Burden of HIV disease and comorbidities on the chances of maintaining employment in the era of sustained combined antiretoviral therapies use

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Objectives: Employment status is a major predictor of health status and living conditions, especially among HIV-infected people, a predominantly working-aged population. We aimed to quantify the risk of work cessation following HIV diagnosis in France in 2004–2010 and to measure the respective burden of HIV-related characteristics and of associated comorbidities on this risk.

Design: We used data from a multicenter cohort made of a diversified sample of recently diagnosed HIV-1-infected adults, antiretroviral treatment-naive at baseline in 2004–2008 (ANRS-COPANA cohort). Detailed information on living conditions and clinical and biological characteristics were collected prospectively.

Methods: The risk of work cessation among the 376 working-aged participants employed at baseline was estimated using the Kaplan–Meier method. Characteristics associated with the risk of work cessation were identified using multivariate Cox models.

Results: The cumulative probability of work cessation reached 14.1% after 2 years and 34.7% after 5 years. Diabetes, hypertension and, to a lesser extent, signs of depression were associated with increased risks of work cessation after accounting for socio-occupational characteristics [adjusted hazard ratios (95% confidence interval): 5.7 (1.7–18.8), 3.1 (1.5–6.4) and 1.6 (0.9–2.9), respectively]. In contrast, HIV disease severity and treatment and experience of HIV-related discrimination were not statistically associated with the risk of work cessation.

Conclusion: The risk of work cessation during the course of HIV disease has remained substantial in the most recent period in France. Comorbidities, but not characteristics of HIV disease itself, substantially affect chances of maintaining employment. This provides insights into strategies for limiting the burden of HIV disease for individuals and society.

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Introduction

Employment is a major factor in maintaining income levels and living conditions, especially among persons with long-lasting chronic diseases [1]. In addition, unemployment has been shown to be an independent predictor of morbidity and mortality both in the general population [2–6] and among HIV-infected people [7,8].

Several studies have shown evidence of adverse effects on employment status of various chronic conditions including diabetes [9–11], cardiovascular disease [12–14], cancer [15–18] or depression [19,20]. As regards to HIV infection, few studies have investigated this topic. They have shown a phenomenon of employment loss occurring from the very first months following disease onset [21–24]. These reports, based on data collected earlier in the era of combined antiretroviral therapies (cARTs), that is, in the years 1996–2004, found that HIV infection weighted on the chances of maintaining employment through various mechanisms including disease severity and experiences of HIV-related discrimination.

Since 1996, the sustained use of cART has resulted in a marked decrease in overall and HIV-related morbidity and mortality among HIV-infected people. At the same time, the relative burden of comorbidities on health status has dramatically increased [25,26]. As a result, the impact of HIV infection on employment may have changed, as well as the respective burden of HIV disease itself and of comorbidities on chances of maintaining employment. Given the importance of employment issues among HIV-infected people, a predominantly working-aged population, such changes are important to be documented in order to be accounted for the implementation of comprehensive care programs. However, data on the topic have remained scarce. The present study aimed at investigating the phenomenon of work cessation during the course of HIV disease in the recent context in France. More specifically, our objectives were to estimate the frequency of work cessation among participants of the ANRS-COPANA cohort followed since HIV diagnosis and to measure the respective impact of characteristics of HIV infection itself and of frequent comorbidities on this risk of work cessation during the period 2004–2010.

Methods

Study design

The French ANRS-C09-COPANA cohort is an ongoing prospective study conducted in 37 hospitals located all over the French territory. The cohort is made of 800 recently diagnosed (<1 year) HIV-1-infected adults, naive of ART at baseline. In the participating centres, participants have been enrolled between April 2004 and May 2008 and followed semi-annually through hospital outpatient visits thereafter. At enrolment and at each scheduled visit, detailed clinical and biological data on characteristics of HIV infection and its management, associated comorbidities, hospitalizations and health behaviours are collected through a physician-administered standard questionnaire. In addition, at enrolment and each year thereafter, patients are asked to answer a self-administered questionnaire including detailed information on the various dimensions of their living conditions and depressive symptoms as measured by the French version of the Center for Epidemiologic Studies-Depression Scale (CES-D) [27].

