

Comparison of key parameters of sexual behaviour in four African urban populations with different levels of HIV infection

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Objective: To explore whether differences in sexual behaviour could explain differences in the rate of spread of HIV in four urban populations in Africa.

Methods: A cross-sectional, population-based study was conducted in two cities where the prevalence of HIV among adults exceeded 20% (Kisumu, Kenya and Ndola, Zambia) and two cities with a much lower HIV prevalence among adults (Cotonou, Benin and Yaoundé, Cameroon). In each of these cities, approximately 1000 men and 1000 women, aged 15–49 years, were randomly selected from the general population. Consenting men and women were interviewed about their socio-demographic characteristics and sexual behaviour, including characteristics of spouses and of non-spousal partners. Key parameters of sexual behaviour were compared between the four cities.

Results: On average, women in the high HIV prevalence cities had their sexual debut earlier than in the other cities. Men and women in Kisumu and Ndola got married earlier than men and women in Cotonou and Yaoundé. High rates of partner change, contacts with sex workers, concurrent partnerships and large age differences between partners were no more common in the two high HIV prevalence cities than in the two low HIV prevalence cities.

Conclusions: In these four African populations, differences in reported sexual behaviour could not explain the differences in rate of spread of HIV. In all four cities, high-risk sexual behaviour patterns were identified. © 2001 Lippincott Williams & Wilkins

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Introduction

It is estimated that over 90% of HIV infections in adults in sub-Saharan Africa are acquired through sexual intercourse between men and women [1]. This is in contrast to other regions in the world where a more substantial proportion of HIV infections are acquired through other transmission routes, including intravenous drug use and

homosexual contacts. One of the objectives of the multicentre study on factors determining the differential spread of HIV in four African cities was to explore whether differences in sexual behaviour were a major determinant of the differences in HIV spread between two cities with relatively low HIV prevalence (Cotonou, Benin and Yaoundé, Cameroon) and two cities with high HIV prevalence (Kisumu, Kenya and Ndola, Zambia).

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Numerous studies have been conducted in sub-Saharan Africa to identify risk factors for HIV infection. At the individual level, multiple sex partners and sex with sex workers have been found to be associated with an increased risk of HIV infection [2–10]. Consistent condom use has been shown to protect against the acquisition of HIV infection [11]. Certain sexual practices, such as anal intercourse, sex during menses and 'dry sex' (sex with a dry and tight vagina) have been shown or postulated to increase the transmission of HIV during sexual intercourse [12].

While there are good empirical data on the role of contacts with sex workers in the spread of HIV in the general population, our understanding of the role of other types of partnerships and, in particular, the role of different mixing patterns, is largely based on work with mathematical models. 'Assortative mixing' (like with like) would limit the spread of HIV. But 'disassortative mixing', whereby individuals choose their partners outside their own class of age, marital status, sexual activity, residence or socio-economic status, would lead to a more rapid spread of the virus through the different groups in the general population [13]. Morris and Kretzschmar have argued that, in populations where concurrent partnerships were common, the risk of an explosive HIV epidemic was greater than in populations where the pattern was more one of serial monogamy [14].

This paper presents the comparison of key parameters of sexual behaviour between the four cities in the multi-centre study on factors determining the differential spread of HIV in African cities. It was postulated that in the cities with high HIV prevalence (Kisumu, Kenya and Ndola, Zambia) high-risk sexual behaviour would be more common than in the cities with low HIV prevalence (Cotonou, Benin and Yaoundé, Cameroon).

Methods

Full details of the study methodology are presented elsewhere [15]. In brief, prior to the population-based survey, a rapid ethnographic assessment was conducted in each of the four cities. Using qualitative methods, including interviews with key informants, observations and focus group discussions, data were collected on social, economic and cultural factors that could help understand sexual behaviour patterns. In addition, the questionnaires were extensively piloted [16] and the acceptability of blood and urine collection was assessed. In the main survey, we aimed at studying a representative sample of 1000 men and 1000 women aged 15–49 years, selected from the general population in each of the four cities. Men and women who gave their verbal informed consent were interviewed and tested for HIV and other sexually transmitted infections.

