

## From prenatal HIV testing of the mother to prevention of sexual HIV transmission within the couple.

Annabel Desgrées Du Loû, Hermann Brou, Annick Tijou Traoré, Gérard Djohan, Renaud Becquet, Valériane Leroy

► **To cite this version:**

Annabel Desgrées Du Loû, Hermann Brou, Annick Tijou Traoré, Gérard Djohan, Renaud Becquet, et al.. From prenatal HIV testing of the mother to prevention of sexual HIV transmission within the couple.. Social Science and Medicine, Elsevier, 2009, 69 (6), pp.892-9. <10.1016/j.socscimed.2009.05.045>. <inserm-00399386>

**HAL Id: inserm-00399386**

**<https://www.hal.inserm.fr/inserm-00399386>**

Submitted on 4 Aug 2009

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# **From prenatal HIV testing of the mother to prevention of sexual HIV transmission within the couple**

Annabel Desgrées Du Loû<sup>1\*</sup>, Hermann Brou<sup>1,2</sup>, Annick Tijou-Traore<sup>3</sup>, Gérard Djohan<sup>2</sup>, Renaud Becquet<sup>4,5</sup>, Valérie Leroy<sup>4,5</sup>  
the ANRS 1201/1202/1253 Ditrane Plus Group

<sup>1</sup> CEPED, Centre population et développement IRD, INED, Université Paris Descartes, CEPED 221 Boulevard Davout 75020 Paris,FR

<sup>2</sup> Ecole Nationale Supérieure de Statistiques et d'Economie Appliquées ENSEA, CI

<sup>3</sup> ADES, Aménagement, Développement, Environnement, Santé et Sociétés CNRS : UMR5185, Université Michel de Montaigne - Bordeaux III, Université Victor Segalen - Bordeaux II, UMR ADES Maison des Suds 12, Esplanade des Antilles 33607 PESSAC CEDEX,FR

<sup>4</sup> ISPED, Institut de Santé Publique, d'Epidémiologie et de Développement Université Victor Segalen - Bordeaux II, 146 rue Léo Signat 33076 Bordeaux Cedex,FR

<sup>5</sup> Epidémiologie, santé publique et développement INSERM : U593, IFR99, Université Victor Segalen - Bordeaux II, ISPED, Université Victor Segalen 146, Rue Leo Saignat 33076 BORDEAUX CEDEX,FR

\* Correspondence should be addressed to: Annabel Desgrées Du Loû <annabel.desgrees@ird.fr >

## **Abstract**

**The first step of prevention of mother-to-child HIV-transmission (PMTCT) programmes is offering HIV counselling and testing to pregnant women. In developing countries where HIV-testing remains rare, it represents a unique opportunity for many women to learn their own HIV status. This prenatal HIV testing is not only the entry point to prevention of mother-to-child HIV transmission, but also an occasion for women to sensitize their male partner to sexual risks. We explore here if these women, HIV-tested as mothers, apply the prevention recommendations they also receive as women.**

**In the Ditrane Plus PMTCT program in Abidjan, Côte d'Ivoire, two cohorts of women (475 HIV-infected women and 400 HIV-negative women) were followed-up two years after the pregnancy when they were offered prenatal HIV testing. In each cohort, we compared the proportion of women who communicated with their regular partner on sexual risks, prior to and after prenatal HIV testing. We analysed sociodemographic factors related to this communication. We measured two potential conjugal outcomes of women HIV testing: the level of condom use at sex resumption after delivery and the risk of union break-up.**

**Prenatal HIV testing increased conjugal communication regarding sexual risks, whatever the woman serostatus. This communication was less frequent for women in polygamous union or not residing with their partner. Around 30% of women systematically used condoms at sex resumption. Among HIV infected ones, conjugal talk on sexual risks was related to improved condom use. After HIV testing, HIV-infected women separated more from their partner than HIV-uninfected women, despite very few negative reactions from the notified partners.**

**In conclusion, offering prenatal HIV counselling and testing is an efficient tool to sensitize women and their partners to HIV prevention. But sexual prevention in a conjugal context remains difficult and need to be specifically addressed.**

**MESH Keywords** Adult ; Chi-Square Distribution ; Cote d'Ivoire ; Counseling ; Disease Transmission, Infectious ; prevention & control ; Female ; Follow-Up Studies ; HIV Infections ; diagnosis ; transmission ; Humans ; Infectious Disease Transmission, Vertical ; prevention & control ; Interpersonal Relations ; Interviews as Topic ; Male ; Pregnancy ; Pregnancy Complications, Infectious ; diagnosis ; Prenatal Diagnosis ; Risk Factors ; Sexual Behavior ; statistics & numerical data ; Sexual Partners ; Truth Disclosure

## **INTRODUCTION**

Despite of considerable expansion of antiretroviral therapy all over the world, the HIV/AIDS epidemic is still going on, and prevention efforts must be reinforced. The 1.7 million incident HIV infections in Sub saharan Africa in 2007 (UNAIDS, 2007 ) highlights the inadequacy of current HIV prevention efforts and the need to find new prevention approaches (Bunnell, Mermin, & De Cock, 2006 ).

In Africa, the main routes of HIV transmission are heterosexual, and from mother to child. During the last decade, considerable progresses in the prevention of HIV mother to child transmission (PMTCT) were achieved. PMTCT programmes using antiretrovirals during pregnancy and labour are now available at moderate cost in most countries affected by the HIV/AIDS epidemic (Leroy, Sakarovitch, Cortina-Borja, McIntyre, Coovadia, Dabis et al., 2005 ).The first step of a PMTCT programme consists of systematically offering HIV counselling and testing to pregnant women attending antenatal care. These PMTCT programmes should also be considered an entry point to the prevention of the sexual transmission of HIV and other Sexually Transmitted Infections (STI). Indeed, this prenatal HIV counselling and testing, if offered routinely and on a large scale, represents a unique opportunity for many women in resource-limited countries to learn their own HIV status. Identified HIV-infected pregnant women can then access PMTCT interventions, and receive

adequate care for themselves and their child, but should also be informed to avoid HIV transmission to their sexual partner. This counselling is also a way to educate on the risks associated with STI transmission and to encourage HIV-negative women to preserve their own negative sero-status (McIntyre, 2005 ). Prenatal counselling and testing is an essential tool for a global prevention of both vertical and horizontal transmission risks. Hence, client women of these programs should be considered not only as future mothers but also as women engaged in relationships with male partners.