The Paris-Cochin Ethics Committee approved the study protocol and all the participants gave their written informed consent to participate.

Variables of interest

Employment status at baseline and at each yearly follow-up was obtained from the self-administered questionnaire and categorized as follows: employed/unemployed/inactive [including participants retired, on disability or long-term (>1 year) sick leave, students and house workers]. Work cessation was defined as moving from employment to either unemployment or inactivity before reaching the legal age of retirement in France, that is, 60 years old. The date of work cessation corresponded to the date of beginning of unemployment or inactivity, as reported in the self-administered questionnaire.

Socio-demographic characteristics including age, sex and educational level were collected at enrolment through the physician questionnaire, in addition to HIV transmission category. Nationality, country of birth and age at arrival in France were documented in the baseline self-questionnaire. Participants born outside of France were considered as migrants if they did not have the French nationality or, for those with the French nationality, if they arrived in France when they were older than 15 years. For those employed, occupational characteristics including occupational grade and job status were self-reported at baseline and during follow-up. Indicators of living conditions, including cohabiting partnership, disclosure of HIV serostatus in close relationships (partner, family members, friends and colleagues) and experience of HIV-related discrimination in the preceding year, were also documented in the baseline and follow-up self-questionnaires.

Health status characteristics documented by the physician at each visit included indicators of HIV disease advancement and management (date of diagnosis, stage B or C defining illness since the last cohort visit, CD4 cell count, HIV viral load and cART prescription) and indicators of comorbidities. These included history of diabetes and cardiovascular disease; co-infection with hepatitis B virus (HBV), as defined by the presence of hepatitis B surface antigens or E antigens; co-infection with hepatitis C virus (HCV), as defined by a positive

HCV PCR; and hypertension, as defined by the prescription of an antihypertensive treatment. The presence of symptoms of depression in the preceding week was assessed by a CES-D score above 17 for men and 23 for women, the optimal cut-off scores identified in the French population [27]. At each follow-up visit, the physician also reported hospitalizations having occurred since the last cohort visit, IDU and alcohol consumption.

Statistical analysis

Analyses were restricted to participants who were of working age (i.e. <60 years) at baseline, whether they were employed, unemployed or inactive. Moreover, to be included, participants had to have attended at least the month 12 visit at the cut-off point of 30 June 2010. The risk of work cessation over time since enrolment among participants employed at baseline was estimated using the Kaplan–Meier method (1 − survival). Characteristics associated with the risk of work cessation were identified using univariate and multivariate Cox models. Both fixed and time-dependent variables were included in the models. Fixed variables included sex, age, migrant status, educational level, job status and HBV or HCV co-infection (as reported at baseline). Time-dependent variables included cohabiting partnership, disclosure of HIV serostatus, experience of HIV-related discrimination in the preceding year, stage B or C-defining illness in the preceding 6 months, CD4 cell count, viral load, cART prescription, diabetes, hypertension, symptoms of depression in the preceding week and hospitalization in the preceding 6 months. For all these time-dependent covariates, we considered the value reported at the preceding visit. In the univariate step, associations of socio-demographic, occupational, living conditions, health status and health behaviours characteristics with the risk of work cessation were measured. All variables associated with the risk of work cessation with a *P* value less than 20% in univariate analysis were included in the multivariate model. Statistical analyses were performed using Statistical Analysis Software (SAS; SAS Institute Inc., Cary, North Carolina, USA) version 9.2.

