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**Disease severity, self-reported experience of workplace discrimination and employment loss during the course of chronic HIV disease: differences according to gender and education**

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4 tables

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## **Abstract**

**Objectives:** Evidence for the existence of a harmful effect of chronic disease on employment status has been provided. Although this effect of chronic illness on employment has been reported to be higher among the groups with the lowest position on the labour market, the mechanisms of such inequalities are poorly understood. The present study aimed at investigating social inequalities in the chances of maintaining employment during the course of HIV infection and at examining the correlates of such inequalities.

**Methods:** We used data from a national representative sample of persons living with HIV in France (ANRS-EN12-VESPA survey). Retrospective information on social trajectory and disease characteristics from the time of HIV diagnosis was available. The risk of employment loss associated with indicators of disease severity and HIV-related workplace discrimination was computed over time since HIV diagnosis according to sociodemographic and occupational factors, using Cox proportional hazards models.

**Results:** Among the 478 working-aged participants diagnosed as being HIV-infected in the era of multitherapies and employed at the time of HIV diagnosis, 149 experienced employment loss. After adjusting for sociodemographic and occupational factors, disease severity and self-reported HIV-related discrimination at work were significantly associated with the risk of employment loss in a socially-differentiated manner: advancement in HIV disease was associated with an increased risk of employment loss among women (HR 4.45, 95% CI [2.10-9.43]) but not among men; self-reported experience of HIV-related discrimination at work was associated with an increased risk of employment loss among individuals with a primary/secondary educational level (HR 8.85, 95%CI [3.68-21.30]) but not among those more educated.

**Conclusions:** Chronic HIV disease affects the chances of maintaining employment in a socially differentiated manner, resulting in increasing inequalities regarding workforce

participation. Disease severity and workplace HIV-related discrimination, by weighing especially on employment status of those with the most disadvantaged socioeconomic position may play a major role.

## **Introduction**

Employment is a major factor in maintaining income levels and living conditions, especially among persons with long-lasting chronic diseases.[1] Moreover, unemployment has been shown to be an independent predictor of morbidity [2] and mortality from suicide and external causes [3-5] in the general population, thus contributing to social health inequalities in the general population.[6]

Studies have shown evidence for the existence of an impact on employment status of different chronic conditions including rheumatoid arthritis,[7,8] diabetes,[9-11] cancer,[12-15] impaired cardiac function [16] and limiting longstanding illness.[17,18] This harmful effect of chronic illness on employment has been shown to be higher among the groups with the lowest position on the labour market, i.e. women, low-educated persons, manual workers and those with the most physically demanding work.[19] However, the mechanisms of such inequalities in the social consequences of chronic disease are poorly understood.

In western countries, since 1996 and the wide-scale diffusion of highly active antiretroviral therapies (HAART), HIV infection has become a chronic disease. The population affected is particularly heterogeneous and divergent in its social characteristic.[20] In this context, social aspects of HIV infection have emerged as key factors for the management and progression of the disease. Stable partnership and temporary employment have been shown to constitute independent predictors of health status during the course of the disease as measured by the risk of progression towards hospitalization, AIDS or death .[21,22] Because HIV infection mostly affects young adults whose social situation is still largely in evolution at the time of disease outset, it may constitute an interesting framework for estimating the social consequences of chronic disease and for identifying the determinants of these consequences.

Although the disease mostly affects a population of working age, studies have reported persistent high unemployment rates among persons living with HIV/AIDS in the era of HAART, ranging from 45 to 65%. [23-29] HIV infection may constitute a barrier to access (or return) to work for those unemployed and/or a cause of employment loss for those in employment through phenomena including health status alterations, HIV-related discrimination from employers/colleagues and difficulties to manage HIV chronic condition and work demands all at the same time. Social inequalities in the consequences of HIV infection on employment status may occur either if such phenomena are distributed unequally across socioeconomic groups or if the magnitude of their effect on employment status differs according to socioeconomic characteristics of persons living with HIV/AIDS.

The existence of a phenomenon of employment loss during the course of HIV infection has been reported in several studies: in a representative sample of US HIV-infected patients, 6% of those employed have lost their job within the first 6 months of HAART. [27] Among HIV-seroconverters followed in the French PRIMO cohort, 18% have lost their job during the 2.5 years following HIV infection; employment loss was more frequent among those with a disadvantaged socioeconomic position regardless of HIV severity and comorbidity, suggesting that differences regarding health status do not explain on their own social inequalities in the chances of maintaining employment during the course of HIV infection, and that additional mechanisms may be involved. [30] A better understanding of such mechanisms would provide an interesting insight into the pathways linking social conditions and health among persons with a chronic disease.

