

Mobility and HIV spread into rural areas of West Africa

Prepared for the IUSSP general conference 2001. Brazil.

Lagarde E¹, Schim M², Enel C¹, Holmgren B², Spira R¹, Pison G³, Piau JP⁴,
Delaunay V⁵, MBoup S⁶, Ndoye I⁷, Cœuret-Pellicer M¹, Whittle H², Aaby P⁸ for
the MECORA group*

¹ Institut National de la Santé et de la Recherche Médicale, Unité 88, Saint-Maurice, France.

² Medical Research Council Laboratories, Fajara, The Gambia

³ Institut National d'Etude Démographique, Paris, France.

⁴ Programme de recherche sur le SIDA de l'Institut de Recherche et Développement, Montpellier, France.

⁵ Laboratoire population et santé, Institut de Recherche et Développement, Dakar, Sénégal.

⁶ Laboratoire de virologie-bactériologie de l'hôpital Le Dantec, Dakar, Sénégal.

⁷ Programme National de Lutte contre le SIDA, Dakar, Sénégal.

⁸ Staten Serum Institute, Copenhagen, Denmark

This research was supported by the Agence Nationale de Recherches sur le Sida, Paris, France, The programme VIHPAL of the French Ministère de la recherche, The Medical Research Council, United Kingdom and the association Ensemble Contre le Sida, Paris, France.

Members of the MECORA group (Etude Multisite des Comportements et MST en zone Rurale d'Afrique) are listed at the end of the paper.

INTRODUCTION

Sub-Saharan Africa is the most affected region in the world by HIV infection, with 70% of all persons living with HIV/AIDS world-wide [1]. The distribution of the pandemic within Africa is not however homogeneous. In some countries like Zambia, Zimbabwe or Namibia, as high as more than 25% of adults are infected with HIV while in other countries like Senegal or The Gambia, the prevalence has not reached more than 2% [2]. The heterogeneity of HIV spread is also found at the country level and urban areas are almost always more infected than rural areas, probably because of different population densities and population mixing patterns. HIV infections in rural areas originate most often from urban areas and migration has often been found to be one of the main risk factor for HIV infection in studies conducted among rural populations [3]; [4]; [5]; [6]. Mobility enables the virus to shift from urban centres to the countryside and populations living in interfaces such as trading centres [7] [8] or main roads [9]; [Colvi, 2000] were found to be more infected than those living in isolated villages. However, going back and forth between villages and cities is not sufficient to act as a potential vector for HIV. The behaviours of migrants are indeed one of the key issues. Previous studies conducted in Africa found that migrants have more risky behaviours than non-migrants [5] [10]; [11]. Two non-exclusive explanations are firstly that travelling exposes migrants to new behaviours. Previous observations showed that risky behaviour was more frequent in town than in nearby rural areas [12]; [13]. Secondly, migration disrupts traditional social constraints and control on sexual behaviours. Married people often travel without their spouse, increasing the risk of extramarital sex. Sometimes, sexual partnership with local people in the migration area are very difficult, orienting migrants to have sex with commercial sex workers with much higher rates of HIV infections than the general adult population.

A recent study conducted in Uganda [14] found that migrants reported higher levels of sexual risk behaviours but that condom acceptance was higher among them than among non-migrants. Another study conducted in Tanzania found that travellers were more likely to report

condom use [12]. We found the same result in a study conducted in southern Senegal [10].

This opens the way for specific prevention among mobile populations.

In order to identify the key determinants of HIV infection in rural West Africa, we conducted standardised comparative surveys among three rural populations with highly mobile populations and expected heterogeneous levels of HIV infection. Two of these areas are located in regions where nearby city centres have very low HIV infection levels [Bulletin Epidémiologique] while the other one is located in a region where nearby cities have relatively high HIV levels [15].

POPULATION AND METHODS

Setting

All three areas have in common that they are located in rural West Africa, two in Senegal and one in Guinea-Bissau. They were chosen because they all have been under demographic follow-up for up to 25 years. All new vital events (births, deaths, marriages and migrations) have been recorded periodically. A list of the population is therefore available from which random samples can be easily and accurately drawn.

Niakhar

The survey was conducted in July 1997 in the region of Fatick, in central Senegal. The population of the area has been under demographic follow-up since 1983. As of January 1st, 1997, 29104 individuals lived in the study area [16]. The population consists mainly of farmers of the Sereer ethnic group, 74% are Muslim, 20% Catholic and 3% Protestant. Although very few report to be Animist (1%), all comply to some degree with traditional rites. The matrimonial system is polygamous.

