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Prevalence of and factors associated with depression among HIV-infected people in France

Running head: Depression among HIV-infected people in France

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ABSTRACT

Objectives: Depression is common among people living with HIV (PLWHIV) and is associated with poorer therapeutic outcomes and risky behaviours. We sought to estimate the prevalence of major depressive episode (MDE) across PLWHIV groups, to compare it to the general population and to assess its associated factors.

Methods: We used data from the ANRS-Vespa2 study, a national representative sample of PLWHIV conducted in France in 2011. The CIDI-SF was used to characterise the occurrence of an MDE during the previous year. MDE prevalence was assessed among the various groups of PLWHIV and compared to the general population, accounting for the socio-demographic characteristics of the two populations, using multivariate Poisson regression models. The same method was used to assess associated factors.

Results: MDE prevalence was 28.1% among PLWHIV, ranging from 10.9 to 55.7% across groups. Compared to the general population by sex regardless of sexual orientation and origin, MDE prevalence was 5.1-fold higher in HIV-infected men who have sex with men (95%CI:[3.9-6.6]), 3.1-fold higher in non-sub-Saharan African (SSA) heterosexual men (95%CI:[2.2-4.4]), 1.6-fold higher in SSA migrant men (95%CI:[0.9-2.6]), 2.6-fold higher in non-SSA heterosexual women (95%CI:[2.1-3.3]), and 1.9-fold higher in SSA migrant women (95%CI:[1.5-2.5]). In the HIV-infected population, MDE was positively related to unemployment, material deprivation, disclosure, experience of discrimination, and untreated hepatitis C, and negatively related to age.

Conclusions: The prevalence of depression varies across the different groups of PLWHIV, with levels much higher than in the general population. Moreover, there is a strong association with socioeconomic status and HIV experience.

Keywords: HIV infection, depression, France

INTRODUCTION

In the last few years, the increased efficacy of combined antiretroviral therapies (cARTs) has resulted in a marked reduction in HIV-related morbidities and mortality, and a considerable improvement in the quality of life of people living with HIV (PLWHIV) (1-3). However, this evolving to a chronic condition is associated with increasing non-AIDS-related comorbidities (including psychological morbidities) linked to aging and the burden of disease and treatment (4, 5).

In the HIV-infected population, depression is known to be negatively associated with HIV/AIDS treatment adherence, therapeutic outcomes and risky behaviours (6-8), with a potential impact on medical and social outcomes. Consequently, it is important to measure and understand the burden of depression among PLWHIV.

Recently published studies report particularly high levels of depression among PLWHIV worldwide (4, 9-13). However, the estimated prevalence is often the overall prevalence. Yet, the HIV-infected population consists of various groups with highly different socioeconomic and behavioural characteristics (14). A number of reports focus on one specific group, most often men who have sex with men (MSM) or intravenous drug users (IDUs) (12), but the comparison of depression among the various groups of PLWHIV has been poorly investigated.

Some studies have reported that the prevalence of depression among PLWHIV is 2 to 3 times higher than in the general population (13, 15). However, PLWHIV differ markedly from the general population in terms of their sociodemographic and socioeconomic characteristics that are mostly not taken into account in the comparison. Our objectives were (1) to estimate the prevalence of major depressive episode (MDE) among the various groups of PLWHIV, (2) to compare with the general population, accounting for the specific socioeconomic profile of PLWHIV, and (3) to identify factors associated with MDE.

METHODS

Study population

Data on PLWHIV were obtained from the ANRS-Vespa2 study (VIH: Enquête Sur Les Personnes Atteintes), a national cross-sectional representative survey aimed primarily at assessing the various dimensions of the socioeconomic and health-related characteristics of PLWHIV in France in their diversity (16, 17). The study was conducted between April 2011 and January 2012 among PLWHIV aged 18 years or older who had a diagnosis of HIV-infection of at least 6 months' duration and who were either French citizens or immigrants who had been living in France for at least 6 months. They were recruited in 73 hospital departments in France randomly selected from among all the hospital settings delivering HIV care. A total of 5,617 individuals were randomized. Of them, 378 were not solicited and 1,767 declined to participate. Thus, a total of 3022 participants answered a standardised questionnaire administered face-to-face by a trained interviewer. The questionnaire contained detailed questions on sociodemographic characteristics, living conditions, health and healthcare. The data were weighted to account for the sampling design and nonparticipation. Details about the weighting procedure are provided elsewhere (16, 17). The survey was approved by the French Advisory Committee on Information Processing in Material Research in the Field of Health and met the ethical requirements of the French National Commission for Computing and Liberties.

