Determinants of regular demand for antiretroviral therapy in Togo

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Abstract

Background: The Human Immunodeficiency Virus (HIV) epidemic reduces the annual growth rate of developing countries by 0.8%. Regular demand for antiretrovirals (ARV) becomes imperative. The purpose of this paper is to determine the factors of regular ARV demand. The study concerns 2269 patients who initiated treatment between January 1 and December 31, 2017 in Togo.

Methods: From the study of the behavior of the care consumer, the analysis of the non-monetary determinants of health care demand is based on the Logit model.

Results: Most patients are between the ages of 26 and 45 years old. Out of 2269 patients, 32% are irregular at monthly appointments. Sex, occupational status, World Health Organization (WHO) stage of illness, marital status and administrative region of life influence patient compliance.

Conclusion: Despite free treatment of HIV, adherence to care remains a crucial problem in the context of HIV treatment. The personalized and differentiated follow-up become important, coupled with the improvement of patients' socio-economic conditions and geographic accessibility to care.

Key words: Demand, Health care, antiretrovirals, consumer, regularity.

Background

It is shown that the demand for health care in general and that of the Human Immunodeficiency Virus (HIV) infection, constitute a major concern for health systems and economies in Africa. Irregular demand for antiretroviral therapy (ARVs) is one of the reasons for the treatment failure of people living with HIV (TenoRes Study Group, 2016). This situation leads to individual and collective economic consequences for African countries. HIV reduces the annual growth rate of developing countries by 0.8% (Bonnell, 2000), as more than 70% of patients in Africa are active populations according to the Joint United Nations Program on HIV (UNAIDS, 2003). 2017). In addition to deaths, hospitalization entails additional costs for social security, as well as professional absenteeism that have a dramatic impact on countries' economic growth (Bayle and Misdrahi, 2002). Added to this is the inefficiency of public spending for the response, especially about the subsidy of treatment in almost all countries.

Despite the clinical efficacy of treatment, non-adherence to treatment continues to be a concern for researchers to study the behavior of patients on treatment to determine the factors of non-compliance (Broers et al., 1994, Morin et al., 2000; Chesney et al., 2014). In their view, health is strongly influenced by a variety of observable and unobservable factors such as biological factors, lifestyle, medical factors and socio-economic factors. For policymakers, in the absence of a vaccine and a cure; the regular demand for treatment remains the only alternative that marks a real break in the history of HIV / AIDS (Acquired immunodeficiency syndrome) with the onset of its chronicization. This is the reason for the total subsidization of the costs of ARVs in some countries since 2008, as in the case of Togo, in order to be aligned with the logic of the 3rd Sustainable Development Goals (SDG).

In Togo, the number of reported non-observances increased from 397 cases in 2014 to 1333 cases in 2015 with more than 2045 people lost to follow-up (PNLS, 2015). Non-observant patients will become lost to follow-up, which constitute foci and vectors of transmission with the possibility of propagation of resistant strains. Regular monitoring of treatment through regular demand is a very important aspect of the response to HIV / AIDS to prevent opportunistic diseases, deaths and new infections (Bessette et al, 2001). According to the report on AIDS Resources and Expenditures, 75% of response resources come from outside and are more oriented towards care (REDES, 2016). Faced with the scarcity and unpredictability of external

financing; efficient and sustainable strategies aimed to control the spread of HIV are essential by means of ensuring observance through research of the factors that affect demand for the completely free treatment.

Two theses are opposed to the approach of analysis of the compliance behavior of a patient. The biomedical, medical-statistical and social sciences approach considers non-compliance as irrational or at least linked to a lack of information (Jane et al., 2006). In contrast, economists believe that patients behave as rational economic agents who use all the available information to decide whether to maintain treatment (Lamiraud, 2004). According to the former, the patient is conceptualized as a passive subject and their analysis does not consider well-being thus making the patient's observance exogenous. For economists, patients acquire information on clinical efficacy to decide whether to maintain treatment. The latter are then based on the microeconomic analysis of the patient's behavior and from the analysis of his utility function (Grossman 1972). Economists consider adherence or regular follow-up as a variable dependent on several sociodemographic factors of health care (Catz et al., 2000; Cardarelli et al., 2008).