Bandafassi

The survey was conducted in March 1998 in the region of Tambacounda in southeast Senegal, near the borders with Guinea and Mali. The population of this area has been under demographic surveillance for the past 25 years. In 1998, the population in the study area was 9576. The population consists mostly of farmers belonging to three ethnic groups. The Peul (57% of the population) are Muslims, while the Bedik (28%) and Malinke (16%) include Muslims, Animists and Christians. The matrimonial system is polygamous.

Caio

The survey area is located in the region of Cacheu in Northwest Guinea-Bissau, near the borders with Senegal. A biological survey was conducted between March 1997 and January 1998 among all adults that consented to give a blood sample for HIV testing. The questionnaire survey was conducted in May and June 1998. The population of this area has been under

demographic surveillance since 1989. In 1996, the population in the study area was 10500. The population consists mainly of farmers of the Manjako ethnic group (more than 95% of population) and 79% of the population self report as of animist religion 20% report to be catholic and 1% to be Muslim. The matrimonial system is polygamous.

Study sample

In Bandafassi and Niakhar, the demographic databases were used to build a random sample of adults aged 15 to 59 years. A sample size of 1000 adults was sought. To determine our sample, we estimated from the demographic follow-up data the proportion of people away from the area to be 20% in Niakhar and 34% in Bandafassi. The initial respective sample sizes were therefore 1200 and 1510. Eligible subjects from Niakhar and Bandafassi were asked to answer the study questionnaire and to give blood sample for HIV testing. In Caio, the biological part of the study used data from a sero-survey conducted between March 1997 and January 1998. The sample was drawn from the population of adults aged more than 15 years who were selected for this former study (but who did not necessarily participate). The sample included 1920 adults. Unlike in Niakhar and Bandafassi, people aged more than 59 years were included in the sample because it was recognised that unlike HIV-1, the prevalence of HIV-2 remains high in older age groups [17].

Interview

Interviewers were recruited from the local population of each area. They went through a four day training period made up of collective courses and individual simulations of interviews. They were taught to translate the questionnaire extemporaneously from written French or Portuguese to spoken local language (they do not write nor read their local language, as school education is in French in Senegal and in Portuguese in Guinea-Bissau). Therefore, a great part of the training period was devoted to the standardisation of the translation. After informed consent, interviews were conducted in private places in order to protect confidentiality.

Content of the questionnaire

We derived a questionnaire from the Knowledge Attitudes Behaviour and Practices (KABP) questionnaire of the WHO's Global Program on AIDS [18] and from our experience during previous surveys on sexual behaviour conducted in another area of Senegal [10]. It was designed to study risk factors for HIV infection as well as perceptions of AIDS and its prevention, all the while taking into account the local socio-cultural context. The questionnaire had first been tested during a pilot study conducted in 1995 [19].

The following personal information was recorded: age, sex, marital status, religion, education, ethnic group, profession. Level of exposure to radio and television was also recorded. Long-term mobility was measured by the question "have you been away from your village for at least one month during the past 12 months?". Short-term mobility was measured by the question "have you been away from your village for at least one day in the past 4 weeks?" Information on date of departure, date of arrival, place and reason for migration were recorded for up to 2 long-term travels of the last 21 months and up to 4 short-term travels of the past 4 weeks.

Respondents were asked to provide information on up to 4 regular sexual partners (including spouses) and up to 4 casual partners of the last 12 months. For each partner, the respondent was asked to provide when possible age, ethnic group and marital status of the partner, place of partnership (on migration or in the village), condom use, exchange of gift and of money for sex and period and duration of the partnership. The Caio study area was divided into a peripheral and a central zone. The latter is the place where almost all shops and facilities were and is the nearest part of the study area to the only track to the nearest urban centre. Men were asked how many commercial sex workers they had sex with in the last 12 months. They were also asked whether they noticed any sexual discharge, sore or ulceration in the last 12 months and whether they were circumcised and at what age. Histories of hospitalisation and injection were recorded. A final part of the questionnaire was devoted to knowledge and perception of HIV and STDs.

Biological tests

Between 1 and 2 ml of blood were collected from each consenting participant. Samples were screened for HIV with the commercial ELISA ICE BASE PACK (Murex Diagnostics, Dartford, UK). For the two Senegalese sites, Positive samples were confirmed using a commercial immunoblot (BIO-RAD, NOVAPATH) for HIV1 and using a house made immunoblot for HIV2 (whole virus lysate of HIV2: MS-U937). Samples were classified as HIV1 according to manufacturer criteria and as HIV2 when antibodies directed against env, \pm gag, \pm pol antigens were recognised. For the Caio site, positives samples were tested using commercial test from Murex Diagnostics (Wellcozyme I for HIV-1 and ICEHIV-2 for HIV-2). Sample that were positive in both ELISA were tested by Pepti-Lav (Diagnostics Pasteur, Marnes-la Coquette, France).

