

## **Labour Participation of People Living with HIV/AIDS\***

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## ABSTRACT

The therapeutic advances that have taken place since the mid 1990s have profoundly affected the situation of people living with HIV/AIDS, not only in terms of life expectancy and quality of life but also socio-economically. This has numerous effects on different aspects of the patients' lives and, especially, on their working lives. We analyze in this paper labour force participation of people living with HIV/AIDS in Spain. Although we first set up our model in a typical neoclassical framework where variables of defence levels, illness stage and patients health related quality of life are added to the normally used demographic and economic variables, we depart from it at several points of the paper. The results point to a high level of labour participation, although lower than the level at the time of the diagnosis, associated with a good health status. Gender, education level, unearned income, clinical indicators and the patients' own perception of their health are the main variables explaining the probability of participating in the labour market. The results obtained in the study may serve both as a basis for making medium term predictions and for designing integral support policies for these people.

**Key words:** HIV/AIDS; workforce participation; quality of life

**JEL class:** I00, I12, J00

## 1. Introduction

Since the discovery of the human immune-deficiency virus at the beginning of the 1980s and its manifestation in the form of the human acquired immune-deficiency syndrome, it was thought that this could become one of the biggest public health problems of the 20<sup>th</sup> century (Fauci, 1999). Unfortunately, such suspicions were not unfounded. The HIV/AIDS disease has not only made and continues to make a strong impact on the health of the populations, but it also represents a serious socio-economic problem for individuals, families, communities and governments of many countries (Ojo and Delaney; 1997, Beck *et al.* 2001; ILO, 2003; UNAIDS, 2006). In developed countries, the medical advances of recent years have still not managed to find a definitive cure, although they have been able to improve the life expectancy and quality of life of the virus carriers, as well as delaying the terminal phase of the disease.

An important feature of the zero-positive population is that the vast majority are working age people. At the beginning of the report on technical cooperation by the International Labour Organization (ILO) on AIDS ([www.ilo.org/AIDS](http://www.ilo.org/AIDS)), Frank Lisk, the director of the ILO programme on HIV/AIDS and the world of work sustains that “...*the fact that nearly 75 percent of the 40 million people who are living with AIDS are workers means that action in the workplace is a decisive factor in the strategies designed to break the dreadful cycle of the epidemic. The capacity to accede, analyse and put the knowledge associated with the disease into practice is essential to mitigate the effects on health and its socio-economic impact*”. According to the Hospital Survey about HIV (Secretaría del Plan Nacional sobre el Sida, 2004), 88.6 percent of HIV carriers in Spain are between 25 and 49 years old.

One of the first series of available studies carried out in countries with high incomes, points out that an HIV diagnosis has a strong impact on participation in the labour force. Therefore, Scitovsky and Rice (1987) assume that a typical AIDS patient is too ill to work for 60 percent of his or her time. Whereas, Yelin *et al.* (1991) report that half of those working when they were informed of the diagnosis left work within the following two years. Messagh *et al.* (1994), state that 76 percent of these people were working at the moment of diagnosis and only 53 percent at the time of the survey (with an average of 16 months elapsing since the diagnosis). The salary loss was estimated as being 75 percent for the whole sample. Leigh *et al.* (1995) conclude that when compared with a control group (not zero-positive), patients with an AIDS diagnosis experienced a substantial and significant loss of working days, but this was the case with zero-positive patients who have not developed the disease. Laursen and Larsen (1995), find that 50 percent of the patients were employed when they were diagnosed with AIDS, 15 percent were off work and 19 percent were

receiving a sickness benefit. The percentage of people with employment fell to 22 percent a month after diagnosis, and to 6 percent two years afterwards, with 67 percent having died. Therefore, the development of the illness reduced the life expectancy of the patients and forced them, in many cases, to leave the job market.

The therapeutic advances made since the mid 90s have substantially changed this panorama and there are some studies making this fact very clear. For example, Dray-Spira *et al.* (2001) state that between 46.8 and 58.8 percent of HIV+ people (depending on the region of France under consideration) were employed and a third of the unemployed said they were looking for job. Rakin *et al.* (2004) conclude that patients who already had work at the beginning of the follow up had higher probabilities of keeping it. On the other hand, people who were unemployed did not manage to return to their jobs or find another job. Goldman and Bao (2004) study the effect of the use of Highly Active Anti-Retroviral Treatments (HAARTs) on the probability of returning to work, keeping the same position and number of hours worked. Their results indicate that the probability of keeping the job in the 6 months following the beginning of the treatment increases from 58 to 94 percent as a result of the treatment. Besides, they clearly state that the results are more appreciable when the treatment is started in the early phases of the infection. A recent paper by Bernell and Shinogle (2005) goes along the same lines: HAARTs substantially increase the zero-positive person's chances of participating in the labour force. Nevertheless, this does not mean that an HIV diagnosis does not affect the patient's participation or that its impact is lesser. Auld (2002) suggests that the decrease in the percentage of HIV-positive people in employment is a consequence of the adaptation of expectation of the person to a health shock which implies a lower life expectancy. He estimates a decrease by 25 percent on the probability of finding a job after the diagnosis.