The literature shows that there are several factors that affect the compliance of patients undergoing treatment. These factors include: the patient's age, sex, marital status, professional status, ethnic and cultural background (Bessette et al., 2001). Other studies have shown the effect of the relationship between caregiver and patient on the degree of adherence (Shin et al., 2011, Tenthani et al., 2012). However, the factors do not act in the same way irrespective of the diseases and their geographical zones. Studies have investigated the positive or negative effects of age and sex on adherence (Marimoutou et al., 2003). Others have found links with the status of occupation and even psychological support (Chesney et al., 2000; Tenthani et al., 2012).

The continuity of the debate on the subject justifies the interest of carrying out the present study to see how these concerns take form in Togo in relation to HIV / AIDS. Thus, we can question whether the age, gender, occupational status, marital status, level of education and stage of the World Health Organization (WHO) affect the continued demand for ARV treatment among patients in Togo? This study aims to determine the factors of the regular demand for ARV treatment in Togo. Specifically, which sociodemographic and medical factors affect the observance, and what is the underpinning the cessation of ARV treatment amongst patients. This study departs from the following assumptions: age, sex, occupation, WHO stage, and level of

education determine the level of adherence of patients on ARVs. Our hypotheses will be tested on the follow-up data of People Living with HIV (PLHIV) based on their utility function from a logistic regression.

This study contributes to the economics of health literature in three ways. The first contribution lies in the fact that unlike previous studies that have addressed the issue from a medical and / or epidemiological point of view (Christian, al., 2006), the present study has the advantage of approaching the subject under the microeconomic and econometric angle. The second contribution is of a methodological nature: unlike previous studies that used the cost of treatment as a fundamental variable for analysis (Dieng, 2014); we approach it in the context of free treatment. The third contribution is geographical. To our knowledge, previous studies have focused more on developed countries while this study considers a developing country that is Togo.

The rest of the document will be organized as follows: the next section will be devoted to the theoretical framework. Section 3 presents the empirical framework and the data. The results are presented in section 4 followed by the conclusion in the last section.

Methods

From the microeconomic approach of behavior analysis of the consumer of care, a patient decides to heal himself by maximizing his utility function (Puig-Junoy, al., 2002). Consumer Choice Theory examines the trade-offs that people face as consumers with regard to their resources. According to this theory, when an economic agent faces several possibilities of choice of goods, he or she can choose what suits him or her according to the desired satisfaction. This is in line with the demand principle underpinning the human capital approach. According to this approach, health is a sustainable good that people inherit with a certain level of an initial stock at birth; which depreciates with age and that they can preserve and / or increase.

This universally recognized reality in economic theory applies in the field of health with all the properties attached to it. Thus, Phelps (1995) and Tesfaye (2010), inspired by the theoretical framework of Grossman (1972), proposed for general purposes, an individual utility function.

$$U = f(s, w) \quad (1)$$

In which U represents individual utility, s represents health goods and services and w represents non-health goods and services.

A PLHIV is a consumer of care related to ARV treatment. This individual has the possibility of maintaining a good level of care consumption to the detriment of the consumption of non-health goods. Inspired by this framework, we first assume that the satisfaction of a PLHIV consuming ARV care depends linearly both on his or her own characteristics (living environment, age, level of education ...) and on those of the health care system (costs of care ...). The justification for this hypothesis is simple.

As an example, it seems obvious to us that the living environment can influence the usefulness of a person through the possibilities it offers to that person in terms of consumption of care (cases of discrimination and non-discrimination). Similarly, the quality of care and the relationship with the caregiver are likely to affect the satisfaction of a patient. On this basis, we can therefore retain that the utility function of a PLHIV is as follows:

$$U_i = f(X_i), (2)$$

Where U represents the utility that results from the patient's behavior in choosing whether or not to respect the monthly appointments of his treatment. X is a basket of variables related to the characteristics of the patient and the care system.