Ethics

Ethical approval for the study in Senegal was obtained from the national AIDS control programme and from the national ethical committee. Ethical approval for the study in Guinea-Bissau was obtained from the Ministry of Public Health, Co-ordination unit of Health Research and from the Gambia Government/Medical Research Council laboratories Joint Ethics Committee in The Gambia.

Analysis

All analyses were performed separately for each sex. The analysis was conducted in three steps. First, we determined whether levels of variables differed between the two populations in Senegal with low levels of infection and the population in Guinea-Bissau with relatively high level of infection. Only variables found to differ significantly either between Niakhar and Caio or between Bandafassi and Caio for at least one sex are presented in Table 1. Proportions were compared using a Chi-square test and medians were compared using a Wilcoxon-Mann-Whitney rank test. Secondly, we performed univariate and multivariate analyses of the risk factors for HIV infection in Caio. Analyses were first performed by univariate comparisons that used Chi-square and Fisher exact tests when appropriate and then by a multivariate method. Descending stepwise logistic regression was used to select among all

potential predictors of HIV infection in the univariate analysis identified with a significance level below 20% [20]. Because mobility was found to be of importance in the latter analysis, a final step consisted in comparing reported sexual behaviour between migrants and non-migrants. A model was build for each behavioural variable in each gender and included potential confounding variables when significant among the following ones: age, matrimonial status, educational level, access to radio and television, religion, and ethnic group. This was completed by an analysis of HIV levels according to destinations of short-term travels. All statistical computations were carried out using SPSS 9.0 for Windows (SPSS Inc. 1997, Chicago, Illinois).

RESULTS

Sample and HIV infection levels

Niakhar

The initial sample was of 1200 adults aged 15 to 59 (600 men and 600 women). Of this sample, 314 were either away from their village, deceased or mentally disabled and could not be interviewed (26% of the initial sample). Another 20 persons refused to answer the questionnaire (2% of those who were present). The final sample for analysis consisted of 404 men and 462 women. Because populations studied were all under demographic surveillance, it was possible to compare mean age of respondents and non-respondents. Those who respectively did and did not answer the questionnaire were 32 and 28 years old for men and 34 and 26 years old for women. Differences were both statistically significant for men and women ($p < 10^{-3}$). 245 men and 396 women were tested for HIV infection. One man was found to be infected with HIV-1 (0.4%) and 2 women with HIV-2 (0.6%).

Bandafassi

The initial sample was of 1510 adults aged 15 to 59 (755 men and 755 women). Of this sample, 391 were either away from their village, deceased or mentally disabled and could not be interviewed (26% of the initial sample). Another 167 persons refused to answer the questionnaire (15% of those who were present). The final sample for analysis consisted of 440 men and 512 women. Those who respectively did and did not answer the questionnaire were 33 and 30 years old for men and 34 and 32 years old for women. Differences were both statistically significant for men ($p=0.001$) and women ($p=0.03$). 393 men and 462 women were tested for HIV infection. None of them was found to be infected with HIV.

Caio

Among those who participated in the serological survey between March 1997 and January 1998 (but were not necessarily tested for HIV infection), an initial sample of 1920 adults aged 15 and more (954 men and 966 women) was drawn. Of this sample, 486 were either away from their village, deceased or mentally disabled and could not be interviewed (25% of the initial sample). Another 18 persons refused to answer the questionnaire (1% of those who were present). The final sample for analysis consisted of 671 men and 745 women. Those who respectively did and did not answer the questionnaire were 38 and 30 years old for men and 42 and 34 years old for women. Differences were both statistically significant for men and women ($p < 10^{-3}$).

Among those who were both tested and participated to the questionnaire survey (616 men and 675 women aged 15 and more), 10.5% were infected with HIV (1.5% with HIV-1, 7.5% with HIV-2, 1.4% dually infected and 0.2% infected with HIV with undertermined type). More women than men were infected with HIV and the difference is even higher when one excludes HIV-1 infected people (6% for men and 9% for women).

Variables by site

Table 1 tabulates values for variables that were found to differ between Caio, the site with relatively high HIV levels and one of the two other sites with low HIV levels. The sample from Caio was restricted to those aged 15-59 in order to assure comparability with the other two sites.

The sample was sorted by age at interview and age at marriage was estimated by the age at which half of the sample is married or has ever been married. Age at marriage was higher in Caio for both genders: (for men 29 in Caio versus 26 in Niakhar and 26 in Bandafassi; the same respective figures for women were 19 versus 16 and 17).