Results

Sample characteristics

A total of 622 participants were included. Among them, 376 (60.4%) were employed at baseline and, thus, constituted the population at risk of employment loss in our study. As of 30 June 2010, these 376 participants had been followed during a median time of 37.0 months [interquartile range (IQR) 24.8–53.2] and had attended a median of six semi-annual scheduled outpatient visits after enrolment. Therefore, at the cut-off point time, all of them had attended the month 12 visit, 327 had attended the month 24 visit, 217 attended month 36 visit, 134 attended month 48 visit, 67 attended month 60 visit and 20 attended month 72 visit.

The 622 participants constituted a diversified sample of HIV-infected patients, with 29.9% women and40.5% migrants (58.4% originating from sub-Saharan Africa). The majority had been HIV-infected through homo/bisexual (44.5%) or heterosexual (44.2%) contacts. Only five participants reported having ever used injecting drugs. As shown in Table 1, women and migrants were underrepresented in the subgroup of participants employed at the time of enrolment in the cohort (19.2 versus 46.3% and 23.7 versus 66.3%, respectively). Compared with participants without employment, the 376 employed participants were also older (median age 36 versus 33 years, respectively) and more educated (91.2% with more than elementary or middle school level versus 68.7%, respectively). In majority, they were employed as clerks or associate professionals or technicians (61.7%) and held a permanent salaried position (71.6%). In addition, compared with participants without employment, those employed at baseline were more likely to live with a partner (57.7 versus 51.2%, respectively) and to have disclosed their HIV serostatus to their close circle of family, friends or colleagues (78.7 versus 58.5%, respectively). Only a minority in both groups reported having ever experienced HIV-related discrimination at enrolment.

Overall, median time between HIV diagnosis and the first cohort visit was 4.5 months (4.5 and 4.3 months, respectively, among participants with and without employment at baseline). At their first visit, employed participants were significantly less likely than those without employment to have full-blown AIDS (5.1 versus 10.6%, respectively), severe immunosuppression with a CD4 cell count of less than 200 cells/μl (15.4 versus 23.2%, respectively) or a viral load higher than 5 $\log_{10}$ copies/ml (21.5 versus 29.8%, respectively). They were also less likely to have HBV or HCV co-infection (2.4 versus 8.9%, respectively) and symptoms of depression (31.6 versus 42.7%, respectively). Overall, 32.6% of participants initiated cART within the 3 months following enrolment.

Work cessation

Overall, among the 376 participants employed at baseline, 67 stopped working before they reached the age of 60 years: 58 became unemployed, four retired, three left on long-term sick leave and two went back to training. Work cessation occurred after a median follow-up time of 20.3 months (IQR 10.2–33.9). The cumulative probability of work cessation reached 5.4% [95% confidence interval (CI) 3.0–7.6%] at month 12, 14.1% (10.2–17.8%) at month 24, 18.7% (13.9–23.2%) at month 36, 23.1% (17.3–28.5%) at month 48 and 34.7% (24.0–43.9%) at month 60.

Table 1. Baseline characteristics of participants with and without employment at the time of enrolment in the cohort.

