Sexual mixing patterns and sex-differentials in teenage exposure to HIV infection in rural Zimbabwe

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Summary

Background HIV-1 prevalence typically rises more rapidly at young ages in women than in men in sub-Saharan Africa. Greater susceptibility to infection on exposure in women is believed to be a contributory factor as is greater exposure to previously infected sexual partners of the opposite sex. We investigated the latter hypothesis using data from a field study in rural Manicaland, Zimbabwe.

Methods Quantitative data on onset and degree of sexual activity, numbers of partners, concurrent partnerships, condom use, and partner characteristics were used in conjunction with epidemiological data on age and sex specific prevalence of HIV infection to do statistical analyses of association between key variables. Mathematical models and qualitative data were used to aid analysis and interpretation.

Findings Older age of sexual partner was associated with increased risk of HIV-1 infection in men (odds ratio 1·13 [95% CI 1·02–1·25]) and women (1·04 [1·01–1·07]). Young women form partnerships with men 5–10 years older than themselves, whereas young men have relationships with women of a similar age or slightly younger. Greater number of lifetime partners is also associated with increased risk of HIV (1·03 [1·00–1·05]). Young men report more partners than do women but infrequent coital acts and greater use of condoms. These behaviour patterns are underpinned by cultural factors including the expectation that women should marry earlier than men. A strong gender effect remains after factors that affect exposure to infected partners are controlled for (6·04 [1·49–24·47]).

Interpretation The substantial age difference between female and male sexual partners in Manicaland is the major behavioural determinant of the more rapid rise in HIV prevalence in young women than in men. Theoretical studies have suggested that this difference is an important determinant of observed epidemiological patterns but the study reported in this paper provides clear empirical evidence of association.

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Introduction

Data from antenatal surveillance[1] and population[2–5] surveys in sub-Saharan Africa reveal extremely high levels of HIV infection in teenage women. By contrast, infection rates in men remain low until their mid-to-late 20s. Development of strategies that prevent the early build-up of HIV infection in young women is a key public-health priority. However, this requires a sound understanding of the biomedical, behavioural, cultural, and socioeconomic processes that contribute to observed patterns of infection.

As with other sexually transmitted diseases (STDs),[6] the probability of male-to-female sexual HIV transmission is greater than that from female to male.[7] However, mathematical-model simulations indicate that differences in exposure to infection, due to contrasting patterns of sexual behaviour and location within sexual networks, also affect patterns of spread of STDs.[8–12] Figure 1 shows how more extensive sexual mixing between young women and older men can increase the sex ratio of HIV prevalence at ages 15–19 years for a plausible range of ratios of male-female:female-male HIV transmission probabilities in a generalised HIV epidemic simulated in a heterosexual, sexual activity-stratified population. The model[13] simulations were generated by varying the ratio of male-female versus female-male transmission while holding the geometric mean of the two constant. From a baseline scenario in which the pattern of sexual partner choice according to age is assortative (like-with-like), the proportion of women who would otherwise have had a partner of the same age but preferentially chose one 5–10 years older was varied systematically along with the
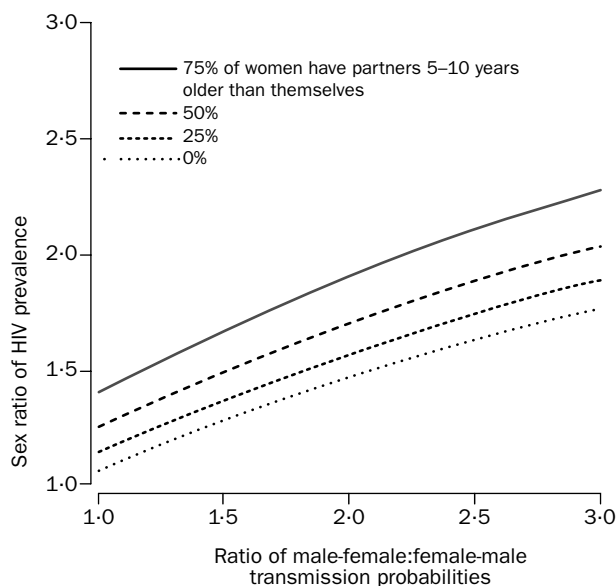
Figure 1: **Modelled effects of age differences between partners on the sex ratio of HIV prevalence at ages 15–19 years**

reciprocal for men, in the reverse direction. Sexual activity was assumed to commence at age 15 years for both sexes.

Similar sex-patterns and age-patterns of HIV infection have been noted in rural Zimbabwe[14] where the HIV epidemic probably began to spread in the late 1980s [15] and HIV prevalence remains very high.[14] One in four adults is currently infected, a level which, if maintained, means that a young person entering the sexually-active population today will have a two out of three chance of acquiring HIV infection before reaching his or her 55th birthday.[12] Clearly the protection of future generations from this tragedy is a crucial goal.