In this study we examine the effect of HIV-testing offered to pregnant women on their conjugal relationship. Indeed, most of the pregnant women have a regular male partner, regardless of their marital status. Once HIV-testing has been offered in prenatal consultation and the implications of its result understood, they will have to choose whether or not to inform their male partner of their HIV testing. Then, HIV-negative women will have to try to preserve their negative status, and HIV-infected ones will have to face the risk of sexual HIV transmission to their partner. Are these women, HIV-tested as mothers, able to apply the prevention recommendations they received as sexual partners?

We observed in Abidjan, Côte d'Ivoire, the consequences of prenatal HIV-testing on HIV-infected and HIV-negative women's behaviours with their regular male partners through three indicators: the communication established by women with their sexual partners about sexual risks and HIV testing, the risk of union dissolution, and condom use when they resume sexual relations after delivery.

## **Background**

### **The urgent need to focus on HIV transmission between regular partners**

The development of HIV prevention strategies targeting couples and not only individuals seems increasingly relevant for improving the prevention of unsafe sexual behaviours. HIV prevention campaigns and messages have mainly been focused on the prevention of "at risk" sexual behaviours, involving professional sex workers or occasional partners. Yet nowadays, and specifically in Africa, the majority of new infections occur within the couple, through the transmission of HIV between regular partners, because of either prior infection by one partner or infidelity (De Walque, 2007 ; Malamba, Mermin, Bunnell, Mubangizi, Kalule, Marum et al., 2005 ). The development of new prevention strategies that target sexual relations between regular partners is essential. The use of condoms is indeed the most problematic within couples. Condoms are frequently associated with occasional sexual intercourse and are not well accepted among stable couples (Van Rossem, Meekers, & Zkinyemi, 2001 ). Suggesting condom use to a partner may be interpreted as a proof of infidelity or may express a lack of trust in the partner's sexual fidelity (Chimbiri, 2007 ). Consequently, condom use remains low in a conjugal context ( De Walque, 2007 ). Nevertheless, women appear able to use condoms when they perceived themselves at risk (Maharaj et Cleland, 2005 ).

### **"In union" category in Africa: a complex spectrum of marital types**

In Africa, it is quite difficult to precisely define the marital status. Marriage is often not reducible to a distinct event and is rather a process that take years to complete (Hattori & Doodoo, 2007 ; Meekers, 1992 ). It often starts by a single cohabitation, sometimes indistinguishable from formal marriage. Beyond marriage and cohabitation, visiting unions (without coresidence) and polygamous unions are frequent in some countries (Locoh, 1994 ). The "in union" category, which includes all persons who declare having a regular partner, seems to be the most relevant category to take into account in order to explore the prevention of HIV transmission within conjugal relationships.

### **Couple communication on sexual risk as a prevention tool**

The couple's knowledge about condoms and the condom availability both need to be improved to increase the proportion of couples using condoms regularly. But dialogue between couple members may also be considered as a prerequisite to behaviour change. It has been shown that reproductive health outcomes improved when couples were discussing the number of children they desired (Babalola, 1999 ). Several couple-oriented HIV counselling and testing programmes have reported increased condom use when both members of the couple had been tested and knew each other's serostatus (Allen, Meinzen-Derr, Kautzman, Zulu and Trask, 2003 ; Farquhar, Kiarie, Richardson, Kalwa, John, Nduati et al., 2004 ). However, most research studies available to date have described the many constraints of discussing sexuality and sexual risks within couples (Ogunjuyigbe & Adeyemi, 2005 ). The factors facilitating this communication and the means by which this dialogue translates to the active and effective prevention of sexual risks both need to be better understood.

### **HIV testing and notifying the partner**

The first step of HIV prevention is the HIV-test, since knowledge of HIV status is associated with preventive behavior by individuals infected with HIV (Bunnell, Mermin, & De Cock, 2006 ). But in Africa, most people have never been tested for HIV infection and are unaware of their serostatus. Many women are now offered HIV-counselling and testing thanks to the expansion of PMTCT programs. Difficulties of delivering routine prenatal HIV counselling and testing have been well documented. Women who fear breaches in confidentiality from health care workers regarding their HIV status or fear the stigmatisation associated with HIV tend to refuse HIV testing (Kilewo, Massawe, Lyamuya, Semali, & Kalokola, 2001 ). Male partners may have negative (sometimes even violent) reactions,

when they discover their wife's HIV infection (Gaillard, Melis, Mwanyumba, Claey, & Muigai, 2002) – although the negative consequences of HIV testing seem less frequent than originally feared (Desgrées du Loû, 2005; Semrau, Kuhn, Vwalika, Kasonde, Sinkala, Kankasa et al., 2005). In a context where HIV-testing is not widespread, prenatal counselling and testing puts women at the “entry point” of the conjugal awareness on HIV. They may thus be considered to be responsible for the HIV infection, when infected. Nevertheless, prenatal care is certainly the most appropriate way to deliver counselling on the prevention of HIV and STIs to women who do not frequently access health care services. Although prenatal care may not be the most appropriate setting for mobilising men, involving partners at least once during the pregnancy appears largely feasible (Baiden, Remes, Baiden, Williams, Hodgson, Boelaert et al., 2005).

### **HIV situation and development of PMTCT programs in Côte d'Ivoire**

Abidjan is the economic capital of Côte d'Ivoire and one of the largest city in West Africa (population approximately 3 millions). HIV prevalence in antenatal clinics was estimated to be 11% in 2002 (Msellati, Sakarovitch, Bequet, Atta, Alioum, Viho et al., 2006). A national survey conducted in 2005 estimated an overall 6.1% HIV prevalence among adults in Abidjan, with a huge difference between women (HIV prevalence of 8.6%) and men (HIV prevalence of 3.5%) (INS & Ministère de la lutte contre le Sida, 2005). Being “in union” did not appear to protect against the HIV infection risk: in 2005, the prevalence was 6.1% among “in union” women and 3.6% among “in union” men.

Prevention of mother-to-child transmission (PMTCT) research programs have been conducted since 1995 in Abidjan (Dabis, Msellati, Meda, Wellfens-Ekra, You, Manigart et al., 1999). Since 1999, several operational programs aimed to reduce MTCT have been implemented in Abidjan with the support from the National AIDS Control Program and research to improve PMTCT programmes was maintained through the several projects (Ekouevi, Leroy, Viho, & al., 2004).

In this context, it appeared necessary to explore how the HIV counselling and testing offered within these PMTCT programs might have beneficial effects on the global prevention of HIV risks. Such a global prevention of both vertical and horizontal transmission risks is particularly relevant in the regular couple, where sexuality and procreation are closely linked and where sexual transmission is thus difficult to prevent.