The previous analyses provide evidence about the negative effects that the illness has on labour participation. Although they have been, to some extent, mitigated by recent therapeutic advances, they continue having non-negligible influence on the patients' participation (Auld, 2002). In this context, the aim of this paper is to make a contribution to test the effects of the disease on the employment situation of HIV-positive persons and to study the factors determining the HIV carriers' participation. We use complementary data both from a survey and from clinical histories of 246 patients. We propose a neoclassical model of labour supply including classical variables (age, gender, education, children at home, wage and unearned income), objective health variables (stage of the illness, viral count and defence levels) and subjective health variables (health related quality of life) on the people living with HIV/AIDS.

We can infer from our results that the participation in the labour market of people living with HIV/AIDS is affected by both variables collecting individual characteristics related to the labour market and by objective and subjective health variables. As for the objective health variables, defence levels and stage of illness exert a significant influence. A low defence level and the position of the patient in the AIDS phase are strongly associated with a low level of participation. At the same time, the health related quality of life (HRQOL) and the participation probability are significantly correlated. It must be stressed that, to date, this concept has only been used in one study on the employment situation of HIV-positive people (Blalock *et al.* 2004), although using a different perspective to ours. Therefore, in spite of the limitations of this study it can be appreciated how the evolution of the state of health determines the probability of participating. In summary, if some of the traditional determining factors on participation, such as wage, do not turn out to be significant, most of the results are generally in line with the theory and existing literature.

The rest of the paper is structured as follows. The data collection process and the main features of the sample are described in detail in section 2. Section 3 is dedicated to the analytical framework, where a specification of a reduced-form participation equation is considered. We present in section 4 the main results and we also discuss their implications. The paper ends up with a summary of the main conclusions.

## **2. Description of the data collection process and sample**

As there were no available data to analyze the proposed problem, the first step was to carry out an observational and multi-centre study before proceeding to the collection of the necessary data. Patients were recruited in December 2003 from four health centres in the Canary Islands, with day hospital service and outpatient departments for HIV-positive people: Nuestra Señora de Africa University Hospital, University Hospital of Tenerife, The Negrín University Hospital and Insular University Hospital. The system proposed in 1993 by the Centre for Disease Control (CDC) in the USA separating the illness into asymptomatic HIV, symptomatic HIV and AIDS phases (Ancelle Park, 1993), was used to classify the gravity of the HIV infection. The HIV-positive people included in the study had to fulfil at least one of the following criteria: a) to be admitted to the Infectious Diseases Unit of one of the different hospitals, during the one year study period; or b) to attend a day surgery from the Infectious Diseases Unit of one the hospitals at an external day health centre. The analysis field of the study was the HIV people population registered at hospital centres in the Canary Islands.

The information about the employment aspects was collected via a questionnaire which had been previously tested in a pilot study (Oliva *et al.*, 2003). 400 questionnaires were posted to the home addresses of the patients who initially consented to participate in the study, of which 246 were completed (a rate of response of 60%). 3 of the questionnaires were discarded as they had been very incorrectly completed and 2 more because the patients were in prison, which made it impossible for them to join the labour force and therefore labour participation could not be studied for them. Thus, we end with 241 valid questionnaires. In general, with the exception of Leigh *et al.* (1995) (1,346 patients) and Dray-Spira *et al.* (2001) (804 patients), the size of our sample is fairly close to those reported in the literature on HIV-positive people labour participation. In terms of comparison, the sample size of Scitovsky and Rice (1987) is 193, Massagli *et al.* (1994) is 305, Laursen and Larsen (1995) is 187, Rabkin JG *et al.* (2004) is 141 and Auld (2002) is 280.

By using official registers on the number of AIDS cases in the Canary Island Community and epidemiological data on the estimated number HIV+ people known to be carriers of the virus (Castilla and de la Fuente, 2000) and, therefore, who are in a position to receive treatment, it is estimated that the collected data represents between 8.3% and 11.3% of the known HIV+ population in the Canary Islands. This seems to be, in principal, a reliable and representative figure for the HIV+ population of the region.

The employment information was completed with data about the clinical indicators of the HIV-positive people which was obtained from clinical histories and a generic questionnaire (EQ-5D), commonly used in the literature about HRQOL. The clinical registers collect information about the date of diagnosis, most probable cause of infection, defence levels (at the time of diagnosis and in the most recent test) and the current stage of the illness (asymptomatic, symptomatic or AIDS). Both the quality of life (EQ-5D) and the participation in the workforce questionnaire were completed by the patients themselves, whereas the information contained in the clinical histories was collected by qualified personnel in the health centres.