To identify current risk behaviours for adult HIV infection in rural Zimbabwe, we did a random household survey of 9843 adults in the eastern province of Manicaland. Here we use quantitative data on sexual behaviour from 4429 young men and women and findings from parallel qualitative research to investigate the behavioural risk factors for HIV infection in young people and to identify factors contributing to the higher incidence in young women.

Methods

Participants and procedure

Individual-based stochastic model simulations of networks of sexual partnerships and STD transmission suggest that, in advanced stages of an epidemic, measures of risk behaviour accumulated over periods similar to the duration of infection will be the best predictors of individuals' infection.[16] For HIV, for which the incubation period for AIDS is long, measures such as age at first sexual intercourse and number of lifetime partners will be better indicators of exposure to infection—and, thus, of current infection—than measures restricted to shorter time intervals. The latter may be indicative of cumulative behaviour but often are not. These simulations also indicate that a person's risk of acquiring infection is determined mainly by local rather than global network structures.

More generally, model simulations show that patterns of mixing between different age-groups and sexual activity classes are important in determining the course of HIV epidemics.[10,17] Thus, a person's position within the local sexual partner network will strongly affect their risk of exposure to infection. An obvious example would be that of a married woman who is faithful to a husband who has unprotected sex with commercial sex workers. In an established epidemic, this woman's risk of HIV infection will be high, even though her own behaviour is intrinsically low risk.

The survey questionnaire was therefore designed to provide measures of individuals' accumulated behaviour (age at first sex and numbers of lifetime partners) and the location (where formed), nature (casual/regular, coital frequency, and condom use) and partner characteristics (age and other concurrent partners) of up to two most recent partnerships within the past month. Regular partnerships comprised marriages and cohabiting and long-term (more than 1 year) relationships.

We collected quantitative data in a stratified population-based survey done in Manicaland province between July, 1998, and January, 2000. Population strata comprised forestry and tea and coffee plantations, rural trading centres, and subsistence farming areas. Eligible men and women—15–54 year old local residents—were identified in a preliminary household survey. Written informed consent was sought as a condition of enrolment and a separate free voluntary HIV counselling and testing service was made available (prior ethical approval for the study was granted by the Research Council of Zimbabwe, Number 02187, and the Applied and Qualitative Research Ethics Committee, Oxford, UK, N97.039).

Participants were interviewed with a structured questionnaire on sociodemographic characteristics and sexual relationships. Previous research in Manicaland has shown that respondents are reticent about disclosing personal information,[18] so an informal confidential voting interview (ICVI) method was used for questions on sexual relationships in three-quarters of the interviews with literate respondents (selected at random). This method provides the confidentiality associated with fuller disclosure in postal self-completion questionnaires or computer-assisted interviews,[19] in a way that is practicable in less-developed settings.[20] Non-literate respondents (8%) were enumerated in standard face-to-face interviews. Enumerators (social science graduates) were trained to introduce themselves and the project thoroughly, to spend time building a good rapport with respondents, to adopt an informal, flexible, and non-prejudicial approach, and to explain the confidentiality procedures carefully.

Dried blood-spot and urine (women only) samples were collected for HIV and pregnancy testing. A dipstick-dot immunoassay with high sensitivity and specificity (99·6% in both cases[21]) was used to detect the presence of antibodies to HIV. We used a commercial test to detect early pregnancy (Betatex Direct Latex Agglutination Test, Omega Diagnostics, Alloa, UK).

Focus group discussions[22] and pocket chart voting exercises[18] on the sexual experiences of young people were done with groups of teenage women (n=7), teenage men (4), older men (4), divorced women (2), married women (1), widowed women (1), and commercial sex workers (1). We did in-depth interviews with key informants and participant observation at local beer halls. Topics explored included the ages at which young men and women first engage in sexual relationships, the nature and circumstances of these relationships, premarital sexual activity, condom use, and characteristics of partners. Common themes emerging from the meetings and observations were identified. The perspectives of the different sociodemographic groupings were compared with greater weight given to themes that occurred repeatedly.