The interviews were conducted face to face in the homes of the study participants or in a field station near their homes. Data were collected on socio-demographic characteristics, including age, educational attainment, occupation, ethnic group, religion, length of residence at present address and previous addresses, travel in the past 12 months, marital status and age at first marriage. 'Being married' was defined as being formally married or living together as if married. The section on sexual behaviour included questions on age at first sexual intercourse, lifetime number of sex partners, number of partners before first marriage, and number of non-spousal partners in the past 12 months. Women were also asked whether they had sex during menses and whether they used any desiccating substances in the vagina. No questions were asked about anal intercourse because it was a taboo subject in each of the four cities. In addition, information provided by sex workers suggests that this practice is rather marginal [17]. Married individuals were asked a number of questions concerning their spouse (age, whether he/she lived with the respondent) and about frequency of sexual intercourse and condom use. Respondents who reported at least one non-spousal partner in the past 12 months were asked more detailed questions concerning these partnerships (up to a maximum of eight). Data were collected on characteristics of the partner (age, ethnic group, marital status, educational attainment, how many other possible partners the partner had in the past 12 months), as well as on details of the relationship (duration of the relationship, frequency of sexual intercourse and condom use, and whether money was exchanged for sex).

The following parameters of sexual behaviour were compared between the four cities: median age at first sexual intercourse and proportion of men and women who had their first sexual intercourse before age 15, marital status, median age at first marriage, median interval between first sex and first marriage, and virginity at marriage (which was defined as getting married in the same year as becoming sexually active and having no more than one partner before marriage), median lifetime number of partners, the distribution of the number of non-spousal partners in the past 12 months, median age difference between spouses and between non-spousal partners, median duration of non-spousal partnerships, the proportions of men and women who had one-off sex and the proportions of men and women who were in a long-standing relationship (a relationship that had lasted for at least 1 year, at the time of the interview), the proportions of men and women who had exchanged money for sex with at least one non-spousal partner in the past 12 months, and the proportions of men and women who used a condom frequently (i.e., in all or most sex acts) with their non-spousal partners and with their spouses.

Table 1. Age at first sexual intercourse, age at first marriage and interval between first sex and first marriage

	Cotonou	Yaoundé	Kisumu	Ndola
Men				
Median age at first sexual intercourse (25th–75th percentile)	19.0 (16.5–20.5)	17.8 (15.5–19.5)	16.9 (14.5–18.5)	18.3 (15.5–19.5)
Median age at first marriage (25th–75th percentile)	28.6 (24.5–32.5)	29.5 (25.5–34.5)	25.5 (22.5–27.5)	26.2 (22.5–28.5)
Median interval between first sex and first marriage	10.5	11.8	8.8	8.5
Women				
Median age at first sexual intercourse (25th–75th percentile)	19.0 (17.5–20.5)	17.7 (15.5–18.5)	16.5 (14.5–18.5)	17.6 (15.5–19.5)
Median age at first marriage (25th–75th percentile)	22.6 (19.5–25.5)	23.6 (18.5–29.5)	19.6 (17.5–22.5)	19.5 (16.5–22.5)
Median interval between first sex and first marriage	3.1	6.0	3.0	1.6

Data on contacts with sex workers are presented in more detail elsewhere [17]. Men were not directly asked whether they had any contact with a sex worker in the past 12 months. The following relationships were considered as contacts with sex workers. The male partner described a partner as a prostitute; or it was a relationship where money was always or often exchanged and one of the following: (1) the duration of the relationship was 1 day or less, or (2) the female partner was reported to have 10 or more partners, or (3) the female partner was reported to exchange sex for money with others.

Mixing between different sexual activity classes was assessed as follows. Never-married men and women who reported one lifetime partner with whom they had sex in the past 12 months were identified and the distribution of the numbers of partners of this partner was calculated and compared between the four cities. In addition, men who reported more than two non-spousal partners in the past 12 months were selected and the distribution of the number of partners of their partners was calculated. These data provided insights into the extent to which sexually inexperienced men and women had sex with men and women who are more experienced. In this paper, a crude assessment is given of concurrent partnerships. The proportion of never-married men with more than one partnership ongoing at the time of the interview was calculated and compared between the four cities. More detailed analyses on concurrent partnerships are presented elsewhere [18].

