2% and 17%, respectively). Thus, in developed regions, the reduced pregnancy rate largely stemmed from a drop in unintended pregnancies, most strikingly in eastern Europe. North America (whose data mainly reflect the rates in the United States) was the only region where rates of intended and unintended pregnancy were essentially unchanged.

Still, the global proportion of pregnancies that were unintended in 2008 was high (41%)—and even higher in such developing regions and subregions as Latin America and the Caribbean (58%), South America (64%) and southern Africa (59%). The proportion was also high in North America (48%), exceeding the proportions in Europe’s northern, southern and western regions (39–42%).

Approximately half of all unintended pregnancies ended in induced abortion. The proportion was greater in developed than in developing regions (53% vs. 48%); it was much lower in North America than in Europe (38% vs. 64%).

The proportion of pregnancies ending in unplanned birth was greatest in Latin America and the Caribbean (28%) and lowest in Asia (12%) and Europe (11%). At the subregional level, the proportions were lowest in East Asia (4%) and eastern Europe (5%).

The investigators note that although increased contraceptive use has helped to reduce rates of unintended pregnancy, roughly 140 million women in developing countries were not practicing contraception in 2008, despite their desire to delay or stop child-bearing, and 75 million more were using traditional, failure-prone methods. This unmet need for effective contraception, together with incorrect and inconsistent use among modern method users and the desire for large families, may explain regional variations in levels of unintended pregnancy.

This study had some limitations, including its reliance on retrospective data on pregnancy intentions (which may underestimate levels of unintended pregnancy) and the lack of survey data regarding men’s pregnancy intentions. Pregnancy rates in the major regions and subregions were approximate, because assumptions were made for countries that lacked survey data. Additionally, the current measure for unintended pregnancy does not account for ambivalence about pregnancy or degrees of intention.

Nevertheless, the study findings present a detailed global, regional and subregional pic-

ture of trends in unintended pregnancies and their outcomes. Even though the recent decline in unintended pregnancies is encouraging, as the authors note, further reductions will require improved access to and quality of contraceptive care. "Efforts to improve family planning services on a global scale would go a long way toward alleviating existing unmet need for contraception, and would make a large contribution to reducing unintended pregnancy."—A. Kott

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Male Circumcision Reduces HPV Risk For Female Partners

New data from Uganda indicate that male circumcision—which has already been shown to reduce men's risk of becoming infected with human papillomavirus (HPV), HIV and other STIs—confers partial protection against HPV infection on female partners.¹ At the end of a two-year randomized trial, 28% of women whose male partner had been circumcised tested positive for a high-risk (i.e., potentially cancer-causing) type of HPV, compared with 39% of women whose partner was uncircumcised (prevalence risk ratio, 0.7).

The data come from a randomized controlled trial conducted in Rakai, Uganda, in 2003–2007 to assess the effects of circumcision on transmission of HIV and other STIs. Researchers recruited uncircumcised men aged 15–49 who wished to undergo the procedure and randomly assigned them to be circumcised immediately (intervention group) or after 24 months (control group). In addition, they invited the female partners of male participants who were married or in a long-term relationship to take part in the study. At baseline, 12 months and 24 months, female partners provided information on their social and demographic characteristics, sexual risk behaviors and health, including symptoms of genital-tract infection. They also provided self-administered vaginal swabs to be tested for 14 high-risk HPV types. If a woman tested positive for an HPV type she had not previously had, the infection was assumed to have occurred midway between the last negative test for that type and the new positive test; infec-

tions were classified as single or multiple, depending on whether more than one HPV genotype was detected. The infection was considered cleared if a previously detected HPV type was no longer present at a subsequent visit.

Because having HIV increases one's risk of HPV infection (and vice versa), participants who were HIV-positive or who seroconverted during the trial were excluded from the analysis. Women who had not enrolled at the same time as their partner or had not provided initial vaginal swabs were also excluded, yielding a sample consisting of 648 women in the intervention group and 597 in the control group. Data from 84–87% of female participants were available at the 12- and 24-month follow-ups. At baseline, most women in the intervention and control groups (82–85%) were in monogamous unions, while the remainder were in polygynous ones. Most were Catholic (60–61%), had a primary education (72–74%) and had not used condoms in the past year (81–85%). Fewer than 1% had had transactional sex, about one-third reported alcohol use with sex and 20–23% had ever used voluntary HIV counseling and testing services. Almost half of women in the two groups (46–47%) reported having had at least one STI symptom in the past year. Patterns of sexual behavior differed between the women and their partners, as 43–46% of men but only 4% of women reported having had more than one sexual partner in the past year.