Statistical analysis

Data entry and validation were done using custom-made forms created in SPSS-PC version 5.0. Data analysis used the STATA (version 6.0) and SAS System for Windows (version 8.0) statistical packages. Logistic regression models were developed to test the effects of the measures of sexual behaviour on the risk of having acquired HIV infection in sexually experienced young people. Bivariate models were constructed for each measure for men and women controlling for age alone. Multivariate models were developed using reverse stepwise regression and including gender interaction terms to test for possible male-female differences in aspects of sexual behaviour found to affect current HIV infection status. These were constructed first for all sexually experienced respondents (model I) and then for the subsets of respondents who reported a sexual partnership in the month and 2 weeks before interview, for whom additional data on recent partners' characteristics (model II), and condom use (model III) were available, respectively. Except where stated, all men and women aged 17–24 years at last birthday were included in the statistical analyses and age at last birthday was transformed by subtracting 20·5 years before analysis.
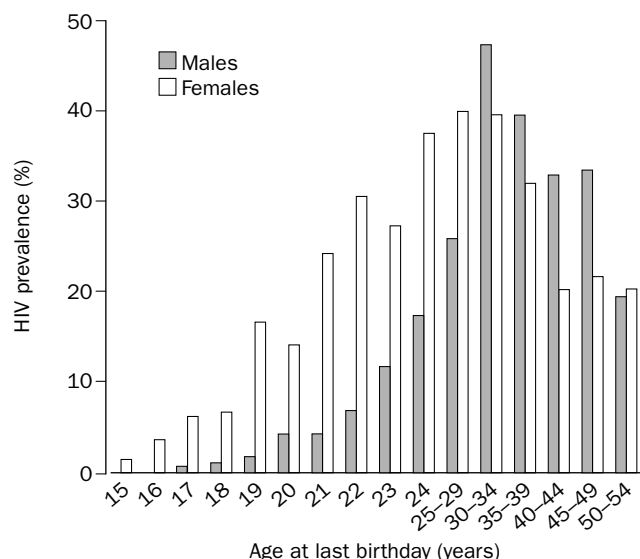
Figure 2: **HIV prevalence by age and sex**

Results

98% (8233 of 8386) of households were included and 4419 men (2153 younger than 25 years of age, 75% of those eligible) and 5424 women (2276 [73%]) joined the study. 8% of respondents were nonliterate.

Women aged 15–24 years are considerably more likely to be infected than men of the same age (age-adjusted odds ratio 4·62 [95% CI 3·65–5·84]; p<0·001; figure 2). In women, HIV infection commences at around age 16 years and incidence is extremely high throughout the late teens and early 20s. In men, the rise in HIV prevalence is concentrated in the mid-to-late 20s and early 30s.

Seven (1·0%) of 710 men and 23 (2·3%) of 980 women reporting never having had sex were HIV-positive. 15 (1·6%) of 958 women had a positive pregnancy test result. Age-adjusted odds ratios for HIV (compared with young people who reported having started sex) were 0·20 for men (95% CI 0·07–0·56) and 0·11 for women (0·07–0·19), and 0·11 (0·06–0·19) for current pregnancy.

Median age at first sexual relationship, calculated from data on proportions of 15–24 year old respondents reporting experience of sex by current age, was similar (18·5 years) for men and women. Focus group estimates of when young women start sex varied widely: 11–13 years (group of older men), 12–15 years (married women), 14–16 years (young men), 15–17 years (young women). All groups felt that most women started sex before age 17 years. The focus group estimates for young men were more consistent and put the median age at around 16–17 years.

The ICVI method was found to be effective in eliciting more reports of multiple and casual partners.[20] However, the qualitative data suggest that the levels of partner acquisition reported by both men and women are still underestimates.

Age-adjusted odds ratios for HIV infection for the various measures of high-risk sexual behaviour are presented in table 1. In these bivariate analyses, the indicators of accumulated exposure show effects on current HIV infection levels. Earlier commencement of sexual activity and larger numbers of lifetime partners are both associated with greater likelihood of infection. By contrast, indicators of recent high-risk behaviour (sex acts in the last 2 weeks and a recent casual partner) show no effects. Consistent condom use with a recent partner is associated with higher chances of infection in young women, partly because those with more lifetime partners were more likely to report recent condom use (age-adjusted odds ratio 1·18 [95% CI 1·09–1·28]; p<0·001). There is also some evidence of reverse causality. Young women found to be HIV-positive in the survey were more likely to report consistent condom use if they had previously had an HIV test (4·46 [1·27–15·59]; p<0·001) which was not the case for uninfected women (p=0·578; n=412).

Among those with at least one partner in the past month, age difference with most recent partner is a significant predictor of HIV infection status. Men with partners of similar age and women with older partners were more likely to be infected (figure 3). Women reporting relationships with men who had other partners were also at higher risk of HIV infection. There is no evidence that individuals who met their partners when working or travelling away from home are at greater risk than those who met partners locally.

Table 2 shows the results of the reverse stepwise, multivariate analysis of behavioural correlates of HIV infection. For all sexually experienced respondents (model I), female sex, older age, more lifetime partners, and younger age at first sexual intercourse are associated with greater risk of HIV infection. Age and number of lifetime partners have stronger effects in men and women, respectively. For those with at least one recent partner (model II), age difference with most recent partner shows a significant effect but the effect of age at first sex ceases to be