Next, we postulate that the regularity at the appointments of care will be influenced by the usefulness expected by the patient. Depending on the management protocol, during the first year of ARV initiation, the patient is required to attend all monthly follow-up appointments. The regular demand for treatment is a function of the present or future utility a patient attribute to his or her choice. In practice, the most appropriate way to evaluate it is to check whether during the elapsed period, the patient has attended all his appointments or not. This second hypothesis allows us to write:

$$Y_i = f(u_i) (3)$$

Y is the regularity at medical appointments and u is the level of utility associated with regularity or irregularity at treatment appointments. The dependent variable Y_i will take the value "1" if the patient is "observant" and "0" otherwise. Two (2) outcomes are therefore expected from this

model: factors that influence (positive and negative) adherence to treatment appointments in a patient; and with the intensity of the factors on his decision (all things being equal). By combining equations (2) and (3), we obtain the following equation:

$$Y_i = f(X_i) \quad (4)$$

This last equation describes the relationship between regularity at care (with two regular and irregular options) and explanatory variables related to patients and the health care system.

In explaining behaviors related to ARV care, to derive the model of analysis incorporating the explanatory variables, most studies depart from the conceptual framework of Tesfaye (2003) and Beninguisse (2003). Considering the framework of Beninguisse (2003), we say that the patient must first be predisposed to receive ARVs after a positive HIV / AIDS screening. Secondly, care centers must be available and accessible. This amounts to explaining behavior towards treatment by socio-economic, demographic and health variables. In the case of our study, the ARV treatment is completely free thus the analysis of the effect of the price is not taken into account. Taking into account the omission of variables in the specification is set in the econometric function by an error term. The law that will follow the request for ARVs will then be a statistical law that is only true on average. Thus, for an individual i , the previously specified relation (4) can be in the following form:

$$Y_i = X_i\beta + \varepsilon_i \forall i = 1, \dots, N \quad (5)$$

With $X_i = (x_{1i} x_{2i} x_{3i} \dots x_{ki})$ the matrix line of the explanatory variables, $\beta = \begin{bmatrix} \beta_0 \\ \cdot \\ \cdot \\ \cdot \\ \beta_k \end{bmatrix}$ that of the

column of the parameters to estimate and ε_i , the random deviation for an individual i . k is the number of explanatory variables.

Based on the work of Araujo et al., (2008); and Nanfosso et al. (2013) on the determinants of demand for prenatal care, our study employs nonlinear econometrics using distribution functions such as Probit and Logit models. This amounts to defining regularity as a dichotomous variable as follows:

$$Y_i = \begin{cases} 1 & \text{if regular patient at medical appointments} \\ 0 & \text{if no} \end{cases}$$

The idea here is to discern the phenomenon of interruptions or non-observance of ARV treatments. Treatment irregularity refers to temporary or permanent interruptions to monthly ARV renewal visits.

The method of calculating probabilities depends on the law followed by the error term ε_i . If ε_i is distributed according to a normal law, one specifies a model Probit, if this term is distributed according to a logistic law one finds the model Logit. In the context of this study, we assume that the error term is distributed according to a logistic law; the distribution function of which is Λ (.). This hypothesis is arbitrary and has no motivation. The logistic distribution function is given by:

$$F(X_i\beta) = \Lambda(X_i\beta) = \frac{e^{X_i\beta}}{1+e^{X_i\beta}} \quad (6)$$

$$\text{Density : } f(X_i\beta) = \frac{e^{-X_i\beta}}{(1+e^{-X_i\beta})^2} = \Lambda(X_i\beta)(1 - \Lambda(X_i\beta)) \quad (7)$$

Since the latent variable Y_i corresponds to the regularity (1 and 0), it is therefore otherwise observable. Therefore, the probabilities can be estimated by the maximum likelihood considering the probability that the individual i , given his characteristics, makes some choice.