At baseline, the proportion of women in the intervention group who tested positive for high-risk HPV (35%) was similar to that in the control group (37%). At 12 months, however, prevalence was lower in the intervention group (34%) than in the control group (41%; prevalence risk ratio, 0.8); after 24 months, those proportions were 28% and 39%, respectively (0.7). The prevalence of low-risk HPV types was also lower among women in the intervention group than among those in the control group (33% vs. 43%; prevalence risk ratio, 0.8).

Similarly, the incidence of infection with any high-risk HPV type was lower in the intervention group than in the control group—25 vs. 34 cases per 100 person-years during the first 12 months (incidence rate ratio, 0.7) and 21 vs. 27 cases per 100 person-years during the full 24 months (0.8). Moreover, the incidence of infection with multiple high-risk strains was lower among women in the intervention group than among those in the con-

trol group, both during the first year (7 vs. 11 cases per 100 person-years) and over the full length of the study (9 vs. 13 per 100).

A regression analysis examining the relationship between infection with high-risk HPV at 24 months and women's social and demographic traits suggested that a number of subgroups benefited from the intervention. Women in the intervention group were less likely than those in the control group to become infected if they were aged 15–19 (incidence rate ratio, 0.5) or 25–29 (0.7), were in a monogamous relationship (0.8) or had at least a secondary education (0.6). They also benefited from circumcision if, in the past year, they had had only one sex partner (0.8), had not had any nonmarital relationships (0.8), had not used condoms (0.8), had not had sex while using alcohol (0.7) and had not experienced STI symptoms (0.7–0.8). After adjustment for women's age, condom use, alcohol use with sex, number of sex partners in the past year and polygyny, the overall incidence of HPV was lower among women in the intervention group than among those in the control group (0.8).

Finally, clearance of high-risk HPV was more common in the intervention group than in the control group. After adjustment for enrollment characteristics, 66% of infections among women in the intervention group cleared, compared with 59% of those among controls.

The investigators conclude that the apparent reduction in HPV risk among women whose partner had been circumcised was most likely due to "a reduction of penile HPV carriage ... [leading to] decreased female incidence and increased clearance, probably by lowering the chances of re-infection." Although these results were obtained among a sample of HIV-negative, partnered individuals and may not be applicable to other populations, the researchers contend that their data strengthen the case for using circumcision to reduce transmission of STIs in resource-poor settings. Because the procedure provides only partial protection against HPV, however, the investigators point out that "the promotion of safe sex practices is also important."—H. Ball

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Training Program for Birth Attendants Reduces Neonatal and Perinatal Mortality in Zambian Clinics

A birth attendant training program that has been shown in a multinational trial to reduce stillbirth and perinatal mortality rates among neonates weighing at least 1.5 kilograms—most of them born outside of hospitals—also reduced mortality among infants of all weights born in Zambian clinics, a related study revealed.¹ Following implementation of the program, the rates of seven-day neonatal mortality (deaths during the first week of life) and perinatal mortality (seven-day neonatal deaths plus stillbirths) declined by about a third. However, a new analysis from the original multinational trial revealed that the intervention did not yield the same benefits for the small subgroup of very low birth weight infants.²

The major causes of death during the first seven days of life are asphyxia, low birth weight, prematurity and infections. To help prevent such deaths, the World Health Organization created the Essential Newborn Care course, which improves birth attendants' ability to provide evidence-based newborn care. Researchers tested the program, in conjunction with the American Academy of Pediatrics' Neonatal Resuscitation Program, in a "train-the-trainer" trial involving a total of 96 rural communities in Argentina, Democratic Republic of the Congo, Guatemala, India, Pakistan and Zambia.

The two programs were introduced sequentially. In each country, after baseline data on birth outcomes had been collected, the Essential Newborn Care program was implemented and outcome data were collected for 4–9 months. Next, the Neonatal Resuscitation Program was initiated (except in Argentina), and outcome data were collected for 12 months. The year of implementation varied by country; data were collected for the first program in 2005–2007, and the second in 2006–2008.

At each study site, two "master trainers" completed the two programs and were trained in all study procedures. These trainers then trained a community coordinator, who in turn trained the community's birth attendants. The courses included material on cleanliness, neonatal care, initiation of breathing and resuscitation, prevention of hypothermia, breast-feeding, infant care and recog-

nition of complications. The birth attendants taught relevant material to the mothers after delivery and collected data on neonatal outcomes at delivery and at seven days. To reduce bias, baseline data were collected after the birth attendants had been trained but before the intervention was implemented. The investigators hypothesized that the intervention would reduce rates of all-cause seven-day neonatal mortality; secondary outcomes included rates of stillbirth, perinatal mortality and death due to birth asphyxia (failure to begin or continue breathing at birth). The study used an intent-to-treat design in which all births in a community were included, regardless of whether a trained attendant was present.