The present study aimed at examining social inequalities in the chances of maintaining employment during the course of HIV infection and at investigating the correlates of such inequalities. More specifically, our objective was to assess whether the impact on employment loss of two major consequences of HIV infection, i.e. disease severity and HIV-related

discrimination at work, differed according to sociodemographic and occupational characteristics. We used data from a French national representative sample of people living with HIV and followed at hospital. In France, access to care for HIV infection is universal and HIV infection is mostly managed through hospital outpatient clinics, regardless of disease severity.[31] The sample we used has been constituted specifically with the concern for reflecting the diversity of the HIV epidemic, thus allowing us to account for the great heterogeneity in situations encountered at the country level.

## **Methods**

### *Study design*

We used data from the ANRS-EN12-VESPA study, a large survey aimed at studying the social situation and living conditions of HIV-infected persons in France. The study design has been detailed elsewhere.[32] Data were collected between December 2002 and September 2003 among a random stratified sample of HIV-infected outpatients recruited in 102 hospital departments delivering HIV care all over France. The stratification criteria were departments' geographic location and size of HIV caseload. Eligible individuals were those diagnosed as being HIV-1-infected for at least six months, aged 18 or older, and, for non-French citizens, living in France for at least six months. In the participating departments, physicians invited a sample of HIV-infected outpatients, randomized according to the order in which they were received, to participate in the study. Those with very poor understanding of the French language were excluded. The selection procedure was the following: at the beginning of each outpatient clinics session, every attending eligible patient was invited to participate by his/her physician. Once one had accepted, he/she was interviewed by a trained interviewer and the following outpatients were no longer invited to participate during the time of this interview. Invitations to participate resumed once the interviewer was available again, and the same procedure was applied until the end of the session.

Individuals who agreed to participate signed an informed consent and answered a face-to-face standardized questionnaire administered. Detailed information was collected on individuals' sociodemographic characteristics and on the different aspects of their life with HIV including access to and use of the healthcare system, health behaviors, occupational status, income, housing, social support, HIV disclosure, HIV-related discrimination, sexual activity and reproductive life. This information concerned both the situation at the time of the study and



that at the time of HIV diagnosis; major changes occurred during the course of the disease were reported and dated, providing retrospective information on participants' social trajectory during the course of the disease. Median length of interview was 40 minutes. After interview completion, participants received a 15€ voucher and were asked to fill in an additional self-administered questionnaire including psychometric scales. Information on health status, including characteristics of HIV infection and its management at the time of the study and retrospectively since diagnosis, and comorbidity was documented from medical records. The study reached the ethical requirements of the French "Commission Nationale Informatique et Libertés".

#### *Data collected*

Overall, 2,932 outpatients were included in the ANRS-EN12-VESPA study (global response rate 59.1%). Compared with participants, non-respondents were more likely to be employed at the study time and to have been HIV-infected through a way other than homo/bisexual contacts.[32] Considering that 1) the present sub study focused on employment loss and 2) consequences of HIV disease on employment status have probably shown major changes with the advent of HAART, the analyses presented in this paper have been restricted to all the 478 working aged participants (i.e., of less than 60 years of age) who were employed at the time of HIV diagnosis and who had been diagnosed as being HIV-infected in the HAART era (i.e., from 1996 onwards).

#### *Variables of interest*

For each participant, the employment trajectory between the time of HIV diagnosis and the time of the interview was obtained using retrospective information collected through the face-to-face questionnaire. Employment loss during the course of HIV infection was defined as

having moved from a situation of employment at the time of HIV diagnosis to a subsequent situation of unemployment.