	Employment status at baseline				
	With employment (*N* = 376)		Without employment (*N* = 246)		
	n	%	*n*	%	*P*-value[a]
Age, years					
<30	82	21.8	82	33.3	<0.01
30–39	149	39.6	103	41.9	
40–49	104	27.7	40	16.3	
50–59	41	10.9	21	8.5	
Women	72	19.2	114	46.3	<0.01
Migrants	89	23.7	163	66.3	<0.01
Educational level					
Elementary or middle school	33	8.8	77	31.3	<0.01
Trade school	82	21.8	32	13.0	
High school	75	20.0	49	19.9	
College or university	181	48.1	81	32.9	
Missing	5	1.3	7	2.9	
Occupational grade					
Managers, craftsmen	22	5.9			
Executive	56	14.9			
Associate professionals or technicians	103	27.4			
Clerks	129	34.3			
Manual workers, farmers	64	17.1			
Missing	2	0.5			
Job status					
Self-employed	34	9.0			
Permanent contract, public sector	86	22.9			
Permanent contract, private sector	183	48.7			
Temporary contract	73	19.4			
Cohabiting partnership	217	57.7	126	51.2	<0.01
HIV status kept secret	80	21.3	102	41.5	<0.01
Experience of HIV-related discrimination	29	7.7	25	10.2	0.29
Clinical stage					
A	337	89.6	212	86.2	0.02
B	19	5.1	8	3.3	
C	19	5.1	26	10.6	
CD4 cell count (cells/μl)					
<200	58	15.4	57	23.2	<0.01
200-349	78	20.7	66	26.8	
350-499	117	31.1	55	22.4	
≥500	123	32.7	68	27.6	
Viral load (log_{10} copies/ml)					
<5	293	78.6	172	70.2	0.02
≥5	80	21.5	73	29.8	
HBV or HCV co-infection	9	2.4	22	8.9	<0.01
Diabetes	8	2.1	3	1.2	0.54
Hypertension	26	6.9	14	5.7	0.54
Symptoms of depression[b]	119	31.6	105	42.7	<0.01

HBV, hepatitis B virus; HCV, hepatitis C virus.
[a]Comparison of individuals with versus without employment at baseline (chi-squared test or Fisher's exact test as appropriate).
[b]Center for Epidemiologic Studies-Depression Scale score above 17 for men and 23 for women.

Among the 67 participants who experienced work cessation, 24 (35.8%) subsequently returned to work during follow-up. Return to work occurred within a median time of 11.5 months (IQR 8.0–16.3) after cessation of the previous work. At the cut-off point time, 20 of these 24 were still employed. Thus, of the 376 participants employed at baseline, a total of 47 (12.5%) were still out of employment at the end of follow-up.

Factors associated with the risk of work cessation over time

As shown in Table 2, in multivariate analysis the risk of work cessation was associated with individuals' socio-demographic and occupational characteristics: participants aged 30–39 years had a higher risk of work cessation compared with those aged 40–49 years [adjusted hazard ratio (aHR) 3.1 (95% CI 1.5–6.5)]. The risk of work cessation was also higher in participants with a primary level of education [aHR 2.6 (1.0–6.7)] and, to a lesser extent, in those with a technical education [aHR 2.1 (0.9–5.1)] compared with participants who attended college or university. In addition, job status was associated with the risk of work cessation, those being self-employed [aHR 6.1 (1.7–21.7)], holding a temporary job contract [aHR 8.8 (3.1–24.8)] or holding a permanent position in the private sector [aHR 2.8

Table 2. Characteristics associated with the risk of work cessation among the 376 participants employed at baseline.