## **Data and measures**

### **Study population and design**

Our study took place within the ANRS DITRAME PLUS multidisciplinary PMTCT research programme conducted in Abidjan, Côte d'Ivoire, from 2001 to 2005. Among the services provided, prenatal counselling and HIV testing was systematically offered to every pregnant women attending seven antenatal clinics in Abobo and Yopougon (Ekouevi, Leroy, Viho et al., 2004). These two districts are located in Abidjan, the economic capital of Côte d'Ivoire. Pre and post counselling was provided by a trained team of social and health workers specifically devoted to the research project. Women who accepted the HIV test and who were HIV-infected entered the PMTCT programme fully described elsewhere (Dabis, Becquet, Ekouevi, & al., 2005; Leroy, Sakarovitch, Viho, Becquet, Ekouevi, Becquet et al., 2007) and were followed-up during two years after the delivery.

HIV-negative women were offered a reproductive health oriented follow-up, with one visit to the health center every six months during the first two years after delivery. No monetary incentive was offered to the participating women, other than the reimbursement of transportation fees.

Mother-infant pairs had access to free health care services, regardless of their HIV status.

The prenatal HIV counselling and testing was offered to pregnant women, and then these women were encouraged to suggest HIV testing to their male partner. Free HIV counselling and testing was provided to the women's partners and relatives who requested it. All women signed an informed consent form before participating in the programme.

### **Data collection**

At the time that the counselling and testing was offered, we collected data on women's socio-demographic characteristics and sexual behaviours during the two years preceding the current pregnancy. At each follow-up visit, standard questionnaires were administered to all women to document the resumption of sexual activity after delivery. Among all women who performed their 18-month post-partum visit between February 2004 and February 2005, data was collected on communication with their partner regarding HIV and sexual risks and on HIV-testing of the male partner since the woman HIV-testing (Desgrées-du-Loû, Brou, Djohan, Becquet, Ekouevi, Zanou et al., 2007). The same structured, close-ended questionnaires were administered to HIV-infected women and HIV-uninfected women. Questionnaires were administered during individual 40-minute-long interviews, in private rooms to secure maximum confidentiality, by specially trained social workers and midwives participating in the program.

In-depth and individual semi-directed interviews were also carried out within a subgroup of these women after delivery and with their male partners when possible. Fourteen HIV-infected women were interviewed, and for ten of them we interviewed also their partners. We interviewed 18 HIV negative women as well as 10 of their partners. The qualitative analysis based on men's and women's interviews was fully described elsewhere (Tijou Traore, 2006 ). In this paper, we do not present the results of this qualitative study in details but we will refer to them in discussion in order to perform a synthesis between quantitative and qualitative data.

## Statistical analysis

Baseline socio-demographic characteristics of the two groups of women (HIV infected and HIV negative) were described and compared with the Pearson Chi<sup>2</sup> test. We compared women's socio-demographic characteristics (religion, education level, age, age at first sexual intercourse, remunerated activity), type of housing (individual housing or common courtyard), living arrangements (with a male partner or not, with the family or the family-in-law or not). If the woman declared a regular partner, we described the partner's socio-demographic characteristics (age and education level) and the type of union (polygamous or monogamous). A woman was classified as living within polygamous household when she declared the existence of at least one co-spouse, regardless of her own marital status: i.e. a woman having a non-spousal polygamous partner and not cohabitating – this partner himself having a legitimate wife with whom he is living – was considered as living within a polygamous household. It may be considered as a modern form of polygamy (Locoh, 1994 ).

The conjugal impact of HIV-testing was assessed through the changes observed in communication between the women and their partner regarding sexual risks (STIs/HIV).

We compared the conjugal communication regarding sexual risks prior to and after the prenatal offering of HIV counselling and testing, in each group (HIV positive and HIV negative women). The indicator of communication on sexual risks prior to HIV testing was the proportion of women who declared at the inclusion visit that they had already discussed STIs with their regular partner at least once within the two years preceding their current pregnancy. The indicator of communication on sexual risks after prenatal HIV testing was the proportion of women who declared at the 18-month post-partum visit that they had discussed STIs with their partner at least once since the prenatal HIV testing. In each group of women (HIV positive and HIV negative), these two proportions prior to/after the prenatal offering were compared with McNemar test.

We also measured the proportion of women who had disclosed their HIV-test result to their partner, the proportion who had suggested at least once to their partner to undertake HIV testing and the proportion who had suggested that their partner use condoms if he had extraconjugal intercourse, between the prenatal HIV-testing and the 18-month post-partum visit. We then created a global indicator of the communication level related to STIs and HIV after HIV testing. Communication was considered « complete » if the woman had discussed STIs with her partner at least once, had notified him her HIV-test result, and had suggested at least once that he undertakes HIV testing. Communication was considered « partial » if she had discussed one or two of these issues, and « non-existent » if she had raised none of them. We performed univariate analyses to assess the influence of the woman's and the partner's socio-demographic characteristics and the woman's serostatus on this global communication indicator.

In order to document potential adverse effects of HIV testing on couples, we compared between HIV-infected and HIV-negative women the proportion of union break-up between HIV-testing and 18 month post-partum. We analysed how the risk of couple break-up was related to socio-demographic characteristics of the woman and her household (polygamous or monogamous, coresidency of the partners or not) and to partner's notification.

Finally we measured the prevention of sexual HIV transmission by condom use at sex resumption, as an outcome of prenatal HIV counselling and testing.

Of the women who resumed sexual intercourse, we measured the proportion who declared they had systematically used condoms at sex resumption after delivery (from the following question asked to women at each follow-up visit: "did you use condoms if you have resumed sexual activity since the last visit? Answer 1: no, answer 2: yes, sometimes, answer 3: yes, systematically "). We analysed how the conjugal communication about sexual risks was related to systematic condom use at sex resumption, following HIV-status of the woman. The data was entered and managed with Epidata 3.0 and MS Access 2000, and the statistical analyses were performed with SPSS 13.0.

## Results

Between August 2002 and August 2003, 475 HIV-infected women and 400 HIV-negative women were included. Of these, 128 (26.7% ) and 45 (11.3%) did not perform their 18-month post-partum visit, leaving 347 HIV-infected and 355 HIV-negative women. All of them

declared having had a regular partner at least once during the two years period preceding the prenatal HIV counselling and testing. After HIV testing, 41 HIV positive women and 3 HIV negative women declared no regular male partner on the whole period between inclusion in the study and 18 months post-partum.