The EQ-5D is a generic tool for HRQOL. It has been used to evaluate health in both the general population and in groups of patients with different pathologies (diabetes, chronic cardiac insufficiency, Parkinson's disease, arthrosis, etc.). The interviewees respond to five aspects of the state of their health: mobility, personal care, usual activities, pain/discomfort and anxiety/depression. There are three possible answers to each of the aspects (absence of problems, moderate problems and severe problems). Therefore, the EQ-5D gives 243 possible combinations about the individual's state of health ( $3^5$  plus the level of unawareness plus death). The questionnaire also includes a

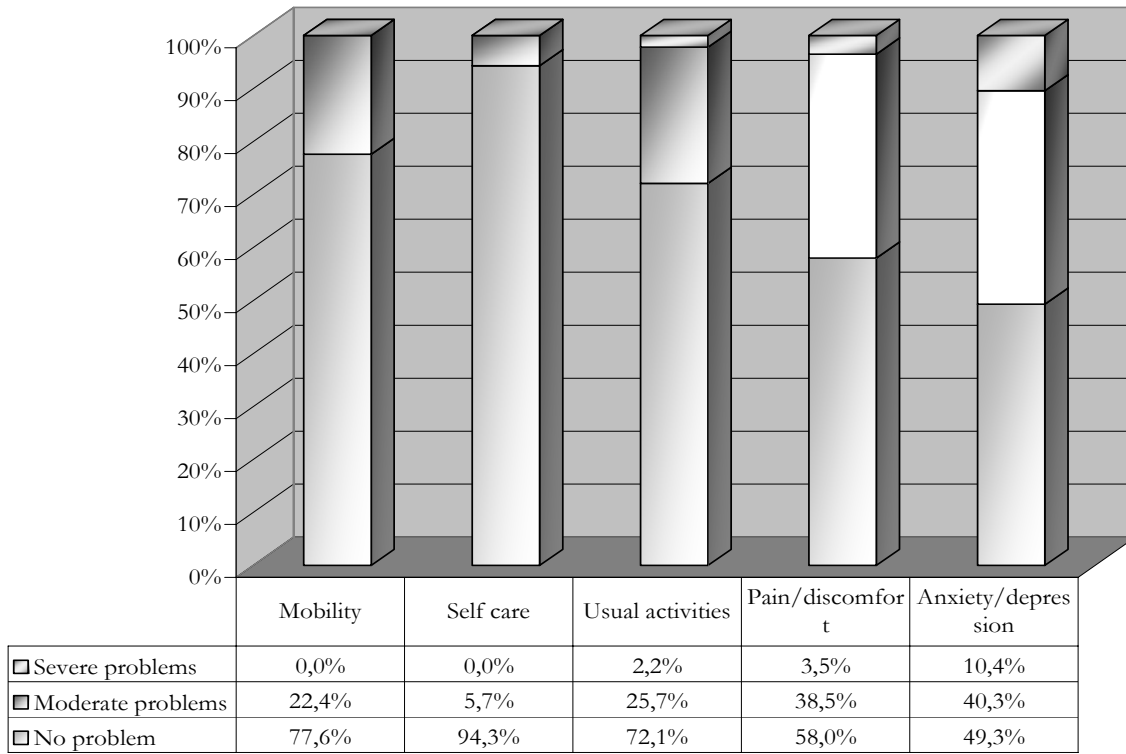
visual analogical scale (also known as thermometer) that shows the person's general state of health and has a range from 0 to 100. The EQ-5D scores are collected in a scale starting with negative scores and finishing with 1; a score of 0 means death, and a score of 1 is the best possible health state, (Dolan and Sutton, 1997). This questionnaire has been validated in Spain, and an estimated social tariff has been obtained using the Time Trade Off method (Badía et al. 1999).

Table 1 and Figure 1 show the main characteristics of the sample. In general terms, it seems that women and persons infected for intravenous drug use (IDU) are under-represented in the survey, when we make comparisons of the described persons with the available information on the characteristics of the Spanish HIV+ population (Hospital Survey about HIV/AIDS, various years). In fact, the basic difference lies on the feature that our sample neither includes data on hospitalized patients at the time of the survey nor on those who were in prison, whereas the Hospital Survey about HIV/AIDS does include data on these people. Representativeness of the survey is of special importance when intending to extrapolate conclusions to the HIV-positive population. In our case, the patients' profile fits in correctly with the new cases of HIV diagnosed in males in 2003 (last available year in the Hospital Survey). It seems, therefore, that the results we get will be able to be used in forecasts about the employment evolution of new cases of infection. In any case, the fact that the sample is made up of external public day health centres should not be considered as a weakness in the design. The tendency is for the illness to become chronic and that most patients will belong to this group.