According to a prior analysis, rates of stillbirth declined among infants weighing at least 1.5 kilograms following introduction of the Essential Newborn Care program. Rates of perinatal mortality also declined, although only among infants delivered by an attendant; no change occurred in rates of all-cause neonatal death during the first seven days, and no further benefits were detected after introduction of the Neonatal Resuscitation Program.

In current analysis, the investigators examined outcomes among the 1,096 very low birth weight infants (<1.5 kilograms) in the study. At each stage of the study, most births occurred at home (52–64%); in 10–19% of all births, no attendant, midwife or physician was present. Logistic regression analyses revealed no reduction in rates of stillbirth, perinatal mortality or all-cause seven-day neonatal mortality following introduction of the Essential Newborn Care program. One benefit did emerge during the Neonatal Resuscitation Program portion of the trial: Rates of death from birth asphyxiation declined from 17 to 3 deaths per 1,000 live births. However, no other outcomes showed improvement.

These findings, the researchers note, are not surprising: Very low birth weight infants "are likely to require advanced care," and the necessary interventions (e.g., prenatal steroid treatment, caesarean section) are not typically available for home births or births that take place in primary-care facilities. However, because the program has shown benefits among infants weighing more than 1.5 kilograms,

who constitute the vast majority of neonates, Essential Newborn Care training "should continue to be advocated for all births, because it can reduce markedly the rates of stillbirths, neonatal deaths and perinatal deaths."

Moreover, the results were more encouraging in a related trial that assessed the intervention's effectiveness for institutional deliveries in Zambia, one of the few countries where the mortality rate among children aged five or younger has increased since 1990. The study was conducted in 18 urban health centers in Lusaka and Ndola (the country's two largest cities) in 2004–2006; these clinics accounted for 98% of institutional low-risk deliveries in these cities. Other than the focus on institutional (rather than all) deliveries, the study protocol, including selection of outcomes, was identical to that of the six-country study, and all 123 midwives who performed deliveries at the institutions were trained. The researchers again used logistic regression models to examine outcomes.

In total, 71,689 infants were born during the study period. After implementation of the Essential Newborn Care program, all-cause seven-day neonatal mortality decreased from 12 per 1,000 births to seven per 1,000 births (relative risk, 0.6), in part because of declines in levels of birth asphyxia and infection; no change was observed in rates of death due to low birth weight or infant malformation. In addition, perinatal mortality fell from 18 to 13 deaths per 1,000 births (0.7), although the stillbirth rate did not change.

After the Neonatal Resuscitation Program training was implemented, the rate of seven-day neonatal mortality increased from six per 1,000 to 10 per 1,000 (relative risk, 1.5), though no change in stillbirth occurred. The increase in seven-day mortality, the researchers believe, was an artifact of suboptimal follow-up rates, especially during the first part of the study; for example, seven-day outcomes were available for only 75% of infants during the Essential Newborn Care portion of the study. When the investigators used a generalized estimating equation model to impute the missing death data, the estimated rate of seven-day mortality decreased from 36 to 25 per 1,000 live births following implementation of the Essential Newborn Care program, and declined further to 16 deaths per 1,000 after the Neonatal Resuscitation Program was started. This trend makes more sense, the investigators note, as "it is unlikely that additional resuscitation training could

have increased 7-day neonatal mortality rates.”

In addition to the low seven-day follow-up rate early in the project, the study's main limitation was its before/after design; the researchers point out that although a cluster-randomized design would have been more desirable, it would have required a far greater sample size to detect statistically significant differences in outcomes. While additional research is needed “to confirm the effectiveness and to assess the sustainability” of Essential Newborn Care training “in other institutional settings,” the investigators believe that the findings to date suggest that “neonatal care packages seem to be an effective way to improve neonatal outcomes in the developing world.”—*P. Doskoch*

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Contraceptive Use Is Rising Faster in Eastern Than Western Africa

In western Africa, progress in promoting women's readiness to use contraceptive methods, and in increasing their actual use of these methods, has been “dismally slow,” according to the authors of a new analysis of Demographic and Health Survey (DHS) data for 1986–2007.¹ In countries where at least two surveys were conducted during that span, the median proportion of fertile, married or cohabiting women who wanted to postpone or cease childbearing was almost identical in the earliest (46%) and latest surveys (47%). Although the median proportion of these women who were using modern contraceptives rose from 7% to 15%, the rate of increase (0.6 percentage points annually) has been slow. Progress has been more substantial in eastern Africa, however: The median proportion wishing to postpone or cease childbearing has risen from 56% to 72%, and the median proportion using a modern method has increased from 16% to 33%, or 1.4 percentage points annually.

