

107714

# A cohort study of factors associated with failure to return for HIV post-test counselling in pregnant women: Kigali, Rwanda, 1992-1993

Joël Ladner\*†, Valériane Leroy†, Philippe Msellati†‡, Marie Nyiraziraje§, André De Clercq§, Philippe Van de Perre¶ and François Dabis† for the Pregnancy and HIV Study Group (EGE)\*\*

**Objective:** To identify factors associated with failure to return for HIV post-test counselling in pregnant women in Kigali (Rwanda).

**Subjects and methods:** In the context of a study on the impact of HIV infection on pregnancy, HIV-1-antibody testing was offered to all pregnant women attending the antenatal clinic of the Centre Hospitalier de Kigali from July 1992 to August 1993. Pre-test counselling was performed after verbal informed consent was obtained. Two weeks later, we formally enrolled all HIV-positive women and a corresponding number of HIV-negative women in a cohort. At this visit, post-test counselling was given to those wishing to be informed of their HIV serostatus. Level of knowledge about modes of HIV transmission and condom use were recorded. Four months after delivery, another interview was conducted to determine the proportion of women who used condoms regularly.

**Results:** A total of 1233 pregnant women were screened. The HIV seroprevalence was 34.4% [95% confidence interval (CI), 31.7-37.1]; 271 (63.9%) out of 424 HIV-positive and 577 (71.3%) out of 809 HIV-negative women asked for their HIV serostatus ( $P=0.008$ ). In multivariate analysis, the only variable significantly associated with failure to return for post-test counselling was a positive HIV test result (odds ratio, 0.7; 95% CI, 0.5-0.9;  $P=0.009$ ), independently of obstetrical history and socioeconomic characteristics. Among the 848 women who had post-test counselling, 50.9% of the HIV-positive women and 94.6% of the HIV-negative women stated that they planned to inform their partner of their serostatus ( $P=0.0001$ ). More than 95% of the women interviewed knew about sexual and parenteral transmission of HIV, but half were unaware of mother-to-child transmission. More than 80% of the women had seen a condom before, but 14% only had used it at least once. Among women who were sexually active 4 months after delivery, 8.8% of the HIV-positive and 3.9% of the HIV-negative women reported using a condom ( $P=0.04$ ).

**Conclusion:** Innovative approaches for HIV testing and counselling programs are needed and the importance of psychosocial and cultural factors associated with HIV testing should be emphasized in African populations.

AIDS 1996, 10:69-75

**Keywords:** HIV-1, counselling, pregnant women, Africa, condom

From the \*Medical Information Unit, Centre Hospitalier de Kigali, Kigali, Rwanda, †INSERM U330, University of Bordeaux II, Bordeaux, France, ‡ORSTOM Petit Bassam, Abidjan, Côte d'Ivoire, the §Department of Gynaecology and Obstetrics, Centre Hospitalier de Kigali and the ¶AIDS Reference Laboratory, National AIDS Control Program, Kigali, Rwanda. \*\*See Appendix for details.

Sponsorship: Supported in part by the World Health Organization Global Programme on AIDS, the Agence Nationale de Recherches sur le SIDA (France), the Belgian and French Cooperations.

Note: This paper was presented in part at the VIII International Conference on AIDS in Africa, Marrakech, 12-16 December 1993 (abstract WOP 47).

Requests for reprints to: Professor François Dabis, Unité INSERM 330, Université de Bordeaux II, 146 rue Léo Saignat, 33076 Bordeaux Cedex, France.

Date of receipt: 2 May 1995; revised: 12 October 1995; accepted: 26 October 1995.

Fonds Documentaire ORSTOM



010007714

© Rapid Science Publishers ISSN 0269-9370

Fonds Documentaire ORSTOM

Cote: B\* 7714 Ex: 1

## Introduction

HIV-1 infection is recognized as a major public-health problem in sub-Saharan Africa [1,2]. Most cases of HIV occur in adults infected through heterosexual contacts [3,4].