	Number of people with work cessation	Univariate HR (95% CI)	Multivariate[a] HR (95% CI)	Multivariate[a] *P* value
Sex[b]				
Women	19	1.7 (1.0–2.9)	1.1 (0.6–2.2)	0.77
Men	48	1	1	–
Age[b], years				
<30	11	1.2 (0.5–2.5)	1.8 (0.7–4.5)	0.22
30–39	32	1.8 (0.9–3.3)	3.1 (1.5–6.5)	0.003
40–49	14	1	1	–
50–59	10	2.5 (1.1–5.5)	1.9 (0.8–4.7)	0.14
Migrant[b]				
Yes	24	1.9 (1.1–3.1)	1.3 (0.6–2.6)	0.48
No	43	1	1	–
Educational level[b]				
Primary school	11	2.6 (1.3–5.3)	2.6 (1.0–6.7)	0.05
Trade school	15	1.4 (0.7–2.5)	2.1 (0.9–5.1)	0.08
High school	14	1.4 (0.7–2.6)	1.3 (0.6–2.9)	0.45
College or university	27	1	1	–
Missing	0	–	–	–
Job status[b]				
Self-employed	9	5.2 (1.8–15.6)	6.1 (1.7–21.7)	0.005
Permanent contract, public sector	5	1	1	–
Permanent contract, private sector	26	2.4 (0.9–6.2)	2.8 (1.1–7.6)	0.04
Temporary contract	27	8.1 (3.1–21.1)	8.8 (3.1–24.8)	<0.001
Cohabiting partnership[c]				
No	35	1.7 (1.0–2.7)	1.6 (0.9–2.9)	0.09
Yes	30	1	1	–
Missing	2	0.8 (0.2–3.6)	0.9 (0.2–3.9)	0.89
HIV status kept secret[c]				
Yes	15	2.7 (1.5–5.0)	1.6 (0.8–3.4)	0.21
No	52	1	1	–
Experience of HIV-related discrimination in the preceding year[c]				
Yes	8	1.7 (0.8–3.6)	1.6 (0.7–3.6)	0.26
No	59	1	1	–
Stage B or C-defining illness in the preceding 6 months[c]				
Yes	4	2.2 (0.8–6.2)	1.3 (0.4–4.3)	0.67
No	63	1	1	–
CD4 cell count[c], cells/μl				
<350	22	1.4 (0.8–2.3)	1.4 (0.8–2.4)	0.24
≥350l	45	1	1	–
Viral load (log_{10} copies/ml)[c]				
≥5	6	1.1 (0.5–2.7)		
<5	61	1	–	–
Prescription of cART[c]				
Yes	28	0.8 (0.5–1.3)		
No	39	1	–	–
HBV or HCV co-infection[b]				
Yes	1	1.3 (0.2–9.8)		
No	66	1	–	–
Diabetes[c]				
Yes	4	4.3 (1.6–11.9)	5.6 (1.7–18.5)	0.005
No	63	1	1	–
Hypertension[c]				
Yes	14	2.4 (1.3–4.4)	3.1 (1.5–6.4)	0.002
No	53	1	1	–
Symptoms of depression in the preceding week[c,d]				
Yes	23	1.5 (0.9–2.5)	1.7 (0.9–2.9)	0.07
No	44	1	1	–
Hospitalization in the preceding 6 months[c]				
Yes	7	2.2 (1.0–4.9)	1.1 (0.4–2.9)	0.84
No	60	1	1	–

cART, combined antiretroviral therapy; CI, confidence interval; HBV, hepatitis B virus; HCV, hepatitis C virus; HR, hazard ratio.
[a]Cox model adjusted for sex, age, migrant status, educational level, job status, cohabiting partnership, HIV-related discrimination, stage B or C-defining illness, CD4 cell count, diabetes, hypertension, symptoms of depression and hospitalization.
[b]As reported at baseline (fixed).
[c]As reported at the preceding visit (time-dependent).
[d]Center for Epidemiologic Studies-Depression Scale score above 17 for men and 23 for women.

(1.1–7.6)] experiencing a higher frequency of work cessation compared with those holding a permanent position in the public sector. Participants living on their own also tended to stop their work more frequently than those living with a partner [aHR 1.6 (0.9 to 2.9)]. Women and migrants were at a higher risk of work cessation in univariate analysis, although these associations were no longer significant after adjustment for educational level and employment status.

Accounting for socio-demographic and occupational characteristics, the risk of work cessation was significantly higher among participants with diabetes [aHR 5.6 (1.7–18.5)] and among those with hypertension [aHR 3.1 (1.5–6.4)] compared with those free of these comorbidities. Symptoms of depression also tended to be associated with an increased risk of work cessation [aHR 1.7 (0.9–2.9)]. In contrast, HIV disease severity, as measured either clinically (i.e. occurrence of a stage B or C-defining illness in the preceding 6 months) or biologically (i.e. CD4 cell count <350 cells/μl or viral load $\geq 5 \log_{10}$ copies/ml), was not associated with a significant increase in the risk of work cessation. Reported experience of HIV-related discrimination, cART prescription and hepatitis co-infection were not statistically associated with the risk of work cessation either.