To examine trends in family planning uptake in Sub-Saharan Africa, the researchers an-

alyzed data from the 24 countries that had conducted two or more DHS surveys between 1986 and 2007, including 13 in western Africa (Benin, Burkina Faso, Côte d'Ivoire, Cameroon, Ghana, Guinea, Liberia, Mali, Nigeria, Niger, Senegal, Chad and Togo) and 11 in eastern Africa (Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe). In western Africa, the median year of the earliest survey for each country was 1991; in eastern Africa, it was 1992. In both areas, the median year of the latest survey was 2004. The researchers examined trends in family-planning-related measures among nonpregnant, fertile women who were married or cohabiting; in assessments of contraceptive use, they excluded women who had had a recent birth but had not yet resumed sexual activity and menstruation.

The analyses focused on four measures. To examine readiness to use contraceptives, the researchers calculated the proportion of women who wished to postpone or cease childbearing. Next, women were classified as willing to use contraceptives if they approved of family planning and they believed their partner approved as well. The third measure, ability to use contraceptives, was examined only among nonusers; it assessed the proportion of women who were familiar with both the pill and the injectable (the two most commonly used methods among married African women) and who knew where to obtain a contraceptive method. The final measure was current use of any modern method. In examining trends for these measures, the investigators adjusted the data for demographic changes during the study period that may have affected contraceptive attitudes and use, such as educational attainment, urban residence and (for the childbearing intentions measure) number of living children and time since most recent birth.

In western Africa, the median proportion of women who wanted to postpone or cease childbearing barely changed between the earliest (46%) and latest (47%) surveys. In contrast, a substantial increase—from 56% to 72%—occurred in eastern Africa; most of this change stemmed from a rise in the proportion of women who wanted to stop (rather than delay) childbearing. Mozambique was an exception to the high proportions seen in eastern Africa: Only 48% of women wished to cease or postpone having children.

Similarly, the change in the median pro-

portion of women who said that both they and their partner approved of family planning was substantially greater in eastern Africa (from 44% to 63%) than in western Africa (from 32% to 39%). Moreover, the range of proportions across countries was much smaller in eastern than western Africa, suggesting greater consistency in attitudes in the former region. In both eastern and western Africa, women were substantially more likely to say that they approved of family planning than to say that their partner approved.

In western Africa, the median proportion of contraceptive nonusers who said they were familiar with both the pill and the injectable and knew where to obtain a method rose from 8% to 29%, although the latter figure is still “shockingly low,” according to the investigators. Once again, the proportions were substantially higher in eastern Africa in both the earliest (32%) and latest (64%) surveys.

Finally, among women at risk of pregnancy, the median proportion who were using contraceptives rose from 7% to 15% in western Africa, equivalent to an increase of 0.6 percentage points annually; in eastern Africa, the median proportion increased from 16% to 33%, or 1.4 percentage points per year. Data from the 16 countries in which three or four DHS surveys had been conducted during the study period revealed that in both regions, the rate of increase in contraceptive use was greater during the 1990s (0.7–2.7 points annually) than during the 2000s (0.6–1.5 points annually).

The researchers note that although their measures of contraceptive attitudes were relatively simplistic, the findings suggest that approval and use of contraceptives remains low in western Africa. At the current rate of contraceptive adoption, fertility in the region will decline far less than the United Nations has projected, and population growth will greatly exceed predicted levels (western Africa's population is currently projected to grow from 270 million to 626 million between 2005 and 2050). In eastern Africa, the researchers note, “the prospects for a future decline in fertility are much more positive.” They contend that two factors may explain a substantial proportion of the differences in contraceptive attitudes and behavior between the two regions. First, the findings from this study regarding awareness of where to obtain contraceptives suggest that countries in western Africa have not made as strong an effort as their counterparts in eastern Africa to make

family planning widely available. Second, educational attainment among young women—a strong predictor of contraceptive use—increased to a much greater extent in eastern than western Africa during the study period. Thus, the investigators suggest that to “reverse stagnation in the use of modern family planning methods in most of western Africa and in some eastern African countries, contraceptive services need to be made more accessible” and “schooling opportunities for girls need to be greatly improved.”—*P. Doskoch*