Sociodemographic characteristics included age, gender, migrant status, and educational level; moreover, information on occupational position and type of work contract held at the time of HIV diagnosis was available. For each of these various characteristics, the reference category was that corresponding to persons who have classically the most disadvantaged position on the labour market in France.[33] An indicator of HIV progression over time was constructed as follows, using retrospective information from the medical records: HIV disease was considered as severe if during the preceding 12 months either progression toward AIDS stage had occurred or a CD4 cell count measurement indicating a severe immunodeficiency (CD4 cell count below  $200/\text{mm}^3$ ) was available; HIV disease was considered as not severe or of unknown severity otherwise. Participants' answer to the following question: 'Have you ever been rejected or discriminated at work for reasons directly related to your HIV infection?' was used to assess experience of HIV-related discrimination at the workplace. Such a question was conceptualized as measuring "self-reported experiences of discrimination", rather than "perceived discrimination". Indeed, while self-reported experiences must be perceived, not all perceived experiences are necessarily reported, depending upon individuals' willingness or ability to report them.[34]

### *Statistical analyses*

For each participant, data were split in as many observations as the number of months between the time of HIV diagnosis and the time of the interview, and the variables of interest were updated for each of these months using retrospective information. Participants were considered at risk for employment loss during the whole period between the time of HIV diagnosis and either their last month employed, the month preceding their 60<sup>th</sup> birthday or the time of the interview, whichever occurred first. The risk of employment loss associated with

HIV disease severity and with self-reported HIV-related discrimination at work was computed over time since HIV diagnosis, both overall and separately according to sociodemographic and occupational characteristics, using univariate and multivariate Cox proportional hazards models. Such models allowed us to account for the inter-subjects variability in duration of HIV infection at the time of the interview. In order to examine social differences in the impact of HIV disease severity and HIV-related discrimination at work on the risk of employment loss, terms of interaction between each of these two indicators and age, gender, migrant status, educational level, occupational position and type of job contract, respectively, were included in the models and their significance tested using likelihood ratio tests. Analyses have not been corrected for multiple testing.

Statistical analyses were performed using Stata 9.0<sup>®</sup> (Stata Corporation, College Station, TX).

## **Results**

### *Study population*

At the time of the interview, the 478 participants had spent a median time of 4 years since HIV diagnosis (range: 6 months to 7.5 years). As shown in Table 1, participants were in majority French-native males. The 85 migrants mostly originated from Sub-Saharan Africa.

At the time of HIV diagnosis, median age was 38 years (range: 21 to 59 years).

Administrative associates and clerks accounted for the majority (59.7%) of the sample.

Almost three participants out of four were stably employed with a permanent contract, either in the private or in the public sector.

**Table 1. Sociodemographic and occupational characteristics<sup>†</sup> of participants who have and who have not lost their employment during the course of HIV disease. ANRS-EN12-VESPA study, N=478.**

		Total sample (N=478)	Employment loss		HR of employment loss [95% CI] <sup>*</sup>
			Yes (N=149)	No (N=329)	
Age (years)	18-29	85 (17.8)	33 (22.1)	52 (15.8)	2.67 [1.67-4.26]
	30-39	176 (36.8)	40 (26.8)	136 (41.3)	1
	40-49	135 (28.2)	35 (23.5)	100 (30.4)	1.05 [0.66-1.65]
	50-59	82 (17.2)	41 (27.5)	41 (12.5)	2.42 [1.57-3.75]
Gender	Males	391 (81.8)	112 (75.2)	279 (84.8)	1
	Females	87 (18.2)	37 (24.8)	50 (15.2)	1.63 [1.12-2.36]
Migrant	No	393 (82.2)	120 (80.5)	273 (83.0)	1
	Yes	85 (17.8)	29 (19.5)	56 (17.0)	1.11 [0.74-1.66]
Educational level	Primary/Secondary school	213 (44.6)	78 (52.3)	135 (41.0)	1.38 [1.00-1.90]
	High school or more	265 (55.4)	71 (47.7)	194 (59.0)	1
Occupational position at diagnosis	Farmers	4 (0.8)	1 (0.7)	3 (0.9)	2.70 [0.33-22.02]
	Craftsmen, traders	29 (6.1)	11 (7.4)	18 (5.5)	4.36 [1.69-11.25]
	Managers, executives	59 (12.3)	7 (4.7)	52 (15.8)	1
	Administrative associates	127 (26.6)	41 (27.5)	86 (26.1)	3.30 [1.48-7.36]
	Clerks	158 (33.1)	52 (34.9)	106 (32.2)	3.27 [1.48-7.20]
	Manual workers	101 (21.1)	37 (24.8)	64 (18.5)	3.71 [1.65-8.32]
Type of contract at diagnosis	Self-employed	42 (8.8)	10 (6.7)	32 (9.7)	1.75 [0.79-3.86]
	Permanent contract, public sector	102 (21.3)	16 (10.7)	86 (26.1)	1
	Permanent contract, private sector	251 (52.5)	83 (55.7)	168 (51.1)	2.42 [1.42-4.13]
	Fixed-term contract or casual job	83 (17.4)	40 (26.8)	43 (13.1)	4.18 [2.34-7.47]