Rwanda, a small French-speaking country in Central Africa, is the most densely populated country in Africa, with around 7.5 million inhabitants in early 1994. Before the civil war, the capital city, Kigali, had a population of 350 000 inhabitants [5]. In 1986, a national serosurvey revealed an overall HIV seroprevalence of 18% in an urban sample, reaching 30% among women aged 26-40 years [6].

Voluntary testing of HIV infection and associated counselling are considered important interventions aimed at reducing HIV transmission. Nevertheless, its efficacy remains to be evaluated [7-10]. Post-test counselling allows the opportunity to announce HIV status and provides prevention and psychosocial support to individuals [11]. In Africa, few HIV counselling and testing centres are operational, and few data are actually available about their attendance and factors associated with failure to return for HIV post-test counselling [7,12].

We evaluated factors predicting the likelihood that pregnant women who are counselled and tested for HIV will return for HIV post-test counselling and test results in Kigali. This research was conducted within the context of a prospective cohort study on the impact of HIV infection on pregnancy outcome (EGE cohort) started in July 1992 in the Centre Hospitalier de Kigali (CHK), the principal community hospital in the capital city providing 10 000 prenatal consultations and 9000 deliveries annually [13].

## Subjects and methods

### Study site and population

All pregnant women attending the antenatal clinic of the CHK were eligible for the EGE cohort study if they fulfilled the following inclusion criteria: gestational age < 28 weeks, residence within 10 km of the CHK, wish to deliver at the CHK and verbal informed consent for enrolment in the cohort. Approval for the study was guaranteed by the Rwandan Ministry of Health.

### Study design and counselling programme

Objectives and procedures of the study were explained to the eligible women. Pre-test counselling was performed in group discussions in the local language (Kinyarwanda), according to the methods approved by the Rwandan National AIDS Program. In this pre-test session, modes of HIV transmission were explained. Information on age, parity, obstetrical history and HIV testing history was collected by social workers on standardized questionnaires. Finally, blood was collected for HIV-1-antibody testing, after verbal consent was obtained.

Two weeks later, all eligible HIV-positive women and a corresponding number of HIV-negative women of comparable maternal age and parity were formally enrolled in the EGE cohort. At this time, socioeconomic characteristics (marital status, educational level, occupation) were collected on standardized questionnaires by trained social workers and nurses, who were blinded to the serostatus of the woman.

For all women who had an HIV test and wished to be informed of their result, regardless of their inclusion in the cohort, the HIV test result was given approximately 2 weeks later by social workers trained in counselling techniques and who were independent of the EGE study staff. During this face-to-face individual post-test counselling, the woman's level of knowledge about HIV infection was determined (open-ended questions) and contraception methods were explained (including demonstration of condom use). Each woman was offered assistance in counselling her partner about her serologic status and in encouraging his participation in testing. For this purpose, the counselling centre specially implemented within the CHK was accessible to every woman and her partner for the duration of the study period until April 1994.

Four months after delivery, another interview was conducted by the same social workers to evaluate condom use among women who were included in the cohort and knew their serostatus.

### Laboratory methods

All serum samples were screened at the Rwandan National AIDS Program laboratory by two commercial enzyme-linked immunosorbent assays (ELISA; Vironostika HIV mixt and Vironostika HIV Uniform; Organon Technika, Boxtel, The Netherlands). Discordant samples were further confirmed by a commercial Western blot (DuPont de Nemours, Wilmington, Delaware, USA) using the Centers for Disease Control and Prevention interpretation criteria [14].

### Statistical analysis

$\chi^2$  test, Fisher's exact test and Students t test were used for comparisons with a significance level of 5%. Odds ratios (OR) were computed to measure the strength of associations and their 95% confidence intervals (CI) were determined according to the semi-exact method. Two multiple logistic regressions were performed to identify the factors associated with failure to return for post-test counselling. A cut-off *P* value of 0.45 was used in the univariate analysis as the criteria to include variables in the model. The first multivariate analysis used data available at the time of HIV testing in the overall sample of pregnant women tested. The following variables were included in this first model: HIV test result, obstetrical history, current vital status of last livebirth, HIV test history and decision of inclusion in the cohort. The second model was restricted to those women enrolled in the prospective cohort. It used the same cut-off *P* value as above to select the following variables for the

multivariate analysis: marital status, woman's occupation and partner's occupation.