No differences in education level, religion, living arrangements, partner's education level were observed between HIV-infected and HIV negative women. Compared to HIV-negative women, HIV-infected ones were slightly older (67% were aged 25 or more versus 57% among HIV-negative,  $p=0.03$ ) and more often in polygamous union (21% of HIV-positive women versus 14% of HIV-negative ones,  $p=0.02$ ). They had older male partners (89% aged 30 or more versus 73% for HIV-negative women,  $p<0.01$ ), with also a greater age difference between partners (partners' age difference was inferior to 5 years for only 14% of HIV-positive women versus 32% of HIV-negative ones,  $p<0.01$ ).

### **Notifying the male partner and talking about sexual risks**

Prior to HIV-testing, HIV-negative pregnant women were more likely to have already discussed STIs than HIV-infected women: 65% versus 28% (Table 1 ). This difference was statistically significant after adjustment on socio-demographic factors ( $p<0,01$ ). After HIV counselling and testing, there was a significant increase in the percentage of communication related to STIs among both HIV-infected and HIV-negative women (37% and 32% respectively). Women discovering their HIV-negative status had high levels of communication with their partner regarding STIs and HIV over the 18-month postpartum period: more than 95 % discussed STIs, disclosed their own HIV test result and suggested that their partners undertake HIV testing. Ninety-four percent suggested condom use to their male partners in extraconjugal sexual relations.

Among HIV-infected women, the increase in couple communication regarding STIs was similar but led to a lower cumulative level of communication, since the baseline pre-test communication was lower: after HIV testing, 65% of HIV-infected women discussed STIs. Nevertheless, only 43% of HIV-infected women disclosed their own HIV-status to their partner. Despite this low level of notification, 72% of HIV infected women suggested that their partner be HIV-tested, and 58% asked their partners to use protection in extraconjugal sexual relations. Among informed partners of HIV-infected women, 81% (106/131) were understanding and 4% (5/131) had negative reactions (anger or rejection).

Women who had a co-spouse and women who did not reside with their male partners were less likely to communicate with him about sexual risks (table 2 ), whatever their serostatus. Among HIV-infected women, a low level of education of the woman or of her partner was associated with less communication regarding sexual risks and HIV-testing. But a high level of education of the woman and/or her partner was associated with a partial communication on sexual risks (table 2 ). A third (36/110) of well educated HIV-infected women used to talk to their partner about STIs and suggested that he undertakes an HIV test, but did not inform him of their own test result. The age of the woman, her age at first intercourse, living in shared or individual housing and having a remunerated activity were not significantly related to the level of communication on sexual risks with the partner.

### **Union dissolution**

Six per cent of HIV-infected women's partners died versus 2% for HIV negative women ( $p<0.01$ ), and 15% of HIV-infected women separated from their male partner versus 2% among HIV-negative women ( $p<0,01$ ) (table 3 ).

Union break-up was associated with having a co-spouse and not residing with one's partner. But having notified one's serostatus to the partner was not associated with a greater risk of union break-up (table 3 ). Only 16 women who separated from their partner had told him they were HIV infected, and of them only 3 experienced a negative reaction. For 12 of them, the partner reacted positively. The last one was indifferent.

### **Prevention of sexual transmission**

At their 18-month post-partum visit, 78.4% (272/347) of HIV-infected women and 94.1% (334/355) of HIV-negative women had resumed sexual activity ( $p<0.01$ ).

Of the women who resumed sexual activity within the 18-month post-partum period, HIV-infected women were not significantly more likely than HIV negative women to systematically use condoms, 33% (89/272) and 27% (91/334) respectively ( $p=0.14$ ) (table 4 ). Among HIV-infected women, condom use was more frequent when their partner had been HIV-tested and in particular if he was also HIV infected (50% of women in HIV+ seroconcordant couples reported condom use versus 39% of women in serodifferent couples and 27% when the male partner was not HIV tested,  $p=0.04$ ). Communication with the partner about STIs and HIV, even partial, was associated with a better systematic use of condoms: 37% of women who discussed sexual risks with their regular partner used condoms versus 18.5% when they did not ( $p=0.03$ ).

For both HIV-infected and HIV-negative women, a high level of education for both male and female partners was associated with a better condom use (table 4 ). Whatever the serostatus, marital characteristics (polygamous or monogamous union and coresidency), type of housing, age of the woman and age of the partner were not associated with condom use.

## Discussion

We observed that prenatal counselling and testing increased conjugal communication about sexual risks between the women tested and their regular partners, among both HIV-infected and uninfected women. After HIV testing, we measured a better condom use than observed in the general population: 27% of HIV-negative women and 33% of HIV-infected women used condom when resuming sex, whereas in the last Demographic and Health survey in Côte d'Ivoire, less than 2 % of "in union" women were using condom at the moment of the survey, and only 15% of women had used condom at least once (INS & Macro, 2001 ). Hence, this offer of prenatal HIV testing appears not only the first step to prevention of mother-to-child transmission, but also an efficient tool to sensitize women and their partners to preventing sexual transmission. Among HIV-infected women, condom use improved when the partner was HIV-tested and when there was a conjugal talk on sexual risks.

These women participated in a research program that offered systematic prenatal HIV testing and counselling, in an urban context and in better conditions than in the operational context of PMTCT services delivery. The effect of prenatal HIV counselling and testing documented is thus likely to have been higher than what would have been observed within the national programme where free and continuous counselling, follow-up and women's support are not provided. However, this setting enabled us to observe a strong effect of prenatal HIV counselling and testing on postnatal spousal communication and HIV prevention, with reliable information thanks to the controlled anteriority of HIV-testing. Thus conclusions drawn from this specific context may be useful to other operational contexts. Other limitations of our study need to be mentioned: first, in the quantitative part of the study we were only able to collect self-reported data from women, and not from their partners, since the follow-up in the PMTCT program concerned only women. But the in-depth interviews conducted with both women and their male partners gave us informations on the male partners' point of view. Second, the only question asked to the women about their marital status was whether they were "in union" or not, without any further details on the type of union (legal, traditionnal, religious or informal union). Each woman was also asked if she had a co-spouse or not, and if she cohabitated with her male partner or not. Thus, for "in union" women, we were not able to analyse precisely the role of the specific type of union on prevention behaviours, but our set of pragmatic questions allowed us to observe how two main components of the women's conjugal life (residating or not with the partner, and having or not to cope with another spouse, a "rival") influence communication and sexual prevention within the couple. Third limitation: to measure the risk of union dissolution after HIV testing, we only considered the male partner of the woman at the moment of HIV testing. This does not reflect the whole conjugal reality of women. Indeed, a woman may have been separated from her partner following the HIV-test, and begun after that another union. But our analysis brings relevant informations on the effect of the HIV-test result on the current union at the time of HIV testing. Last point: for condom use analysis, we focused on resumption of sexual activity after delivery. It is a key moment to investigate prevention of sexual transmission. Indeed, women tested for HIV during pregnancy had often ceased any sexual activity after being informed of their HIV status; the resumption of sexual activity after delivery thus challenged for the first time their management of HIV infection in their couple relationship.

