Self-rated Health among HIV-infected People Receiving Treatments in Thailand

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Abstract

Few studies have investigated the impact of antiretroviral treatment on the self-rated health of people living with HIV/AIDS. Self-rated health provides a global assessment of an individuals' health status, encompassing several dimensions that no other single health outcome is able to capture. In this paper, we investigate the self-rated health of HIV-infected people receiving antiretroviral treatment at two different time-points, the time of interview and the time of antiretroviral initiation. A life-event history survey was carried-out among 513 HIV-infected individuals receiving treatment in four community hospitals in Chiang Mai province, Northern Thailand. Interviews cover their family, residential, education, occupation and health history including self-rated health over their lifespan. The proportion of participants reporting poor or very poor health decreased dramatically from 56% before treatment initiation to 6% at the time of interview. This huge improvement in self-rated health paralleled with clinical and biological markers. At the time of interview, factors independently associated with better self-rated health were the absence of symptoms and an immunological recovery (Odd Ratios (OR): 2.22 and 1.52, respectively). At treatment initiation, the absence of symptoms, of severe immunosuppression and no history of hospitalization were independently associated with better self-rated health (OR: 2.22, 1.52, and 3.11, respectively). These results confirm the validity of the self-rated health indicator in the particular context of HIV/AIDS.

Keywords: Self-Rated Health, HIV/AIDS, Life-event survey, Antiretrovirals, Thailand, South-East Asia

1. Introduction

With more than one million people infected since the beginning of the HIV epidemic, mostly through heterosexual contacts, Thailand remains the most severely hit country in South-east Asia. According to the Joint United Nations Programme on HIV/AIDS (*UNAIDS*) (WHO/UNAIDS, 2014), in 2013 the prevalence of HIV was estimated at 1.1% among adults aged 15 to 49 years old, with a total of 440,000 people living with HIV/AIDS. Among those meeting the criteria for initiating antiretroviral treatment, 80% were receiving it (Anonymous, 2014).

With improved survival due to antiretroviral treatments, increased attention is paid to the quality of life of people living with HIV/AIDS (Bing et al., 2000; Briongos Figuero, Bachiller Luque, Palacios Martin, Gonzalez Sagrado, & Eiros Bouza, 2011; Duracinsky, Herrmann, et al., 2012). To date, few studies have investigated their self-rated health, which in fact is an important component of quality of life (Harding et al., 2012; Koelmeyer, English, Smith, & Grierson, 2014; Liu et al., 2006; Mrus et al., 2006; Munyati et al., 2006).

Because it is both global and easy-to-collect, self-rated health is widely used in surveys and in evaluation programmes. More than 30 years of research have established that this subjective indicator provides a global assessment of the individuals' health status, encompassing a host of dimensions that no other single health outcome is able to capture. Self-rated health is strongly correlated with morbidity and disability (Ferraro, Farmer, & Wybraniec, 1997; Goldberg, Gueguen, Schmaus, Nakache, & Goldberg, 2001; Johnson & Wolinsky, 1993; Manor, Matthews, & Power, 2001; Singh-Manoux et al., 2006). Important determinants of self-rated health are also unhealthy behaviours, mental health and psychosocial factors (e.g., personality traits, coping styles) (Benyamini, Idler, Leventhal, & Leventhal, 2000; Eriksson & Lindstrom, 2006; Manderbacka, Lundberg, &

Martikainen, 1999). Moreover, poor self-rated health has consistently been reported to be predictive of mortality, even after controlling for the presence of a number of life-threatening diseases (Frankenberg & Jones, 2004; Idler & Benyamini, 1997). This relationship has mainly been established for developed countries, but several studies, notably in Asia (Hirve et al., 2012; Jylha, 2009; Zimmer & Prachuabmoh, 2012), suggest that they also hold in developing countries.

In this paper, our focus is on the self-rated health of people living with HIV/AIDS in Thailand. The data we use are from the Living with Antiretroviral Study LIWA project (ANRS 12 141), which was designed to evaluate the impact of antiretroviral treatments on the lives of people living with HIV/AIDS in Thailand (Le Coeur, Collins, Pannetier, & Lelievre, 2009). Participants, all receiving treatment, were asked to assess their health status throughout their life (including childhood) with a particular focus at the time of the survey as well as at the time of treatment initiation. The disease stage of the participants as indicated by their immunological status, was also available at both dates, allowing to compare self-rated health to a robust biological marker. We also investigate to which extent other characteristics of the participants (medical and socioeconomic) correlate with self-rated health, both at the time of interview and of treatment initiation.