Median age at first sex was significantly lower among men from Caio (17) than among men from any of the other two sites (19 in Niakhar and 18 in Bandafassi). Conversely, Median

age at first sex was significantly higher among women from Caio (18) than among women from any of the other two sites (16 in Niakhar and 14 in Bandafassi). These results together with age at marriage suggest that while age at first sex is near from age at marriage among women in all three sites, this is not the case among men. Moreover, the gap between age at first sex and age at marriage is important and much wider among males from Caio (12 years) than from Niakhar (7 years) and Bandafassi (8 years).

Both men and women from Caio were much more likely to report alcohol consumption in the past week than in the other two sites (80% of men and 84% of women versus less than 32% of respondents from the other two sites). Men and women from Caio were more likely to report condom use in the last 4 weeks than respondents from the other two sites and men from Caio were more likely to have ever been in school than men from Niakhar and Bandafassi. Women from Caio were more likely to have ever been in school than women from Niakhar.

Married men from Caio were more likely to report non-spousal regular partners (23% versus 4% in Niakhar and 8% in Bandafassi) but this was not the case for women. However, it must be noted that respondents from Caio were not more likely to report casual partners, casual partners in a city and partners in exchange of money.

Sexual contacts with exchange of money and commercial sex are clearly two different concepts: while one third of male respondents reported sex in exchange of money in Bandafassi, only 2% of these men reported contacts with sex workers. The highest proportion of men reporting contacts with sex workers was in Caio (8%). Nobody reported contact with sex workers in Niakhar.

Men from Caio were less likely to report being circumcised: male circumcision is almost universal in Niakhar and Bandafassi while 72% of men from Caio reported to be circumcised. This reflects a lower rate of male circumcision in Caio but also the fact that men from Caio are circumcised later than men from the two Senegalese sites. However, according to men's reports, it is likely that a substantial proportion of men will never be circumcised: among men

from Caio aged more than 29 years old, 9% are still not circumcised. Female circumcision is almost non-existent in Niakhar and Caio, but universal in Bandafassi.

Both long-term mobility and short-term mobility were very common in all 3 sites. Long-term mobility was more frequent in Niakhar (reported by 39% of men and 26% of women) and short-term mobility was more frequent in Bandafassi (reported by 56% of men and 35% of women).

Risk factors in Caio

Because of the low HIV prevalence in the 2 Senegalese sites, the risk factor analysis was restricted to Caio. HIV prevalence varied greatly by age group and the age distribution of HIV prevalence is the results of the mixing of two well known distribution for HIV-1 (with a peak at young ages) and HIV-2 (with an increasing prevalence with age). For the risk factors analysis however, HIV-1 and HIV-2 positive individuals were grouped to achieve sufficient statistical power. Because mobility could be associated with health care seeking, we excluded from the multivariate analyses all respondents who reported at least one short-term travel for a medical reason. The multivariate analysis was conducted among 520 sexually active men and 626 sexually active women from Caio. Results of the univariate and multivariate analyses of risk factors for HIV infection are presented in Table 3 and Table 4 respectively. Among men, the prevalence of HIV was highest in the age group 30-39 and HIV infection was associated with absence of education, report of more than one partner in the last 12 months and short-term mobility. When adjusted using multivariate, only age (aOR=11.1 CI95%=[3.65-33.9] for those aged 30-39 and aOR=11.1 CI95%=[3.42-35.7] for those aged 40-59, compared to those aged 15-29) and short-term mobility (aOR=2.06 CI95%=[1.06-3.99]) remained associated with HIV infection. Among women, factors associated with HIV infection in univariate analysis were age, living in the central area, absence of education, report of partners in a city and short-term mobility, especially for a medical reason. In multivariate analyses, factors associated with an

increased risk of HIV infection among women were age (aOR=6.70 CI95%=[3.81 –16.0] for those aged 40-59 and aOR=5.06 CI95%=[1.56-20.2] for those aged more than 59 when compared to those aged 15-29), living in the central part of the area (aOR=1.79 CI95%=[1.05-3.06]) and having reported sex in a city during migration (aOR=5.61 CI95%=[1.56-20.2]).