**Table 1. Main characteristics of the sample**

|                                                   | N   | %               |
|---------------------------------------------------|-----|-----------------|
| <b>Gender</b>                                     |     |                 |
| Male                                              | 200 | 85.1            |
| Female                                            | 35  | 14.9            |
| Total                                             | 235 | 100.0           |
| <b>Age</b>                                        |     |                 |
| 20-29                                             | 13  | 5.6             |
| 30-39                                             | 91  | 38.9            |
| 40-49                                             | 90  | 38.5            |
| ≥50                                               | 40  | 17.1            |
| Total                                             | 234 | 100.0           |
| <b>Education</b>                                  |     |                 |
| No education                                      | 13  | 5.5             |
| Primary                                           | 96  | 40.7            |
| Secondary                                         | 67  | 28.4            |
| Tertiary                                          | 60  | 25.4            |
| Total                                             | 236 | 100.0           |
| <b>Labour participation when diagnosed</b>        |     |                 |
| Without job                                       | 64  | 27.6            |
| Working                                           | 168 | 72.4            |
| Total                                             | 232 | 100.0           |
| <b>Labour participation when surveyed</b>         |     |                 |
| Without job                                       | 99  | 43.4            |
| Working                                           | 129 | 56.6            |
| Total                                             | 228 | 100.0           |
| <b>Year of HIV+ diagnosed</b>                     |     |                 |
| Befote 1993                                       | 43  | 18.5            |
| 1993-1996                                         | 72  | 31.0            |
| 1997-2000                                         | 81  | 34.9            |
| 2001-2003                                         | 36  | 15.5            |
| Total                                             | 232 | 100.0           |
| <b>Defences Level (CD4+)</b>                      |     |                 |
| <200                                              | 17  | 7.40            |
| 200-500                                           | 57  | 24.7            |
| >500                                              | 157 | 68.0            |
| Total                                             | 231 | 100.0           |
| <b>Stage of disease</b>                           |     |                 |
| HIV+ asymptomatic                                 | 111 | 47.2            |
| HIV+ symptomatic                                  | 61  | 26.0            |
| AIDS                                              | 63  | 26.8            |
| Total                                             | 235 | 100.0           |
| <b>Most likely cause of transmission</b>          |     |                 |
| IDU                                               | 45  | 18.7            |
| Heterosexual contact                              | 44  | 18.3            |
| homo/bisexual contact                             | 116 | 48.1            |
| Others                                            | 4   | 1.7             |
| Unknown                                           | 32  | 13.3            |
| Total                                             | 241 | 100.0           |
| <b>Health Related Quality of Life (EQ-5D TTO)</b> |     | 0.7776 (0.2206) |

**Figure 1. Health Related Quality of Life of Spanish People Living with HIV/AIDS (EQ-5D)**



### 3. Analytical Framework

In order to analyze the individual HIV/AIDS carrier's participation in the job market it is necessary to have a reference framework in which to mould the labour supply of the individuals. Given the characteristics of this exercise, the analysis is only focused on the individual decisions on labour supply although the presence of some typical variables of the household is controlled among the determining factors. Since we have only information about the indicator of participation, we propose the following model:

$$1(h_i^*) = f(Z_i, w_i, \alpha, \beta) \quad (1)$$

where  $1(h_i^*)$  is the indicator of participation with  $h_i^*$  being the potential (latent) hours,  $Z_i$  being the conditioning factors and  $\alpha$  and  $\beta$  are parameters. The observability rule is:

$$h_i = \begin{cases} 1 & \text{si } h_i^* > 0 \\ 0 & \text{si } h_i^* \leq 0 \end{cases} \quad (2)$$

and assuming linearity for  $f(\cdot)$

$$h_i^* = \alpha' Z_i + \beta w_i + u_i \quad (3)$$

Where  $h^*$  is a latent variable defining the qualitative nature of  $h$ . We include in  $Z$  variables which we consider to be exogenous as personal and family characteristics and unearned income (disability benefits, income support and income from other members of the family...). Another determining factor is the individual's wage,  $w_i$ , whose inclusion in a labour supply specification presents two well-known problems in the literature: i) potential endogeneity and, ii) problems of observability for non-workers.