2. Methods

2.1 Survey Design

A life-event history survey was conducted from August to November 2007 in four community hospitals in Chiang Mai province, Northern Thailand. Among all the patients under antiretroviral treatment (n=578) during the study period, 513 persons (i.e., 89% of all patients receiving treatment in the four hospital sites) agreed to be interviewed.

Data collected with the life-event history questionnaire included the respondents' socio-demographic characteristics (sex, age, educational level, marital and work histories) as well as the main events related to the HIV disease: presence of symptoms, hospitalizations, year of HIV diagnosis, reasons for testing and year of treatment initiation. At the very end of the interview, respondents were asked to evaluate their health throughout the entire life course ("How would you rate your health status throughout your life"). They themselves defined the different periods and qualified each using a pictogram (smiley) scale corresponding to the 5 possible item responses (very poor, poor, fair, good, very good). The disease stage was evaluated by the number of CD4 lymphocytes, the blood cells progressively destroyed by the HIV virus. The clinical indicators are the self-reported weight and height, as well as the weight loss before the beginning of the treatment.

The survey was approved by the Ethical Committee of the Faculty of Associated Medical Sciences, Chiang Mai University.

2.2 Statistical Analysis

Self-rated health is used as an ordinal categorical variable, ranging from 1 (very poor) to 5 (very good), but to account for small numbers, responses to the self-rated health question have been combined into three categories. At the time of interview, since the distribution of self-rated health tended strongly towards better health, the three categories used were "very poor/poor/fair", "good" and "very good", while before treatment initiation the distribution tended towards poorer health and the three categories used were "very poor", "poor/fair", "good/very good". The cut-off values for the CD4 levels are those recommended for clinical management: < 200 cells/mm^3 (threshold below which there is an immunosuppression and therefore a high risk of infections) at the time of interview, and <50 cells/mm^3 (threshold for severe immunosuppression and therefore a high risk of death) before treatment initiation. Following the World Health Organization (WHO) classification (2004), the body mass index (BMI) computed at the time of the interview is categorized into three groups: underweight (<18.5), optimal weight (18.5<=BMI<25), overweight or obese (>=25). For the year of diagnosis, patients were classified as diagnosed before or after 2003, the year when antiretroviral treatments became available for free in Thailand.

The very limited missing data –only 3% of the respondents' heights and only 1% of their weight deficits before antiretrovirals initiation—were considered as missing completely at random. Missing BMIs were imputed using a regression model while missing weight deficits were imputed using a simple hot-deck procedure, i.e. replacing missing values with values from "similar" respondents (Andridge & Little, 2010).

The correlation between self-rated health and the CD4 counts is estimated with the Spearman correlation coefficient, which does not require a linear correlation. To examine the association between self-rated health and the respondents' characteristics at the time of the interview and at the time of treatment onset, separate multivariable ordinal logistic regressions have been adjusted to control for sex, age and educational level, as well as for the variables found to be significantly (p<0.20) associated with self-rated health in bivariate models. Age

and age^2 were introduced in the model to take into account the nonlinear relationship between age and self-rated health which improved the fit. The proportional odds assumption was considered tenable *vis à vis* the gain in the number of parameters estimated on a relatively small size sample (Agresti, 2010). We conducted the statistical analysis using SAS software, version 9.2 (SAS Institute Inc., Cary, NC, USA).

2.3 Ethics Approval and Consent to Participate

The survey was approved by the Ethical Committee of the Faculty of Associated Medical Sciences, Chiang Mai University. Before participation in the study, written informed consent was obtained from all individual participants.

3. Results

3.1 Characteristics of the Population

Characteristics of the HIV-infected population in the study are provided in Table 1, column 1. There are slightly more women than men (53% versus 47%). The average age of the participants is 40 years old. Half of them are currently married, and 44% have experienced widowhood in the past. Only one third have reached secondary education level or above. The vast majority of the respondents (87%) draw a regular income from work. More than half of them (55%) were diagnosed before 2003, and 55% initiated treatment within one year of diagnosis. At the time of the survey, 56% of the respondents had already been under treatment for at least 3 years. We therefore deal here with a sample of low-income, middle-aged HIV-infected people (88.5% infected sexually), who were regularly working and who in most cases had a family and children to support.