Median age at first sexual intercourse and median age at first marriage were computed using survival techniques for the whole sample, with censoring of individuals who had not had sex and individuals who were still single, respectively. For those who had had sexual intercourse, the median interval between first sexual intercourse and first marriage was also computed. Ages were recorded as

numbers of completed years and, to better approximate the exact ages, 0.5 was added to the recorded ages. Median duration of non-spousal partnerships in the past 12 months was computed with survival techniques, with censoring of the partnerships that were still ongoing at the time of the interview. Other medians were computed with standard techniques. Differences between medians were tested on their statistical significance using the Kruskal–Wallis test. Statistical significance of differences between proportions was assessed with the likelihood ratio statistic. All computations were carried out with SPSS 8.0 (1997) for Windows (SPSS Inc., Chicago, Illinois, USA).

Results

Sexual debut

The proportions of men and women, aged 20 years and older, who reported that they had had sexual intercourse was similar in all four cities and ranged between 97 and 99%. However, in the age group 15–19 years, the proportion of sexually active men was 48.5% in Cotonou, 60.7% in Yaoundé, 72.7% in Kisumu, and 54.4% in Ndola. The corresponding figures for women were 45.8, 63.8, 70.1 and 59.8%. There were slight differences in the age distribution of young people aged 15–19 years between the four cities, but the age-standardized proportions of sexually active youth were similar to the crude proportions (data not shown).

Age at first sexual intercourse was lowest for men and women in Kisumu, and highest for men and women in Cotonou ($P < 0.001$; Table 1). In Kisumu and Ndola, significantly more women had their sexual debut before age 15, 27.4% [95% confidence interval (CI) = 24.7–30.2] and 17.0% (95% CI = 14.8–19.5), respectively, compared with women in Cotonou (5.3%, 95% CI = 4.1–6.9) and Yaoundé (10.4%, 95% CI = 8.7–12.4). This is supported

Table 2. Marital status by city and sex

	Cotonou		Yaoundé		Kisumu		Ndola	
	Men (n = 1023)	Women (n = 1094)	Men (n = 981)	Women (n = 1118)	Men (n = 828)	Women (n = 1060)	Men (n = 720)	Women (n = 1009)
Marital status (%)								
Never married	56.7	36.2	62.3	45.8	44.0	26.4	44.2	27.8
Currently married	41.0	55.1	34.5	44.2	53.3	62.8	51.1	57.5
Separated/divorced	2.3	5.5	3.0	8.0	2.0	4.3	4.0	9.5
Widowed	0.1	3.2	0.2	2.0	0.7	6.5	0.7	5.2
% in polygamous union among currently married	16.1	32.1	7.2	14.1	12.3	23.6	5.8	5.4

by the proportion of non-spousal partners of male respondents who were under age 15. Men in Cotonou and Yaoundé reported that 0.8% (95% CI = 0.3–1.9) and 1.0% (95% CI = 0.6–1.6) of their non-spousal partners in the past 12 months were younger than 15 years. The corresponding figures for Kisumu and Ndola were 5.6% (95% CI = 3.9–7.9) and 4.7% (95% CI = 2.8–7.6), respectively.

In Yaoundé, median age at first sexual intercourse was 19.1 years for men aged 40–49 years, but 17.2 years for men aged 20–29 years. This shift towards younger age at first sex was not seen in men in the other cities nor in women in any of the cities, and is discussed in more detail in another paper in this supplement [19].

Marriage patterns

The proportions of men and women who were married or had been married were significantly higher in the high HIV prevalence cities than in the 'low' HIV prevalence cities (Table 2). Median age at first marriage was significantly lower for both men and women in Kisumu and Ndola than in Cotonou and Yaoundé ($P < 0.001$; Table 1). For men, the median interval between first sexual intercourse and first marriage was longer in Cotonou and Yaoundé (10.5 and 11.8 years) than in Kisumu and Ndola (8.8 and 8.5 years, respectively) (Table 1). For women, the interval was longest in Yaoundé (6.0 years), similar in Cotonou and Kisumu (3.0 years), and shortest in Ndola (1.6 years). Men and women in the younger age groups tended to marry later than men and women aged 40–49 years in all cities except Kisumu, where the median age at first marriage was the same in the different age groups [19].