Conjugal communication about sexual risks was improved after prenatal HIV counselling and testing. Among women who were informed of their negative sero-status, these improvements were dramatic. Comforted and motivated by this negative result, almost all women communicated their HIV test result and encouraged their partner to undertake HIV testing. HIV positive women were less likely than HIV negative ones to discuss sexual risks with their partner, before and after HIV testing. Among HIV positive women, the communication related to STIs and HIV was different according to the type of marital union. It occurred less frequently when partners were living separately. Within households where women had « rivals » such as official co-spouses or non-official mistresses, talking about STIs and HIV appeared to be less common than within monogamous couples. When partners did not live together and/or when women lived with co-spouses, HIV-infected women seemed less likely to trust their partner, probably because the conjugal bond union is weaker than within a monogamous marriage or when partners live under the same roof (Fainzang, 1988 ).

After HIV testing, two thirds of HIV-infected women discussed sexual risks with their partners, but only 43% notified him of their HIV infection. This notification remains perceived as risky, related to the fear of being rejected by their partner, as often described in other settings (Gaillard, Melis, Mwanyumba et al., 2002 ; Kilewo, Massawe, Lyamuya et al., 2001 ; Medley, Garcia-Moreno, McGill, & Maman, 2004 ) (even though the data collected within our study only indicated a few cases of rejection).

Well-educated HIV-infected women often used indirect communication modes about HIV/AIDS. They were well informed, but feared their partners' potentially negative reaction. They discussed HIV/AIDS issues, and suggested their partners to undertake HIV testing, but did not inform them about their own HIV test and their own HIV infection. These women said little, but just enough to establish the basis for prevention practices.

Despite these difficulties in notifying the partner, the in-depth interviews revealed that HIV-infected women were willing to inform their partner of their serostatus (Tijou-Traoré, 2006 ). Even those who did not disclose their serostatus explained that they needed their partner's support, in particular to adhere to recommendations given by the medical team to prevent postnatal transmission to their baby and sexual HIV transmission to their partner. In this context where prolonged breastfeeding is widely practiced (Becquet, Castebon, Viho, Ekouevi, & Bequet, 2005 ), it is important for HIV-infected women opting for formula feeding to receive their partner's support. When they resume sex, suggesting condom use to their partner is also complex and may lead to suspicion if the partner is unaware of his wife's HIV status.

The greater condom use we observed in this study compared to the general population level confirms that women are not as powerless to negotiate condoms as it has been written. They may manage to use condoms when they perceive the risk of HIV infection, as previously suggested in a South African study (Maharaj & Cleland, 2005 ).

Nevertheless, this condom use, even if higher than in the general population, remains insufficient to ensure a good prevention of HIV transmission. Only one out of four HIV-infected women whose partner has not been HIV tested used condoms. This relative failure of the recommendations reveals firstly that conjugal communication about sexual risks is not enough to lead to effective sexual prevention. Secondly, it confirms the difficulties linked with condom use in a conjugal situation. In-depth interviews of women and men confirm that condom use remains a practice to be used with " women from the outside". As often described (Bauni & Jarabi, 2003 ; Chimbiri, 2007 ), both women and men are often reluctant to use condoms in a relation concerning the so-called "inside women", participating in a regular and stable relationship, in a conjugal way. Some women and men living in serodifferent couples and aware of each other's serostatus even explained that they did not use condom to avoid an object that reminded them the HIV-infection. This low condom use in serodifferent couples may also come from misconception or denial of the sexual HIV transmission risk between serodifferent partners (Bunnell, Nassozi, Marum, Mubangizi, Malamba, Dillon et al., 2005 ).

Only one on four HIV-negative women whose partner has not been tested used condoms. Yet, for these HIV-negative women, the post-partum period may be a time of increased risk for HIV infection, as traditional prolonged abstinence after pregnancy may result in men seeking extraconjugal relations (Cleland, Ali, & Capo-Chichi, 1999 ).

We found a greater risk of union dissolution among HIV infected women than among the uninfected ones. This comes partly from a higher mortality rate among male partners of these HIV-infected women, most probably due to AIDS. Though we also observed a greater risk of couple break-up when the woman was HIV infected, this was not linked to the partner's notification, since in most cases these partners were not informed of their wife's infection. But the risk of union break-up was greater when the conjugal bond was weak (unsettled relations, no cohabitation of partners) and in case of polygamy. In PMTCT programs, medical teams hesitate to convince women to share with their partner their informations on HIV-testing. It is mainly because staff is afraid of negative reactions of the women male partners, which could lead to divorce or separation. Our study results show that the problem may not be there: the reaction of the partners, when informed of their wife's status, was mostly positive and comprehensive and rarely led to divorce. It is possible that HIV-infected women chose themselves to break the relationship, in particular when this relationship was not solid enough and well installed. It seems that they preferred to break this union rather to face the difficulties of a conjugal relationship coping with HIV. One on five HIV-infected women stayed sexually abstinent 18 months after delivery. For some of these women, it may have appeared easier to be single and avoid completely sexual intercourses than to have protected intercourses in a regular relationship. Some women may also have left their partner because they perceived him to be the source of their HIV infection.

Hence, sexual prevention in a conjugal context is possible but remains difficult. In any case, conjugal condom use is greater when both partners have been HIV-counselled and tested, and when there is a conjugal communication regarding sexual risks. These results confirm that condom use in a conjugal context, though difficult, is possible when both partners are conscious of the transmission risk. The efficacy of such a sensitization of both partners on prevention has been also observed in other contexts (Gordon, Forsyth, Stall, & Cheever, 2005 ; Roth, Stewart, Clay, van der Straten, Karita, & Allen, 2001 ; Allen, Meinzen-Derr, Kautzman, Zulu, & Trask, 2003 ; Farquhar, Kiarie, Richardson, Kabura, John, Nduati et al., 2004 ; Semrau, Kuhn, Vwalika et al., 2005 ). But despite various recommendations to develop couple-centred approaches and researches (Painter, 2001 ; UNAIDS, 2001 ), this has not been implemented at a large scale and male partners are rarely involved in PMTCT.