**Results**

From 1 July 1992 to 13 August 1993, 1233 pregnant women attending the antenatal clinic of the CHK were tested for HIV-1 antibodies. Among them, 424 (34.4%) were found to be HIV-positive (prevalence 95% CI, 31.7–37.1) and 809 were HIV-negative. Overall, the mean age of HIV-positive and HIV-negative women was 25 years. The average number of pregnancies, including the current one, was 2.5 in the two groups, but HIV-positive women were less likely to be primiparous than HIV-negative women: 28.5 versus 40.7% ( $P=0.0001$ ). HIV-positive women more frequently reported a history of abortion and stillbirth (OR, 1.9; 95% CI, 1.2–3.0;  $P=0.008$ ) and a history of at least one death of a previously born child (OR, 1.8; 95% CI, 1.2–2.8;  $P=0.01$ ) than HIV-negative women. Thirty-four (8.0%) HIV-positive women and 80 (9.9%) HIV-negative women reported having been previously tested for HIV antibodies ( $P=0.30$ ). Other baseline characteristics have been published elsewhere [15].

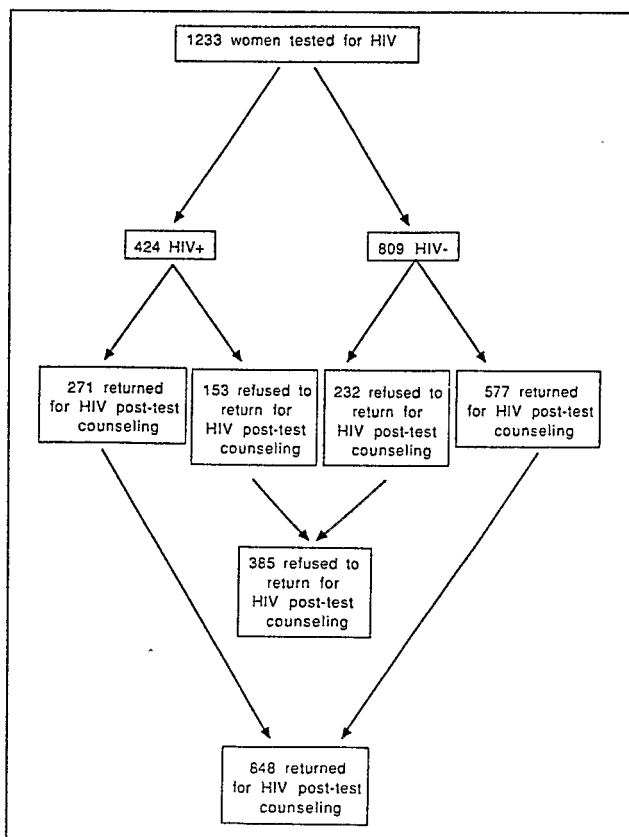
**Table 1.** Variables in relation to attendance of HIV post-test counselling in pregnant women tested at the antenatal clinic of Centre Hospitalier de Kigali, 1992–1993 ( $n=1233$ )\*.

	%		P
	Attendance (n=848)	No attendance (n=385)	
HIV-positive test	32.0	39.7	0.008†
Age (years)			0.45
<20	10.7	9.3	
20–24	37.9	34.3	
25–29	35.1	38.1	
≥30	16.3	18.3	
No. previous pregnancies			0.36†
0	36.1	37.4	
1	26.8	27.3	
2	16.3	12.5	
≥3	20.8	22.8	
Prior HIV testing	8.1	9.8	0.33†
History of abortion or stillbirth (n=783‡)	21.2	23.7	0.44†
Death of the last child born alive (n=61§)	11.5	8.2	0.22†
Women enrolled in the prospective cohort study	61.1	64.2	0.30†

\*Univariate analysis. †Variables included in the logistic regression model. ‡Multiparous women. §Multiparous women with at least one child born alive.