Polygamy was significantly more common in Cotonou and Kisumu than in Yaoundé and Ndola (Table 2). In Ndola, 5.8% (21/365) of married men stated that they had more than one wife, but of the 21 polygamous men 10 could or would not say how many wives they had. Of the married women, 5.4% (31/564) said their husband had more than one wife but 10 of the 31 women in a polygamous marriage were unable to say how many

wives their husband had. Repeat marriages were more common in Cotonou and Ndola than in Yaoundé and Kisumu. Of the currently married women in Cotonou, 22.6% (95% CI = 19.3–26.1) had been married more than once; in Yaoundé, this percentage was 12.4% (95% CI = 9.7–15.7), in Kisumu 6.5% (95% CI = 4.8–8.7) and in Ndola it was 24.9% (95% CI = 21.4–28.6).

The proportion of ever-married men who were virgins at marriage was 8.2% in Cotonou, 5.4% in Yaoundé, 2.9% in Kisumu, and 8.3% in Ndola. Among women, the proportion of virgins at marriage was also higher in Cotonou and Ndola [45.8% (95% CI = 42.0–49.6) and 51.3% (47.6–55.1), respectively] than in Yaoundé (32.5%, 95% CI = 28.7–36.5) and Kisumu (16.4%, 95% CI = 13.9–19.3).

Rate of partner change

Men and women in Yaoundé reported the highest lifetime numbers of partners. Men reported a median of 10 (interquartile range, 4–21) lifetime partners in Yaoundé, compared with 5 (interquartile range, 2–9) in Kisumu, and 4 (interquartile range, 2–8) in Cotonou and Ndola. The median lifetime number of partners reported by women in Yaoundé was 3 (interquartile range, 1–5) compared with 2 (interquartile range, 1–3) in Cotonou, Kisumu and Ndola. The differences were statistically significant ($P < 0.001$).

The comparison of the numbers of non-spousal partnerships in the past 12 months was restricted to what was reported by the respondents who had had sexual intercourse. Men and women in Yaoundé reported the highest numbers of non-spousal partners in the past 12 months, followed by men and women in Kisumu (Table 3). The same trend was seen in never-married men and women. Currently married men in the high prevalence cities reported fewer non-spousal partners than currently married men in Cotonou and Yaoundé. Extramarital relationships were reported by few married women in all cities (0.8–3.2%) except Yaoundé, where 12.2% of women reported at least one extramarital relationship in the past 12 months.

Table 3. Distribution of number of non-spousal partners in the past 12 months, by sex and marital status, among sexually active respondents

	Cotonou		Yaoundé		Kisumu		Ndola	
	Men	Women	Men	Women	Men	Women	Men	Women
All sexually active								
0	49.5	80.3	26.3	51.1	51.8	78.9	63.3	84.9
1	31.5	17.2	24.2	33.8	28.7	17.1	20.2	14.0
> 1	18.9	2.5	49.5	15.2	19.5	4.1	16.6	1.1
Never married (%)								
0	32.0	38.9	14.6	13.4	19.9	28.2	38.1	56.3
1	42.9	54.0	26.7	60.1	45.2	55.2	34.3	39.9
> 1	25.1	7.1	58.7	26.5	34.9	16.6	27.5	3.8
Currently married (%)								
0	69.4	99.2	44.7	87.8	74.4	96.8	83.3	98.8
1	19.6	0.8	21.0	8.7	16.6	2.7	10.1	0.9
> 1	11.0	0	34.3	3.5	8.7	0.5	6.6	0.3
Married in the past (%)								
0	34.8	70.5	18.8	28.8	31.8	54.4	29.4	61.1
1	30.4	23.2	18.8	45.9	45.5	40.4	32.4	37.6
> 1	34.8	6.3	62.5	25.2	22.7	5.3	38.2	1.3