Data on the general population were obtained from the 2010 Baromètre Santé, a French national health survey conducted every 5 years by the French Institute for Health Promotion and Health Education (INPES) (18). Data were collected by telephone among a national representative sample of 27,653 noninstitutionalised residents aged 15 to 85 years. The estimated refusal rate was 39%. Questions on depression were administered to a randomly selected subsample of 8,782 participants.

Variables of interest

Major Depressive Episode

In both studies, the occurrence of major depressive episode (MDE) during the preceding 12-month period was assessed using the short form of the depression module of the World Health Organization's Composite International Diagnostic Instrument (CIDI-SF) (19). This fully structured instrument is used to diagnose mental disorders according to the definitions and criteria in the International Classification of Diseases (ICD-10) and the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV). A 12-month MDE is defined as a period of at least two weeks with the presence of at least 5 of the 8 core depressive symptoms, and affecting daily activities. MDE was considered to be of severe intensity if the individual reported at least 7 of the 8 depressive symptoms with significant disruption of daily activities. Since hepatitis C treatment provided in 2011 was peg-interferon and ribavirin, with a high risk of depression as an adverse effect (20), participants with chronic hepatitis C who were currently on therapy or who had stopped receiving such therapy less than 6 months earlier were excluded from the study. Patients included in the present study were classified as untreated hepatitis C versus no hepatitis C.

Covariates

Data on sociodemographic and socioeconomic characteristics were collected in both studies, including age (25-34; 35-44; 45-54; 55-65), household composition (single; couple with no children; couple with child(ren)), educational attainment (primary level; less than a high school diploma; high school diploma; more than a high school diploma) and occupational status (employed; unemployed; on disability, retired or inactive). Monthly income was categorised in three groups (<€1100; ≥€1100-≤€1800; and ≥€1800) based on tertiles.

In addition, the available data on PLWHIV included the following social and health indicator: material deprivation (yes [at least 4 out of 9 privations (food, clothes...)]/no), participation in AIDS association activities during the previous year (yes/no), having experienced discrimination during the previous 2 years (yes, on the basis of HIV; yes, on some other basis; no discrimination), the period of HIV diagnosis (after 2008; between 1997 and 2008; before 1997), being on cART with a viral load <50 copies/mL (yes/no), cancer in the previous 5 years (yes/no), chronic hepatitis B (yes/no), untreated hepatitis C (yes/no [no hepatitis C]) and cardiovascular risk documented from medical records (yes [diabetes, hypertension, cardiovascular disease]/no). For each participant, the proportion of family and friends to whom his/her HIV status had been disclosed was categorised in four groups (none; less than half; more than half; all).

HIV-infected individuals were divided into seven mutually exclusive categories, which correspond to the major groups of PLWHIV in France and which differ markedly in terms of HIV epidemic dynamics and socioeconomic conditions (14, 21): injection drug-using men or women (IDU men/women); men who have sex with men (MSM); sub-Saharan Africa (SSA) migrant men or women; and non-drug-using, non-SSA heterosexual men or women.

Statistical analyses

The statistical analyses were limited to individuals aged 25 to 65 years for whom information on depression was available and who did not have a current or recent history of hepatitis C therapy at the time of the interview. Individuals with missing information for the variables used in the models were excluded from the analyses.

The first step consisted in determining MDE prevalence and in describing severity overall and by group of PLWHIV.

IDUs were excluded from the remaining analyses because of their very specific susceptibility to depression, regardless of their HIV status (22, 23).

MDE prevalence was compared between each group of HIV-infected men or women and the general population of the same gender (but not taking into account sexual orientation and origin). Adjusted prevalence rate ratios (aPRR) were determined using multivariate Poisson regression models with robust variance (24). Each model was adjusted for age, household composition, educational attainment, occupational status and monthly income.