In order to solve the two problems we proposed a reduced form auxiliary regression:

$$w_i = \delta' X_i + \varepsilon_i \quad (4)$$

in which  $X$  contains all the exogenous variables in the model including interactions between them. Specifically  $X$  contains: age; age squared; gender; education; marital status; health related quality of life; relationship with partner at home; size of household; wage at the moment of diagnosis and interactions between age, gender, academic qualifications, quality of life, size of household and cause of infection. Equation (3) is estimated in two stages. At the first stage, we fit a reduced form probit model and we construct the Mill's ratio using the parameter estimates. Then, at the second we estimate (3) by OLS conditional on participation adding the selection term to account for potential participation (Heckman, 1976, 1979). We then predict the wage for the whole sample using the parameter estimates at the second stage. In order to identify the parameters at the two stages we only use as exclusion restrictions interactions between the demographics as previously stated. Identification rests on the possibility of different functional forms for the participation and wage equations. We are aware that this is so strong to impose to our data. We propose another way of getting identification below. Once we have predicted wages for the whole sample, we adjust the following equation:

$$h_i^* = \alpha' Z_i + \beta \hat{w}_i + v_i \quad (5)$$

in which  $\hat{w}_i$  is the predicted wage.

However, we cannot forget that a diagnosis of an illness like HIV is such an important event in a person's life that it can affect individual preferences.

This is therefore due to the fact that changes occur in perceived life expectancies and quality of life which are susceptible to influencing decisions on how affected people share their work and leisure time. Thus, a decrease in a person's life expectancy or quality of life may reduce their participation in the workforce independently of other determining factors in the job supply. Auld (2002) argues that the probability of an individual working goes down by 25% as a result of an HIV+ diagnosis. Nevertheless, it is difficult to consider the effects of these perceptions on participation in the workforce explicitly. One of the advantages that the information we use has is that we have variables (status in the labour market, state of health and socio-economic characteristics) both at the moment of diagnosis and after the interview. Their availability allows us to estimate different models for transitions (into and out from work) and what seems to be more important to avoid the potential identification problems in assuming exclusion restrictions in adjusting the wage equation. This is so because we can include in the decision to participate the lagged participation indicator instead of the wage. In doing so we account for effects such as motivation and discipline of the patients and we can get causal effects of the health status variables.

In the equations adjusting transitions in the labour market, we prove both the standard neoclassical model and also the one with lagged participation on the right hand side. Finally, we estimate models in differences of the variables such as changes in the state of health between the moment of diagnosis and the time of the survey, changes in unearned income and changes in wages (predicted). On the one hand, changes in defence levels (CD4s) and in the individual's own perceived quality of life that are included in  $\Delta Z_i$  are susceptible to affect life expectancies and quality of life with indirect effects on participation in the labour force. On the other hand, wages changes can be considered a proxy of productivity changes as a consequence of the evolution of the disease, that as suggested by some authors (Scitovsky and Rice, 1987) will also have an effect on participation. The main difficulty when calculating (4') is that we do not have measures of individual HRQOL available at both the moments. This is the reason why we cannot include this conditioning in the specification. Therefore, we have to assume that the difference in the defence levels between the time of the diagnosis and the time of the survey will include not only the effects of the reduction of life expectancy, but also that of the patients' quality of life.

In order to estimate the equation of interest, we can make different assumptions regarding the error term,  $v$ . It is possible to get consistent estimators of the model's parameters using least squares linear methods if the regressors are independent of the error term (linear probability model). However, since we can obtain negative predicted probabilities it prevents us from using this method. So, we assume that  $v$  is normal and we estimate the models using maximum likelihood methods.

#### 4. Results

In general, variables explaining the probability of participating are gender, education, unearned income and the state of health. Age is only marginally significant in some specification. Neither should this be thought unusual if we bear in mind the heavy concentration in the sample around the age of 40. In spite of this, the signs of the coefficients are in line with what is expected; age positive and age squared negative. This means that initially the higher the age, the higher the probability of being at work until a threshold (37 years in this case) after which the participation goes down possibly as a consequence of the disease's evolution.

The patient's gender is a significant determining factor of labour participation, although we have to be aware that women are under-represented in the survey. In spite of this problem, the marginal effect indicates that women have between 25 and 28 percent less probability of participating than men, once we control for the effect of the remaining variables. Education strongly influences the participation of the patients in the labour force. HIV carriers without qualifications or with only basic schooling have between 18 and 22 percent less probability of being at work than HIV-positive people with secondary or university education. Apart from explanations unique to the job market, two factors related to the illness may help to explain this result. In the first place is the possible relationship between higher academic qualifications and job quality, also reflecting the lower need of physical effort to perform the job and, in second place, the possibility of less job discrimination at higher academic levels.

As for the cause of infection, IDU infected persons are distinguished, in terms of participation, from those who have been infected via sexual transmission or by blood transfusion. It must be stressed that there are no appreciable differences in participation due to the cause of infection or rather that they are at the border of significance, because independently of the said cause the effects of the illness are the same, or possibly because other variables such as academic qualifications or predicted wages already collect the differences between the patient sub-groups classified according to cause of infection.