Only 16 men reported to have a wife not currently living in Caio while 140 women reported to have a husband not living in Caio. HIV prevalence among these 16 men was 18.8%, which is twice the level of the general adult population, but the statistical power was not sufficient to attribute this as a risk factor. ($p=0.17$ from comparison, Fisher's Exact Test) Among women, the HIV infection levels were similar between those with and with no husband living in Caio (10.7%(N=140) versus 11.1% (N=505))

Sexual behaviours of short term migrants

Because the risk factor analysis strongly suggested the importance of short-term mobility and (for women) associated risky behaviour, we investigated this issue further by comparing in the three sites of our study behavioural variables between those who reported short-term mobility and those who did not. Table 4 shows associations of variables related to risky behaviours and condom use with short-term mobility adjusted on potential confounding sociodemographic characteristics. Short-term mobility was associated with a higher frequency of risky behaviours in Bandafassi and Caio for men (aOR were 1.5 and 1.8 respectively) and in Niakhar and Caio for women (aOR were 4.4 and 3.9 respectively). More specifically, short-term mobility was associated with the report of casual partners among men from Bandafassi (aOR=1.9) and among women from Niakhar (aOR=8.3) and Caio (aOR=5.7) while short-term mobility was associated with the report of more than one partner among men from Caio (aOR=2.8). Among men from Bandafassi and women from Niakhar, migration was associated, in addition to an higher frequency of risky behaviours, with an increase in the reports of condom use (aOR=3.3 and 5.3 respectively). In Caio however, mobility was not statistically associated with such an increased reported use of condom, although the trend was observed.

Risk of HIV infection by destination of migration (Caio area)

Respondents were asked to indicate the destinations for up to 4 short-term travels. This enabled us to compare HIV infection levels by destination among participants from Caio. Men who reported at least one short-term travel in Bissau were more likely to be infected with HIV (15.7% versus 6.5% $p=0.005$). If included in the multivariate risk factors analysis, short-term mobility to Bissau was a better predictor of HIV infection than overall short-term mobility (aOR=3.44; data not shown). By contrast, no specific destination was significantly associated with an increased probability of being infected with HIV among women.

DISCUSSION

We present here the first study that uses comparative standardised data from different settings to study the epidemiology of HIV spread in rural areas of West Africa. The study provides some evidence that mobility is a key feature of HIV spread throughout rural areas. Because of its ubiquity, mobility does not explain why HIV prevalence is high in certain regions and low in others but when HIV infection levels are significant, mobility appears as an important risk factor. This is allowed by the particular risky behaviour of both male and female migrants, presumably on migration sites. These conclusions are supported by a body of observations made throughout the present paper: (i) mobility is very prevalent in all of the 3 sites but not more frequent in Caio than in the other two sites; (ii) in Caio, HIV infection is associated with short-term mobility among men and with the report of casual sex in a city among women; (iii) short-term mobility is associated with risky behaviours in all of the three sites; (iv) in Caio, particularly high HIV infection levels were found for men who reported to have travelled to Bissau, the capital city where relatively high level of HIV-2 infection were reported [21]. It is however not certain that HIV epidemics in Bissau prevailed HIV epidemics in Caio. In addition, it is still not clear why HIV infection is higher in Bissau than in urban centres of Senegal. Even if one could argue that the differences reflect a gradient spreading from the epicentre of HIV-2 epidemic, the time elapsed since its beginning and the intensive population mobility in West-Africa would have led to more even HIV prevalences if all population were at the same risk. Some authors have hypothesised that the liberation war against the Portuguese colonial forces could be an explanation for the epidemic in Guinea-Bissau [22].

In order to explain the heterogeneity of HIV infection in our three sites, we sought socio-demographic and behavioural factors possibly associated with HIV infection both at the population and the individual level. However, no factor were found both to be a risk factor in Caio and to discriminate between Caio and the two Senegalese populations with low levels of infection. However, the observed associations between HIV infection and mobility does not imply

that HIV is not further transmitted within the Caio area. This is supported by the fact that among women, both residence in the central area and short-term mobility were independently associated with an increased risk of HIV infection. This result suggests that mobility could not explain by itself the observed HIV prevalence in Caio [Bückner, 1999].

Surveillance of HIV prevalence in Ziguinchor, Senegal, found that prostitutes from Guinea-Bissau were more likely to be infected with HIV-2 than other prostitutes [23]. Further observations noted that a high proportion of the prostitutes who were working in Bissau and Ziguinchor came from the Caio sector. This led the Medical Research Council to conduct a study in 1989-1991 to investigate HIV epidemiology in the area [15]; [Bückner, 1999]. In our survey, no woman reported to work as a prostitute while migrationing. The question was however not asked specifically, only reasons for migration were asked. An in-depth qualitative study did not notice reports of commercial sex work either [24] but the sample was small (25 women). However, the strong association between sex in a city and HIV infection may have hidden commercial sex work for some women.