## Conclusion

Pregnant women have been the main target for increased access to counselling and testing for HIV, due to increasing availability of PMTCT interventions. Prenatal services represent a unique and good opportunity of interaction between both women and men with health services. It is necessary to approach these pregnant women, not only as future mothers but also as women engaged in conjugal and sexual partnerships. Our study in Abidjan confirms that these women HIV-tested as mothers talk to their partners about the counselling they received, not only as future mothers but also as women exposed to HIV transmission risk within their couple. Prenatal counselling and testing may facilitate the three main approaches necessary in order to implement a positive prevention, as recommended by UNAIDS (



UNAIDS, 2006 ; Bunnell, Mermin and De Cock, 2006 ): it should help HIV-infected individuals learn their HIV status, disclose their status to their partner, and encourage partner testing.

Despite the positive results of several couple-centred approaches in PMTCT (including not only mothers but also fathers) and the conclusions of other studies about the need to involve male partners, women are still often considered only as mothers. Yet, it is essential to consider all their needs. We must not forget that women attending prenatal centres and being offered HIV-testing are both mothers and women often engaged in a conjugal relation they wish to preserve from all adverse events, including couple splitting and HIV/Aids.

## Acknowledgements:

### Sources of financial support

The primary sponsor of the Ditrane Plus study was the Agence Nationale de Recherches sur le Sida (ANRS). Hermann Brou was a fellow of the ANRS. Annick Tijou-Traoré was a fellow of the French charity SIDACTION. Renaud Becquet was a post-doctoral fellow of the French charity SIDACTION.

## References:

- Allen S , Meinen-Derr J , Kautzman M , Zulu I , Trask S . 2003 ; Sexual behavior of HIV discordant couples after HIV counseling and testing . *Aids* . 17 : ( 5 ) 733 - 740
- Babalola S . 1999 ; Spousal communication and safe motherhood practices: evidence from the Tanzania 1996 DHS data . 3ème Conférence Africaine de Population . 37 - 50 Durban Republic of South Africa ;
- Baiden F , Remes P , Baiden R , Williams J , Hodgson A , Boelaert M , Buve A . 2005 ; Voluntary counseling and HIV testing for pregnant women in the Kassena-Nankana district of northern Ghana: is couple counseling the way forward? . *AIDS Care* . 17 : ( 5 ) 648 - 657
- Bauni EK , Jarabi BO . 2003 ; The low acceptability and use of condoms within marriage: evidence from Nakuru district, Kenya . *Etude de la Population Africaine/African Population Studies* . 18 : ( 1 ) 51 - 65
- Becquet R , Castebon K , Viho I , Ekouevi D , Bequet Lea . 2005 ; Infant feeding practices before implementing alternatives to prolonged breastfeeding to reduce HIV transmission through breast-milk in Abidjan, Côte d'Ivoire . *J Trop Pediatr* . 51 : 351 - 355
- Bunnell RE , Nassozi J , Marum E , Mubangizi J , Malamba S , Dillon B , Kalule J , Bahizi J , Musoke N , Mermin JH . 2005 ; Living with discordance: knowledge, challenges, and prevention strategies of HIV-discordant couples in Uganda . *AIDS Care* . 17 : ( 8 ) 999 - 1012
- Bunnell RE , Mermin JH , De Cock KM . 2006 ; HIV prevention for a threatened continent. Implementing positive prevention in Africa . *Journal of American Medical Association* . 296 : ( 7 ) 855 - 858
- Chimbiri AM . 2007 ; The condom is an 'intruder' in marriage: evidence from rural Malawi . *Soc Sci Med* . 64 : ( 5 ) 1102 - 1115
- Cleland JG , Ali MM , Capo-Chichi V . 1999 ; Post-partum sexual abstinence in West Africa: implications for AIDS-control and family planning programmes . *Aids* . 13 : ( 1 ) 125 - 131
- Dabis F , Msellati P , Meda N , Wellfens-Ekra C , You B , Manigart . 1999 ; 6 month efficacy, tolerance, and acceptability of a short regimen of oral zidovudine to reduce vertical transmission of HIV in Breastfed children in Cote d'Ivoire and Burkina Faso: a double-blind placebo-controlled multicentre trial . *Lancet* . 353 : 786 - 792
- Dabis F , Becquet R , Ekouevi DK . 2005 ; Field efficacy of Zidovudine, Lamivudine and single-dose Nevirapine to prevent peripartum transmission of HIV. The ANRS 1201/1202 Ditrane Plus study, Abidjan, Cote d'Ivoire . *Aids* . 19 : ( 3 ) 309 - 318
- Desgrées du Lou A . 2005 ; The couple and HIV/AIDS in Sub-Saharan Africa. Telling the partner, sexual activity and childbearing . *Population-E* . 60 : ( 3 ) 179 - 188
- Desgrées-du-Lou A , Brou H , Djohan G , Becquet R , Ekouevi D , Zanou B , Viho I , Allou G , Dabis F , Leroy V . 2007 ; Beneficial effects of offering prenatal HIV counselling and testing on developing a HIV preventive attitude among couples. Abidjan, 2002-2005 . *Aids and Behavior (Online first)* . 10.1007/s10461-007-9316-6
- De Walque D . Serodiscordant couples in five African countries: implications for prevention strategies . *Population and Development Review* . 2007 ; 33 : ( 3 ) 501 - 23
- Ekouevi DK , Leroy V , Viho I . 2004 ; Acceptability and uptake of a package to prevent mother-to-child transmission using rapid HIV testing in Abidjan, Cote d'Ivoire . *Aids* . 18 : ( 4 ) 697 - 700
- Fainzang S . 1988 ; La femme de mon mari: anthropologie du mariage polygamique en Afrique et en France . Paris L'Harmattan ;
- Farquhar C , Kiarie J , Richardson B , Kabura M , John F , Nduati R , Mbori-Ngacha D , John-Stewart GC . 2004 ; Antenatal couple counseling increases uptake of interventions to prevent HIV-1 transmission . *J Acquir Immune Defic Syndr* . 37 : ( 5 ) 1620 - 1626
- Gaillard P , Melis R , Mwanjumba F , Claeys P , Muigai E . 2002 ; Vulnerability of women in an African setting: lessons for mother-to-child HIV transmission prevention programmes . *Aids* . 16 : ( 6 ) 937 - 939
- Gordon CM , Forsyth AD , Stall R , Cheever LW . 2005 ; Prevention interventions with persons living with HIV/AIDS: state of the science and future directions . *AIDS Educ Prev* . 17 : ( 1 suppl A ) 6 - 20
- Hattori MK , Dodoo FN . 2007 ; Cohabitation, marriage and 'sexual monogamy' in Nairobi's slums . *Soc Sci Med* . 64 : ( 5 ) 1067 - 1078
- INS . Macro O . Editor: Macro O . 2001 ; Enquête démographique et de Santé, Côte d'Ivoire, 1998-1999 . Calverton, Maryland, USA INS et ORC Macro ;
- (INS) & Ministère de la lutte contre le Sida . 2005 ; Enquête sur les indicateurs du sida, Côte d'Ivoire, 2005 . Calverton, Maryland, USA INS et ORC Macro ; 215 -
- Kilewo C , Massawe A , Lyamuya E , Semali I , Kalokola F . 2001 ; HIV counseling and testing of pregnant women in sub-Saharan Africa. Experiences from a study on prevention of mother-to-child HIV-1 transmission in Dar Es Salaam, Tanzania . *JAIDS. Journal of Acquired Immune Deficiency Syndromes* . 28 : ( 5 ) 458 - 462
- Leroy V , Sakarovitch C , Cortina-Borja M , McIntyre J , Coovadia H , Dabis F , Newell M . 2005 ; Is there a difference in the efficacy of peripartum antiretroviral regimens in reducing mother-to-child transmission of HIV in Africa? . *Aids* . 19 : 1865 - 1875
- Leroy V , Sakarovitch C , Viho I , Becquet R , Ekouevi D , Bequet L , Rouet F , Dabis F , Timite-Konan M . 2007 ; Acceptability of formula-feeding to prevent postnatal transmission of HIV-1 infection in Abidjan, Côte d'Ivoire, Ditrane Plus ANRS 1201/1202 . *J Acquir Immune Defic Syndr* . 44 : 77 - 86
- Locoh T . Editor: Caroline Bledsoe , Gilles Pison . 1994 ; Social changes and marriage arrangements: new type of union in Lome, Togo . *Nuptiality in Sub-Saharan Africa. Contemporary Anthropological and Demographic experiences* . 215 - 230 Clarendon press ; Oxford
- Maharaj P , Cleland J . 2005 ; Risk perception and condom use among married or cohabiting couples in Kwazulu-Natal, South Africa . *International Family Planning Perspectives* . 31 : ( 1 ) 24 - 29
- Malamba S , Mermin JH , Bunnell RE , Mubangizi J , Kalule J , Marum E , Hu D , Wangalwa S , Smith D , Downing R . 2005 ; Couples at risk. HIV-1 concordance and discordance among sexual partners receiving voluntary counseling and testing in Uganda . *J Acquir Immune Defic Syndr* . 39 : ( 5 ) 576 - 580
- McIntyre J . 2005 ; Sex, pregnancy, hormones, and HIV . *The Lancet* . 366 : 1141 - 1142
- Medley A , Garcia-Moreno C , McGill S , Maman S . 2004 ; Rates, barriers and outcomes of HIV serostatus disclosure among women in developing countries: implications for prevention of mother-to-child transmission programmes . *Bulletin of the World Health Organization* . 82 : ( 4 ) 299 - 307
- Meekers D . 1992 ; The process of marriage in African societies: a multiple indicator approach . *Population and development review* . 18 : ( 1 ) 61 - 78
- Msellati P , Sakarovitch C , Bequet L , Atta H , Alioum A , Viho I , Timothée O , Leroy V , Wellfens-Ekra C , Dabis F . 2006 ; Decrease of human immunodeficiency virus prevalence in antenatal clinics in Abidjan, Côte d'Ivoire, 1995-2002 . *Int J STD AIDS* . 17 : ( 1 ) 57 - 60