In the neoclassical labour supply framework, the wage effect on participation should be unmistakably positive (except if we were in area where the supply function curves backwards). In truth, the above mentioned arguments mean that the effects of the diagnosis on labour participation are similar to wage effects on the hours in the area where the job supply function curves. Thus, in this last case leisure has become such a scarce good that an increase in wage

does not produce an increase in hours or work (or participation). In the case of the HIV+ diagnosed patients' participation in the workforce, the reduction in life expectancy reduces their available leisure time that also becomes a scarce good which is why marginal wage increments which would encourage participation, in normal conditions, do not compensate for accompanying reductions in leisure. In accordance with the above mentioned approach, the results suggest that the wage is no longer an important factor explaining participation in the labour market of people living with HIV/AIDS. This is compatible with the work–leisure choice preferences that make other determining factors truly significant, given the effect the illness has on the reduction in the life expectancy and quality of life of these workers.

As far as unearned income is concerned, this has been defined as the difference between total income of the household and the wage of the individual. Thus, this variable would be integrated by the individual's unearned income (including sickness or unemployment benefits) and by the income of other members of the household. This variable is clearly significant in any of the specifications and the sign is the expected one: the higher the unearned income, the lower the probability of being employed. We have to mention that the variable stays negative when the sickness benefits the worker perceives are not included in the definition of the variable.

As regards the variables controlling for the individual's health, they are divided into two categories: objective and subjective measures. In the objective measures group there is information on the person's defence levels (measured by number of lymphocytes CD4/ $\mu$ l) and on the stage of illness. The defence level is shown by two binary variables: the individual base would be the one that showed a high defence level in the most recent analytical test (more than 500 CD4s/ $\mu$ l), whereas a low defence level is assigned if the patient shows less than 200 lymphocytes CD4/ $\mu$ l and a medium defence level is assigned if  $200 < \text{CD4}/\mu\text{l} < 500$ . Clinical history classifies the stages of illness into three levels: asymptomatic HIV (base case), symptomatic HIV (dichotomic variable) and AIDS (dichotomic variable). The defence level is available for both the time of diagnosis and the time of the survey. In the specifications in which the defence level at the time of diagnosis is included, this variable does not affect participation. This means that the initial situation of the patients at the time they began the therapy does not influence participation in the workforce significantly. It is the evolution of the illness over time what drives labour market participation. These results, which are not shown here, are available for the interested readers.

We do not find important differences in participation among individuals who had medium or high defence levels at the time of the survey. However,

individuals with low levels present a 55-57 percent lesser probability of participating in the labour market than individuals with medium to high levels. As far as the stage of the illness is concerned, there are no important differences in the probability of an asymptomatic HIV patient being at work than another who is HIV symptomatic. However, if the person is in the AIDS phase, his probability of working is 18-20 percent less than the probability of an asymptomatic HIV person. Defence levels and stage of illness cover similar effects as far as the classification of the illness is concerned (AIDS stage) which is associated not only to the defence level but also to the appearance of an opportunist disease (Ancelle Park, 1993). The difference in the effects that both variables have on the probability of working could be, therefore, attributable to this last cause.

On the other hand, we define a variable to cover the evolution of the illness. It is defined as a discrete variable taking a value of 1 when the individual is experiencing the evolution from the initial stage (diagnosis) with high levels of CD4s to another current stage (survey) with medium or low defence levels: or rather at the time of the survey their defence levels they have are low, regardless of the defence level at the time of diagnosis. Having experienced a negative evolution of the defence level reduces the probability of working by 49-50 percent.

The viral count (number of copies of the virus) does not usually have the same explanatory power regarding life expectancy or individual's health stage as the defence levels or the stage of the illness. Several regressions were performed (not shown) using viral count as a substitute variable (and complementary) of the stage of the illness and the defence levels. As expected a priori, given the results of other studies, viral count did not exert any significant influence on the probability of participating in the labour market.

Finally, the EQ-5D, a measurement of self-perceived health or health related quality of life (HRQOL) is used. The numerical scores of the social tariff calculated by Time Trade Off method (TTO) are used. The said tariff, validated both internationally and in Spain (Badía *et al.*, 1999) is usually used in the field of economic evaluation of health care technologies although it is less common in employment participation models. The individual base is the one that does not present any problems in the 5 EQ-5D categories (mobility, personal care, usual activities, pain/discomfort, and depression/anxiety) or presented a mild problem in only one of the five categories. Medium HRQOL (dichotomic variable) was defined if EQ-5D scores were between 0.5 and 0.75 out of 1 and low HRQOL (dichotomic variable) if the EQ-5D scores were lower than 0.5 out of 1. It turns out to be a statistically significant variable in all the models. Individuals with an intermediate quality of life showed a probability of working of between 22 and

26 percent less than people with a high quality of life. People with a bad quality of life gave 27 and 36 percent lower probability of being employed than people with a high quality of life.