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China's Imbalanced Sex Ratio May Lead to Reduced Risk of STIs Among Males

Men in China have elevated odds of having had nontransactional premarital sex and of testing positive for an STI if age-matched women are relatively abundant in their communities, according to a national study on the relationship between sex ratios and men's sexual risk behaviors.¹ Moreover, men who live in communities with higher ratios of females to males have decreased odds of having engaged in transactional sex. Extrapolating from these findings, the researchers suggest that the continuing masculinization of China's sex ratio may reduce men's risk of engaging in nontransactional premarital sex and of contracting an STI, while increasing the likelihood of their having intercourse with a sex worker.

China has had an unequal sex ratio at birth for decades, and this imbalance grew substantially between 1982 and 2001, from 93 to 85 girls per 100 boys. Few studies have examined how a deficit of women influences men's sexual risk behaviors and STI risk. This study used individual-level data from the 1999–2000 Chinese Health and Family Life Survey (CHFLS) and sex ratio measures from national censuses conducted in 1982, 1990 and 2000. The analytic sample consisted of 1,023 nonmigrant male CHFLS respondents aged 20–44, most of whom provided a urine sample for STI testing. To standardize the data for men born in different decades, and to restrict the sex ratio calculations to individuals of similar age, the re-

searchers calculated the community-level sex ratio as the ratio of women aged 15–21 to men aged 17–23 in each respondent's community when he was 20 years old. Separate logistic regression models were used to identify associations between the sex ratio and three sexual risk outcomes: having ever had nontransactional premarital sex, having ever had transactional sex (regardless of marital status) and testing positive for an STI (gonorrhea, chlamydia or trichomoniasis).

Forty-eight percent of respondents were born in the 1970s, while 38% were born in the 1960s and 14% in the 1950s. On average, 49% of the population in men's communities resided in urban areas, and the mean sex ratio was 90 females per 100 males. One-fourth of respondents had had nontransactional premarital sexual intercourse, 9% had engaged in transactional sex and 4% tested positive for gonorrhea, chlamydia or trichomoniasis.

Regression analysis revealed that an increase in the sex ratio of one woman per 100 men was associated with a 1.5% increase in the odds that a man had engaged in nontransactional premarital intercourse. At this rate of change, a reduction in the sex ratio of eight women per 100 men—roughly the change in China's sex ratio at birth from 1982 to 2001—would result in an 11% decline in the odds that a man had had nontransactional premarital intercourse. Compared with men born in the 1950s, those born in the subsequent two decades were more than twice as likely to have had such sex (odds ratios, 2.5 and 2.8, respectively).

By contrast, the odds that a man had engaged in transactional sex declined by 2% for every additional woman per 100 men, though this association just missed statistical significance ($p=.053$). At this rate, a reduction in the female-to-male sex ratio of eight women per 100 men would increase the odds that a man had had transactional sex by 17%. Men born in the 1970s were more likely than those born in the 1950s to have had transactional sex (odds ratio, 2.2). In the final regression analysis, an increase in the sex ratio of one woman per 100 men was associated with a 3% increase in the likelihood that a man would test positive for an STI; a decrease of eight women per 100 men would reduce the odds of a positive test by 22%.

Together, these findings suggest that the shortage of women in China increases the likelihood that men will engage in transactional sex, but decreases their odds of contracting an

STI. Further analysis found that men who had had transactional sex were, in fact, more likely than others to test positive for an STI (odds ratio, 3.3), but that the increase in STI risk resulting from transactional sex was outweighed by a reduction in STI risk resulting from the decline in nontransactional premarital sex. Additional analyses revealed no evidence of confounding cohort or community effects on the sexual risk outcomes.

The researchers note that, in contrast to speculations that China's declining female-to-male sex ratio will lead to increased prevalence of HIV and other STIs, their study found that men were less likely to test positive for STIs when relatively fewer women were available for sexual relationships or marriage. However, they identified several limitations of the study: the inability to date the timing of respondents' sexual behaviors, the lack of complete residential histories and the unknown influence of sex ratio on frequency of intercourse and prevalence of extramarital sex or multiple partnerships. The authors recommend that future research examine women's sexual behavior—which may counterbalance men's behavior—and explore “the consequences of imbalanced sex ratios for men's and women's sexual health behavior in ... other countries [such as India] that are experiencing a numerical deficit of women.”—*J. Thomas*

REFERENCE

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