Sexual behaviour	Men			Women		
	Odds ratio (95% CI)	p	n	Odds ratio (95% CI)	p	n
Respondents' characteristics						
Age of respondent	1·56 (1·39–1·76)	<0·001	1453	1·18 (1·11–1·25)	<0·001	1255
Age at first sexual intercourse	0·92 (0·84–1·01)	0·076	1453	0·86 (0·80–0·92)	<0·001	1253
Lifetime partners	1·02 (1·01–1·04)	0·007	1444	1·17 (1·09–1·25)	<0·001	1232
Sex acts in the past 2 weeks	1·01 (0·96–1·07)	0·604	1438	0·99 (0·96–1·02)	0·523	1226
Partnership characteristics						
Age difference with most recent partner (number of years partner is older)	1·13 (1·02–1·25)	0·017	559	1·03 (1·00–1·06)	0·032	677
Recent partner a casual partner	0·94 (0·51–1·74)	0·848	582	1·53 (0·87–2·68)	0·134	690
Recent partner has other partners	0·82 (0·38–1·77)	0·622	468	2·06 (1·35–3·14)	0·001	505
Met recent partner when away from home area	0·93 (0·49–1·76)	0·824	580	1·21 (0·86–1·72)	0·277	691
Consistent condom use with most recent partner	1·15 (0·52–2·55)	0·729	403	2·57 (1·40–4·72)	0·002	568

Adjusted odds ratios from reverse stepwise logistic regression analyses. Univariate analysis for age; bivariate analysis controlling for age for the behavioural variables.

Table 1: **Univariate and bivariate analysis of effects of aspects of sexual exposure on risk of HIV infection in sexually-experienced male and female respondents aged 17–24 years**
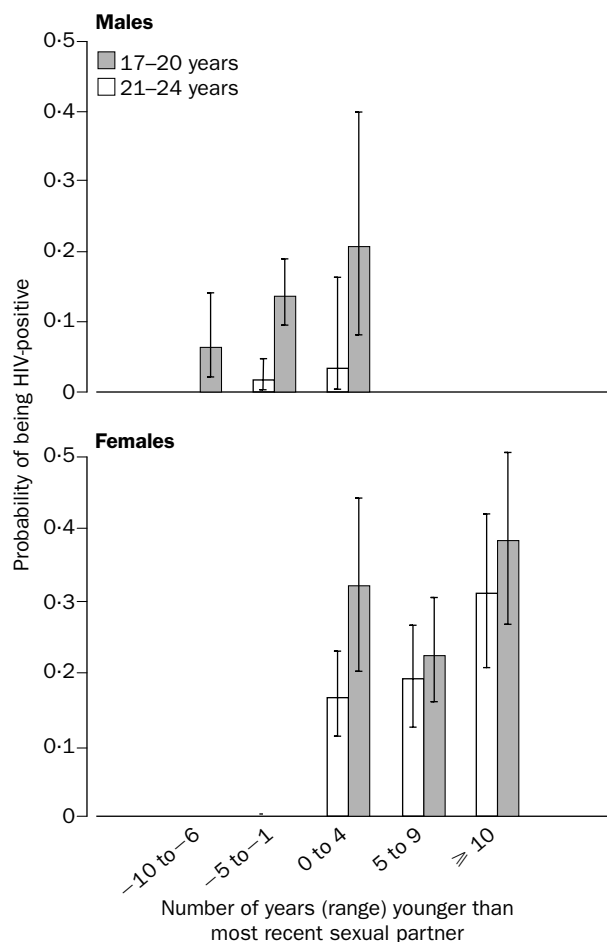
Figure 3: **Probability of being infected with HIV by age and age difference with most recent sexual partner**

Despite the very similar pattern of reported age at first sexual intercourse, young men report larger numbers of lifetime partners than women of the same age (figure 4). 106 (51%) of 207 men aged 24 years reported five or more partners compared with eight (5%) of 175 women (p<0·001).

Among sexually experienced 17–24 year olds, more women than men reported a partner in the past month (732 [60%] of 1226 vs 613 [43%] of 1430; age-adjusted odds ratio 1·89 [95% CI 1·61–2·21]; p<0·001). Similarly, a greater proportion of young women with a recent partner reported having had sex in the past 2 weeks (575 [79%] of 730 vs 440 [72%] of 611; 1·43 [1·11–1·84]; p<0·001). These, in turn, reported more sex acts than men of the same age (age-adjusted negative binomial regression coefficient 0·32 [0·19–0·45]; p<0·001). Of those currently abstaining from sex, women were more likely to be doing so due to a pregnancy (76 [16%] of 482 vs 20 [3%] of 797; p<0·001) and men due to fear of HIV transmission (305 [38%] of 797 vs 32 [7%] of 482; p<0·001).

An assessment of characteristics of recent partnerships found that even at young ages, men typically form sexual relationships with younger women (figure 5). The age difference is narrow during the late teens but increases progressively with age. For young women, the age difference reduces with age, but even in the 20s, nearly a quarter are in relationships with men 10 years older than themselves. Over the full age-range of 15–24 years, the median age difference with partners is 3 years (IQR 1–4) for men and 6 years (4–9) for women, the discrepancy being due to the exclusion of the older men involved in partnerships with young women.

271 (51%) of 534 young women and 181 (39%) of 467 young men suspected their most recent partner of having other partners (age-adjusted odds ratio 1·67 [95% CI 1·26–2·09]; p<0·001). 483 (37%) of 1310 respondents reported meeting their most recent partner when away from home, with no significant difference between men and women (p=0·103).