<sup>†</sup> Values are #(%) unless stated otherwise

HR : Hazard Ratio      CI : Confidence Interval

\* Univariate Cox proportional hazard model

Overall, 197 participants (41.2%) had reached AIDS stage or a CD4 cell count below 200/mm<sup>3</sup> and were thus considered as having a severe disease at least at one time point between HIV diagnosis and the time of the study. As shown in Table 2, after adjusting for year of HIV diagnosis, this proportion of participants with severe HIV infection did not show any significant difference according to sociodemographic and occupational characteristics, with the exception that this proportion increased with age at diagnosis. Twenty participants (4.2%) reported having ever experienced HIV-related discrimination at work. This proportion did not statistically differ according to sociodemographic and occupational characteristics.

**Table 2. Frequency<sup>†</sup> of severe HIV infection and self-reported experience of HIV-related discrimination at work, overall and according to sociodemographic and occupational characteristics. ANRS-EN12-VESPA study, N=478.**

		AIDS or CD4 count<200/mm <sup>3</sup> between diagnosis and data collection			Experience of HIV-related discrimination at work		
		Yes	No/NA	p*	Yes	No	p*
Overall		197 (41.2)	281 (58.8)	-	20 (4.2)	458 (95.8)	-
Age at diagnosis (years)	18-29	25 (29.4)	60 (70.6)	0.02	4 (4.7)	81 (95.3)	0.51
	30-39	69 (39.2)	107 (60.8)		9 (5.1)	167 (94.9)	
	40-49	62 (45.9)	73 (54.1)		6 (4.4)	129 (95.6)	
	50-59	41 (50.0)	41 (50.0)		1 (1.2)	81 (98.8)	
Gender	Males	164 (41.9)	227 (58.1)	0.47	17 (4.3)	374 (95.7)	0.59
	Females	33 (37.9)	54 (62.1)		3 (3.4)	84 (96.6)	
Migrant	No	157 (39.9)	236 (60.1)	0.23	18 (4.6)	375 (95.4)	0.35
	Yes	40 (47.1)	45 (52.9)		2 (2.3)	83 (97.7)	
Educational level	Primary/Secondary school	93 (43.7)	120 (56.3)	0.36	7 (3.3)	206 (96.7)	0.29
	High school or more	104 (39.2)	161 (60.8)		13 (4.9)	252 (95.1)	
Occupational position at diagnosis	Farmers	2 (50.0)	2 (50.0)	0.79	0 (0)	4 (100.0)	0.12
	Craftsmen, traders	10 (34.5)	19 (65.5)		0 (0)	29 (100.0)	
	Managers, executives	22 (37.3)	37 (62.7)		7 (11.9)	52 (88.1)	
	Administrative associates	49 (38.6)	78 (61.4)		3 (2.4)	124 (97.6)	
	Clerks	71 (44.9)	87 (55.1)		6 (3.8)	152 (96.2)	
	Manual workers	43 (42.6)	58 (57.4)		4 (4.0)	97 (96.0)	
Type of contract at diagnosis	Self-employed	16 (38.1)	26 (61.9)	0.64	1 (2.4)	41 (97.6)	0.74
	Permanent contract, public sector	38 (37.3)	64 (62.7)		5 (4.9)	97 (95.1)	
	Permanent contract, private sector	110 (43.8)	141 (56.2)		9 (3.6)	242 (96.4)	
	Fixed-term contract or casual job	33 (39.8)	50 (60.2)		5 (6.0)	78 (94.0)	

<sup>†</sup> Values are #(%) unless stated otherwise

\* Likelihood ratio test, adjusted for year of HIV diagnosis

### *Frequency and circumstances of employment loss*

Among the 478 participants, 18 reached the age of 60 years between the time of HIV diagnosis and the time of the interview while they were still in employment. Among the 460 others, 149 (32.4%) were aged less than 60 years and were no longer employed at the time of the study: 78 were unemployed, 30 were in disability for health reasons, 14 were retired and 27 were excluded from the labour market for other reasons.