The likelihood function for estimating parameters (marginal effects) is as follows:

$$L(Y, \beta) = \prod_{i=1}^N [F(X_i\beta)]^{Y_i} [1 - F(X_i\beta)]^{1-Y_i} \quad (8)$$

The logarithm for likelihood is given by:

$$\text{Log}L(Y, \beta) = \sum_{i=1}^N \{Y_i \log F(X_i\beta) + (1 - Y_i) \log(1 - F(X_i\beta))\} \quad (9)$$

Since the value of the coefficient β does not matter in this model, we are only interested in its sign. To do this, we will focus more on the marginal effects that measure the sensitivity of the X_i variables on the likelihood of seeking care. These marginal effects are obtained by deriving the conditional probabilities with respect to the explanatory variables X_i .

The likelihood being linearized, it is globally concave and therefore admits a maximum which verifies:

$$\begin{aligned}
\text{MaxLog}L(Y, \beta) &\Leftrightarrow \frac{\partial \text{Log}L(Y, \beta)}{\partial X_i} = 0 && \Leftrightarrow \frac{\partial P_r(Y=1)}{\partial x_k} = \frac{\epsilon^{X_i \beta}}{(1 + \epsilon^{X_i \beta})^2} \frac{\partial (X_i \beta)}{\partial X_i} \\
&= \frac{\epsilon^{X_i \beta}}{(1 + \epsilon^{X_i \beta})^2} \beta_k \\
&= \Lambda(X_i \beta) (1 - \Lambda(X_i \beta)) \\
\frac{\partial P_r(Y=1)}{\partial x_k} &= P_r(Y = 1) \times P_r(Y = 0) \times \beta_k \quad (10)
\end{aligned}$$

With X as the independent variables and β_k as the coefficients.

1. Empirical model

In accordance with the theoretical formalization of the problem in the previous section, the empirical application of the model to be estimated is finally:

$$Reg = f(\text{sex} + \text{age} + \text{education level} + \text{situation} + \text{WHO-stage} + \text{occupation} + \text{region})$$

The dependent variable is the regularity (Reg) and will take the value "1" if the patient is regular at all appointments and "0" if not. Table 1 presents the operational definition of the variables.

2. The data

Our study uses the national database of personalized follow-up of patients available to the National AIDS Control Program and STIs. We use data from all patients who started treatment between January 1st and December 31st, 2017. Our research thus, concerns a maximum period of 12 months of treatment. The duration of a patient's treatment for our study is determined in absolute months. Since the salary renewal is monthly, the theoretical duration of treatment during the first year is determined by differentiating between the starting date and 31 December 2017. The first year of follow-up of a patient is very important because it is after 6 to 12 months of treatment that the first assessment of compliance is made.

Results

In this section, we will review the socio-demographic and medical characteristics of patients.

Table 1: Distribution of patients by age and sex

SEX	AGE	15-25	26-35	36-45	46-55	56-65	66-80	Total
M		33	187	282	169	58	12	741
F		198	546	457	219	89	19	1528
Total		231	733	739	388	147	31	2269

Sources: *Author's calculations; PNLS-IST data, 2017*

Out of 2269 patients, 67% are female. More than 65% of patients of both sexes are between the ages of 26 and 45. This means that most people living with HIV make up the workforce.

Speaking of the distribution by region, our sample is mainly composed of patients from the maritime region (46.01%) followed by Lomé commune. The savanna region is less represented (6.96%). This distribution illustrates the impact of the disease in different regions of the country, except in the central region where data were not available.

Table 2: Distribution of Patients by Disease Stage According to World Health Organization

WHO STAGE	Frequencies	Percentage	Cumulative
1	1028	45,31%	45,31%
2	793	34,95%	80,26%
3	348	15,34%	95,59%
4	100	4,41%	100%
Total	2269	100%	

Sources: *Calculations of the authors; PNLS-IST data, 2017*

The results show that 45% of PLHIV are in the first stage of the disease followed by stage 2. Only 5% are at stage 4 complications.