Among the 1233 women tested, 848 (68.8%) asked for their serostatus at the counselling centre (Fig. 1). This proportion was significantly lower for HIV-positive women (271 out of 424, 63.9%) than HIV-negative women (577 out of 809, 71.3%;  $P=0.008$ ). Table 1 shows the comparison of the characteristics of the 1233 women tested in relation to attendance of post-test counselling. There was no significant difference between the two groups for age, parity, previous obstetric history, or previous HIV testing. Being HIV-negative was the only characteristic strongly associated with attendance of post-test counselling in the univariate analysis (Table 1). Among the four variables introduced in the multivariate analysis, a positive HIV test result was the only variable significantly associated with failure to return for post-test counselling (OR, 0.69; 95% CI, 0.52–0.91;  $P=0.009$ ).

Among the 1233 women tested at the prenatal clinic, 424 HIV-positive and 406 HIV-negative women were eligible for inclusion in the EGE cohort. Among those, 7.8% (40 HIV-positive and 25 HIV-negative) declined enrolment into the study, mainly because of change of residence or refusal from the partner. Thus, 384 HIV-positive and 381 HIV-negative pregnant women were enrolled in the prospective cohort study. The mean age of these 765 women was 26.0 years (SD, 4.8 years). The average number of pregnancies, including the current one, was 2.5 (SD, 1.7; mean, 2.0). Table 2 compares the socioeconomic characteristics of the women enrolled in the cohort in relation to attendance of post-



**Fig. 1.** Flow chart of the repartition of pregnant women tested for HIV at the antenatal clinic in relation with attendance of HIV post-test counselling ( $n=1233$ ); Centre Hospitalier de Kigali, 1992–1993.

test counselling. There was no significant difference between women who returned for post-test counselling and those who did not for marital status, occupation and education, or for partner's occupation and education (Table 2).

**Table 2.** Variables in relation to attendance of HIV post-test counselling in pregnant women included in the EGE cohort at Centre Hospitalier de Kigali, 1992-1993 (n = 765)\*.

	%		P
	Attendance (n = 519)	No attendance (n = 246)	
Marital status			0.23†
Single/divorced/widowed	6.8	10.2	
Common-law	57.8	57.3	
Married	35.4	32.5	
Woman's education			0.57
None	7.3	8.1	
Primary (1-7 years)	22.0	31.3	
Secondary (8-13 years)	53.2	49.6	
Higher (≥ 14 years)	12.5	11.0	
Woman's occupation			0.12†
Housewife	66.3	61.8	
Farmer or small business	17.0	23.2	
Employee	16.7	15.0	
Partner's education			0.10†
None	2.6	5.5	
Primary (1-7 years)	50.0	40.5	
Secondary (8-13 years)	29.5	31.8	
Higher (≥ 14 years)	17.9	22.2	
Partner's occupation			0.56
Farmer	7.7	6.8	
Merchant	25.3	21.3	
Employee	53.4	55.7	
Other	13.6	16.2	

\*Univariate analysis. †Variables included in the logistic regression model.

Among the 848 women who returned for post-test counselling 2 weeks after testing (Table 1), 84.9% of the HIV-positive women versus 92.2% of the HIV-negative women had informed their partner that they had been tested ( $P=0.0003$ ); 50.9 versus 94.6% stated that they planned to inform their partner of the test result ( $P=0.0001$ ); and 73.8 versus 69.5% wished their partner to be tested ( $P=0.30$ ). Knowledge about heterosexual and parenteral transmission of HIV exceeded 85% in HIV-positive and HIV-negative women (Table 3). However, only 45.3% of the women mentioned mother-to-child transmission in an open question (no difference between the two groups). Furthermore, other modes of transmission were also frequently reported. The difference between the asymptomatic and symptomatic stages of HIV infection was known by 52 (19.3%) HIV-positive women and 128 (22.3%) HIV-negative women ( $P=0.30$ ). Over the study period, only 63 partners, including 32 partners of HIV-positive women, came for an

HIV test at the project site. Except for two, they were partners of women who had post-test counselling.

