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## Retention and Risk Factors for Loss to Follow-up of Female and Male Sex Workers on Antiretroviral Treatment in Ivory Coast: A Retrospective Cohort Analysis

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### Abstract

**Background:** Antiretroviral therapy (ART) for HIV-infected sex workers is an important HIV prevention strategy. However, sex workers may have additional challenges for retention in ART care. The objectives of this study were to assess retention of sex workers on ART in a routine setting in Ivory Coast and identify risk factors for loss to follow-up (LTFU).

**Methods:** The design was a retrospective cohort study. An analysis of clinic files was conducted in 2 sites providing ART services to sex workers in Ivory Coast. Demographic, behavior, and clinical data of female and male sex workers on ART were abstracted onto a standardized anonymous data collection form. Data collection took place between May 11 and 28, 2010.

**Results:** A total of 376 female and 38 male sex workers were included in the analysis. The retention probability was 75% at 6 months, 68% at 12 months, 55% at 24 months, and 47% at 36 months. Attrition was mainly because of LTFU. Factors significantly associated with LTFU in bivariate analysis were lower schooling level, later calendar year of starting ART, and not receiving initial adherence counseling. Later year of starting ART and not receiving adherence counseling at ART initiation remained significantly associated with LTFU in a multivariate Cox regression model.

**Conclusions:** To improve the retention of sex workers on ART, there is a need for more in-depth investigation of the role of pre-ART counseling and the increasing rates of LTFU with each calendar year.

### Keywords

ART; sex workers; retention on ART; loss to follow-up

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## INTRODUCTION

Advances in HIV treatment have resulted in substantial increases in longevity and quality of life among people living with HIV/AIDS in high-income countries.<sup>1</sup> In recent years, access to antiretroviral therapy (ART) in low- and middle-income countries has greatly improved, and impressive progress has been made with 7.5 million people receiving ART in the African region by the end of 2012.<sup>2</sup> ART is not only improving quality of life and decreasing morbidity in those receiving treatment, but the public health impact of scaling up ART may contribute significantly to prevention efforts.<sup>3,4</sup> A recent study has shown that early provision of ART reduced transmission of HIV in discordant couples by 96%.<sup>5</sup> The results of that study and other recent studies show the enormous potential of treatment for prevention.<sup>6,7</sup>

The ability to successfully engage key hard-to-reach populations, such as sex workers, in HIV care and treatment programs is important to maximize effectiveness of treatment as prevention strategies.<sup>8</sup> Providing ART to sex workers may have an important impact on the HIV epidemic in many countries. However, there are many hurdles to effective treatment, one of the major ones being retention on ART. Sex workers have additional challenges, including their mobility, irregular working hours, and difficult or no family relationships, that increase risk for loss to follow-up (LTFU).<sup>9</sup>

Other studies have shown effectiveness of ART and high retention rates of sex workers in ART care in research settings.<sup>8</sup> These results may not be representative for sex workers on ART in a nonresearch “routine” care setting for high-risk populations.

Ivory Coast in West Africa has a generalized HIV epidemic with an HIV prevalence of 3.7% among the general population in 2005.<sup>10</sup> In collaboration with multiple partners, the Ministry of Health rapidly scaled up ART services between 2004 and 2007. More than 10,000 patients started ART during that time and >30,000 HIV-infected patients were receiving ART by 2007.<sup>11</sup> Collaboration with partners, decentralization, and integration with primary care systems have been important strategies used by the Ministry of Health to rapidly improve access to HIV care and treatment nationally. On a routine basis, site-specific aggregate program data and limited demographic and clinical information on patients receiving ART are reported.

Sex workers bear a disproportionate burden of the HIV epidemic in Ivory Coast, and HIV prevalence as high as 50% among male and 31% among female sex workers has been found.<sup>12,13</sup> A large-scale prevention and care program for sex workers named “Projet d’Assistance aux Populations Hautement Vulnérables (PAPO-HV)” was set up in 2004, with the financial support of the President’s Emergency Plan for AIDS Relief (PEPFAR). Services for sex workers include condom promotion, screening, and management of sexually transmitted infections, HIV testing and counseling, HIV care and support services, and access to ART. Specific counseling and referral services are available for sex workers younger than 18 years. Services were gradually scaled up, and by 2008, sex worker clinics were operational in 10 of the largest cities in the country. At the same time, 7 of the sex worker clinics were

providing ART in accordance with the national ART guidelines. Although the exact magnitude of the problem is not known, LTFU is reported frequently by the clinic staff and should be addressed to increase effectiveness of the ART program among sex workers.