Finally, the factors associated with MDE were assessed in the HIV-positive population using multivariate Poisson regression models with robust variance. The covariates included in the models were sociodemographic and economic characteristics, comorbidities, social relations, and HIV-related characteristics. Covariates with a *p*-value <0.10 in the crude models were included in the multivariate models. To make sure that including all the groups of PLWHIV in the same model did not affect our results, we performed additional analyses stratifying by group that globally lead to the same associated factors for each group (not presented here).

All the analyses were performed using Stata 12 (Stata Corporation, College Station, Texas, USA) and accounted for the data weighting so that the estimates would be representative of the

entire HIV-infected population followed at hospitals in France in 2011 or of the general population in France in 2010.

RESULTS

Demographics of the study population

Of the 2,392 PLWHIV included in this study, 40% were MSM, 25% were SSA migrants (men: 8%; women: 17%), 25% were non-SSA heterosexuals (men: 12%; women: 13%) and 10% were IDUs (men: 6%; women: 4%). These groups varied in terms of age (the median age ranging from 39 years among the SSA migrant women to 51 years among the non-SSA heterosexual men) and household composition (the proportion of individuals living as a couple with one or more children ranging from 2.4% among the MSM to 35.1% among SSA migrant men) (Table 1). There were also marked differences in terms of educational attainment (the proportion of individuals with more than a high school diploma ranging from 7.8% among the IDU men to 44% among the MSM), occupational status (the proportion of unemployed individuals ranging from 6.4% among the MSM to 24.9% among the SSA migrant women) and income (the lower quartile of monthly income ranging from €540 among the SSA migrant women to €1300 among the MSM).

Among the 5,859 respondents in the general population aged 25 to 65 years, the proportion of men was 49.2%. The median age was 44 years among the men and 45 years among the women. Of the men and women, respectively, 40.1% and 32.2% were living as a couple with one or more children. A fourth had more than a high school diploma, and a minority were unemployed (men: 10.8%; women: 7.5%). The lower quartile of monthly income among the men was €972 and €900 among the women. Twenty percent of the general population have a chronic disease.

Major depressive episode across the various groups of HIV-infected persons

Overall, 28.1% of the HIV-infected participants had experienced a MDE during the previous 12 months. This prevalence of depression varied considerably across the groups of PLWHIV (Figure 1). Among the men, the rate of depression was 32.8% of the IDUs, 31.3% in the MSM, 18.3% in the non-SSA heterosexuals and 10.9% in the SSA migrants. Among the women, it was 55.7% in the IDUs, 29.7% in the non-SSA heterosexuals and 27.0% in the SSA migrants. Severe MDE was noted for 9.3% of the HIV-infected individuals. The rate of severe MDE, too, varied significantly across the groups, from 1.6% in the SSA migrant men to 35.0% in the IDU women. One third of individuals with MDE had had their first episode prior to HIV diagnosis.

Comparison with the general population

In the general population, 6.0% of men and 9.9% of women had experienced an MDE during the previous 12 months. After adjustment for age, household composition, educational attainment, occupational status and income, the prevalence of MDE remained higher among PLWHIV compared to the general population of the same gender (Table 2). The HIV-infected MSM (aPRR: 5.12, 95%CI:[3.94-6.64]; $p=0.000$) and HIV-infected non-SSA heterosexual men (aPRR: 3.13, 95%CI:[2.21-4.42]; $p=0.000$) had a significantly higher prevalence of MDE than men in the general population, but the difference between the HIV-infected SSA migrant men and men in the general population was not significant (aPRR: 1.55, 95%CI:[0.93-2.60]; $p=0.094$). Among the women, the HIV-infected non-SSA heterosexual women (aPRR: 2.61, 95%CI:[2.06-3.32]; $p=0.000$) and HIV-infected SSA migrant women (aPRR: 1.94, 95%CI:[1.50-2.50]; $p=0.000$) were significantly more likely to have had an MDE than women in the general population.