**Table 3.** Level of knowledge regarding the transmission of HIV in HIV-1-infected and uninfected pregnant women at the antenatal clinic at Centre Hospitalier de Kigali, 1992-1993 (n = 848).

Modes of transmission	%		P
	HIV+ (n = 271)	HIV- (n = 577)	
Sexual	98.9	99.7	0.18
Parenteral	90.4	87.4	0.20
Mother-to-child	47.0	44.5	0.40
All three modes	45.9	43.9	0.58
Other modes	25.1	28.3	0.32

From 1 January 1993, we interviewed 139 of the 271 HIV-positive women and 298 of the 577 HIV-negative women at the counselling centre who returned for post-test counselling about condom use: 114 (82.0%) HIV-positive women and 240 (80.5%) HIV-negative women had seen a condom before; 27 (19.4%) HIV-positive and 36 (12.1%) HIV-negative women had used a condom at least once ( $P=0.05$ ); and 21 HIV-positive women and 28 HIV-negative women used condoms with their regular partner. Table 4 shows the reasons reported for absence of condom use according to HIV serostatus. Three-quarters of the HIV-positive women and two-thirds of the HIV-negative women quoted partner's refusal or woman's fear of their partner. One-third of the HIV-negative women who never used condoms quoted fidelity versus 16% of the HIV-positive women. Finally, 11% of HIV-positive and 17% of HIV-negative women thought that condoms were dangerous ( $P=0.50$ ).

**Table 4.** Reported reasons for non-condom use in HIV-1-infected and uninfected pregnant women, among women who never used condoms, at the antenatal clinic of Centre Hospitalier de Kigali, 1993-1993 (n = 392).

Main reason	%	
	HIV+ (n = 86)	HIV- (n = 306)
Fidelity	16.3	33.6
Partner's refusal	41.9	35.9
Woman's fear	33.7	24.1
Other reasons	8.1	6.4

$P=0.03$ ;  $\chi^2$  test with 3 degrees of freedom.

Among the 765 women enrolled in the EGE cohort, 67.4% (251 HIV-positive and 265 HIV-negative) attended the postnatal visit 4 months after delivery, of whom 95.0% reported to be sexually active. Among them, 8.8% of the HIV-positive women versus 3.8% of the HIV-negative women reported condom use since

delivery ( $P=0.04$ ); 13 HIV-positive and two HIV-negative women reported using condoms at every sexual intercourse; and five HIV-positive and four HIV-negative women said that they supplied the condoms rather than their partner. At the time of this postnatal visit, 51 (20.4%) HIV-positive and 49 (18.6%) HIV-negative women used a modern contraceptive method ( $P=0.61$ ).

## Discussion

In our study, two-thirds of the pregnant women tested asked voluntarily for their HIV serostatus in the counselling centre. There are at least three reasons for this relatively high level of attendance: first, pre-test counselling was intensive; second, the counselling centre was specially implemented with social workers trained in post-test counselling techniques and third, the study personnel in charge of prenatal and postnatal care were blinded to the HIV serostatus. As in Kinshasa, Zaïre and Nairobi, Kenya, the fear of family conflicts or expulsion from the marital home by the partner explains why only half of the HIV-infected women said that they intended to inform their partners of their serostatus [8,9,16]. More than 70% of the women who had post-test counselling wished their partner be tested. However, despite our encouragement and the infrastructure available, only 8% of the partners have been tested in our project. An unknown number may have attended the anonymous testing centre available in town.

In our study, obstetrical history and socioeconomic characteristics of the women do not appear to predict factors of attendance of post-test counselling among pregnant women. An HIV-positive result was the only factor related to failure to return for HIV test result. As shown in Kigali [17], this suggests that HIV-infected women perceived themselves at risk of HIV infection and consequently were afraid to learn their test result. In the United States, Slukster *et al.* [18] have identified heterosexuality, prostitution, recent history of intravenous drug use and youth as predicting factors of failure to return for test result, but they have not found that the self-perception of risk to be HIV-positive itself could have an influence. Also in the United States, Catania *et al.* [19] have identified that failure to return for post-test counselling was associated with low educational level, anxiety about HIV infection, poor understanding of what the HIV test result meant, young age and looking for testing because of a blood transfusion. Factors relating to sexual behaviour and above all psychological factors are probably key determinants of failure to return for HIV test result [20,21]. Temmerman *et al.* [20] suggest that HIV-positive women in Nairobi feel afraid of the violent repression from their partner. In addition, in Rwanda, violence between partners is not uncommon [22]. There are some difficulties identifying and measuring these factors in the African context. However, several factors might explain why HIV-positive women refuse