Excluding contacts with sex workers (see earlier definition), the number of non-spousal partnerships in the past 12 months per 1000 men was 640 in Cotonou, 1402 in Yaoundé, 701 in Kisumu, and 483 in Ndola. The total estimated number of sex acts in the past 12 months with those non-spousal partners was 5363 per 1000 men in Cotonou, 17 322 in Yaoundé, 6556 in Kisumu, and 4938 in Ndola. Based on reports by sex workers, it was estimated that there were 3360 contacts with sex workers per 1000 men per year in Cotonou, 1700 in Yaoundé, 960 in Kisumu, and 3330 in Ndola [17]. These data suggest that, in Cotonou and Ndola, non-spousal partnerships of men more often involve sex workers than in Yaoundé and Kisumu.

Characteristics of non-spousal partnerships

The median duration of all non-spousal partnerships that were initiated in the past 12 months was longest in Kisumu and shortest in Ndola, for both men and women (Table 4). In Cotonou, Yaoundé and Ndola, similar proportions of men reported one or more one-off sexual contacts in the past 12 months, but in Kisumu fewer men reported such contacts (Table 4). In Yaoundé and Kisumu, more men and women were in a relationship that had lasted for more than 1 year at the time of the interview than in Cotonou and Ndola (Table 4). Among the men who reported at least one non-spousal partnership in the past 12 months, married men in Kisumu and Ndola more often reported casual sex and less often a long-term relationship than never-married men. These differences between married men and never-married men were not observed in Cotonou and Yaoundé.

Sex in exchange for money was reported more often by men in Ndola than by men in the other cities. In Ndola, 42.9% of men who had non-spousal partners in the past 12 months exchanged money for sex with at least one partner. The corresponding percentages were 14.9% for Cotonou, 23.3% for Yaoundé and 19.6% for Kisumu. Of the women who reported non-spousal partnerships in the past 12 months in Kisumu and Ndola, around 40% reported at least one relationship with sex in exchange for money in the past 12 months, compared with 5.9% of women in Cotonou and 13.7% of women in Yaoundé. For women, these differences between low and high HIV prevalence cities were statistically significant ($P < 0.001$).

Mixing between age groups and sexual activity classes

The median age difference between spouses, as reported by married men, was smaller in Cotonou than in the other cities (Table 5). The median age difference reported by married women was smaller in Cotonou and Yaoundé than in Kisumu and Ndola.

The proportion of non-spousal partnerships for which the respondent could not give an estimate of the age of the partner was very variable. For male respondents, it was 1% in Cotonou, 2.4% in Yaoundé, 6.2% in Kisumu, and 21.5% in Ndola. For women, it was 5.6% in Cotonou, 2.0% in Yaoundé, 14.4% in Kisumu, and 16.2% in Ndola. The median age difference between non-spousal partners was similar in Cotonou, Yaoundé and Ndola, but smaller in Kisumu (Table 5). However the proportion of partnerships where the age difference

Table 4. Median duration of non-spousal partnerships, proportions of respondents who had one-off sex and proportions of respondents who were in a long-term relationship

	Men					Women				
	Cotonou	Yaoundé	Kisumu	Ndola	P	Cotonou	Yaoundé	Kisumu	Ndola	P
Median duration (months) of all relationships initiated in the past 12 months (25th–75th percentile)	6 (0.7–12)	6 (1–12)	10 (4– ^a)	3 (0.2–11)	< 0.001	11 (4– ^a)	12 (6– ^a)	12 (7– ^a)	6 (1– ^a)	< 0.001
% of those with non-spousal partners who had one or more one-off contacts in the past 12 months	14.5	13.5	7.1	12.6	0.004	1.6	2.0	1.0	3.0	0.58
% of those with non-spousal partners who were in a relation for > 1 year	27.4	45.3	38.7	13.0	< 0.001	33.7	54.3	36.9	16.4	< 0.001

^a Too many cases censored to be able to calculate the 75th percentile.