Characteristics associated with major depressive episode in the HIV-infected population

In univariate analysis (Table 3), prevalence varies across PLWHIV groups: the MSM (PRR: 1.71, 95%CI:[1.23-2.36]), SSA migrant women (PRR: 1.47, 95%CI:[1.05-2.07]) and non-SSA heterosexual women (PRR: 1.62, 95%CI:[1.15-2.28]) had a higher prevalence than the non-SSA heterosexual men. MDE prevalence decreased with age; and the participants living as a couple with or without children (vs. living alone) had a lower prevalence (PRR: 0.70, 95%CI:[0.52-0.94] / PRR: 0.71, 95%CI:[0.57-0.89]). As regards socioeconomic factors, those unemployed (vs. employed) (PRR: 1.81, 95%CI:[1.46-2.24]), on disability, retired or inactive (PRR: 1.30, 95%CI:[1.08-1.57]) or with material deprivation (PRR: 1.84, 95%CI:[1.54-2.20]) were more likely to have MDE. The social relations factors were also significantly associated with a higher prevalence of MDE: disclosure within the friend and family network (more than half vs. less than half, PRR: 1.50, 95%CI:[1.24-1.81] / all, PRR: 1.78, 95%CI:[1.42-2.23]); participation in AIDS association activities (PRR: 1.29, 95%CI:[1.05-1.59]); and discrimination on the basis of HIV status (PRR: 2.29, 95%CI:[1.86-2.81]) or on some other basis (PRR: 1.82, 95%CI:[1.49 to 2.22]). As for comorbidities, the individuals with untreated hepatitis C had a higher prevalence of MDE (PRR: 1.59, 95%CI:[1.14-2.22]). Finally, being HIV-diagnosed for a longer period was related to a lower prevalence of MDE (1997-2008 vs. \geq 2009, PRR: 0.67, 95%CI:[0.51-0.89] / <1997 vs. \geq 2009, PRR: 0.75, 95%CI:[0.57-0.99]), as was being on treatment success (vs. untreated/VL>50copies, PRR: 0.79, 95%CI:[0.63-0.99]).

In the final multivariate model (Table 3), MDE prevalence always decreased with age. The prevalence among the MSM was 1.52 times higher than in the non-SSA heterosexual men (95%CI:[1.07-2.16]), and it was 2.08 times lower among the SSA migrant men (aPRR: 0.48, 95%CI:[0.27-0.83]). In addition, those unemployed (vs. employed) (aPRR: 1.43, 95%CI:[1.15-1.77]) or with material deprivation (aPRR: 1.69, 95%CI:[1.41-2.03]) were more likely to have MDE. Regarding the social relations factors, disclosure within the friend and family network (more than half vs. less than half, aPRR: 1.27, 95%CI:[1.05-1.54] / all, aPRR: 1.50, 95%CI:[1.17-1.92]) and discrimination on the basis of HIV status (aPRR: 1.75, 95%CI:[1.41-2.18]) or on some other basis (aPRR: 1.74, 95%CI:[1.45-2.09]; $p=0.000$) were associated with a higher prevalence of MDE. The prevalence was also higher among those with untreated hepatitis C (aPRR: 1.60, 95%CI:[1.16- 2.20]).

DISCUSSION

Our results indicate that, in France, almost 3 in 10 HIV-infected people had experienced an MDE in the previous 12-month period. The prevalence of MDE varied from 10.9 to 55.7% across the various groups of PLWHIV. Compared to the general population of the same gender, HIV-infected men had a 1.55- to 5.12-fold higher prevalence, and HIV-infected women had a 1.94- to 2.61-fold higher prevalence. In the HIV-infected population, the prevalence of MDE negatively related to age and appeared to be positively related to unemployment, material deprivation, disclosure, experience of discrimination and having untreated hepatitis C.