Table 1. Self-rated health at the time of interview according to social and medical characteristics

	All patients		Very poor, Poor, Fair		Good		Very Good		P-value*
	N	(%)	N	(%)	N	(%)	N	(%)	
	513	(100)	173	(33.7)	233	(45.7)	107	(20.9)	
Sex									
Women	271	(52.8)	92	(34.0)	125	(46.1)	54	(19.9)	
Men	242	(47.2)	81	(33.5)	108	(44.6)	53	(21.9)	0.853
Mean Age	40.6		41.2		40.1		40.6		0.352
Current marital status									
Separated/Never married	140	(27.3)	51	(36.4)	60	(42.9)	29	(20.7)	
Married	259	(50.5)	80	(30.9)	123	(47.5)	56	(21.6)	
Widowed	114	(22.2)	42	(36.8)	50	(43.9)	22	(19.3)	0.742
Experience of partner death (n=480)**									
Yes	211	(44.0)	68	(32.2)	97	(46.0)	46	(21.8)	
No	269	(56.0)	95	(35.3)	123	(45.7)	51	(19.0)	0.668
Education Level									
Up to primary	346	(67.4)	126	(36.4)	150	(43.4)	70	(20.2)	
Secondary or above	167	(32.6)	47	(28.1)	83	(49.7)	37	(22.2)	0.179
Regular income from work									
Yes	445	(86.7)	139	(31.2)	208	(46.7)	98	(22.1)	
No	68	(13.3)	34	(50.0)	25	(36.8)	9	(13.2)	0.010
Year of HIV diagnosis									
≤2003	281	(54.8)	89	(31.7)	135	(48.0)	57	(20.3)	
After 2003	232	(45.2)	84	(36.2)	98	(42.2)	50	(21.6)	0.412
Delay between HIV diagnosis and ART initiation									
≤1year	282	(55.0)	94	(33.3)	126	(44.7)	62	(22.0)	
> 1 year	231	(45.0	79	(34.2)	107	(46.3)	45	(19.5)	0.800
Antiretroviral treatment duration									
< 3 years	224	(43.7)	92	(41.1)	89	(39.7)	43	(19.2)	
≥3 years	289	(56.3)	81	(28.0)	144	(49.8)	64	(22.2)	0.008
Body Mass Index (BMI)									
<18.5	108	(21.1)	48	(44.4)	45	(41.7)	15	(13.9)	
18.5-24.9	337	(65.7)	112	(33.2)	151	(44.8)	74	(22.0)	
≥25	68	(13.3)	13	(19.1)	37	(54.4)	18	(26.5)	0.008
Presence of symptoms									

Yes	57	(11.1)	33	(57.9)	21	(36.8)	3	(5.3)	
No	456	(88.9)	140	(30.7)	212	(46.5)	104	(22.8)	<0.001
History of hospitalization in the last 12 months								
Yes	47	(9.2)	24	(51.1)	17	(36.2)	6	(12.8)	
No	466	(90.8)	149	(32.0)	216	(46.3)	101	(21.7)	0.035
CD4 count (cells/mm^3)								
<200	98	(12.1)	52	(53.1)	34	(34.7)	12	(12.2)	
≥200	415	(80.9)	121	(29.2)	199	(47.9)	95	(22.9)	<0.001

Source: LIWA survey, 2007.

* Fisher exact test of the difference in the distribution of perceived health, except for age (continuous variable) for which the one-way variance F-test was used to test the difference between mean ages according to perceived health status.   ** for ever married respondents

3.2 Health Status at the Time of the Interview

All health indicators point towards a favourable condition under antiretroviral treatments (Table 1, column 1). Two thirds of the participants have a BMI in the normal range. Only a small minority (11%) experience symptoms related to HIV. The majority of the patients (81%) are not immunosuppressed as indicated by a CD4 count above 200 cells/mm^3. Only 9% of all patients have been hospitalized at least one night in the last 12 months. At the time of interview, 45% of the respondents rate their health as good, 21% as very good, 28% as fair, and only a small percentage as poor (5.5%) or very poor (0.5%) (Table 2).