- Ogunjuyigbe PO , Adeyemi EO . 2005 ; Women's sexual control within conjugal union: implications for HIV AIDS infection and control in a metropolitan city . *Demographic Research* . 12 : ( 2 ) 29 - 50
- Painter TM . 2001 ; Voluntary counseling and testing for couples: a high-leverage intervention for HIV AIDS prevention in sub-Saharan Africa . *Social Science and Medicine* . 53 : ( 11 ) 1397 - 1411
- Roth DL , Stewart KE , Clay OJ , van der Straten A , Karita E , Allen S . 2001 ; Sexual practices of HIV discordant and concordant couples in Rwanda: effects of a testing and counselling programme for men . *International Journal of STD and AIDS* . 12 : ( 3 ) 181 - 188
- Semrau K , Kuhn L , Vwalika C , Kasonde P , Sinkala M , Kankasa C , Shutes E , Aldrovandi G , Thea DM . 2005 ; Women in couples antenatal HIV counseling and testing are not more likely to report adverse social events . *Aids* . 19 : ( 6 ) 603 - 609
- Tijou Traore A . 2006 ; Pourquoi et comment en parler ? Dialogue conjugal autour de l'annonce de la séropositivité à son conjoint au sein de couples sérodiscordants à Abidjan (Côte d'Ivoire) . *Sciences sociales et Santé* . 24 : ( 2 ) 43 - 65
- UNAIDS . 2001 ; The impact of Voluntary counseling and testing. A global review of the benefits and challenges . Best practice collection . 23 - geneva UNAIDS ;
- UNAIDS . 2006 ; Intensifying HIV prevention (UNAIDS policy position paper) . UNAIDS ;
- UNAIDS . 2007 ; AIDS Epidemic update. December 2007 . Geneva
- Van Rossem R , Meekers D , Zkinyemi Z . 2001 ; Consistent condom use with different types of partners: evidence from two Nigerian surveys . *AIDS Education and Prevention* . 13 : ( 3 ) 252 - 267

**Table 1**

Conjugal communication regarding STIs and HIV, prior to and after prenatal HIV counselling and testing.