Table 5. Age differences between partners

	Cotonou	Yaoundé	Kisumu	Ndola
Men				
Median age difference with spouses (25th–75th percentile)	5 (3–9)	6 (4–10)	6 (4–10)	6 (4–10)
	Kruskal–Wallis, $P < 0.001$			
Median age difference with non-spousal partners: all men (25th–75th percentile)	4 (1–7)	4 (1–7)	3 (1–6)	4 (2–7)
	Kruskal–Wallis, $P = 0.04$			
Never-married men	3 (1–5)	3 (1–5)	2 (1–4)	3 (2–5)
Currently married men	8 (4–12)	8 (4–13)	7 (4–13)	7 (4–10)
% non-spousal partnerships with a partner more than 9 years younger	16.8	17.9	13.1	14.8
Women				
Median age difference with spouses (25th–75th percentile)	6 (3–10)	6 (4–10)	7 (4–11)	7 (4–10)
	Kruskal–Wallis, $P = 0.002$			
Median age difference with non-spousal partners: all women (25th–75th percentile)	5 (3–8)	5 (2–8)	4 (2–7)	5 (3–7)
	Kruskal–Wallis, $P = 0.01$			
Never-married women	5 (3–8)	5 (3–9)	3 (2–5)	5 (3–7)
Currently married women	4 (0.5–9.5)	4 (2–9)	7 (2–9.5)	4 (1.5–5.5)
% non-spousal partnerships with a partner more than 9 years older	20.1	21.3	15.9	15.3

between the partners was more than 10 years was higher in the two low HIV prevalence cities than in the two high HIV prevalence cities. Of the partnerships reported by men in Cotonou, 14.2% were with women 10 years younger; the corresponding figure for Yaoundé was 14.6%, for Kisumu was 11.1%, and for Ndola was 8.7%. The corresponding figures for the partnerships reported by women were 14.7, 15.4, 11.7 and 12.1%.

For men, there was a strong correlation between the age difference with their non-spousal partners and their own age: older age was correlated with a larger age difference in all four cities. The Pearson correlation coefficients were 0.73 for Cotonou, 0.67 for Yaoundé, 0.74 for Kisumu and 0.53 for Ndola. These correlation coefficients were all statistically significant ($P < 0.001$).

In Cotonou, Yaoundé and Kisumu, 95% of non-spousal partners of never-married men were single. In Ndola, this percentage was 87%. Married men had single women as non-spousal partners less often. The proportion of single women among the non-spousal partners of married men was 63% in Cotonou, 76% in Yaoundé, 59% in Kisumu and 81% in Ndola. Never-married women had partners who were single less often than never-married men. The percentage of single men among the non-spousal partners of never-married women was 73% in Cotonou, 77% in Yaoundé, 83% in Kisumu, and 91% in Ndola.

Of the women who reported one lifetime partner with whom they had sexual intercourse in the past 12 months, at least one-half thought their partner had had other partners in the past 12 months. The comparison between the four cities, however, was hampered by small sample sizes: the denominator varied between 12 in Ndola and 40 in Yaoundé. Of the men in Cotonou who reported more than two non-spousal partners in the past 12 months, 33.3% (95% CI = 19.1–51.1) had had at least one partner who herself did not have any other partners in the past year. For Yaoundé, this proportion was 23.4% (95% CI = 17.8–30.0), for Kisumu 48.0% (95% CI = 33.9–62.4) and for Ndola it was 44.1% (95% CI = 27.6–61.9). These data suggest extensive mixing between men and women who are sexually inexperienced and men and women who are experienced.

Concurrency

As a crude measure of concurrency, the proportions of men who had more than one partnership ongoing at the time of the interview was calculated. Of the never-married men in Yaoundé, 33.3% (95% CI = 28.9–37.9) reported two or more partnerships ongoing at the time of the interview. This was more than in Cotonou (12.1%, 95% CI = 8.7–16.4), Kisumu (24.1%, 95% CI = 18.9–30.1) and Ndola (12.9%, 95% CI = 8.0–19.4). More detailed analyses of concurrent partnerships are presented elsewhere [18].