The objectives of this study were to assess retention of sex workers on ART in Ivory Coast and to identify risk factors for LTFU.

## METHODS

### Study Design and Procedures

A retrospective cohort analysis of clinic files was conducted in 2010. All ART sites, supported by Project PAPO-HV that had supported 50 or more sex workers on ART, as of December 31, 2007, were eligible for inclusion in the study. Of a total of 7 PAPO-HV sites, which had ever provided ART services to adults, only 2 had provided ART services in 2007. The two sites were Clinique de Confiance in Abidjan and Centre Espérance in San Pedro. Five other sites started to provide ART to sex workers in 2008 but accounted only for 38% of the total number sex workers on ART by December 2009 (with 7–31 sex workers per clinic).

At these 2 clinics, all medical records belonging to female and male sex workers aged 15 years and older at the time of ART initiation, who had initiated ART at least 6 months before the date of chart abstraction, were eligible for inclusion. Before beginning data collection, all data abstractors underwent 3–5 day training on the protocol, forms, and study procedures. For each eligible patient, data were abstracted from 3 different sources onto a standardized data collection form without personal identifiers. Clinical data were abstracted from standardized Ministry of Health-recommended medical records. If CD4 counts were not recorded in the charts, laboratory records were reviewed. Finally, data related to sex work were abstracted from a registration form that is routinely completed for all sex workers at enrollment in the clinics. In addition to key outcome data, such as retention, reasons for attrition (death, LTFU, or stopping ART), patient demographic, and behavior characteristics were abstracted. Data collection took place between May 11 and 28, 2010.

To ensure quality of the data, all data abstraction forms were reviewed and 10% of the randomly selected charts were re-abstracted by the team facilitators.

### Analyses

For statistical analyses, we used STATA (version 11.1; StataCorp LP, College Station, TX). A patient was considered retained on ART if he/she had attended the clinic for any reason, including a doctor's appointment or pharmacy refill, within the 90 days preceding data abstraction, and was not documented to have died or stopped ART. A patient was considered LTFU if he/she had not attended the clinic within 90 days preceding data abstraction and was not documented to have died, stopped ART, or being transferred out for treatment (definition of LTFU used by the Ministry of Health, Ivory Coast). A Kaplan-Meier curve was used to define the cumulative retention probabilities at 6, 12, 24, and 36 months of follow-up. The follow-up started from the date the sex worker initiated ART treatment. Patients referred to another health facility were censored at the time of transfer.

A Cox proportional hazards regression model, setting LTFU as the primary outcome, was used to estimate unadjusted and adjusted hazard ratios, 95% confidence intervals, and *P* values for patient-level characteristics at ART initiation, which are potential risk factors for LTFU.<sup>1,11,14,15</sup> To best manage missing data for a priori patient-level characteristics of interest, which were assumed to be missing at random, multiple imputations with chained equations were used to impute the missing data.<sup>16</sup> The *ice*<sup>17–19</sup> procedure in STATA was used to create 20 imputed data sets for the key outcome: LTFU. The imputation model included the event indicator, all study variables, and the Nelson-Aalen estimate of cumulative hazard.<sup>20</sup> Final estimates were combined across the imputed data sets according to Rubin's rules<sup>14</sup> using the multiple imputation of missing values procedure in STATA.<sup>21</sup> The proportional hazards assumption was assessed using visual methods and the Grambsch and Therneau<sup>22</sup> test.

### Ethics Considerations

The protocol received approval from the ethics committees of the Ministry of Health, Ivory Coast; the Institutional Review Board of the Institute of Tropical Medicine and the ethics committee of the University of Antwerp, Belgium; the Institutional Review Board of the US Centers for Disease Control and Prevention; and Family Health International's Protection of Human Subjects Committee, the United States. A waiver of informed consent for medical record abstraction was obtained. Although no names or other personal identifiers were abstracted, the abstractors saw names on the charts that were reviewed. The abstractors signed a form stating that they would not disclose any information from the charts.