	HIV-positive women	HIV-negative women	p <sup>4</sup>
<b>Prior to HIV testing<sup>1</sup></b>	<b>n=347 (%)</b>	<b>n=355 (%)</b>	
Ever discussed STIs with their regular partner	97 (28.0)	230 (64.8)	<0.01
<b>After HIV testing<sup>2</sup></b>	<b>n=306 (%)</b>	<b>n=352 (%)</b>	
Discussed STIs with their regular partner	199 (65.0)	340 (96.6)	<0.01
p value prior/after HIV testing <sup>3</sup>	<0.01	<0.01	
Disclosed their HIV result to their partner	131 (42.8)	345 (97.4)	<0.01
Suggested to the partner to undertake HIV testing	219 (71.6)	340 (96.6)	<0.01
Suggested to the partner to use condoms in case of extra conjugal relationships	178 (58.2)	339 (94.3)	<0.01

<sup>1</sup> **Prior to HIV testing:** within the two years preceding the pregnancy when they were offered HIV counseling and testing<sup>2</sup> **After HIV testing:** between HIV testing and the 18 month post-partum. Only women still having a regular partner after delivery are considered; 14 partners of HIV-infected women were deceased; 3 HIV-negative women and 27 HIV-infected women were separated from their partner.<sup>3</sup> comparison prior/after HIV testing. Mc Nemar test.<sup>4</sup> comparison between HIV positive vs HIV negative. Pearson Chi2 test

**Table 2**  
Socio-demographic factors related to conjugal communication regarding sexual risks  
Only women still having a regular partner after delivery are considered

Proportion of women who communicated with their regular partner regarding HIV and sexual risks between prenatal HIV testing and 18 month post-partum										
	HIV positive women					HIV negative women				
	N	None <sup>1</sup> %	Partial <sup>1</sup> %	Complete <sup>1</sup> %	p <sup>2</sup>	N	None <sup>1</sup> %	Partial <sup>1</sup> %	Complete <sup>1</sup> %	p <sup>2</sup>
All	306	22.9	43.4	33.7		352	0.5	7.7	91.8	
If the woman has a co-spouse	54	40.7	35.2	24.1	<0.01	47	2.1	14.9	83.0	0.02
If no co-residency with the partner	64	32.8	40.6	26.6	0.06	104	1.9	10.6	87.5	0.01
Woman's education level										
None	85	32.9	30.6	36.5		105	-	7.6	92.4	
Primary	111	21.6	43.2	35.1	<0.01	133	-	6.8	93.2	0.07
Secondary- 1 <sup>st</sup> cycle	69	21.7	58.0	20.3		73	2.7	12.3	84.9	
Secondary -2 <sup>nd</sup> cycle	41	7.3	46.3	46.3		41	-	2.4	97.6	
Religion										
Christian	184	17.9	49.5	32.6		215	0.9	5.6	93.5	
Muslim	99	30.3	32.3	37.4	0.04	118	-	10.2	89.8	0.26
Other	23	30.4	43.5	26.1		19	-	15.8	84.2	
Male partner's education level										
None	41	34.1	48.8	17.1		58	-	13.8	86.2	0.12
Primary	52	26.9	32.7	40.4	<0.01	55	-	5.5	94.5	
Secondary- 1 <sup>st</sup> cycle	71	21.1	42.3	36.6		103	1.0	8.7	90.3	
Secondary -2 <sup>nd</sup> cycle	104	9.6	51.0	39.4		128	-	3.1	96.9	

<sup>1</sup> Communication was considered « complete » if the woman had discussed STIs with their partner at least once, had notified him her HIV-test result and had suggested him at least once to undertake HIV testing. Communication was considered « partial » if she had discussed one or two of these issues, and « non-existent» if she had raised none of them

<sup>2</sup> Pearson Chi2 test (p value).

**Table 3**  
Union dissolution after prenatal HIV testing

	HIV-positive women		HIV-negative women	
	%	(n/N)	%	(n/N)
<b>Male Partner deceased</b> **	6.3	(22/347)	1.7	(6/355)
<b>Union break-up</b> **				
All women	15.4	(50/325)	1.7	(6/350)
			p <sup>1</sup>	p <sup>1</sup>
Age of the woman				
18–19	30.8	(4/13)	0.32	7.1 (2/28) 0.14
20–24	17.7	(17/96)		1.6 (2/125)
25–29	12.8	(16/125)		0.9 (1/115)
30 et +	14.3	(13/91)		1.2 (1/83)
Religion of the woman				
Christian	17.8	(35/197)	0.05	0.9 (2/213) 0.01
Muslim	8.7	(9/104)		1.7 (2/118)
Others	25.0	(6/24)		10.5 (2/19)
Polygamous household	30.8	(20/65)	<0.01	0.0 (0/47) 0.33
Monogamous household	11.5	(30/260)		2.0 (6/303)
Coresidency with partner				
Yes	9.2	(22/240)	<0.01	1.2 (3/241) 0.31
No	32.9	(28/85)		2.8 (3/109)
Woman notified her HIV result to the partner	12.7	(16/126)	0.29	1.7 (6/349) 0.90

\*\* Proportions are significantly different between the two groups (HIV infected and HIV negative). Pearson Chi-2 test: p<0.01.

<sup>1</sup> p: pvalue – Pearson Chi-2 test.

**Table 4**  
Systematic condom use (%) at sex resumption after delivery

	HIV positive women (n=272) <sup>a</sup>			HIV-negative women (n=334) <sup>a</sup>		
	%	(n/N)	p	%	(n/N)	p
All	32.7	(89/272)		27.2	(91/334)	
Woman Education level						
None	18.9	(14/74)	<0.01	16.7	(17/102)	<0.01
Primary	36.6	(37/101)		28.6	(36/126)	
Secondary – 1 <sup>st</sup> cycle	32.2	(19/59)		28.4	(19/67)	
Secondary -2 <sup>nd</sup> cycle and more	50.0	(19/38)		48.7	(19/39)	
Religion						
Christian	39.8	(66/166)	<0.01	31.2	(63/202)	0.06
Muslim	20.2	(18/89)		19.3	(22/114)	
Other	29.4	(5/17)		33.3	(6/18)	
Male partner's education level						
None	13.9	(5/36)	<0.01	16.1	(9/56)	0.15
Primary	21.3	(10/47)		26.4	(14/53)	
Secondary – 1 <sup>st</sup> cycle	39.1	(25/64)		29.2	(28/96)	
Secondary -2 <sup>nd</sup> cycle and more	44.1	(41/93)		32.5	(40/123)	
Couple communication on sexual risks <sup>**</sup> (after HIV testing)						
None	18.5	(10/54)	0.03	0	(0/1)	0.80
Partial	37.7	(43/114)		25.0	(6/24)	
Complete	37.1	(36/97)		27.5	(85/309)	
Partner HIV tested <sup>b</sup> <sup>**</sup>						
No	27.4	(51/186)	0.04	27.3	(76/278)	0.06
Yes, HIV+	50.0	(13/26)		100	(2/2)	
Yes, HIV-	38.9	(14/36)		22.9	(11/48)	

<sup>\*\*</sup> Proportions are significantly different between the two groups (HIV infected and HIV negative). Pearson Chi-2 test: p<0.01.

<sup>a</sup> Only women having resumed sex before the 18 month post-partum survey were considered

<sup>b</sup> Data on male partner HIV-testing was missing for 24 femmes HIV+ women and 6 HIV- women.