As the interview was conducted shortly or immediately after the serological survey, the predictive role of short-term mobility in the last 4 weeks in multivariate risk factors analyses should not be misinterpreted as genuine exposure variables. The variable is rather used as an index of mobility habits.

A major concern is the reliability of self-reported data on behaviours related to AIDS and sexuality. A reliability survey we carried out in another rural area of Senegal showed that the same interview procedure (questionnaires filled out by local interviewers) provided very reliable data on sexual behaviour in married couples [25].

Participants were older than those who were not interviewed and this was consistently true across the 3 populations. The main reason for non-participation was that selected people were not at home when the interviewer came repeatedly to contact them. Non-participation is therefore associated with mobility and this could lead to a selection bias in our study. We do not

see how this selection bias could differ significantly from one site to another. We therefore think that even if it is likely that mobility was under-estimated in our study, the comparison of population's characteristics between sites remains valid. The very large age difference between participants and non-participants in Caio is explained by the fact that permanent migration is very common in this area. Many adults aged more than 30 are reported by family to be part of the population even if they have been living elsewhere for a long time.

Concerning the risk factors analysis, it cannot be excluded that people who are infected with HIV were less likely to participate in the interview conducted in Mai-June 1998 because some of them asked for their results after being tested between March 1997 and January 1998.

The area under study had a relatively low level of HIV infection when compared to level found in Southern and East Africa. However, Caio exhibits prevalence levels that are comparable to that found in the capital city, Bissau [21] and that are concordant with what was found during a previous study conducted in 1989-1991 in the same area [15]. However, in 1990 only 0.1% of adults were found to be infected with HIV-1 while it is now 1.5%. This confirms the trend found in nearby region of Ziguinchor in Senegal where the proportion of HIV-1 tends to increase while HIV-2 remains stable [26], [27].

Even if HIV transmissions are likely to occur within villages, our results confirm that rural HIV epidemics are continuously refuelled by the way of rural-urban mobility. Our study stresses that attention should be given to migrants from rural areas in relation to nearby cities with substantial level of HIV infection.

ACKNOWLEDGEMENTS

We are indebted to Koya Ariyoshi, Yero Baya, Bocar Daf, Eric Delaporte, Aldiouma Diallo, Oulimata Diop, Emmanuelle Guyavarch, Elizabeth Harding, Gérard Maamudu Kamara, Fili Keita, Tofen Ndiaye, Mamady Njie, Laurent Paupy, Lucy Pembrey, Sitor Ndour, Moussa Dieng Sarr, Tim Vincent for their contributions to field and laboratory work.

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MECORA group members

Peter Aaby; Projecto de Saùde de Bandim, Guinée-Bissau - Bocar Daf; Ministère de la Santé du Sénégal - Valérie Delaunay; laboratoire Population et Santé de l'Institut de Recherche et Développement, Dakar, Sénégal - Aldiouma Diallo; laboratoire Population et Santé de l'Institut de Recherche et Développement, Dakar, Sénégal - Oulimata Diop; Programme National de Lutte contre le SIDA du Sénégal - Catherine Enel; Institut National de la Santé et de la Recherche Médicale, Unité 88, France - Aïssatou Gueye-Ndiaye; Laboratoire de Virologie-Bactériologie de l'Hôpital Le Dantec de Dakar, Sénégal - Hilton Wittle; Medical Research Council, Banjul, The Gambia - Birgitta Holmgren; Projecto de Saùde de Bandim, Guinée-Bissau - Emmanuel Lagarde; Institut National de la Santé et de la Recherche Médicale, Unité 88, France - Souleymane Mboup; Laboratoire de Virologie-Bactériologie de l'Hôpital Le Dantec de Dakar, Sénégal - Ibrahima Ndoeye; Programme National de Lutte contre le SIDA du Sénégal - Jean-Pierre Piau; Programme de recherche sur le Sida de l'Institut de Recherche et Développement, Montpellier, France - Gilles Pison; Institut National d'Etudes Démographiques, Paris, France - Maarten Schim van der Loeff; Medical Research Council, Banjul, The Gambia - Karim Seck; Programme National de Lutte contre le SIDA du Sénégal - Rosemary Spira; Institut National de la Santé et de la Recherche Médicale, Paris, France - Ndeye Toure Kane; Laboratoire de Virologie-Bactériologie de l'Hôpital Le Dantec de Dakar, Sénégal - Mamadou Sarr; Programme National de Lutte contre le SIDA du Sénégal - Abdulaye Wade; Programme National de Lutte contre le SIDA du Sénégal.

Table 1. Sample size and selected socio-demographic and behavioural characteristics of the respondents.