## RESULTS

### Baseline Characteristics

Between August 2005 and December 2008, 384 female and 40 male sex workers started treatment in 1 of the 2 clinics. Nineteen patients (17 females and 2 males) were transferred in from other treatment centers and were excluded from the analysis. Baseline characteristics of the study participants are presented in Table 1. The median age was 32 years for both female [interquartile range (IQR), 26–37] and male (IQR, 27–34.5) sex workers. Twenty percent of the female and 66% of the male sex workers attended secondary school or higher.

The median duration in sex work was 3 years (IQR, 2–4) for the female and 5 years (IQR, 3–10) for the male sex workers. Female sex workers reported a median of 2 clients a day, and male sex workers reported a median of 1.5 clients a day. The usual amount of money received from clients was US \$2 [median (IQR): 2–3] for female and US \$6 [median (IQR): 4–20] for male sex workers. At ART initiation, the median weight of the female sex workers was 53 kg [median (IQR): 47–60] and 58 kg for the male sex workers [median (IQR): 53–63]. No viral loads were performed, but CD4 counts were recorded for most of the patients. The median CD4 count was 202 cells per cubic millimeter (IQR, 117–279) for female and 218 cells per cubic millimeter (IQR, 125–295) for male sex workers.

### Time Sequences

All patients were ART naive at the time of ART initiation. A majority of sex workers had their HIV test performed on the same day they registered for the first time at the clinic (79%). The time between HIV diagnosis and ART at the sex worker clinic was less than 1 month for 92% of the sex workers. The median time between HIV diagnosis and ART treatment was 18 days (IQR, 10–85) for female and 120 days (IQR, 9–406) for male sex workers.

### Survival Probabilities

The 367 female sex workers accumulated a total of 677.0 person-years of follow-up, whereas the 38 male sex workers accumulated 68.6 person-years of follow-up.

The retention probability was 75% at 6 months, 68% at 12 months, 55% at 24 months, and 47% at 36 months. Table 2 shows the cumulative incidence of death, LTFU, stopping ART, and attrition as composite end point among sex workers starting ART during 2005–2008. Figure 1 shows the cumulative incidence curves for each competing outcome stratified by calendar year of ART initiation.

### Risk Factors for LTFU

Factors significantly associated with LTFU in bivariate analysis were lower schooling level, later year of starting ART, and not receiving initial adherence counseling at ART initiation (Table 3). Taking all variables into consideration in the multivariate model, only later year of starting ART, and not receiving adherence counseling at ART initiation remained significantly associated with LTFU.

## DISCUSSION

This is one of the first studies assessing retention of sex workers on ART in a routine setting in a low-income country. The retention of sex workers on ART in Ivory Coast was 55% after 2 years.

Two other studies, 1 from Burkina Faso and 1 from Benin, showed the effectiveness of ART provided for female sex workers in a research setting. The study in Burkina Faso measured the long-term virologic, immunological, and clinical efficacy of highly active ART in a cohort of female sex workers in Bobo-Dioulasso.<sup>23</sup> Only 47 female sex workers were followed up, counting for a total of 111 person-years of follow-up. During the observation time, 2 women dropped out and 4 women died. However, as Huet et al pointed out that their results were obtained within the framework of a research study, which used frequent visits combined with intensive counseling and case management services to maintain patients in care. Therefore, these results may not be representative for sex workers on ART in other programs.<sup>8</sup> A similar study in Benin showed the response to ART among 53 female sex workers to be lower than the response in the general population because of poor adherence.<sup>24</sup> None of the 2 studies focused on retention rates and predictors for LTFU.

Compared with general population cohorts in Ivory Coast, our retention probabilities are slightly lower. In a recent study, using the same methodology among a representative sample

of all ART facilities in Ivory Coast, retention was 79% after 6, 74% after 12, 65% after 24, and 56% after 36 months.<sup>25</sup> Reasons for the lower retention of among sex workers, as compared with the general population, may include their higher mobility but should be further investigated.<sup>24</sup>

Compared with patients starting ART in high-income countries, patients in low- and middle-income countries tend to start ART with lower CD4 counts and have higher early mortality.<sup>26</sup> The sex workers in our studies were late presenters, with more than half of them on ART less than 1 month after their HIV diagnosis (median time between diagnosis and ART 21 days, IQR 10–112). Because their CD4 at initiation of ART was very low, they were at high risk of early mortality. It is likely that our study underestimates true mortality in this cohort because deaths were not always recorded and a proportion of LTFU may be because of unrecorded deaths. Other studies have shown that mortality is not the major reason for patient attrition in large ART programs in developing countries.<sup>14,15</sup> The greater threat to the success of the ART program may be the high levels of LTFU, insofar as this outcome reflects patients who have truly left care.<sup>27</sup>