As shown in Table 1, the crude risk of employment loss over time since HIV diagnosis showed marked differences according to sociodemographic and occupational characteristics. In a univariate Cox proportional hazard model, this risk was higher among individuals aged below 30 or above 49 years compared with those aged 30-39 years (respectively, hazard ratio (HR) 2.67, 95% confidence interval (CI) [1.67-4.26] and HR 2.42, 95% CI [1.57-3.75]); women were at increased risk of employment loss compared with men (HR 1.63, 95% CI [1.12-2.36]), as were individuals with a primary/secondary educational level compared with those more educated (HR 1.38, 95% CI [1.00-1.90]). Being employed either stably in the private sector or unstably was associated with an increased risk of employment loss compared with being stably employed in the public sector (respectively, HR 2.42, 95% CI [1.42-4.13] and HR 4.18, 95% CI [2.34-7.47]). Managers and executives had a risk of employment loss which was lower than that of individuals holding any other occupational position (HR 0.29, 95% CI [0.13-0.62]).

Among the 149 participants with employment loss, median time between HIV diagnosis and employment loss was 15 months (range: 2 months to 5.7 years). Major reported causes of employment loss were health-related reasons (31%), dismissal (21%), end of work contract (12%) and early retirement (9%); 42% of the individuals reported HIV infection had played an important role in their employment loss. At the time of the interview, the 149 participants with employment loss had been unemployed for a median time of 2.5 years.



### *HIV disease severity and the risk of employment loss*

Crude estimates of the excess risk of employment loss associated with having reached AIDS stage or severe immunodeficiency in the 12 preceding months, both overall and according to sociodemographic and occupational characteristic are shown in Table 3. Overall, having met a criterion of HIV disease severity was associated with a slightly but non-significantly increased risk of employment loss during the 12 following months (HR 1.37, 95% CI [0.88-2.14]).

However, the magnitude of this excess in the risk of employment loss associated with disease severity was not homogeneous across genders: among women, HIV disease severity was associated with a more than 4-fold increase in the risk of employment loss (HR 4.12, 95% CI [1.96-8.68]), a hazard ratio significantly higher than among men (HR 1.02, 95% CI [0.59-1.76]). No difference in the magnitude of this excess in the risk of employment loss associated with disease severity was observed according to age, migrant status, educational level, occupational position or type of contract at the time of HIV diagnosis.

### *Self-reported experience of workplace HIV-related discrimination and the risk of employment loss*

Crude estimates of the excess risk of employment loss associated with reporting having ever experienced HIV-related discriminations at work, both overall and according to each sociodemographic and occupational characteristic are shown in Table 3. Overall, participants who reported having ever experienced HIV-related discrimination at work had a slightly but non-significantly increased risk of employment loss over time since HIV diagnosis (HR 1.48, 95% CI [0.78-2.81]). However, the magnitude of this excess in the risk of employment loss associated with HIV-related discrimination was not homogeneous across educational levels: among individuals with a primary/secondary educational level, self-reported experience of HIV-related discrimination was associated with a more than 5-fold increase in the risk of employment loss (HR 5.20, 95% CI [2.25-12.02]), a hazard ratio significantly higher than

among those more educated (HR 0.78, 95% CI [0.28-2.14]). Also, the hazard ratios for employment loss associated with self-reported discrimination were particularly high among participants aged below 30 years (HR 4.34, 95% CI [1.31-14.33]) and among the manual workers (HR 4.04, 95% CI [1.23-13.26]). However, no statistically significant difference in the magnitude of this excess in the risk of employment loss associated with self-reported experience of HIV-related discrimination was observed according to age, gender, migrant status, occupational position or type of contract at the time of HIV diagnosis.

**Table 3. Estimated risk of employment loss associated with having reached AIDS stage or severe immunodeficiency in the 12 preceding months and with self-reported experience of HIV-related discrimination at work, overall and according to sociodemographic and occupational characteristics. ANRS-EN12-VESPA study, N=478.**