to seek their HIV test results: lack of self trust, lack of confidence in screening or counselling procedures, socioeconomic fragility or fear of rejection from partner or community in case of a positive result. Our findings do not allow us to determine a typical profile of women who fail to return for post-test counselling in the Kigali population, although this behaviour is the main concern for the counsellors at the time of pre-test counselling.

More than 80% of the women had seen a condom before. However, only 14% reported using a condom at least once, most women with their regular partner. Similar results have been found in Kinshasa [8], where 22% of women used condoms at least once. Four months after delivery (i.e.,  $\leq 6$  months after post-test counselling), effective condom use remained moderate in our study, as only 6% of women reported using condoms regularly. Different factors may explain these findings. First, the women tested in this project were young and with relatively few children for Rwandan standards. So, we suppose that the desire for another pregnancy was still high. Second, popular beliefs of the importance of transfer of bodily fluids, traditional methods of sexual intercourse and common misconceptions about the dangers of condom use may explain why Rwandese people are very reluctant to use condoms [23]. Third, using a condom requires the woman to inform her partner about this change, with not only the risk of refusal but more importantly of expulsion from the marital home. Indeed, it has been shown that men control sexual decision making in Rwanda [22]. In our study, this last point was strongly supported by the woman's fear of using condoms. At the time of post-test counselling, these difficulties are reduced for couples who together agree to be tested for HIV (data not shown). We found high levels of knowledge regarding the heterosexual transmission of HIV, but these remain difficult to translate into changes in behaviour [10]. To maximize the probability of success of condom use, counselling should target couples and not only women, as demonstrated in Kigali and elsewhere [7,22,24-26].

Since 1987, the level of knowledge about heterosexual and parenteral transmission of HIV has been high in Kigali [17]. However, half of the pregnant women in our sample were unaware that HIV infection could be transmitted perinatally. In 1987, 98% of women of child-bearing age, but not pregnant, knew about mother-to-child HIV transmission [17]. Reasons for this difference may result from the method of interview by social workers (who used open-ended questions), socioeconomic characteristics of the women and in the modalities of the counselling programme. Pregnant women may also be less inclined to accept the reality of perinatal HIV transmission. The same observation has been made in Kinshasa, where one-third of the pregnant women did not know about mother-to-child HIV transmission in 1991 [8], whereas in 1988, 89% of non-pregnant women interviewed knew that HIV could be transmitted perinatally [27].

The HIV seroprevalence figure obtained from our study in 1992–1993 was high among pregnant women in Kigali, but coherent with previous estimates made in the same population [28,29] and with a high incidence [30,31].

Women attending the antenatal clinic were likely to be representative of women of reproductive age in Kigali. First, 92% of urban pregnant women seek prenatal medical services during the last trimester of pregnancy [5]; second, the maternity ward of the CHK is the main medical facility performing deliveries; and third, only 2% of women in Rwanda are sterile [32].

In summary, no specific factor can predict the failure to return for HIV test result in our study, except the self-perception of risk of being HIV-infected. Different methods must be developed to increase awareness and include sexual partners in the HIV counselling process. Methods developed by social scientists could help in identifying factors related to sexual behaviour and condom use, and provide better understanding of the psychosocial factors associated with testing and pre- and post-test counselling [21,33]. In the context of the rapidly spreading HIV epidemic in Africa, our findings suggest that we must continue looking for innovative and cautious approaches of testing and counselling individuals, especially pregnant women.