Increased global access and use of ART has been postulated to undermine HIV prevention efforts by changing individual risk-taking behavior.<sup>28</sup> If behavior of sex workers was similar, the effect of a lower viral load through ART may be compromised by an increase in risky behavior. However, studies in Kenya and Benin found that ART initiation was not associated with an increase in unprotected sexual contacts by female sex workers.<sup>24,29</sup> We do not have longitudinal data on condom use after initiating ART in our cohort.

As the ART program expanded during 2004 through 2007, retention of newly enrolled ART patients decreased, a temporal trend that has been observed in other programs in resource-constrained settings.<sup>27,30</sup> This declining trend of the retention rates with later calendar year of ART initiation is worrisome, and reasons for this trend should be explored. The lower retention rate may be related to the increasing workload in the clinics after scaling up of ART treatment. Scaling up of ART treatment may also be related to an increase in observed LTFU because of undocumented transfer of patients to other health facilities. Finally, between 2007 and 2009, there was a perceived pressure from international donors to increase the numbers of patients on ART. This may have resulted in a less thorough screening for ART readiness before starting ART and a selection of patients who are less motivated to remain on treatment. A study in a primary health care setting in South Africa has demonstrated the importance of careful selection and preparation of patients for their retention in ART care.<sup>31</sup> Further qualitative research is needed to explain this declining retention with later calendar years.

In addition to earlier calendar year of ART initiation, the counseling session at the ART initiation seems to be very important for retention of sex workers in ART care. This is in line with findings of an ecologic study of 349 clinics in 10 countries in sub-Saharan Africa. Availability of counseling services was significantly associated with higher retention rates in this study.<sup>32</sup>

This study also has some limitations. Because this was a retrospective chart review, other important structural predictors of retention, such as mode of transport, income, and social support systems could not be assessed. In addition, the retrospective design resulted in many challenges of incomplete data. They highlight the importance of strengthening data collection systems to better respond and assess retention to care and treatment.

Another limitation is the not randomized selection of study sites, which could have introduced some selection bias. However, at the time of the study, the 2 sites were the only sites providing ART care to sex workers since more than 12 months in Ivory Coast. It was estimated that these 2 sites adequately reflect the spectrum of ART care that has been provided to sex workers in Cote d'Ivoire.

## CONCLUSIONS

The question/debate is not any more whether to put sex workers on ART but how to retain them in ART care to reduce HIV transmission. To improve the retention of sex workers on ART in Ivory Coast, there is a need for more in-depth investigation of the role of pre-ART counseling and the increasing rates of LTFU with each calendar year.