	# with employment loss		HR [95% CI] <sup>1</sup>	Test for HR heterogeneity p*	# with employment loss		HR [95% CI] <sup>2</sup>	Test for HR heterogeneity p*
	AIDS or CD4<200/mm <sup>3</sup> in the preceding year				Self-reported experience of discrimination at work			
	No/NA	Yes			No	Yes		
<b>Overall</b>	122	27	1.37 [0.88-2.14]	-	139	10	1.48 [0.78-2.81]	-
<b>Age (years)</b>								
18-29	29	4	1.44 [0.50-4.11]	0.947	30	3	4.34 [1.31-14.33]	0.360
30-39	34	6	1.28 [0.53-3.09]		36	4	1.98 [0.70-5.56]	
40-49	29	6	1.27 [0.52-3.14]		33	2	1.01 [0.24-4.20]	
50-59	30	11	1.70 [0.83-3.47]		40	1	0.81 [0.11-5.88]	
<b>Gender</b>								
Males	95	17	1.02 [0.59-1.76]	<b>0.003</b>	104	8	1.45 [0.71-2.98]	0.664
Females	27	10	<b>4.12 [1.96-8.68]</b>		35	2	2.09 [0.50-8.71]	
<b>Migrant</b>								
No	96	24	1.58 [0.98-2.54]	0.135	111	9	1.47 [0.75-2.91]	0.874
Yes	26	3	0.65 [0.19-2.16]		28	1	1.76 [0.24-12.93]	
<b>Educational level</b>								
Primary/Secondary	64	14	1.34 [0.74-2.44]	0.918	72	6	<b>5.20 [2.25-12.02]</b>	<b>0.005</b>
High school or more	58	13	1.40 [0.75-2.61]		67	4	0.78 [0.28-2.14]	
<b>Occupational position at diagnosis</b>								
Farmers	1	0	-	0.708	1	0	0	0.624
Craftsmen, traders	9	2	3.23 [0.69-15.04]		11	0	0	
Managers, executives	6	1	1.34 [0.16-11.21]		5	2	2.39 [0.46-12.34]	
Administrative associates	35	6	1.00 [0.41-2.41]		39	2	2.00 [0.50-8.62]	
Clerks	41	11	1.47 [0.74-2.92]		49	3	1.29 [0.40-4.16]	
Manual workers	30	7	1.49 [0.64-3.46]		34	3	4.04 [1.23-13.26]	
<b>Type of contract at diagnosis</b>								
Self-employed	8	2	2.14 [0.45-10.19]	0.686	10	0	0	0.602
Permanent contract, public sector	13	3	1.82 [0.51-6.47]		15	1	0.89 [0.12-6.74]	
Permanent contract, private sector	69	14	1.09 [0.60-1.98]		78	5	1.79 [0.72-4.41]	
Fixed-term contract or casual job	32	8	1.76 [0.80-3.86]		36	4	1.94 [0.69-5.45]	

NA: Non available HR: Hazard Ratio CI: Confidence Interval

<sup>1</sup> Hazard Ratio for employment loss associated with having reached AIDS stage or severe immunodeficiency in the 12 preceding months (compared with neither AIDS nor severe immunodeficiency), estimated for each category of sociodemographic/occupational characteristics by a Cox proportional hazard model including a term of interaction between disease severity and the considered sociodemographic/occupational characteristic

<sup>2</sup> Hazard Ratio for employment loss associated with self-reported experience of HIV-related discrimination at work (compared with no reported experience of HIV-related discrimination at work), estimated for each category of sociodemographic/occupational characteristics by a Cox proportional hazard model including a term of interaction between self-reported discrimination and the considered sociodemographic/occupational characteristic

\* Likelihood ratio test

*Risk of employment loss according to disease severity, self-reported experience of discrimination and sociodemographic/occupational characteristics*

Disease severity and self-reported experience of workplace discrimination remained significantly associated with the risk of employment loss, even after adjusting for sociodemographic and occupational characteristics. In a multivariate Cox proportional hazard model adjusted for sociodemographic and occupational characteristics and including terms of interaction between gender and updated HIV disease severity and between educational level and self-reported experience of discrimination at work, progression toward AIDS stage or a CD4 cell count below 200/mm<sup>3</sup> in the preceding 12 months was associated with an increased risk of employment loss among women (HR 4.45, 95% CI [2.10-9.43]) but not among men (Figure 1a); in addition, experience of discrimination at work was associated with an increased risk of employment loss among individuals with a primary/secondary educational level (HR 8.85, 95% CI [3.68-21.30]) but not among those more educated (Figure 1b). Furthermore, even after accounting for disease severity and self-reported discrimination the risk of employment loss was higher among individuals aged below 30 or above 49 years compared with those aged 30-39 years (respectively, HR 2.55, 95% CI [1.56-4.14] and HR 2.88, 95% CI [1.81-4.60]) and among those employed either stably in the private sector or unstably compared with those stably employed in the public sector (respectively, HR 2.49, 95% CI [1.42-4.36] and HR 4.58, 95% CI [2.48-8.45]), and this risk was lower among managers and executives compared with individuals holding any other occupational position (HR 0.34, 95% CI [0.15-0.75]).