## Acknowledgements

The authors would like to dedicate this manuscript to the women and the children participating to the EGE study and to the medical and paramedical staff, who have paid a heavy price to the 1994 war in Rwanda. We thank Drs Jean Batungwanayo, Abel Kagame, Faustin Kanyangabo, Martin Ngabonziza, Henry Taelman and the nurses and the social workers of the Department of Gynaecology and Obstetrics of the CHK for their active collaboration. We also thank Drs Antoine Serufulira (WHO, Kigali), Mambu Ma Disu (WHO, Kigali) and Benjamin Nkowane (WHO, Geneva) for supporting the study. The authors wish to acknowledge the assistance of Mrs C. Gazille in the daily management of the project and Mrs Louise Garaud and Rhoda Kantengwa for their advice in counselling techniques.

## References

- World Health Organization, Global Programme on AIDS: *The HIV/AIDS Pandemic, 1993 Overview*. Geneva: WHO; 1993 (WHO/GPA/EVA/93.1).
- Mann J: The AIDS pandemic: status and trends. In *AIDS in the World*. Edited by Tarantola D. Cambridge: Harvard University Press; 1992:11–109.
- Chin J: Current and future dimensions of the HIV/AIDS pandemic in women and children. *Lancet* 1990, 336:221–224.
- Piot P, Plummer F, Mhalu F, Lamboray JL, Chin J, Mann J: AIDS: an international perspective. *Science* 1988, 239:573–579.
- République du Rwanda: *Recensement Général de la Population et de l'Habitat, 15 Août 1991, Analyse des Résultats*. Kigali: République du Rwanda; 1994:226.
- Rwandan HIV seroprevalence study group: Nationwide community-based serological survey of HIV-1 and other human retroviruses in a central African country. *Lancet* 1989, i:941–944.
- Allen S, Tice J, Van de Perre P, et al.: Effect of serotesting with counseling on condom use and seroconversion among HIV discordant couples in Africa. *BMJ* 1992, 304:1605–1609.
- Heyward W, Batter V, Malulu M, et al.: Impact of HIV counseling and testing among child-bearing women in Kinshasa, Zaïre. *AIDS* 1993, 7:1633–1637.
- Temmerman M, Moses S, Kiragu D, Fusallah S, Wamola I, Piot P: The impact of HIV counselling on subsequent reproductive behaviour. *AIDS Care* 1990, 2:247–252.
- Pickering H, Quigley M, Pépin J, Todd J, Wilkins A: The effects of post-test counselling on condom use among prostitutes in the Gambia. *AIDS* 1993, 7:271–273.
- World Health Organization: *Guidelines for Counseling about HIV Infection and Diseases (WHO AIDS Series 8)*. Geneva: WHO; 1990.
- Müller O, Barugahare L, Schwartländer B, et al.: HIV prevalence, attitudes and behaviour in clients of a confidential HIV testing and counselling centre in Uganda. *AIDS* 1992, 6:869–874.
- République du Rwanda: *Rapport d'Activités du Centre Hospitalier de Kigali 1992*. Kigali: Ministère de la Santé; 1993.
- Centers for Disease Control: Interpretative criteria used to report Western Blot results for HIV-1 antibody testing — United States. *MMWR* 1991, 40:692–695.
- Leroy V, De Clercq A, Ladner J, Bogaerts J, Van de Perre P, Dabis F: Should screening of genital infections be part of antenatal care in areas of high HIV prevalence? A prospective cohort study from Kigali, Rwanda; 1992–1993. *Genitourin Med* 1995, 71:207–211.
- Ryder R, Batter V, Nsuami M, et al.: Fertility rates in 238 HIV-1-seropositive women in Zaïre followed for 3 years post-partum. *AIDS* 1991, 5:1521–1527.
- Lindan C, Allen S, Carael M, et al.: Knowledge, attitudes and perceived risk of AIDS among urban Rwandan women: relationship to HIV infection and behavior change. *AIDS* 1991, 5:993–1002.
- Slutsker L, Klockner R, Fleming D: Factors associated with failure to return for HIV post-test counseling [letter]. *AIDS* 1992, 6:1226–1227.
- Catania J, Kegeles S, Coates T: Psychosocial predictors of people who fail to return for their HIV test results [letter]. *AIDS* 1990, 4:261–262.
- Perry S, Jacobsberg L, Fishman B, Weiler P, Gold J, Frances A: Psychological responses to serological testing for HIV. *AIDS* 1990, 4:145–152.
- Temmerman M, Ndinya-Achola J, Ambani J, Piot P: The right not to know HIV-test results. *Lancet* 1995, 345:969–970.
- van der Straten A, King R, Grinstead O, Serufulira A, Allen S: Couple communication, sexual coercion and HIV risk reduction in Kigali, Rwanda. *AIDS* 1995, 9:935–944.
- Taylor C: Condoms and cosmology: the 'fractal' person and sexual risk in Rwanda. *Soc Sci Med* 1990, 31:1023–1028.
- King R, Allen S, Serufulira A, Karita E, Van de Perre P: Voluntary confidential HIV testing for couples in Kigali, Rwanda [letter]. *AIDS* 1993, 7:1393.
- Kamenga M, Ryder R, Jingu M, et al.: Evidence of marked sexual behavior change associated with low HIV-1 seroconversion in 149 married couples with discordant HIV-1 serostatus: experience at an HIV counselling center in Zaïre. *AIDS* 1991, 5:61–67.
- Padian N, O'Brien T, Chang Y, Glass S, Francis D: Prevention of heterosexual transmission of human immunodeficiency virus through couple counseling. *J Acquire Immune Defic Syndr* 1993, 6:1043–1048.
- Bertrand J, Makani B, Hassig S, et al.: AIDS-related knowledge, sexual behavior, and condom use among men and women in Kinshasa, Zaïre. *Am J Public Health* 1991, 81:53–58.
- Allen S, Van de Perre P, Serufulira A, et al.: Human immunodeficiency virus and malaria in a representative sample of childbearing women in Kigali, Rwanda. *J Infect Dis* 1991, 164:67–71.
- Lepage P, Dabis F, Hitimana D-G, et al.: Perinatal transmission of HIV-1: lack of impact of maternal HIV infection on characteristics of livebirths and on neonatal mortality in Kigali, Rwanda. *AIDS* 1991, 5:295–300.
- Bucyendore A, Van de Perre P, Karita E, Nziyumvira A, Sow I, Fox E: Estimating the seroincidence of HIV-1 in the general adult population in Kigali, Rwanda. *AIDS* 1993, 7:275–277.