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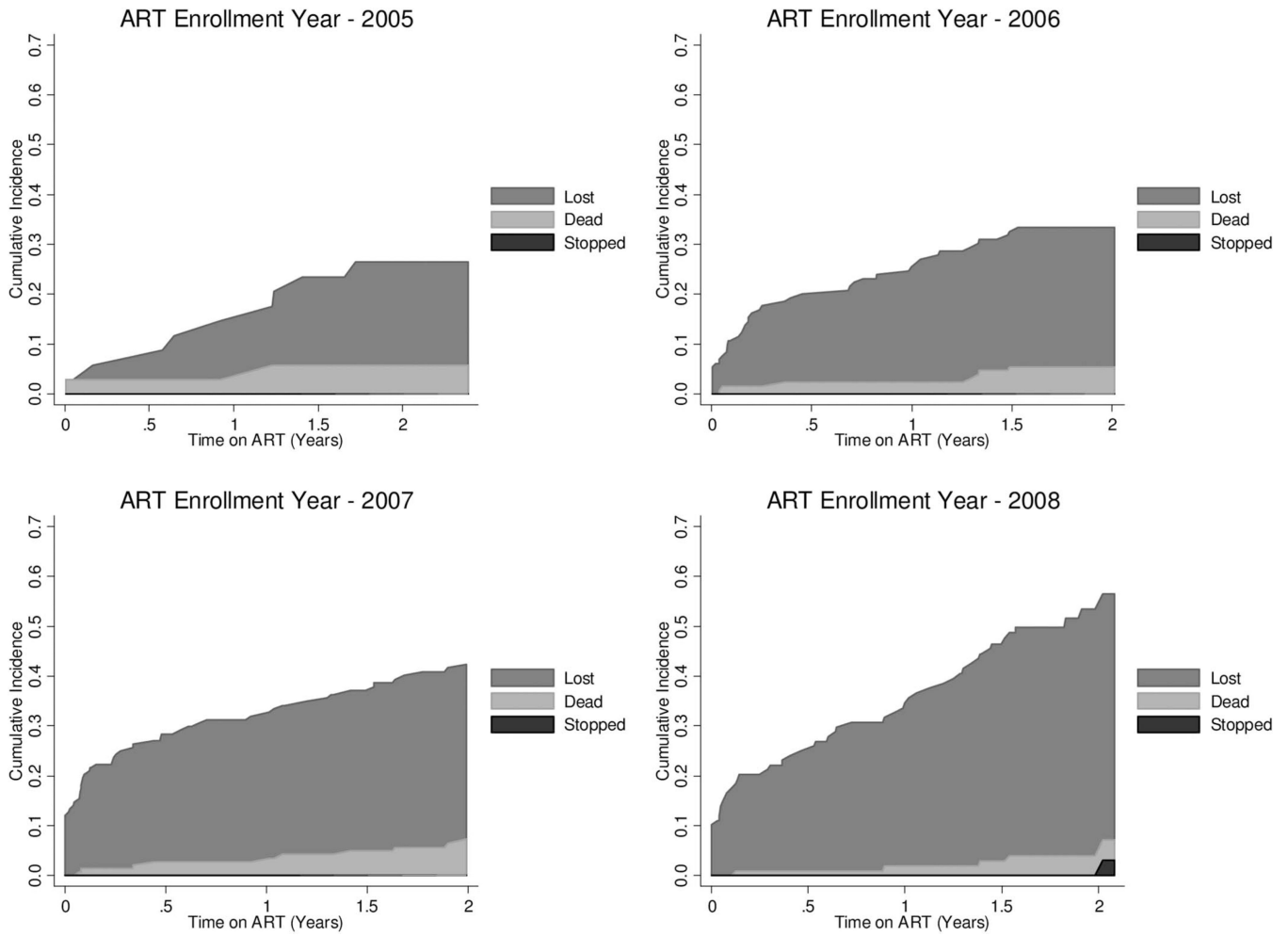
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**FIGURE 1.** Cumulative incidence of death, LTFU, and stopping ART among sex workers starting ART in Côte d'Ivoire during 2005–2008.

**TABLE 1.**

Characteristics of Female and Male Sex Workers at ART Initiation in 2 Clinics in Ivory Coast

Characteristic	FSW (N = 367)	MSW (N = 38)
	No. Observations (%)	No. Observations (%)
Sociodemographics		
Clinic site		
Abidjan	177 (48.2)	38 (100)
San Pedro	190 (51.8)	0 (0.0)
Age group, yrs		
<25	37 (10.1)	8 (21.1)
25–29	94 (25.6)	8 (21.1)
30–39	145 (39.5)	16 (42.1)
40	62 (16.9)	4 (10.5)
Missing	29 (7.9)	2 (5.3)
Schooling level		
Married/cohabitating	30 (8.2)	1 (2.6)
Single	227 (61.9)	36 (94.7)
Divorced	7 (1.9)	0 (0.0)
Widowed	19 (5.2)	0 (0.0)
Missing	84 (22.9)	1 (2.6)
Educational status		
None	189 (51.5)	1 (2.6)
Primary school	101 (27.5)	11 (28.9)
Secondary school	68 (18.5)	22 (57.9)
University	4(1.1)	3 (7.9)
Missing	5 (1.4)	1 (2.6)
Number of children		
0	67 (18.3)	17 (44.7)
1	82 (22.3)	4 (10.5)
2 or more	145 (39.5)	2 (5.3)
Missing	73 (19.9)	15 (39.5)
Characteristics related to sex work		
Country of origin		
Ivory Coast	268 (73.0)	36 (94.7)
Other	66 (18.0)	1 (2.6)
Missing	33 (9.0)	1 (2.6)
Having a nonpaying partner		
Yes	132 (36.0)	22 (57.9)
No	186 (50.7)	16 (42.1)
Missing	49 (13.4)	0 (0.0)
Duration in sex work, yrs		
<2	78 (21.3)	3 (7.9)