A greater proportion of young men's sexual relationships are casual (247 [46%] of 542 vs 59 [9%] of 676; age-adjusted odds ratio 8·92 [95% CI 6·48–12·28]; p<0·001) and more of their regular partnerships are premarital (163 [55%] of 295 vs 29 [5%] of 617; 40·98 [24·56–68·38];

significant and none of the other measures of sexual partnership characteristics improves the fit of the model. For those reporting sexual activity in the past 2 weeks (model III), consistent condom use with the most recent partner is positively associated with risk of HIV infection.

Sexual behaviour	Model I (n=2649) Odds ratio (95% CI)			Model II (n=923) Odds ratio (95% CI)			Model III (n=715) Odds ratio (95% CI)		
	Men	Women	p*	Men	Women	p*	Men	Women	p*
Respondents characteristics									
Female	··	6·11 (4·21–8·86)	<0·001	··	3·19 (1·24–8·19)	0·016	··	6·04 (1·49–24·47)	0·012
Age of respondent	1·58 (1·40–1·79)	1·22 (1·14–1·30)	<0·001	1·86 (1·42–2·44)	1·16 (1·04–1·29)	0·001	2·30 (1·52–3·48)	1·20 (1·06–1·35)	0·003
Age at first sexual intercourse	0·91 (0·87–0·97)	†	0·002	··	··	NS	··	··	NS
Lifetime partners	1·02 (1·00–1·04)	1·15 (1·07–1·23)	0·001	0·97 (0·91–1·03)	1·34 (1·18–1·51)	<0·001	0·91 (0·79–1·03)	1·30 (1·13–1·48)	<0·001
Partnership characteristics									
Age difference with most recent partner (number of years partner is older)	··	··	··	1·04 (1·01–1·08)	†	0·007	1·04 (1·00–1·07)	†	0·039
Consistent condom use with most recent partner	··	··	··	··	··	··	1·98 (1·02–3·82)	†	0·043

Adjusted odds ratios from reverse stepwise logistic regression analyses. Model I: All respondents reporting sexual experience (ie, including those not sexually active in the past month). Model II: Respondents reporting having a sexual partner in the past month. Model III: Respondents reporting sexual activity in the past 2 weeks (ie, for whom data on consistent condom use are also available). *For variables showing significant interaction effects with sex, significance levels are given for the interaction effect. In other cases, the main effects are shown († in the "men" column only) together with their significance levels. Recent partners here are the (up to) two most recent partners with whom the respondent had sex in the past month. NS=variables that did not improve the model (p<0·05). Variables with significant effects in the bivariate analysis (table 1) but that do not improve models I, II, or III are not shown.

Table 2: **Multivariate analysis of effects of aspects of sexual exposure on risk of HIV infection in sexually-experienced male and female respondents aged 17–24 years**
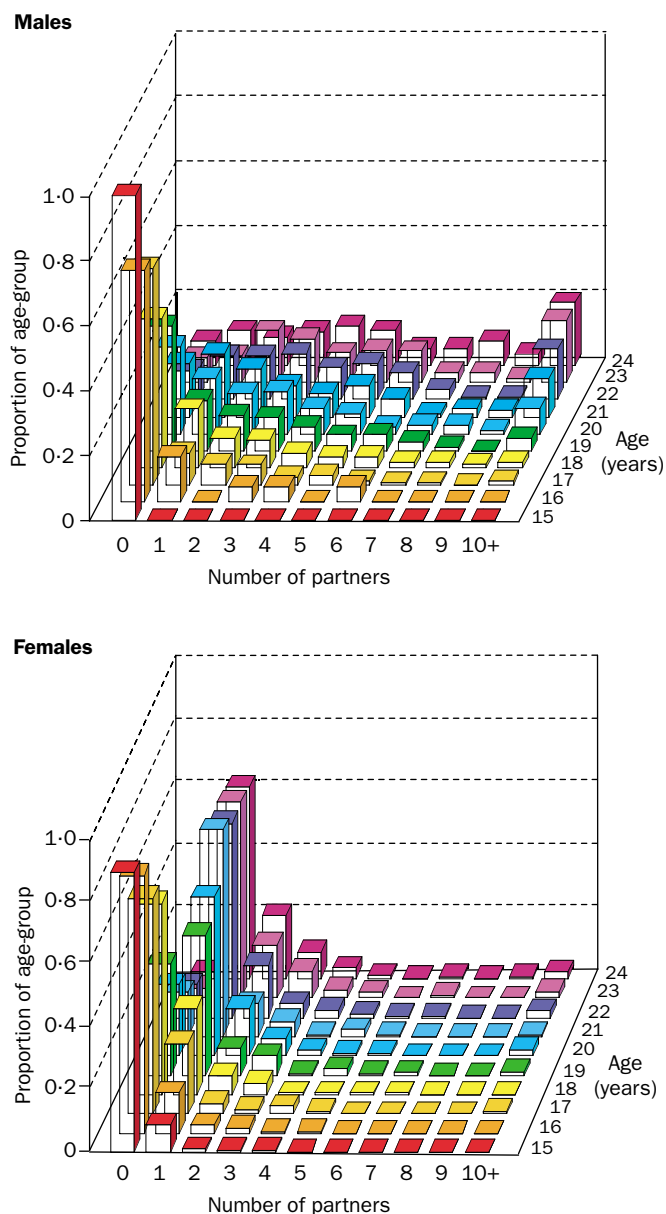
Males