31. Leroy V, Van de Perre P, Lepage P, *et al.*: Seroincidence of HIV-1 infection in African women of reproductive age: a prospective cohort study in Kigali, Rwanda, 1988-1992. *AIDS* 1994, 8:983-986.
32. Office National de la Population, République du Rwanda: *Enquête Démographique et de Santé au Rwanda*. Kigali: Office National de la Population; 1992:22.
33. Ickovics J, Morill A, Beren S, Walsh U, Rodin J: Limited effects of HIV counseling and testing for women. *JAMA* 1994, 272:443-448.

## Appendix

---

The EGE Study Group comprises:

**Gynaecology and Obstetrics:** Principal co-investigators: André De Clercq, Juvénal Ntawuruhunga (deceased); Augustin Cyamana, Mathieu Mudaheranwa (deceased), Camille Munyangabe, Benoît Ntezayabo, Marie Nyiraziraje, Cyridion Ukulikiyimfura and Charles Zilimwagabo (CHK, Rwanda); **Microbiology:** Joseph Bogaerts (CHK, Rwanda), Etienne Karita, Arlette Simonon and Phillipe Van de Perre (AIDS Reference Laboratory, Kigali, Rwanda); **Paediatrics:** Anatholie Bazubagira (deceased), Deo-Gratias Hitimana (deceased), Emmanuel Murayire, François Nsengumuremyi, Chantal Nyandwi and Christian Van Goethem (CHK, Rwanda); **Epidemiology:** François Dabis, Claire Gazille, Joël Ladner, Valériane Leroy, Phillipe Msellati and Roger Salamon (INSERM U330, Bordeaux, France).