	Men					Women				
	Niakhar	Bandafassi	Caio ^{&}	p (NC) [£]	p(BC) ^{££}	Niakhar	Bandafassi	Caio ^{&}	p (NC) [£]	p(BC) ^{££}
Sample										
Initial sample size	600	755	954			600	755	966		
Absent, unable to participate or deceased	189	257	271			125	134	215		
Refusals	7	58	12			13	109	6		
Respondents	404	440	671			462	512	745		
Marriage										
Estimated median age at marriage ^{**}	26	26	29			16	17	19		
Mobility										
Long-term mobility in the last 12 months	39%	19%	21%	<10 ⁻³	ns	26%	7%	22%	0.11	<10 ⁻³
Short-term mobility in the last 12 months	33%	56%	35%	ns	<10 ⁻³	29%	35%	24%	0.09	<10 ⁻³
Circumcision										
Is circumcised	99%	96%	72%	<10 ⁻³	<10 ⁻³	1%	97%	1%	ns	<10 ⁻³
Median reported age at circumcision	15	14	16		<10 ⁻³	4	8	8	ns	ns
Sexual behaviour										
Median reported age at first sex [#]	19	18	17	<10 ⁻³	<10 ⁻³	16	14	18	<10 ⁻³	<10 ⁻³
Married respondents who reported one or more non-spousal regular partner ^{#&}	4%	8%	23%	<10 ⁻³	<10 ⁻³	4%	10%	3%	ns	0.002
Reported at least one casual partner ^{#&}	22%	23%	21%	ns	ns	5%	7%	2%	0.02	<10 ⁻³
Reported at least one casual partner in a city ^{#&}	13%	2%	17%	0.09	<10 ⁻³	8%	0%	3%	<10 ⁻³	<10 ⁻³
Reported at least one partner with exchange of money ^{#&}	12%	33%	11%	ns	<10 ⁻³	11%	20%	2%	<10 ⁻³	<10 ⁻³
Reported one or more contact with a commercial sex worker ^{#&}	0%	2%	8%	<10 ⁻³	<10 ⁻³					
Reported condom use in the last 4 weeks [#]	2%	17%	28%	<10 ⁻³	0.007	6%	7%	12%	0.01	0.09
Miscellaneous										
Ever been in school	49%	61%	87%	<10 ⁻³	<10 ⁻³	21%	50%	45%	<10 ⁻³	0.07
Has drunk alcohol in the past week	19%	31%	80%	<10 ⁻³	<10 ⁻³	5%	25%	84%	<10 ⁻³	<10 ⁻³

* among those who reported one or more casual partners.

** Age at which 50% of the sample is ever married.

\$ in the last 12 months.

& Sample sizes are given for the whole sample (ages 15 and more) but comparisons of variables are restricted to the age group 15-59.

Among sexually active respondents.

£ p values for comparison between Niakhar and Caio (ns means >0.20).

££ p values for comparison between Bandafassi and Caio (ns means >0.20).

Table 2. Univariate analysis of risk factors for HIV infection in Caio.

	Men			Women		
	% HIV positive	N**	p	% HIV positive	N**	p
Age group						
15-29	1.3	308		3.9	232	
30-39	17.1	111		8.7	184	
40-59	14.6	82		21.3	108	
>59	11.3	115	>10 ⁻³	15.9	151	>10 ⁻³
Residence						
Peripheral	5.9	341	0.05	8.1	372	0.02
Central	10.2	275		13.9	303	
Marital status						
Married in monogamous union	10.3	156		7.7	156	
Married in polygamous union	16.2	117		9.6	322	
Divorced	11.8	17		13.3	15	
Widowed	21.4	14		22.1	104	
Never married	2.6	312		5.1	78	
Ever been in school						
No	13.9	151	0.003	14.1	447	>10 ⁻³
Yes	5.8	465		3.9	228	
More than 1 partner in the last 12 months						
No	6.0	447		10.8	669	
Yes	12.4	169	0.01	0	6	ns
Reported one or more casual partner among sexually actives						
No	9.7	442		11.1	637	
Yes	5.5	91	ns	11.1	9	ns
Reported partner(s) in a city\$&						
No	9.0	457		10.7	629	
Yes	9.3	75	ns	25.0	16	0.09
Reported partner(s) with exchange of money\$&						
	8.7	483		11.2	634	
	12.2	49	ns	0	11	ns
Went out of the village for one day or more in the last 4 weeks (short-term mobility)						
No	5.9	423		9.1	528	
Yes without any medical reason	11.0	181	0.03	14.1	128	0.09
Yes with a medical reason	27.3	11	0.03	31.6	19	0.007
Went out of the village for one month or more in the last 12 months (long-term mobility)						
No	7.4	502		10.6	127	
Yes without any medical reason	8.2	97	ns	11.7	103	ns
Yes with a medical reason	17.6	17	ns	8.3	24	ns
Had been in hospital in the last 5 years						
No	6.9	493		10.4	539	
Yes	10.9	119	ns	11.9	135	ns
Had received a transfusion during those hospitalisation						
No	10.6	104		10.6	113	
Yes	15.4	13	ns	18.2	22	ns