In the face of potential colinearity problems between the objective health variables (stage of illness and defence level) and the self-perceived stage (quality of life), a sequence of Spearman tests were performed between the objective and subjective health variables. Although the results are in line with what was expected in the case of the stage of the illness (statistically significant relationship between the AIDS stage and low quality of life), the correlation coefficient was not very high (0.16). The same result appears when we compare the evolution of defence levels with the self-perceived quality of life.

We have estimated different specifications including and excluding objective health variables (stage of the illness, defence level and variation in the defence level), together with the inclusion of a subjective health variable or self-perceived health related quality of life (HRQOL). In the same way that an evolution of the illness variable (negative evolution of the defence level) is defined, two explanatory variables are also included that change between the moment of diagnosis and the time of the survey: evolution of wages and unearned income. In order to do this, we calculate the difference in wages between the current wage and the actualized wage at the time of the diagnosis of the presence of HIV was calculated, and the same calculation was made for non salary income. The expected effect of the variable accounting for the evolution of wage on participation is positive while that associated with unearned income is negative. This means that wage increments should increase labour participation, *ceteris paribus*, unless the individual is not prepared to substitute additional leisure hours, which seems to be the case. The individuals' non wage income increases should reduce their incentives to participate. Although the results are not reported they clearly show that the wage evolution has no significant effects, whereas the effect of unearned income is line with expectations.

We have replicated the *neoclassical* labour supply specifications presented in columns 1 and 2 of Table 2 by the same specifications except for the inclusion of the lagged indicator (i.e., participation at the moment of the diagnosis). In doing so we account for effects such as motivation and discipline of the patients and we expect to get causal effects of the health status variables without contamination by the problems of using predicted wages for the whole sample. There are at least two reasons to believe that this model should provide an adequate adjustment. First, the lagged indicator is usually a good predictor of actual participation. Second, in a simultaneous framework of hours and wages, the reduced form for both variables is the same and, as a result, using the lagged

indicator as instrument is as good as using the predicted wage. The results confirm our priors. The results are significantly the same as those using the predicted wages, except for the case of the age variables. We must note, however, that age has been used in the reduced form for wages and some identification problem can arise once we include it again in the structural equation.

The present work is not exempt from limitations. In the first place, such a limited sample size suggests proceeding with a certain amount of caution with the conclusions. In second place is the type of information. Having retrospective information available has turned out to be an advantage for calculating some specifications, but it would have been desirable to have had prospective information available, selecting a group of HIV-positive people and following them for several years. Unfortunately, this kind of study is beyond our means. Although an interesting result is obtained about the influence that HRQOL has on the labour participation, we have to be careful when attributing coincidental effects to this variable as the cause-effect relationship may well be the opposite (or be combined). Although Auld (2002) suggests that the decision of this group to reduce participation in employment after receiving the diagnosis is a voluntary one, our opinion is that this is a debatable argument, basically due to the appearance of physical and psychological problems connected with the illness. Both kinds of problems can appear both immediately after the diagnosis (especially the psychological ones) and after years of treatment. For example, there is a high number of people suffering from lypodistrophia after years of anti-retroviral treatments. This problem leaves physical scars, which mark people as carriers of the disease, which at the same time may involve psychological problems and even discrimination in the workplace. Finally, defence levels make for an imperfect indicator of the state of health, although there have been attempts to overcome this limitation by the use of several alternative indicators, two of them clinical and a subjective one that goes in the same direction.