Females

Figure 4: **Numbers of reported lifetime sexual partners by sex and age**

p<0·001). This contributes to their lower coital frequency because sex is less frequent in casual relationships (mean number of sex acts in the last 2 weeks: 2·18 vs 3·46 for men, 3·27 vs 4·70 for women; age-adjusted and gender-adjusted Poisson regression coefficient –0·40 [95% CI –0·49 to –0·31]; p<0·001; n=1218).

Consistent condom use is more common in casual relationships. The difference is greater in young women (39% vs 6%) than in young men (51% vs 32%), possibly because many of the young men's so-called regular partners are premarital. Condom use within marriage is comparatively low (5%, n=632), but may be higher in potential marriages due to the desire to avoid pregnancy. Overall, substantially more male respondents reported consistent condom use (age-adjusted odds ratio 7·47 [95% CI 5·21–10·72]; p<0·001). More female than male respondents were married (45% vs 10%; 9·89 [8·18–11·95]; p<0·001) or divorced, separated, or widowed (12% vs 1%; 11·21 [7·35–17·09]; p<0·001) at the date of interview. Among the sexually active, coital

frequency (sex acts in the last 2 weeks) is greater within marriage for both men and women (p<0·001). Married respondents were less likely to report condom use with the most recent partner (male age-adjusted odds ratio 0·10 [95% CI 0·05–0·18]; female age-adjusted odds ratio 0·06 [0·03–0·12]).

There was no evidence in the data for differences in age difference with partner between the marital and non-marital relationships or between the regular and casual relationships formed by young men and women.

Young men's first sexual experiences were said to be with young girls, young single parents, widows, and commercial sex workers. First sex was usually the result of curiosity and peer pressure. Early sexual activity was intermittent. Teenage men are seen (by themselves and by society at large) as being too young and lacking the necessary socioeconomic status for marriage. They must finish school and find employment before settling down. It is also felt that a man should have slept with a number of women by the time he gets married. Therefore, young men often lie about their social and economic standing and their marital intentions in order to get sexual partners. As they grow older, they gradually accumulate more partners.

Reasons given for young women starting sex were marriage or to attract a husband, enjoyment, money, gifts, and peer-pressure—the latter being by example (eg, seeing friends of a similar age wearing fashionable hairstyles and clothing). Some young women mentioned pressure from their parents to have casual relationships as a means of getting money and household necessities such as soap and cooking oil and to marry and bring in lobola (bridewealth) for the family. With one exception, all groups maintained that girls' first sexual experiences were usually consensual. Nowadays, few waited until marriage before having sex. Having started, most young women continued to have sex on a regular basis.

We noted that young women often have two types of partners: one, an older boyfriend, who has accumulated assets and is able to provide money and gifts; the other, slightly younger, being cultivated as a potential husband. In both cases, employed men are preferred. In a pocket chart voting exercise with older men (aged 26 years and older), five of 13 reported sex with a single woman under 19 years old in the past year. These men also reported sexual relationships with commercial sex workers but said they favoured young girls because they were less expensive and "AIDS free". Older men saw themselves and their peers as responsible for spreading STDs due to their involvement with both commercial sex workers and young women. Teenage women admitted that STDs were a problem in their age-group but feared the rebukes and adverse notice they received when seeking treatment at health clinics.

Young women rarely married their first partners: estimates of numbers of sexual partners before marriage ranged from five to 15. Whereas young women might be looking for potential husbands, male partners often lost interest after having had sex. To counter this, some girls tried to become pregnant so as to exert extra pressure on their boyfriends to marry them.

Condoms are rarely used in casual relationships involving girls and older men because the men are making an economic investment in the relationship, wish to avoid extra expense, and feel there is less need because young women are free of HIV. The latter are not in a position to insist as they stand to lose economic benefits. Girls sometimes do use condoms with younger partners whose bargaining position is weaker and who wish to avoid pregnancy and marriage—but may seek to avoid using condoms for the opposite reason. Condoms may be used in