& among sexually actives

\$ in the last 12 months

** variations in the total number of respondents are due to a small number of non-responses

Table 3. Multivariate logistic regression analysis of risk factor[&] for HIV infection in Caio among men (N=520) and women (N=626).

	OR [*]	CI ^{**}	p
Men			
Age group			<10 ⁻³
15-29	1		
30-39	11.1	3.65-33.9	<10 ⁻³
40-59	11.1	3.42-35.7	<10 ⁻³
>59	7.64	2.32-25.2	<10 ⁻³
Travelled out of the village for one day or more in the last 4 weeks			
No	1		
Yes	2.06	1.06-3.99	0.03
Women			
Age group			0.008
15-29	1		
30-39	2.22	0.91-5.43	ns
40-59	6.70	3.81-16.0	<10 ⁻³
>59	5.06	1.56-20.2	<10 ⁻³
Residence			
Peripheral	1		
Central	1.79	1.05-3.06	0.03
Reported casual partner(s) in a city in the last 12 months			
No	1		
Yes	5.61	1.56-20.2	0.008

& Respondents who reported short-term mobility with a medical reason were excluded from the analysis

* adjusted Odd-ratios

** 95% confidence interval

Table 4. Comparison of sexual behaviour between those reporting short-term mobility and those who did not by site and gender.

	NIAKHAR			BANDAFASSI			CAIO		
	Mobile % (n)	Non Mobile	aOR [§] [CI95%]	Mobile % (n)	Non Mobile	aOR [§] [CI95%]	Mobile % (n)	Non Mobile	aOR [§] [CI95%]
Men									
Number of respondents	132	272		245	194		188	352	
Reported risky behaviour in the last 12 months	21.2 (28)	22.4 (61)	-	30.6 (75)	21.7 (42)	1.5 [¶] [0.9-2.4]**	45.7 (86)	28.4 (100)	1.8 [1.2-2.6]***
Casual partner (s)	20.5 (25)	23.1 (53)	-	27.8 (68)	17.1 (33)	1.9 [1.1-3.2]***	23.6 (42)	19.8 (54)	-
Sexual contact with commercial sex worker (s)	0	0	-	2.9 (7)	0	-	7.9 (14)	8.5 (23)	-
Non-spousal partners (married men)	2.5 (2)	5.2 (7)	-	5.0 (8)	7.8 (9)	-	26.3 (21)	14.3 (17)	-
More than 1 partner	17.7 (3)	22.2 (6)	-	6.9 (2)	7.7 (2)	-	25.9 (28)	8.2 (19)	2.8 [1.4-5.5]***
Reported condom use in the last 4 weeks	4.4 (3)	2.6 (3)	-	20.9 (149)	11.1 (8)	3.3 [1.1-9.6]***	34.0 (36)	23.1 (28)	-
Women									
Number of respondents	132	330		180	331		138	441	
Reported risky behaviour in the last 12 months	16.7 (22)	4.2 (14)	4.4 [2.0-9.6]***	13.3 (24)	10.6 (35)	-	7.3 (10)	2.0 (9)	3.9 [1.5-10.2]***
Casual partner (s)	11.1 (14)	2.3 (7)	8.3 [2.6-27.0]***	8.9 (16)	5.5 (18)	-	5.3 (7)	1.0 (4)	5.7 [1.5-21.5]***
Non-spousal partners (married women)	7.5 (9)	2.8 (8)	-	6.8 (10)	6.6 (19)	-	3.0 (3)	1.4 (5)	-
More than 1 partner	25.0 (1)	10.0 (1)	-	14.3 (1)	14.3 (1)	-	0	0	-
Reported condom use in the last 4 weeks	13.5 (13)	3.8 (8)	5.3 [1.7-16.7]***	8.8 (8)	6.4 (9)	-	15.0 (6)	10.7 (15)	-

*** p ≤ 0.05

** p ≤ 0.10

& Adjusted Odds-Ratio. Potential cofounders included age, matrimonial status, educational level, access to radio and tv, religion and ethnic group. They were included only when statistically significant.