The use of the CIDI-SF constitutes a major strength of our study. It is a widely validated and widely used diagnostic test for depression in international studies (25-28), including HIV studies (29-31). The CIDI-SF is convergent with the full-length CIDI (19). There are many different depression scales, which often makes it difficult to compare data between studies, but the CIDI-SF was used as a tool for measuring depression both in the ANRS-Vespa2 study and the 2010 Baromètre Santé survey, with the result that a comparison was possible. Of note, data were collected face-to-face among HIV-infected people versus by phone in the general population. However, we did not find any evidence suggesting that the mode of administration leads to different responses to the CIDI-SF questionnaire. Another significant strength is the nationally representative nature of the ANRS-Vespa2 dataset, as well as the availability of detailed sociodemographic, economic and HIV-related information. However, it should be noted that the study was limited to HIV-infected persons attending hospitals for HIV care. Presently, in France, HIV care is essentially provided at hospitals, and since 2006, the experts have been recommending that all PLWHIV have at least an annual checkup at a hospital (32). Estimates are therefore likely to apply to the vast majority of PLWHIV being treated in France. Yet, since the ANRS-Vespa2 study was cross-sectional, our findings describe MDE during the previous 12 months and only the year of first episode to account for the individual depression history. The prevalence of MDE among HIV-infected individuals is consistent with recent European studies (33, 34). The higher prevalence of MDE than in the general population is also consistent with the few reports in which such a comparison is made. A meta-analysis found a 2-fold higher frequency of MDE in seropositive individuals than in seronegative individuals (13), although it did not take the specific socioeconomic profile of PLWHIV into account. In the United States, HIV-infected persons were recently found to have a 3-fold higher prevalence of depression than the general population (15) when gender and, in turn, age, race/ethnicity and education were controlled for. But when controlled for gender and annual household income, the prevalence was 1.5-fold higher, which indicates that the difference in income between the two populations played an important role. In our study, the comparison accounted simultaneously for the specificities of the PLWHIV, with controlling for monthly income not reducing the prevalence rate ratio. The difference between the HIV-infected population and the general population is much wider than differences observed within the general population, for instance for the materially deprived versus the well-off (35), or the difference between people with cancer versus those without cancer (36).

In this study, each socioepidemiological group of PLWHIV was considered separately. IDU men and women had the highest prevalence of MDE of all the groups, as reported in recent reviews (12, 37). MSM were also a high-risk group for depression in the HIV-infected population in our study, as well as in previous reports (12, 37). Considering the low proportion of MSM in the general population (0.4% as it is defined by male-to-male sex in the last 12 months), the comparison was

made with the entire male population. MSM are known to be at high risk for psychological disorders compared to the rest of the population. A meta-analysis revealed a 1.5-fold higher risk of depression and anxiety disorders, and a 2-fold higher risk of suicide attempts (38). Therefore, our prevalence rate ratio probably reflects differences in HIV serostatus but also between MSM and heterosexuals. Conversely, HIV-infected SSA migrant men and women tended to be less depressed than other groups of men and women. However, the rate of depression was higher among the HIV-infected SSA migrants in our study than those reported among HIV-infected populations in sub-Saharan Africa (39, 40). This is consistent with studies that reported higher rates of depression among migrants than among the population in their country of origin (41). Compared to the general population of the same gender, the prevalence of depression is higher among SSA migrant women but not significantly so among SSA migrant men. Women could be affected more than men because they are more isolated, less educated and more deprived (42), as observed in the ANRS-Vespa2 study. Considering the low proportion of SSA migrants in the general population (0.6% in the Baromètre Santé sample), the population of reference actually consisted mostly of non-SSA heterosexuals. Some studies have reported a slightly higher lifetime prevalence of depression in the entire migrant population than in the general population (41). Therefore, our prevalence rate ratio probably reflects differences in HIV serostatus but also between migrants and non-migrants. In addition, the cross-cultural validity of the French version of the CIDI-SF among migrant subgroups might be questioned.

Our findings indicate a higher prevalence of MDE among seropositive women than seropositive men, which is consistent with recent reviews (9, 10, 12, 43). Other characteristics, such as age, employment status and level of income, are commonly associated with depression among PLWHIV (9, 10, 12, 15) and were also observed in this study. In the general population of most countries, there is also a high correlation with sex, age, marital status, employment status and level of income (44, 45). Therefore, sociodemographic and economic characteristics related to depression are similar in both populations. However, the adjusted prevalence rate of depression is higher among PLWHIV than in the general population, the hypothesis being that HIV disease plays a role. For instance, discrimination is known to be frequent and persistent against PLWHIV (46). Our results indicate a positive association between MDE and experience of discrimination, regardless of the perceived reason. The disclosure of HIV status is another important concern. The more PLWHIV informed their close relatives (family and friends), the higher the prevalence of MDE, suggesting two possible interpretations: disclosure needed to seek support to cope with depression or disclosure contributing to depression due to negative attitudes and discrimination. However data are lacking to disentangle these assumptions. However, due to the cross-sectional design of our study, disclosure status before the onset of MDE was not known. A recent German study reported no association between PLWHIV's mental health status and disclosure or experienced social support (47). Finally, the association between having depression and untreated hepatitis C needs to be considered with caution but is a clue that hepatitis C is a marker of vulnerability. More generally, there is no possible causal interpretation between MDE and the characteristics of HIV-infected individuals (9). On the one hand, people with mental disorders, such as MDE, would have an increased risk of exposure to HIV infection. On the other hand, several HIV-related psychosocial or biological factors could lead to the development of depression, such as stigma or a persistent viral presence in the central nervous system.