**Table 2. Maginal effects on labour participation of people living with HIV/AIDS**

|                                               | Dep Var<br>Work     | Dep Var<br>Work     | Dep Var<br>Work     | Dep Var<br>Work     | Dep Var<br>Work      | Dep Var<br>Work      |
|-----------------------------------------------|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
|                                               | Coef<br>(SD)        | Coef<br>(SD)        | Coef<br>(SD)        | Coef<br>(SD)        | Coef<br>(SD)         | Coef<br>(SD)         |
| Age                                           | 0.038<br>(0.04)     | 0.050<br>(0.04)     | 0.045<br>(0.04)     | 0.069<br>(0.04)     | 0.087*<br>(0.045)    | 0.073*<br>(0.04)     |
| Age <sup>2</sup>                              | -0.001<br>(0.0004)  | -0.001<br>(0.0005)  | -0.001<br>(0.0005)  | -0.001*<br>(0.0005) | -0.001**<br>(0.0005) | -0.001**<br>(0.0005) |
| Gender                                        | -0.262**<br>(0.112) | -0.246**<br>(0.112) | -0.246**<br>(0.116) | -0.278**<br>(0.114) | -0.262**<br>(0.116)  | -0.268**<br>(0.118)  |
| No studies or primary studies                 | -0.224**<br>(0.101) | -0.176*<br>(0.095)  | -0.210**<br>(0.100) | -0.216**<br>(0.089) | -0.212*<br>(0.085)   | -0.210**<br>(0.088)  |
| Most likely cause of transmission (no IDU)    | 0.155<br>(0.123)    | 0.144<br>(0.118)    | 0.162<br>(0.123)    | 0.130<br>(0.121)    | 0.139<br>(0.116)     | 0.137<br>(0.123)     |
| (Predicted) Wage when surveyed                | 0.039<br>(0.136)    | 0.133<br>(0.110)    | 0.039<br>(0.123)    | --                  | --                   |                      |
| Working when HIV was diagnosed                | --                  | --                  | --                  | 0.234**<br>(0.100)  | 0.256**<br>(0.097)   | 0.210**<br>(0.104)   |
| Unearned income                               | -0.057**<br>(0.014) | -0.051**<br>(0.013) | -0.052**<br>(0.013) | -0.059**<br>(0.014) | -0.053**<br>(0.013)  | -0.054**<br>(0.014)  |
| HIV+ symptomatic                              | --                  | -0.0314<br>(0.099)  | --                  | --                  | -0.030<br>(0.098)    | --                   |
| AIDS                                          | --                  | -0.179*<br>(0.099)  | --                  | --                  | -0.201*<br>(0.100)   | --                   |
| Medium level defences (200<CD4s<500)          | 0.016<br>(0.098)    | --                  | --                  | 0.025<br>(0.098)    |                      | --                   |
| Low level defences (CD4s<200)                 | -0.567**<br>(0.091) | --                  | --                  | -0.546**<br>(0.095) |                      | --                   |
| Negative evolution of level of defences (CD4) | --                  | --                  | -0.504**<br>(0.117) | --                  | --                   | -0.489**<br>(0.115)  |
| HRQOL-medium (0.5≤EQ-5D<0.75)                 | -0.231**<br>(0.096) | -0.219**<br>(0.093) | -0.219**<br>(0.097) | -0.251**<br>(0.096) | -0.260**<br>(0.094)  | -0.242**<br>(0.098)  |
| HRQOL-low (EQ-5D<0.5)                         | -0.347**<br>(0.131) | -0.301**<br>(0.135) | -0.357**<br>(0.131) | -0.309**<br>(0.130) | -0.271*<br>(0.134)   | -0.311**<br>(0.133)  |
| N                                             | 200                 | 200                 | 196                 | 206                 | 207                  | 203                  |
| chi2                                          | 83.35               | 73.55               | 78.82               | 94.67               | 87.54                | 89.98                |
| Pseudo R <sup>2</sup>                         | 0.3063              | 0.2703              | 0.2974              | 0.3360              | 0.3095               | 0.3260               |
| % correctly predicted                         | 70.5%               | 68.0%               | 67.2%               | 67.2%               | 71.4%                | 69.7%                |

\* Statistically significant at 90%

\*\* Statistically significant at 95%

## Conclusions

The labour participation of people living with HIV/AIDS has improved considerably compared to the situation before HAARTs were applied. In spite of this positive point, and in spite of enjoying the better health that new medicines offer, the employment rates of these people are lower, in the first place, to the general population in the Canary Islands and secondly to the employment rates of the same people before catching the virus. Although 56 percent of the sample was working at the time of the survey, 73 percent were working when they were diagnosed with the presence of the virus. Whereas new treatments have brought about an improvement in the employment situation of 8.4 percent of the patients, the employment situation of 25.3 percent of them got worse in spite of the advances, although the said advances show a significant reduction in the deterioration of the virus carriers' health.

It is also inferred from the results presented here that the initial stage of illness (measured by the initial level of the viral count and the initial defence level) does not seem to condition these persons' participation in the workforce. Therefore, the evolution of the illness and the evolution of the health related quality of life of the patients appear to be the key factors and not so much the initial situation.

Gender, education, health related quality of life, defence level (and its evolution), stage of illness and non wage income are very relevant variables when explaining this group's participation in the workforce. Other variables such as age and the cause of infection do not show any incidence on the group's participation. Without doubt, the role played by wage and the differences in wage between the time of diagnosis and the time of the survey is the most surprising result we find, and is in line with that already reported by Auld (2002), that the perception experienced by the patients of a shortening of life expectancy and the deterioration in quality of life have effects on their work – leisure substitution.

Finally, we must point out that the profile of the surveyed persons is very similar to the distribution of newly identified cases of infection in males in Spain. Therefore, the results may serve as the basis for making medium term predictions and for the design of integral policies transcending both the purely sanitary environment and the strictly working environment, and for contributing to improving the well-being and opportunities of people with this health problem.

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