Sensitivity analysis

Predictors of work cessation may be different according to various factors including individuals' willingness to maintain employment and the type of work contract (permanent versus temporary). To estimate the impact of these differences on our results, we performed two sensitivity analyses: censoring work cessations that are likely to have been chosen, that is, those followed by a return to training or by retirement, and excluding individuals with a temporary job contract for who work cessation was likely to result from the termination of their contract. In both analyses, diabetes and hypertension remained associated with an increased risk of work cessation. Furthermore, the associations between indicators of HIV disease severity and work cessation remained nonsignificant.

Discussion

HIV infection most often occurs in early adulthood, and the majority of HIV-infected individuals are of working age. Therefore, employment constitutes a major dimension in the life of HIV-infected people, and understanding the ways by which the disease interferes with employment may provide insights into strategies for limiting the burden of HIV disease for individuals and society. This requires the availability of longitudinal datasets documenting both clinical, biological and socio-occupational aspects. Information on socio-occupational characteristics are generally not routinely collected in hospital databases; as a result, studies on the impact of HIV infection on employment have remained limited in the recent period, despite the dramatic changes having occurred regarding the course of the disease. To our knowledge, our study is the first to prospectively document this major issue in the current context of sustained use of cART.

Our results provide evidence for the existence of a phenomenon of work cessation starting from the very first months following HIV diagnosis and persisting during the 5 subsequent years in the current context in France, suggesting substantial social and economic consequences for patients, employers and society. Accounting for individuals' socio-demographic and occupational characteristics, HIV disease advancement and treatment and self-reported experience of HIV-related discrimination do not appear to be significant predictors of work cessation. In contrast, comorbidities frequently associated with HIV disease, including diabetes, hypertension and depression, substantially affect the chances of maintaining employment during the course of HIV infection.

The ANRS-COPANA cohort constitutes a unique source of information to appropriately investigate the social aspects of HIV infection. Indeed, information collected prospectively from the early time of HIV diagnosis includes detailed data both on social, occupational and health characteristics. In addition, the cohort is made of a diversified sample of HIV-infected patients: overall, women account for 30% of the participants, migrants (mostly from sub-Saharan Africa) for 41% and MSM for 64%. Such diversity suggests that the ANRS-COPANA cohort provides insights into the situation of the different socially contrasted subgroups of patients encountered in France, as in many other European settings. The employment rate at baseline in the whole cohort (62.9%) was close to the rate of 59.3% estimated among a representative sample of people diagnosed HIV-infected in France in the cART era [28], suggesting that the study population also provides a good reflection of the employment situation of HIV-infected people in France. The longitudinal design of the ANRS-COPANA cohort allowed us to consider covariates as time-dependent variables, thus accounting for underlying dynamic processes. Covariates systematically measured previous work cessation (at baseline or at the time of the preceding visit), suggesting that the associations we show are unlikely to reflect reverse causality or contemporaneity. However, it must be acknowledged that, as in any single observational study, causality cannot definitely be established.

Our results indicate that the risk of work cessation during the course of HIV infection has remained substantial in the recent period in France, with more than one-third (34.7%) of patients having ended the job they held at the

time of HIV diagnosis after 5 years. A previous study showed that in France, employment rate was lower in HIV-infected people than in the general population, probably as a result of decreased chances of maintaining employment for the former [28]. In the present study, the extent to which the rate of work cessation was higher than that in the general population, reflecting the overall burden of HIV infection on work cessation, could not be examined. Only a formal comparison to the frequency of work cessation during the same period in HIV-uninfected people with comparable positions on the labour market would allow the quantification of this burden.