In conclusion, the results of this study show that, despite the major improvements in HIV care and treatment, the prevalence of depression remains much higher in the HIV-infected

population than in the general population. Moreover, depression rates vary across the groups of PLWHIV and are strongly related to socioeconomic status and enduring discrimination.

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P.F., R.D.-S., F.L., L.T., C.A., B.S. and ANRSVSG conceived and designed the experiments. P.F. performed the statistical analyses. P.F., R.D.-S. and F.L. analysed the data and wrote the manuscript. L.T., C.A. and B.S. critically reviewed the manuscript.

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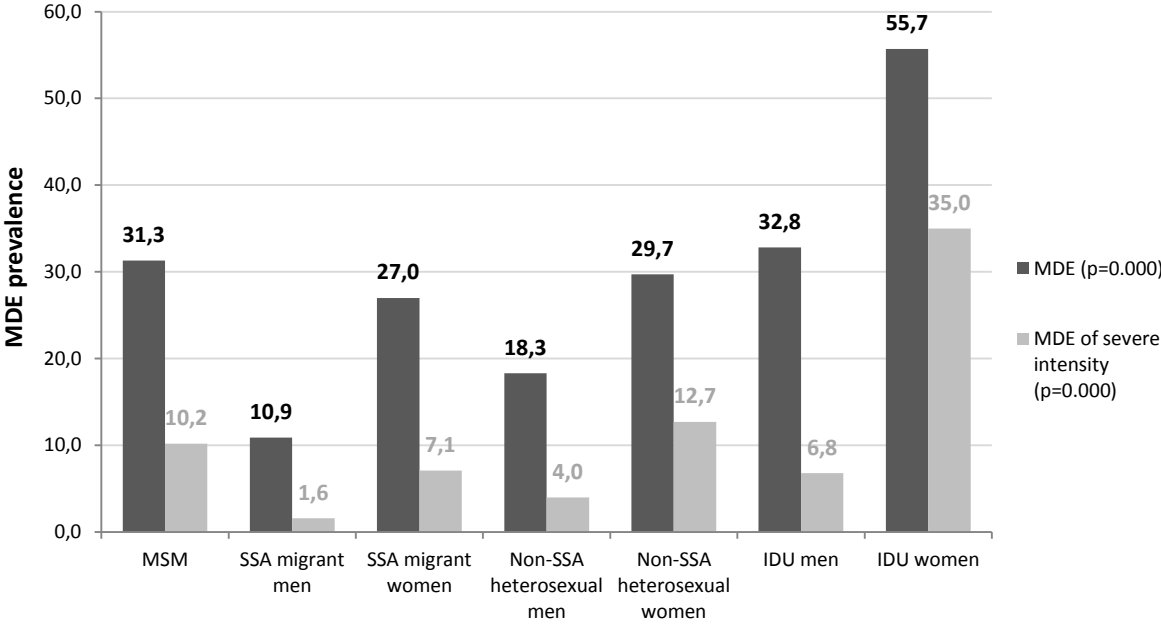
TABLES AND FIGURES

Table 1. Sociodemographic and socioeconomic characteristics of people living with HIV and the general population in France.