Table 2. Health perception indicator by sex at the time of the interview, and before treatment initiation

	At the time of the interview*					
	Females		**Males**		**Total**	
	N	%	N	%	N	%
	271	(53)	242	(47)	513	(100)
Self-rated health						
Very Poor	2	(0.7)	1	(0.4)	3	(0.6)
Poor	12	(4.4)	16	(6.6)	28	(5.5)
Fair	78	(28.8)	64	(26.5)	142	(27.7)
Good	125	(46.1)	108	(44.6)	233	(45.4)
Very good	54	(19.9)	53	(21.9)	107	(20.9)

* Self-rated health at the time of interview is ultimately grouped into 3 categories: Poor (very poor, poor and fair); Good &Very Good. There is no effect of sex (p-value=0.8527).

	Before treatment initiation**					
	Females		**Males**		**Total**	
	N	%	N	%	N	%
	271	(53)	242	(47)	513	(100)
Self-rated health						
Very Poor	63	(23.3)	80	(33.1)	143	(27.8)
Poor	76	(28.0)	70	(28.9)	146	(28.5)
Fair	68	(25.1)	50	(20.7)	118	(23.0)
Good	40	(14.8)	22	(9.1)	62	(12.1)
Very good	24	(8.9)	20	(8.3)	44	(8.6)

Source: LIWA survey, 2007.

** Self-rated health before treatment initiation is ultimately grouped into 3 categories: Very Poor, Fair (fair /poor), Good (good & very good) with a significant sex effect (p-value=0.0283).

In the bivariate analysis (Table 1), sex, age, marital status, educational level and year of diagnosis do not appear

to be significantly associated with self-rated health. However, good and very good self-rated health is associated with regular income from work (p=0.010), treatment duration longer than 3 years (p=0.008), normal BMI (p=0.008), absence of symptoms (p<0.001), absence of recent hospitalization (p=0.035), and CD4 count above 200 cells/mm3 (p<0.001). Figure 1 shows the strong correlation between self-rated health and the CD4 count, with the mean CD4 counts increasing steadily from 138 cells/mm^3 for those declaring very poor health to 410 cells/mm^3 for those in very good health (Spearman correlation coefficient 0.194, p<0.01). The multivariable ordinal logistic regression analysis (Table 3) indicates that, after adjustment on the characteristics of the respondents, the remaining variables associated with a better self-rated health are the absence of symptoms (Adjusted Odds Ratio (AOR): 2.85; 95% Confidence Interval (95%CI): 1.6-5.0), and a CD4 count above 200 cells/mm^3 (AOR: 2.1; 95%CI: 1.3-3.4). Although less statistically significant (at 90% not 95%), patients with a regular income from work (AOR for no income: 0.6; 90% CI: 0.4-0.9) and those with a BMI above normal (AOR: 1.6; 90% CI: 1.0-2.4) tend to report better health.

Table 3. Ordinal logistic regression results for better self-rated health at the time of interview

	N	(%)	AOR*	95%CI	p-value
Sex					
Women	271	(52.8)	1.00		
Men	242	(47.2)	0.86	0.61-1.20	0.372
Mean age			1.04	0.88-1.23	0.653
Mean square Age			1.00	1.00-1.00	0.564
Education Level					
Up to primary	346	(67.4)	1.00		
Secondary or above	167	(32.6)	1.28	0.89-1.86	0.182
Regular income from work					
Yes	445	(86.7)	1.00		
No	68	(13.3)	0.62	0.67-1.04	0.070
Antiretroviral treatment duration					
< 3 years	224	(43.7)	1.00		
≥3 years	289	(56.3)	1.27	0.90-1.81	0.174
Body Mass Index　(BMI)					
<18.5	108	(21.0)	0.78	0.51-1.20	0.253
18.5-24.9	337	(65.7)	1.00		
≥25	68	(13.3)	1.55	0.94-2.56	0.084
Presence of symptoms					
Yes	57	(11.1)	1.00		
No	456	(88.9)	2.85	1.62-5.04	<0.001
CD4 count (cell/mm^3)					
<200	98	(12.1)	1.00		
>=200	415	(80.9)	2.14	1.35-3.38	0.001
History of hospitalization in the last 12 months					
Yes	47	(9.2)	1.00		
No	466	(90.8)	1.37	0.74-2.55	0.321