Characteristic	FSW (N = 367)	MSW (N = 38)
	No. Observations (%)	No. Observations (%)
2	70 (19.1)	3 (7.9)
3	86 (23.4)	6 (15.8)
4	97 (26.4)	22 (57.9)
Missing	36 (9.8)	4 (10.5)
Number of clients during last working day		
1	103 (28.1)	17 (44.7)
2	109 (29.7)	10 (26.3)
3	91 (24.8)	7 (18.4)
Missing	64 (17.4)	4 (10.5)
Condom use with clients		
Always	102 (27.8)	22 (57.9)
Many times	57 (15.5)	11 (28.9)
Sometimes	89 (24.3)	1 (2.6)
Never	78 (21.3)	0 (0.0)
Missing	41 (11.2)	4 (10.5)
Money received from last client, in CFA *		
1000 CFA	171 (46.6)	3 (7.9)
1001–3000 CFA	80 (21.8)	6 (15.8)
>3000 CFA	54 (14.7)	24 (63.2)
Missing	62 (16.9)	5 (13.2)
Usual amount of money received from clients, in CFA		
1000 CFA	218 (59.4)	7 (18.4)
1001–3000 CFA	58 (15.8)	9 (23.7)
>3000 CFA	30 (8.2)	15 (39.5)
Missing	61 (16.6)	7 (18.4)
Current drug use		
Yes	0 (0.0)	5 (13.2)
No	306 (83.4)	30 (78.9)
Missing	61 (16.6)	3 (7.9)
Biomedical characteristics		
Weight, kg		
<50	129 (35.1)	6 (15.8)
50–54.9	78 (21.3)	5 (13.2)
55–55.9	62 (16.9)	10 (26.3)
60	74 (20.2)	10 (26.3)
Missing	24 (6.5)	7 (18.4)
Hemoglobin, g/dL		
<8.5	79 (21.5)	4 (10.5)
8.5–10	93 (25.3)	6 (15.8)
10–11.5	113 (30.8)	2 (5.3)
11.5	52 (14.2)	22 (57.9)

Characteristic	FSW (N = 367)	MSW (N = 38)
	No. Observations (%)	No. Observations (%)
Missing	30 (8.2)	4 (10.5)
CD4 cells/mm <sup>3</sup>		
<200	180 (49.0)	16 (42.1)
200–49	152 (41.4)	16 (42.1)
350	29 (7.9)	5 (13.2)
Missing	6 (1.6)	1 (2.6)
CDC† clinical stage		
A	27 (7.4)	2 (5.3)
B	249 (67.8)	23 (60.5)
C	25 (6.8)	8 (21.1)
Missing	66 (18.0)	5 (13.2)

\* 1 US \$= 500 F CFA (at the time of the study).

CDC, centers for disease control and prevention; CFA, Communauté Financière Africaine; FSW, female sex worker; MSW, male sex worker.

**TABLE 2.**

Cumulative Incidence of Death, LTFU, and Stopping ART Among Sex Workers Starting ART During 2005–2008

	Time After ART Initiation, yrs	2005, %	2006, %	2007, %	2008, %
Dead	0.5	3	2	3	1
	1	3	2	3	2
	2	6	5	7	4
	3	6	8	9	—
	4	9	10	—	—
Stopped	0.5	0	0	0	0
	1	0	0	0	0
	2	0	0	0	0
	3	0	0	2	—
	4	0	1	—	—
LTFU	0.5	3	18	26	24
	1	12	23	29	33
	2	21	28	35	49
	3	24	31	45	—
	4	30	38	—	—
*Attrition	0.5	6	20	28	25
	1	15	25	32	35
	2	27	33	42	53
	3	30	39	55	—
	4	39	49	—	—

\*Attrition is the combined outcome of death, LTFU, and stopping ART.