	MEN					WOMEN			
	GENERAL POPULATION	PLWHIV				GENERAL POPULATION	PLWHIV		
	All men (%) (N=2,613)	MSM (%) (N=1,078)	Migrants from SSA (%) (N=141)	Non-SSA heterosexuals (%) (N=276)	IDUs (%) (N=140)	All women (%) (N=3,246)	Migrants from SSA (%) (N=353)	Non-SSA heterosexuals (%) (N=312)	IDUs (%) (N=92)
Age at time of survey									
25-34	22.8	9.7	13.5	4.4	0.4	23.2	29.5	9.4	7.7
35-44	27.4	25.7	26.1	21.2	12.5	26.5	46.6	27.6	16.6
45-54	25.6	42.1	43.7	35.4	79.4	26.2	16.7	40.0	65.8
55-65	24.2	22.4	16.7	39.0	7.7	24.2	7.2	23.0	9.9
Household composition									
No partner	26.2	64.6	49.2	47.7	57.6	28.5	61.6	57.8	58.8
Couple without children	33.7	33.0	15.8	35.4	23.6	32.2	9.1	27.5	30.9
Couple with child(ren)	40.1	2.4	35.1	16.9	18.8	39.4	29.3	14.8	10.4
Educational attainment									
Primary level	14.8	6.0	19.2	14.2	20.4	16.3	24.2	15.0	27.6
Less than a high school diploma	43.8	31.7	24.0	45.5	66.4	37.5	46.6	40.1	40.4
High school diploma	15.6	18.2	17.8	11.3	5.4	17.9	17.9	16.3	16.7
More than a high school diploma	25.8	44.0	39.0	29.0	7.8	28.3	11.4	28.6	15.2
Occupational status									
Employed	71.6	64.8	63.2	52.5	36.7	63.1	54.5	52.3	21.7
Unemployed	10.8	6.4	23.8	7.7	9.1	7.5	24.9	8.8	10.5
On disability, retired or inactive	17.8	28.8	12.9	39.8	54.2	29.4	20.6	38.9	67.7
Monthly income									
<€1100	28.4	18.3	61.5	28.6	59.0	35.9	71.0	40.5	54.5
≥€1100-<€1800	39.4	25.3	30.3	33.1	25.2	36.6	24.0	30.3	38.4
≥€1800	32.3	56.4	8.2	38.4	15.9	27.4	5.1	29.2	7.1

MSM: Men who have sex with men, SSA: Sub-Saharan Africa

Figure 1. Prevalence of major depressive episode among people living with HIV.



MDE: Major depressive episode; MSM: Men who have sex with men; SSA: Sub-Saharan Africa.

Table 2. Prevalence rate ratios of major depressive episode in men and women living with HIV as compared to the French general population of the same gender.

	Crude model		Adjusted model	
	PRR ¹	[95% CI]	aPRR ²	[95% CI]
MEN				
General population	1.00	[1.00,1.00]	1.00	[1.00,1.00]
MSM living with HIV	5.24***	[4.22,6.51]	5.12***	[3.94,6.64]
SSA migrants living with HIV	1.83*	[1.08,3.09]	1.55	[0.93,2.60]
Non-SSA heterosexuals living with HIV	3.07***	[2.21,4.27]	3.13***	[2.21,4.42]
WOMEN				
General population	1.00	[1.00,1.00]	1.00	[1.00,1.00]
SSA migrants living with HIV	2.72***	[2.17,3.41]	1.94***	[1.50,2.50]
Non-SSA heterosexuals living with HIV	2.99***	[2.40,3.73]	2.61***	[2.06,3.32]

¹ Prevalence rate ratio (unadjusted).

² Prevalence rate ratio adjusted for age, household composition, educational attainment, occupational status and income.

Significance level: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. CI = Confidence interval.

MSM: Men who have sex with men; SSA: Sub-Saharan Africa.

Table 3. Factors associated with major depressive episode in people living with HIV.