Source: LIWA survey, 2007.　　　* *AOR*: Adjusted Odds Ratio

3.3 Health Status at the Time of Treatment Initiation

Self-rated health at the time of treatment onset is shifted toward worse health compared to the time of the interview (Table 2). More than half of the participants (56%) reported poor (28%) or very poor self-rated health (29%), 23% reported it as fair and only 21% considered their health as good or very good.
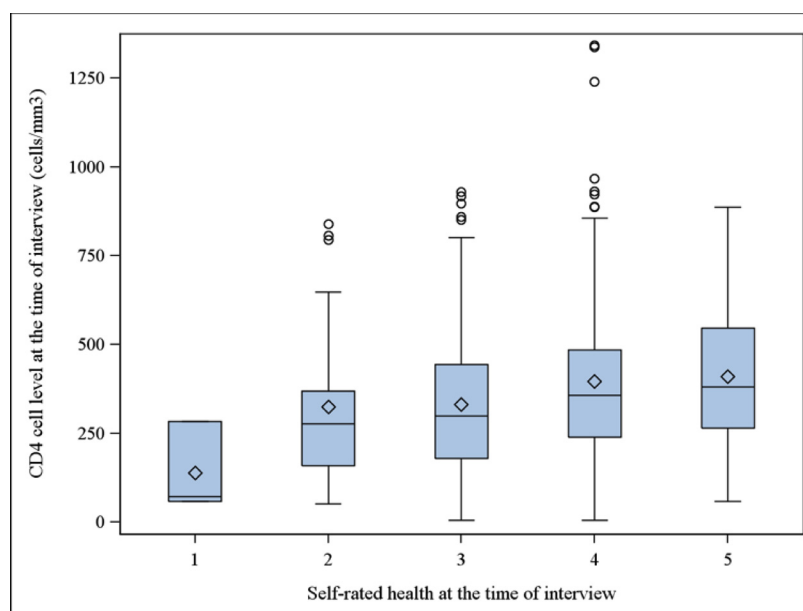
Figure 1. Immunological status as indicated by the CD4 level, according to self-rated health at the time of the interview (*Source*: LIWA survey, 2007)

Overall, eighty five percent of the respondents were experiencing symptoms, some of them severe (Table 4, column 1). For half of them, it was the presence of HIV symptoms which triggered HIV testing and therefore diagnosis. Only one-fourth had been tested because their partner or child had been diagnosed as HIV infected, usually before having symptoms. One third of the patients (32%) had experienced a weight loss of more than 10 kg. Almost half of the participants (49%) had been hospitalized before treatment onset, and the majority had a very low CD4 count (44% were severely immunosuppressed as indicated by a CD4 cell count below 50 cells/mm^3), being at high risk for opportunistic infections and death.

Table 4. Self-rated health at the time of treatment initiation according to social and medical characteristics

	All patients		Very poor		Poor/Fair		Good/Very Good		P-value[*]
	N	(%)	N	(%)	N	(%)	N	(%)	
	513	(100)	143	(37.9)	264	(51.5)	106	(20.7)	
Sex									
Women	271	(52.8)	63	(23.3)	144	(53.1)	64	(23.6)	
Men	242	(47.2)	80	(33.1)	120	(49.6)	42	(17.3)	0.028
Mean Age	40.6		41.2		40.1		40.6		
(Standard deviation)	(8.1)		(8.2)		(7.8)		(8.1)		0.087
Education Level									
Up to primary	346	(67.4)	88	(25.4)	181	(52.3)	77	(22.3)	
Secondary or above	167	(32.6)	55	(32.9)	83	(49.7)	29	(17.4)	0.159
Reasons for testing									
HIV symptoms	255	(49.7)	82	(32.2)	130	(51.0)	43	(16.8)	
Partner/child with HIV	123	(24.0)	31	(25.2)	64	(52.0)	28	(22.8)	
Other	135	(26.3)	30	(22.2)	70	(51.9)	35	(25.9)	0.115
Weight deficit									
≥ 10 kg	165	(32.2)	55	(33.3)	84	(50.9)	26	(15.8)	
< 10 kg	348	(67.8)	88	(25.3)	180	(51.7)	80	(23.0)	0.066
Presence of symptoms									
Yes	435	(84.8)	135	(31.0)	228	(52.4)	72	(16.6)	
No	78	(15.2)	8	(10.3)	36	(46.1)	34	(43.6)	<0.001

History of hospitalization before treatment initiation

Yes	252	(49.1)	103	(40.9)	125	(49.6)	24	(9.5)	
No	261	(50.9)	40	(15.3)	139	(53.3)	82	(31.4)	<0.001

CD4 count (cells/mm³)

< 50	225	(43.9)	83	(36.9)	107	(47.6)	35	(15.5)	
[50;200]	242	(47.2)	49	(20.3)	130	(53.7)	63	(26.0)	
≥ 200	46	(8.9)	11	(23.9)	27	(58.7)	8	(17.4)	<0.001

Source: LIWA survey, 2007.