Although substantial, the rate of work cessation in our study appears lower than that reported earlier in the cART era in France. Indeed, in our study, 12.5% of patients initially employed were out of employment almost 3 years after HIV diagnosis; this proportion was twice higher (25.0%) after 2.5 years of follow-up in a cohort of individuals diagnosed with primary HIV infection in 1996–2002 (ANRS-PRIMO cohort), although they had been enrolled at an earlier stage of the disease and were followed during a shorter time [21]. In addition, data from a representative sample of the HIV-infected population in France showed that among people diagnosed HIV-infected in 1996–2002 while they were employed, 32.4% had lost their employment 4 years later [22]. Some cases of work cessation might have been underreported in the ANRS-COPANA database. This is particularly the case for episodes of work cessation occurring early in the course of HIV infection, that is, previous enrolment in the cohort, and for those of short duration. However, similar sources of underestimation might have biased estimates of work cessation rates in previous studies as well; thus, the lower frequency of work cessation we report is likely to reflect an actual decreasing burden of HIV disease on work cessation with the sustained use of cART.

Our results do not provide evidence for a significant role of HIV-related characteristics on the risk of work cessation in the current context in France. This finding is consistent with a recent study showing that employment status was not associated with the level of CD4 cell count among HIV-infected outpatients followed in 2008–2009 in the UK [29]. In contrast, HIV disease severity and reported experience of HIV-related discrimination were found to be significant predictors of work cessation earlier in the cART era [21–24]. Such a discrepancy is likely to reflect changing barriers and attitudes to continued employment during the course of HIV disease in the most recent period. Of note, in the present study, we focused on the termination of the job held at the time of enrolment in the cohort. Thus, our results pertain to HIV-infected patients employed at the time of HIV diagnosis, a subgroup more privileged than those out of employment as regards to position on the labour market (i.e. more likely to be middle-aged educated French-native men), HIV disease severity and comorbidity. Although we did not find any significant role of HIV disease characteristics on the risk of work cessation in this specific subgroup of patients employed at baseline, the existence of a significant impact of these characteristics on employment status of patients unemployed at the time of HIV diagnosis cannot be ruled out. Future studies need to investigate the determinants of access to and maintain employment during the course of HIV disease among patients unemployed at the time of HIV diagnosis.

Physical and mental health impairments related to longstanding illnesses, such as cardiovascular disease, diabetes or depression, are known to be significant predictors of unemployment in the general population [19,20,30,31]. In a previous study, such chronic conditions have also been found to weight on the chances of maintaining employment among HIV-infected people, independently of HIV disease characteristics [21]. Here we found that unlike HIV disease severity and reported experience of HIV-related discrimination, comorbidities including diabetes, hypertension and symptoms of depression were associated with an increased risk of work cessation during the course of HIV infection. This suggests that comorbidities constitute major barriers to continued employment among HIV-infected people in the current context in France,.

Employment discontinuation during the course of HIV infection may result from various pathways. Physical and mental functioning, workplace discrimination and difficulties combining job demands in addition to disease management may directly weigh on the chances of maintaining employment, resulting in involuntary work cessations. Such involuntary work cessations may also result from nonhealth-related factors, for example, the termination of a temporary work contract. On the contrary, employment discontinuation may result from a reasoned choice of leaving employment, for example, for people who wish to go back to training or to retire or for those who can afford to live on their partner's (or other supportive person's) income. In our study, back to training and retirement only accounted for six of the 67 work cessations; furthermore, living with a partner tended to be associated with a decreased risk of work cessation. This suggests that this phenomenon of planned work cessation is probably limited. Moreover, sensitivity analyses showed that the burden of HIV-related characteristics and comorbidities on the chances of maintaining employment remained unchanged when potentially planned work cessations were censored and individuals with a temporary work contract were excluded, thus supporting our results.

In conclusion, the present study provides evidence that the risk of work cessation during the course of HIV infection has remained substantial in the most recent

period in France. Social and economic consequences for patients, employers and society are likely to be important and should be addressed at different levels including clinical settings, employers and social workers. A particular attention should be paid to prevent HIV-infected patients affected by comorbidities from leaving employment.

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Conflicts of interest

The authors have no conflict of interest to disclose.

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