	N (% with MDE)	Crude model		Adjusted model	
		PRR ¹	[95% CI]	aPRR ²	[95% CI]
Total	2,160 (26.6)				
<i>Sociodemographic variables</i>					
Socioepidemiological group					
MSM	1,078 (31.3)	1.71**	[1.23,2.36]	1.52*	[1.07,2.16]
SSA migrant men	141 (10.9)	0.60	[0.33,1.06]	0.48**	[0.27,0.83]
SSA migrant women	353 (27.0)	1.47*	[1.05,2.07]	0.93	[0.64,1.34]
Non-SSA heterosexual men	276 (18.3)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Non-SSA heterosexual women	312 (29.7)	1.62**	[1.15,2.28]	1.22	[0.85,1.75]
Age at time of survey					
25-34	281 (36.1)	1.98***	[1.48,2.65]	1.71**	[1.23,2.38]
35-44	637 (26.7)	1.47**	[1.12,1.92]	1.31	[0.99,1.73]
45-54	783 (28.1)	1.54**	[1.19,2.00]	1.41*	[1.08,1.83]
55-65	459 (18.2)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Household composition					
Single	1,305 (30.2)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Couple without children	599 (21.6)	0.71**	[0.57,0.89]	0.87	[0.70,1.08]
Couple with child(ren)	256 (21.2)	0.70*	[0.52,0.94]	0.98	[0.75,1.28]
<i>Socioeconomic variables</i>					
Educational attainment					
Primary level	284 (19.7)	0.76	[0.55,1.04]	0.78	[0.58,1.05]
Less than a high school diploma	830 (29.6)	1.14	[0.93,1.40]	1.07	[0.89,1.28]
High school diploma	366 (26.7)	1.03	[0.80,1.32]	0.95	[0.76,1.21]
More than a high school diploma	680 (26.0)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Occupational status					
Employed	1,208 (22.5)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Unemployed	283 (40.7)	1.81***	[1.46,2.24]	1.43**	[1.15,1.77]
On disability, retired or inactive	669 (29.3)	1.30**	[1.08,1.57]	1.20	[0.99,1.46]
Material deprivation					
Yes	595 (40.1)	1.84***	[1.54,2.20]	1.69***	[1.41,2.03]
No	1,565 (21.7)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
<i>Social relations</i>					
Proportion of family and friends informed of HIV status					
None	208 (25.6)	1.23	[0.91,1.68]	1.04	[0.78,1.39]
Less than half	615 (20.0)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
More than half	453 (31.2)	1.50***	[1.24,1.81]	1.27*	[1.05,1.54]
All	884 (29.6)	1.78***	[1.42,2.23]	1.50**	[1.17,1.92]
Participation in AIDS association activities or activist					
Yes	326 (32.9)	1.29*	[1.05,1.59]	1.01	[0.82,1.24]
No	1,834 (25.5)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Discrimination					
Yes, on the basis of HIV	304 (43.9)	2.29***	[1.86,2.81]	1.75***	[1.41,2.18]
Yes, on some other basis	596 (34.8)	1.82***	[1.49,2.22]	1.74***	[1.45,2.09]
No discrimination	1,260 (19.2)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
<i>Comorbidities</i>					
Recent cancer (<5 years)					
Yes	92 (38.6)	1.27	[0.97,1.66]	1.32	[1.00,1.76]
No	2,068 (26.2)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Chronic hepatitis B					
Yes	100 (24.6)	0.92	[0.61,1.40]		
No	2,060 (26.7)	1.00	[1.00,1.00]		
Untreated hepatitis C (vs. no hepatitis C)					
Yes	93 (41.4)	1.59**	[1.14,2.22]	1.60**	[1.16,2.20]
No	2,067 (26.0)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
Cardiovascular risk					
Yes	458 (25.7)	0.96	[0.78,1.17]		
No	1,702 (26.9)	1.00	[1.00,1.00]		

HIV-related characteristics

Period of HIV diagnosis					
≥ 2009	258 (36.2)	1.00	[1.00,1.00]	1.00	[1.00,1.00]
1997-2008	1,058 (24.4)	0.67**	[0.51,0.89]	0.76	[0.58,1.01]
< 1997	844 (27.1)	0.75*	[0.57,0.99]	0.74	[0.55,1.01]
On cART and viral load < 50 copies/mL					
Yes	1,872 (25.7)	0.79*	[0.63,0.99]	0.94	[0.75,1.17]
No	288 (32.4)	1.00	[1.00,1.00]	1.00	[1.00,1.00]

¹ Prevalence rate ratio (unadjusted).

² Prevalence rate ratio adjusted for socioepidemiological group, age, household composition, educational attainment, occupational status, material deprivation, proportion of family and friends informed of HIV status, participation in AIDS association activities or being an activist, discrimination, cancer, chronic hepatitis B, chronic hepatitis C, period of HIV-diagnosis and virological success.

Significance level: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. CI = Confidence interval.

MSM: Men who have sex with men, SSA: Sub-Saharan Africa.

APPENDIX

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