* Fisher exact test of the difference in the distribution of perceived health, except for age (continuous variable), for which the one-way analysis of variance F-test was used to test the difference between mean ages according to perceived health status

Table 5. Ordinal logistic regression results for a better self-rated health before treatment initiation

	N	(%)	AOR*	95%CI	p-value
Sex					
Women	271	(52.8)	1.19	0.83-1.72	0.343
Men	242	(47.2)	1.00		
Mean age			1.12	0.96-1.31	0.138
Square Age			1.00	1.00-1.00	0.207
Education Level					
Up to primary	346	(67.4)	1.00		
Secondary or above	167	(32.6)	0.84	0.57-1.22	0.357
Reasons for testing					
HIV symptoms	255	(49.7)	0.835	0.54-1.28	0.406
Partner/child with HIV	123	(24.0)	0.615	0.37-1.01	0.054
Other	135	(26.3)	1.00		
Weight deficit before ART					
≥10kg	165	(32.2)	0.847	0.58-1.23	0.382
< 10kg	348	(67.8)	1.00		
Presence of symptoms					
Yes	435	(84.8)	1.00		
No	78	(15.2)	2.22	1.33-3.72	0.002
History of hospitalization before treatment initiation					
Yes	252	(49.1)	1.00		
No	261	(50.9)	3.11	2.12-4.56	<0.001
CD4 count (cells/mm³)					
<50	225	(43.9)	1.00		
≥50	288	(56.1)	1.52	1.06-2.18	0.022

Source: LIWA survey, 2007.   * *AOR*: Adjusted Odds Ratio

In contrast with the situation at the time of interview, there is a significant difference in the self-rated health of the two sexes, with women declaring better health (p=0.028). Other factors associated with good or very good self-rated health at the time of treatment initiation are the absence of symptoms (p<0.001), the absence of past hospitalization (p<0.001) and higher CD4 count (p<0.001). There is a trend toward an association between an important weight loss (more than 10 kg before treatment initiation) and a poorer self-rated health (p=0.066). Age, educational level and reason for HIV testing are not associated with self-rated health. Results of the multivariable ordinal logistic regression (Table 5) indicate that the remaining characteristics associated with a better self-rated health at the time of treatment initiation, after adjustment, were the absence of symptoms (AOR: 2.2; 95%CI: 1.3-3.7), the absence of hospitalization history (AOR: 3.1; 95%CI: 2.1-4.6), and a CD4 above 50 cells/mm³ (AOR: 1.5; 95%CI: 1.1-2.2).

4. Discussion

Our study among HIV-infected persons living in Thailand confirms the health improvement after receiving

antiretroviral treatments. The proportion of participants reporting poor or very poor health decreased dramatically from 56% to 6%. Compared to their situation prior to treatment onset, one third of the HIV-infected persons interviewed have gained more than 10 kg of body weight and only 11% (vs. 85% at treatment onset) have symptoms. The percentage of patients with no or minor immunosuppression as indicated by a CD4 cell count above 200 cells/mm^3 has risen from 9% to 81%.

Our results are in line with other studies that have shown improved quality of life in the antiretroviral treatment era (Bing et al., 2000; Call et al., 2000; Duracinsky, Lalanne, et al., 2012; Liu et al., 2006; Miners et al., 2001). They testify to the remarkable efficacy of antiretroviral treatments, allowing patients to recover a better health status and to regain their position in society. Indeed, the vast majority of the HIV-infected persons surveyed (87%) draw a regular income from work. As shown in a previous analysis (Lelièvre & Le Cœur, 2012), they are able to regain their family role as parents and to fulfil their supporting role to older relatives.

Interestingly, the self-rated health of our study population at the time of interview (i.e., after an average 3 years under antiretroviral treatment) is strikingly similar to that observed among 87,000 Thai university students with a median age of 29 years (Seubsman, Kelly, Yiengprugsawan, Sleigh, & Thai Cohort Study, 2011): 21.1% (vs. 20.9% in our study) reported excellent or very good health; 49.2% (vs. 45.4%) good health; 25.1% (vs. 27.7%) fair health; 4.0% (vs. 5.5%) poor health; and 0.6% (vs. 0.6%) very poor health. As mentioned before, the cognitive process involved in the self-rating of health relies on a great deal of elements that may vary from one person to another. In particular, it is commonly agreed that self-rated health is a relative statement: among other things, people compare their health status to how it was in the past (Fayers & Sprangers, 2002). Most persons included in our survey have lived through times when treatments were not available, HIV infection was lethal, and death was the only prospect. This may explain why their self-rated health in our survey is very close to that of a "healthy", younger population.