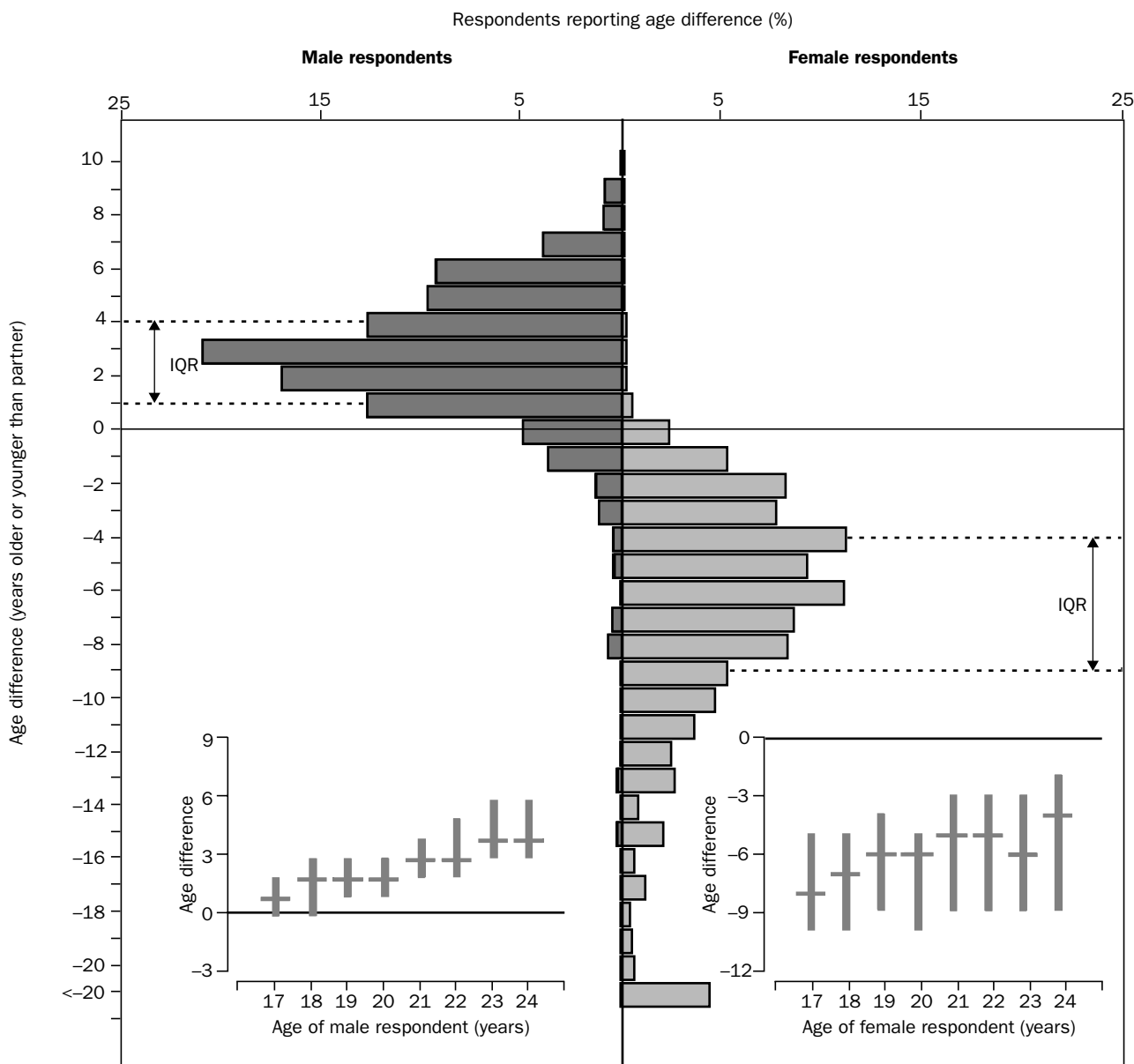Respondents reporting age difference (%)

Figure 5: **Age-difference (number of years older) between respondent and most recent sexual partner for respondents aged 17–24 years**
Upper (dotted lines) IQR for males and lower IQR for females. Inserted graphs show median and IQR by single year of age. Line represents zero difference.

initial contacts but discontinued when relationships become more serious.

Discussion

It has long been suspected that younger women having relationships with older men contributes to the spread of HIV infection in young women.[17,23] However, we describe and provide empirical evidence that shows this effect. This aspect of sexual partner networks has a pivotal role in the persistence of major HIV epidemics because not only do large segments of successive cohorts of young women become infected through this route, but many further infections result when these women marry and have children. Breaking this link in the pattern of transmission must become a central focus of HIV prevention strategies.

Other aspects of sexual behaviour, including age at onset of sexual relations and number of lifetime partners, were found to affect the risk of being infected with HIV among young men and women. Taken in combination with the pattern of women being younger than their male sex partners, these also affect the sex-differential in HIV infection rates at young adult ages. There was little difference in the ages at which men and women commenced sexual relations but most young women reported few lifetime partners and described recent partners as being regular (usually marital). The partnerships that young women do form provide far greater exposure to HIV. Sex is more frequent, condom use is rare, and their partners, being older rather than younger, are more likely to be infected. Women's partners are also more likely to have other concurrent partners. The qualitative data indicate that young women seek employed partners. This may further increase their chances of exposure to infection, since, within the age-range 19–28 years (ie, 4–9 years older than 15–19 year-old women), men with jobs are more likely to be HIV-positive (age-adjusted odds ratio 1·38 [95% CI 1·05–1·82]; p=0·023).