Condom use

Condom use with non-spousal partners, as reported by men, was similar in the four cities. In Cotonou, 20.5% of men reported that they used a condom always or most of the time with all their non-spousal partners of the past 12 months; the corresponding figure for Yaoundé was 23.9%, for Kisumu was 23.3%, and for Ndola was 24.8%. Women reported condom use with their non-spousal partners less often, except for women in Ndola. In Cotonou, 10.8% of women reported that they frequently used a condom with all their non-spousal partners; in Yaoundé, 16.3% of women reported frequent condom use, in Kisumu it was 20.6%, and in Ndola it was 24.4%. The proportion of men reporting frequent condom use with at least one spouse ranged between 4.1% in Cotonou and 7.4% in Ndola. The proportion of

women reporting frequent condom use with their spouses ranged between 2.4% in Cotonou and 6.0% in Yaoundé. Condom use is described in more detail elsewhere [20].

Sexual practices with an increased risk of HIV transmission

The proportion of women who reported sexual intercourse during menses was variable, but there was no pattern of more sex during menses in the high HIV prevalence cities than in the low HIV prevalence cities. In Cotonou, 11% of women reported ever having sexual intercourse during menses; in Yaoundé, it was 20%, in Kisumu 13%, and in Ndola it was 7%.

So-called dry sex (sexual intercourse with a dry and tight vagina) was reported by 17% of women in Ndola. In the other cities, less than 5% of women reported this practice.

Discussion

The main objective of the present study was to identify differences in the distribution of sexual behaviour risk factors and of factors that influence the transmission probability of HIV during sexual intercourse, which could explain the differences in rate of spread of HIV in four African urban populations. We postulated that in the high HIV prevalence cities, Kisumu and Ndola, high-risk sexual behaviour patterns would be more common than in Cotonou and Yaoundé. The following parameters of high-risk behaviour were explored: early age at first sexual intercourse and long interval between first sexual intercourse and first marriage (which allows the accumulation of a large number of non-spousal partners), high rates of partner change, contacts with sex workers, extent of mixing between different groups in the population (notably by age and sexual activity level), and extent of concurrent partnerships.

In Kisumu and Ndola, the two high HIV prevalence cities, more women had their first sexual intercourse younger than age 15 than in Cotonou and Yaoundé. They also got married at an earlier age so that the interval between first sexual intercourse and first marriage was not longer in the high HIV prevalence cities than in the low HIV prevalence cities. Women in Cotonou, Kisumu and Ndola reported similar lifetime numbers of sex partners, and these were less than in Yaoundé. Non-spousal partnerships were reported more frequently by women in Yaoundé and Kisumu than by women in Cotonou and Ndola. But women in Yaoundé and Kisumu had fewer spousal partners than women in the two other cities.

Men in Kisumu and Ndola got married at an earlier age than men in the two other cities. The interval between first sexual intercourse and first marriage was shorter in

Table 6. Comparison of parameters of risky sexual behaviour in the four cities

	Men			Women		
	More common in the high HIV prevalence cities than in the low HIV prevalence cities	More common in the low HIV prevalence cities than in the high HIV prevalence cities	Most common in one low HIV prevalence city and one high HIV prevalence city	More common in the high HIV prevalence cities than in the low HIV prevalence cities	More common in the low HIV prevalence cities than in the high HIV prevalence cities	Most common in one low HIV prevalence city and one high HIV prevalence city
Sexual debut before age 15	^a			X		
Early age at first marriage	X			X		
Long interval between first sex and first marriage		X			^b	
High lifetime numbers of sex partners			X			X
High numbers of non-spousal partners in the past 12 months			X			X
Large age difference between non-spousal partners		X			X	
Concurrent partnerships			X			
Contacts with sex workers			X			
Sex in exchange for money or gifts				X		
Low condom use with non-spousal partners			^c		X	

^a Most common in Kisumu, followed by Ndola and Yaoundé. ^b Most common in Yaoundé, followed by Cotonou and Kisumu. ^c The differences between the four cities were very modest and not statistically significant.

the high HIV prevalence cities than in the low HIV prevalence cities. Men in Yaoundé reported the highest lifetime numbers of partners, followed by men in Kisumu. Men in Cotonou and Ndola reported fewer lifetime partners. However, there is evidence that men under-reported their contacts with sex workers and that under-reporting may have been a more serious problem in Cotonou and Ndola than in Yaoundé and Kisumu [17]. The reported lifetime numbers of partners are thus probably under-estimates.