**Table 4. Characteristics associated with the risk of employment loss in multivariate analysis\* (final model). ANRS-EN12-VESPA study, N=478.**

		Adjusted HR of employment loss [95% CI] *
<b>Updated age (years)</b>	18-29	2.55 [1.56-4.14] <sup>‡</sup>
	30-39	1
	40-49	1.26 [0.79-2.02]
	50-59	2.88 [1.81-4.60] <sup>‡</sup>
<b>Occupational position at diagnosis</b>	Farmers	3.85 [0.36-40.78]
	Craftsmen, traders	5.76 [1.72-19.29] <sup>‡</sup>
	Managers, executives	1
	Administrative associates	2.65 [1.16-6.06] <sup>‡</sup>
	Clerks	2.77 [1.18-6.48] <sup>‡</sup>
	Manual workers	2.38 [0.96-5.85]
<b>Type of contract at diagnosis</b>	Self-employed	1.23 [0.36-4.15]
	Permanent contract, public sector	1
	Permanent contract, private sector	2.49 [1.42-4.36] <sup>‡</sup>
	Fixed-term contract or casual job	4.58 [2.48-8.45] <sup>‡</sup>
<b>Updated HIV disease severity according to gender</b>		
<u>Males:</u> AIDS or severe immuno-deficiency in the 12 preceding months	No/Unknown	1
	Yes	1.01 [0.58-1.74]
<u>Females:</u> AIDS or severe immuno-deficiency in the 12 preceding months	No/Unknown	1
	Yes	4.45 [2.10-9.43] <sup>‡</sup>
<b>Self-reported experience of workplace discrimination according to educational level</b>		
<u>Primary/Secondary school:</u> Experience of HIV-related discrimination at work	No	1
	Yes	8.85 [3.68-21.30] <sup>‡</sup>
<u>High school or more:</u> Experience of HIV-related discrimination at work	No	1
	Yes	1.09 [0.39-3.07]

\* Obtained from a multivariate Cox proportional hazard model adjusted for age, being a migrant, occupational position at diagnosis, contract type at diagnosis, interaction between gender and updated HIV disease severity, and interaction between educational level and self-reported experience of workplace discrimination

HR : Hazard Ratio    CI : Confidence Interval

<sup>‡</sup> p<0.05

## Discussion

Our results suggest that in the HAART era, HIV infection weighs on the chances of maintaining employment through phenomena including disease severity and discrimination, and that this impact of HIV infection is socially differentiated. Indeed, disease severity and self-reported HIV-related discrimination at work constitute independent risk factors of employment loss among women and low-educated individuals, i.e. those who have classically the most disadvantaged position on the labour market in France;[33] however, these factors do not impair the chances of maintaining employment among men and high-educated individuals, resulting in strengthening the social gradient among HIV-infected persons compared with the French general population.

The ANRS-EN12-VESPA study, by providing detailed data on health and social trajectory throughout the course of the disease among a nationally representative sample of HIV-infected persons in France, provides a unique dataset to study the social aspects of HIV infection in their diversity at the level of the country. In France, access to care for HIV infection is universal and labour protection policies are under effect. The retrospective design of the study has probably allowed for the inclusion of individuals who are likely to be underrepresented in prospective studies, since prospective follow-up is likely to lead to the exclusion of the individuals with the most precarious socioeconomic conditions [35].

Nonetheless, the interpretation of our results must remain cautious due to the nature of the data. Of the participants included in the ANRS-EN12-VESPA study, only 478 met the inclusion criteria for the present sub study; such a small sample may have limited our ability to detect statistical differences, especially when subgroup analyses using interaction terms were conducted. Likelihood of participation in the ANRS-EN12-VESPA study was associated with employment status, those in employment being more likely to decline to participate;

thus, the rate of employment loss may have been overestimated in our study. On the other hand, the selection procedure may have led to underestimate the rate of employment loss in several ways. First, only individuals still alive in 2002-2003 have been included in the sample of the ANRS-EN12-VESPA study; therefore, those with the most severe disease, who might be particularly subject to employment loss, have not been accounted for. Second, among the respondents unemployed at the time of HIV diagnosis and thus not considered for the present analyses, the majority (78.5%) had had an employment experience prior to HIV diagnosis (data available on request); it is possible that, in some instances, loss of employment may have been related to HIV disease (albeit undiagnosed at that point). Although these various sources of bias prevent us from drawing any accurate estimate of the rate of employment loss during the course of HIV infection, they are unlikely to have influenced the magnitude of the associations we measured.