Our research adds to the literature about the reliability of the self-rated health indicator, particularly in the context of HIV infection. We indeed find a significant association between self-rated health and a robust biological marker, the CD4 counts, both at the time of the survey and at the time of treatment onset. Few studies have explored self-rated health in the particular context of HIV infection. In a study on 1941 HIV-infected persons enrolled in the US between 2000 and 2002, poor self-rated health was significantly associated with older age, history of injecting drug use, lower CD4 cell count, and salvage therapy (Mrus et al., 2006). A more recent study (Borges de Souza Junior, Landmann Szwarcwald, & de Castilho, 2011) investigated the self-rated health of 1260 HIV-infected persons under treatment in Brazil, using the same scale as ours. Sixty five percent of the participants rated their health as good or excellent, which is very similar to our result (66%). Biological data were unfortunately not available in this study, but the authors also found that antiretroviral side effects and AIDS-related symptoms, as well as educational level and occupation, were independent predictors of poor self-rated health.

The literature has provided conflicting results on the relation between the socio-economic situation and self-rated health (Dowd & Zajacova, 2010; Singh-Manoux et al., 2007). In the present research, being able to draw a regular income from work is borderline associated with better self-rated health (p=0.07). We cannot rule out that, with a larger sample size, this association would have reached statistical significance.

Regarding gender differences in health rating, studies on the general population generally find that women report poorer health than men (Case & Paxson, 2005). Nevertheless, this gender effect usually disappears after taking into account socioeconomic variables and chronic conditions. In our study, we do not find any differences in self-rated health between men and women at the time of interview. However, at the time of treatment initiation, women reported significantly better health than men. Indeed, most men (65% *versus* 38% of women) were diagnosed because of health problems related to HIV, while a large proportion of the women were diagnosed at a time when they had not developed any symptoms, either because their spouse was infected or had died of AIDS (34%), or during antenatal care (17%). We have shown previously that women benefit from better access to HIV testing and treatment (Le Coeur et al., 2009). This differential is clearly reflected in their self-rated health.

We also find that retrospectively self-rated health at the time of treatment onset is significantly correlated with clinical information (CD4 count, weight loss and symptoms at that time). This result has important implications in terms of public health. Valid measurements of changes in health are indeed needed to evaluate response to treatment and to monitor treatment efficacy over time. Changes may be evaluated in the frame of a follow-up survey, where the same question is asked repeatedly over time. But in the case of self-rated health, changes are affected by "ceiling" or "floor" effects: people who declare being in excellent (or very poor) health at one time cannot declare a better (or worse) self-rated health at a subsequent time (Gunasekara, Carter, & Blakely, 2012).

Little is known about the validity of self-rated health assessed retrospectively. Some authors suggest that self-rated health is a "self-enduring" concept (Bailis, Segall, & Chipperfield, 2003): though it is sensitive to changes in "true" health (Quesnel-Vallee, 2007), it also presents stability over time. As suggested by the reference theory (Festinger, 1954), comparison to the health status of others or to one's health at other periods of time contributes to this relative stability. In our survey, the self-rated health question is asked after other life trajectories (family, migration, occupation, and disease) have been reconstructed, therefore facilitating the contextualization of the assessment. This feature of the questionnaire is likely to reduce the risk of "recall bias", which is entailed in retrospective surveys. It must also be noted that antiretroviral initiation is a turning point in the disease history, which is generally well remembered by the patients.

We have to acknowledge several limitations in our study: Our study population is relatively small and it is possible that, with a larger population size, some borderline differences would have reached statistical significance. Also, our population is mostly composed of "recovered" patients who accessed antiretroviral treatment after being symptomatic. They may not be representative of all HIV-infected patients, in particular, those who have earlier access to treatment.

5. Conclusion

Our study indicates the improvement in the self-rated health of the people infected with HIV after receiving antiretroviral treatment in parallel with the improvement of their clinical and biological status. The "normalization" we observe, as indicated by the fact that the self-rated health of these people is similar to that of a "healthy" younger population (Seubsman et al., 2011), constitutes a strong positive message for patients, health care workers and policy makers.

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