There were striking differences in the duration of non-spousal partnerships between the four cities. Men and women in Yaoundé and Kisumu were more often in a long-term non-spousal relationship than men and women in Cotonou and Ndola. Women in the two high HIV prevalence cities received money or gifts in exchange for sex more often than women in the low HIV prevalence

cities. Most of these relationships with money in exchange for sex were not commercial sexual transactions in the sense that they did not constitute the main source of living for a woman who had many partners. Qualitative research revealed that such relations do not exclude later marriage and that money may be an important motivation for a woman to start a sexual relation with a man [21].

The data on mixing between different age groups in the population and different sexual activity classes suggest that, in all four cities, there is extensive mixing between men and women who are sexually inexperienced and men and women who are much more experienced. It seems there are no striking differences between the four cities, but the data have to be interpreted with caution. First, the analyses were based on few reports and, second, it has been shown that information on partners of partners may be unreliable [22].

In summary, of the parameters of high-risk sexual behaviour that were explored, only young age at first sexual intercourse for women and young age at marriage for both men and women were more common in the two high HIV prevalence cities than in the two low HIV prevalence cities. None of the other parameters were more common in Kisumu and Ndola than in Cotonou and Yaoundé, including high rates of partner change, which has been found to be an independent risk factor for HIV infection at the individual level [23] (Table 6). In fact, the data suggest that Cotonou, one of the low HIV prevalence cities, and Ndola, one of the high HIV prevalence cities, are more like each other than Cotonou and Yaoundé or than Kisumu and Ndola. In Cotonou and Ndola, there seems to be a pattern of intensive contacts between men in the general population and sex workers, while women have relatively few non-spousal partners. In Yaoundé and Kisumu, both men and women had more non-spousal partners than in the other cities, but there seemed to be less commercial sexual activity.

Any self-reports on sexual behaviour have to be interpreted with caution. Issues pertaining to the validity of the data on sexual behaviour in the four cities, including examination of discrepancies in reporting by men and women, are discussed in more detail in another paper in this supplement [19]. In this study, any important changes in sexual behaviour as a result of the HIV/AIDS epidemic, would have reduced risk behaviours that existed at the time of the start of the epidemics, more than 15 years ago, and would question the validity of the comparison between the four cities. In particular, the low level of commercial sexual activity in Kisumu was puzzling. There are anecdotal reports that men in Kisumu have turned away from sex workers and are seeking out younger female partners who are believed to be less HIV infected (M. Kahindo, personal communication, 1998). On the contrary, key informants maintained that commercial sexual activity in Kisumu was on the increase [21]. Other parameters of sexual behaviour (including age at first sex, interval between first sex and first marriage, and number of premarital partners) are similar across different age groups, suggesting that there has not been a major change towards safer sex either in the low HIV prevalence cities or in the high HIV prevalence cities [19]. In addition, comparison of behaviour patterns in the younger age groups suggests that there is no under-estimation of risky sexual behaviour in the high HIV prevalence cities due to differential mortality of the more sexually active. The only marked change that has been taking place as a result of the HIV/AIDS epidemics is the increase in condom use, which is similar in all four populations.

In conclusion, our data suggest that in all four cities the sexual behaviour patterns are such that there is the potential for a widespread epidemic of HIV. In each city, there is intense commercial sexual activity and high pro-

portions of men and women engage in non-spousal partnerships that are not protected by condom use. Our results suggest it is unlikely that the differences in rate and extent of spread of HIV between the four cities can be explained by differences in sexual behaviour. Other factors, such as those that influence the transmission of HIV during sexual intercourse, must be playing a very important role in determining the rate and extent of spread of HIV in the general population.

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