Our findings are consistent with studies reporting a socially differentiated impact of various chronic conditions including rheumatoid arthritis,[7,8,36,37] cancer,[14,38,39] coronary heart disease [16,40] or self-reported limiting longstanding illness [17,18,41-44] on employment: persons with the most disadvantaged socioeconomic position suffer more consequences of disease on their employment status than those more privileged. Such inequalities have mostly been related to differences in working conditions (e.g., work physical demand, control over the pace and scheduling of work activities). However, our findings suggest that beyond these factors, chronic disease itself may exert an effect on employment status through phenomena including disease severity and workplace discrimination.

Our results suggest that disease severity and experience of discrimination at work, rather than being more frequent among the most socially disadvantaged HIV-infected individuals living with HIV/AIDS, are associated with a particularly marked increase in the risk of employment loss among these persons. Women, more involved in domestic and family responsibilities than

men, might have more difficulty to combine job demand additionally to household duties and disease management when they have to face a severe health problem. Women are also more likely to live in single parent family than men (19.5% vs. 2.3% in our sample), a situation further increasing these difficulties. On the other hand, one can think that the gender differences we report may result from a more frequent reasoned choice of women to stop working when they are sick on the basis that they can live on their partner's (or other supportive persons') income. We have computed complementary analyses showing that the hazard ratio associated with disease severity is higher for women, whether they live in couple or not, than for men (data available on request). However, our data do not allow examining the potential role of other supportive sources on women's decision of employment termination. In our study, the indicator available to assess disease severity, i.e. AIDS diagnosis or CD4 cell count below 200, did not provide information on subjects' capabilities on performing at one's job. In a previous study,[14,38,39] physical functioning has been found to be associated with job loss. Detailed, repeated prospective measures of symptoms and physical/mental functioning would be useful to better understand the inequalities we show in the consequences of disease severity on employment.

Low education may be associated with a lack of resources, especially of psychosocial nature (e.g., social support) to face workplace HIV-related discrimination. However, for several reasons our results concerning discrimination must be interpreted with caution: first, information on discrimination was collected through a single general question, providing only unspecific information. In particular, no information on the type, the time and the frequency of experiences of HIV-related discrimination was available. Second, the questionnaire did not allow distinguishing between experiences of discrimination and those of rejection, two concepts that are likely to result in distinct consequences. Third, the perception and report of experiences of discrimination are likely to be affected by individuals' educational, cultural



and socioeconomic background as well as their personality. Fourth, the retrospective nature of information on discrimination in our study makes it likely that the less severe cases of discrimination have been underreported. These various limitations impede any causal interpretation of the associations we report using our measure of discrimination. In addition, a major mode of coping with HIV-related discrimination consists of discrimination anticipation and keeping of secrecy on HIV status. [45] Although such discrimination anticipation seems to be widespread in France as suggested by the low rate (less than 30%) of HIV status disclosure at the workplace in our study, [46] our data do not allow investigating the extent to which this phenomenon is associated with employment termination by free volition of patients. Probably as a result of this frequency of discrimination anticipation, only 20 persons in our sample reported that they had been discriminated against and the analyses involving this variable may have lacked statistical power to show differences in the frequency and/or the impact of HIV-related discrimination on the risk of employment loss. In particular, we can not exclude from our results the possibility of a more pronounced impact of discrimination among people aged below 30 years compared with those older, as well as among manual workers compared with those in more favorable occupational positions. Thus, our findings concerning discrimination and its association with employment loss are exploratory and definitely deserve to be further investigated in the future, using adequate designs to study this phenomenon.

In conclusion, our results suggest that despite protective labour policies, chronic HIV disease affects the chances of maintaining employment in a socially differentiated manner in France, resulting in increasing inequalities regarding workforce participation. Disease severity and experience of workplace HIV-related discrimination, by weighing especially on employment status of those with the most disadvantaged socioeconomic position may play a major role. Since HIV infection mostly affects adults of prime working age, among whom a substantial and increasing proportion belong to socially vulnerable populations, the impact of HIV

disease on employment suggested by our data is likely to translate into a high socio-economic burden in Western countries. This suggests that occupational/employment issues should be considered in implementing comprehensive care of persons living with HIV/AIDS. Further studies are required to confirm these findings in the context of HIV infection as well as among persons facing other chronic health conditions.

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## **Competing interests**

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