Survey data on sexual behaviour such as those presented here are subject to participation, recall, and social desirability bias. Steps were taken to counter these

difficulties but the results show that some residual bias remains. The estimates provided in the qualitative studies suggest under-reporting of early sexual activity, especially by girls. The difference is so extreme that it is likely that popular beliefs are out of step with actual practice. The cases of HIV and pregnancy among respondents reporting no sexual experience also indicate some under-reporting. However, the ratio of HIV prevalence in these men and women is similar to that in the sexually experienced, which suggests that the gender difference in under-reporting is not large. Although the interview method used increases completeness of reporting of multiple sexual partners, the extent of residual bias remains uncertain. The qualitative data suggest that young people continued to under-report their numbers of short-term partners.

Survey respondents' reports on the characteristics of their sexual partners should be less subject to systematic social desirability bias but there was probably some degree of guesswork, particularly for casual partners. The preponderance of older male partners is consistent with the additional finding that early male sexual activity is typically more intermittent in a population in which numbers of young men and women are roughly equal.

These biases obscure the inter-connections between measures of high-risk sexual behaviour and HIV infection and differences between the behaviour of men and women and tend to make our findings more conservative. Nonetheless, as predicted in mathematical-model simulations, measures of sexual behaviour covering periods similar in duration to HIV infection—age at first sex and number of lifetime partners—are the strongest predictors of current infection status in an established epidemic, even among the young. Measures that indicate an individual's location within the local sexual network—age difference with current partner and having a partner who has other partners—were also correlated with current infection status. As is also the case elsewhere in Zimbabwe,[24] consistent condom use is positively correlated with HIV infection in women because of its association with casual sex and because those who know or suspect they have HIV or another STD may use condoms to protect their sexual partners.

Similar behavioural risk factors are associated with early-age HIV infection in men and women but there are important differences in exposure to these risk factors. Consider, for example, a man and a woman, each aged 20 years. Typically, the man will be single. He will have had several short-term casual partnerships with girls aged younger than 19 years. Relatively few (5%) girls of this age have HIV or other STDs; he has few sexual contacts with each partner and often uses condoms. The young woman, on the other hand, is probably married to a man older than 25 years. Before marriage, she had sexual relationships to obtain gifts and to secure a husband. The chances that her husband is infected are high (24%), she has sex with him on a regular basis, and they are unlikely to use condoms. The husband has other partners; many commercial sex workers he meets at beer halls. Most of these women are infected with HIV and many have STDs. After a few drinks, it is doubtful that condoms—if available—are used properly. The heightened risk of transmission associated with concurrent partnerships is present.[9,11,25]

Thus, the different locations of young men and young women within local sexual networks and differences in the nature of their sexual experiences within relationships result in very different levels of exposure to HIV infection. Practices such as dry and forced sex[26,27] may magnify underlying female biological susceptibility. However, it remains the case that young women can only acquire HIV infection from previously infected partners and this is most likely to happen if they form partnerships with older or employed men who have accumulated large numbers of previous partners.

In Manicaland, as elsewhere, young people's sexual behaviour is shaped by the local cultural and socioeconomic context[28] and, particularly, by the marriage system. Young women are anxious to acquire the socioeconomic security and status associated with marriage and subsequent motherhood. Casual relationships with older employed men provide resources to increase their attractiveness to potential husbands. Many of these men are HIV-infected but it is difficult to negotiate condom use with them. The search for a husband is itself hazardous as many eligible men pretend to be serious about marriage as a strategy for obtaining casual sex. To secure a husband, some women try to become pregnant which precludes the use of condoms. Insisting on regular condom use can be taken as a sign of prostitution or lack of serious intent. In *Shona* culture, marriage is a long drawn-out process and many so-called marriages end in early separation. For young men, the need to obtain employment and other economic assets to pay bridewealth and support new families re-enforces the cultural norm wherein they should wait until their late 20s before contemplating marriage. Substantive factors therefore underpin the wide age difference between spouses.

Although it is unrealistic to expect to alter the underlying socioeconomic context quickly, understanding its nature and influence on local patterns of sexual behaviour should aid development of more relevant and, therefore, more effective HIV prevention strategies. Given the sexual partner network structure found in rural Manicaland, reducing unprotected sexual contacts between men and commercial sex workers, and improving services for STD patients, should lower HIV incidence in young women. This may be easier to achieve than reductions in unprotected sex in regular and even casual partnerships involving older men and young girls. Nevertheless, public-health education programmes that highlight the extent of HIV infection among teenage girls could discourage men from seeking unprotected casual relationships with this group. Greater awareness of the high prevalence in young single people should also encourage young men to use condoms with premarital partners and could increase use of voluntary counselling and testing services by couples considering marriage. Where feasible, programmes that strengthen the socioeconomic position of young women should reduce their exposure to HIV infection from older partners.

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