**TABLE 3.** Baseline Characteristics as Predictors for LTFU in Bivariate and Multivariate Analyses (Cox Proportional Hazards Model)

	N	Crude			Adjusted*			
		Rate/100 PY	HR	95% CI	P	AHR	95% CI	P
<b>Sociodemographics</b>								
Sex								
Male	40	12.7	1		1			
Female	384	21.7	1.68	0.89 to 3.19	0.111	1.13	0.53 to 2.40	0.748
HIV type								
HIV-1	388	20.3	1		1			
HIV-2 or dual HIV-1 and 2	33	26.2	1.32	0.80 to 2.17	0.280	1.37	0.78 to 2.40	0.266
Age group, yrs								
<30	151	26.2	1		1			
30	273	18.0	0.74	0.54 to 1.02	0.065	0.77	0.51 to 1.15	0.198
Marital status								
Married/living with partner	33	16.5	1		1			
Single/divorced/widowed	306	21.5	1.23	0.69 to 2.18	0.484	1.34	0.71 to 2.51	0.361
Schooling level								
Primary or less	314	23.2	1		1			
Secondary or higher	104	14.4	0.65	0.44 to 0.95	0.027	0.72	0.47 to 1.11	0.140
Number of children								
0-1	176	22.0	1		1			
2 or more	154	19.6	0.97	0.70 to 1.34	0.837	0.99	0.66 to 1.48	0.964
<b>Operations characteristics</b>								
Study site								
Abidjan	232	20.0	1		1			
San Pedro	192	21.6	1.16	0.86 to 1.57	0.329	1.00	0.64 to 1.58	0.995
Adherence counseling pre-ART								
Yes	299	15.3	1	0.43 to 0.90	0.013	1		
No	125	23.1	1.59	1.11 to 2.30	0.012	2.35	1.49 to 3.70	<0.001
Year of starting ART at the sex worker clinic								

	Crude					Adjusted*		
	N	Rate/100 PY	HR	95% CI	P	AHR	95% CI	P
2005–2006	166	13.1	1			1		
2007	149	24.3	1.63	1.12 to 2.37	0.010	1.85	1.23 to 2.77	0.003
2008	109	39.6	2.21	1.48 to 3.29	0.000	3.06	1.93 to 4.87	0.000
Prescription of cotrimoxazole at initiation care								
No	282	24.5	1			1		
Yes	142	15.6	0.73	0.52 to 1.01	0.058	0.76	0.53 to 1.09	0.140
Type of initial ARV regimen								
D4T combination	359	20.0	1			1		
AZT combination	63	26.0	1.19	0.78 to 1.80	0.416	1.17	0.74 to 1.87	0.491
Sex work related								
Time since starting sex work								
Up to 3 yrs	162	22.6	1			1		
3 yrs or more	216	19.7	0.93	0.67 to 1.28	0.643	1.19	0.84 to 1.69	0.319
Number of clients last working day								
0–2	248	19.2	1			1		
3	102	25.0	1.24	0.86 to 1.79	0.249	1.33	0.88 to 2.02	0.171
Usual client price <sup>†</sup>								
1000 CFA	234	22.7	1			1		
>1000 CFA	116	17.2	0.75	0.53 to 1.06	0.103	0.81	0.54 to 1.22	0.315
Reported condom use with clients								
Not always	133	20.4	1			1		
Always	240	20.4	1.02	0.74 to 1.42	0.888	1.10	0.73 to 1.65	0.654
Biomedical								
CD4 cells/mm <sup>3</sup>								
<200	190	22.1	1			1		
200–349	164	20.2	0.90	0.65 to 1.24	0.506	0.90	0.64 to 1.26	0.528
350	25	14.9	0.65	0.31 to 1.39	0.269	0.61	0.28 to 1.34	0.217
Hemoglobin, g/dL								
<10	171	24.7	1			1		
10	180	17.7	0.77	0.56 to 1.07	0.115	0.80	0.57 to 1.14	0.216



	Crude					Adjusted*			P
	N	Rate/100 PY	HR	95% CI	P	AHR	95% CI	P	
CDC disease stage									
A	32	18.3	1		1				
B	283	21.7	1.21	0.66 to 2.23	0.532	1.19	0.63 to 2.24	0.596	
C	35	15.6	0.88	0.38 to 2.02	0.763	0.83	0.35 to 2.01	0.687	

\* Adjusted: all variables were included in the final model.

<sup>†</sup> 1 US \$= 500 F CFA (at the time of the study).

ART, antiretroviral therapy; AZT, zidovudine; CI, confidence intervals; D4T, stavudine; CFA, Communauté Financière Africaine; HR, hazard ratio.