Table 3: Distribution of patients by occupation

PROFESSION	Frequencies	Percentage	Total
Farmers and artisans	504	22,21%	22,21%
Traders	855	37,68%	59,89%
Independent workers	90	3,97%	63,86%
Employees	67	2,95%	66,81%
Transport	147	6,48%	73,29%
unemployed	343	15,12%	88,41%
military	35	1,54%	89,95%
Pupil or student	197	8,68%	98,63%
teacher	13	0,57%	99,21%
Health staff--agent	18	0,79%	100%
Total	2269	100%	

Sources: Calculations of the authors; PNLS-IST data, 2017

Regarding the patient occupancy status of our study in Table 3, trade is the sector of activity in which we encounter more PLHIV with 38%; monitoring of farmers and artisans (22%) and the unemployed (15%).

Table 4: Distribution of patients by regularity at appointments.

Regula rity	Frequencies	Percentage	Cumulative
Irregulars	708	31,2%	31,2%
Regulars	1561	68,8%	100%
Total	2269	100%	

Sources: Calculations of the authors; PNLS-IST data, 2017

Of 2269 patients, more than 31% are irregular at treatment appointments. In other words, almost a third of patients are non-observant to ARV treatment.

To confirm the relevance of the model used in this study, we verified the distribution law of residuals through the Kernel density function.

Figure 1:
Kernel density
function

Sources: Estimated results, 2017

The distribution of residues does not follow the normal distribution. So, the logistic regression is appropriate in this context.

The results of the econometric estimation in Table 5 overall show the significance of the gender variables, the occupational status, the WHO stage of the disease, the marital status and the administrative region of life of the patients. The threshold of significance of these variables is between 1% and 10%.

Table 5: Logistic regression results

Variable	Coefficients	Z	P> z	X
Sexe				
Fem	-0,0406563	-1,93	0,054*	0,673424
Professional Status				
Com	0,0106308	0,41	0,683	0,376818
Prof_L	0,0789798	1,7	0,09*	0,039665
Ouvr	-0,0656404	-1,03	0,301	0,029528
Transp	-0,0103301	-0,23	0,815	0,064786
S_empl	0,0297231	0,9	0,366	0,151168
Corp_ha	0,1480106	2,37	0,018*	0,015425
El.etu	-0,0107619	-0,27	0,788	0,086822
Ensei	0,0905476	0,78	0,434	0,005729
Per.sant	-0,0319748	-0,28	0,778	0,007933
WHO stage				
Stad2	-0,0541824	-2,38	0,017*	0,349493
Stad3	0,0017994	0,06	0,952	0,153372
Stad4	0,0124028	0,26	0,796	0,044072
Education level				
Educ2	-0,0417893	-1,51	0,132	0,449097
Educ3	-0,0201754	-0,69	0,493	0,314235
Educ4	-0,0460913	-0,86	0,39	0,048039
Age				
Age2	0,0013088	0,04	0,97	0,32305
Age3	0,0260376	0,74	0,456	0,325694
Age4	0,0086215	0,22	0,825	0,171
Age5	0,0136995	0,28	0,777	0,064786
Age6	0,0709283	0,86	0,391	0,013662
Marital status				
Stma2	-0,0530583	-2,08	0,038*	0,592772
Stma3	-0,2009169	-1,33	0,184	0,00617
Stma4	-0,1992279	-2,24	0,025*	0,016307

*** = significant at 1%; ** = significant at 5%; * significant at 10%

Sources: Estimated results, 2017

Discussion

Table 5 presents the results of the estimation of the explanatory variables that have a direct effect on the respect of appointments for renewal of ARV treatment among people living with HIV / AIDS in Togo. Heteroscedasticity is controlled with the "robust" command in the Stata 14 software.

In our study, more than 65% of patients are aged between 26 and 45 years old. The age group of active subjects is the most affected. These results are consistent with data from UNAIDS (2017). We also observed a female predominance of 67% in the cohort. These results are like those of Nachege et al. (2006) in South Africa and Oumar et al. in Mali (2007).

Women are less regular at ARV treatment appointments than men. In other words, the sex of the patient is a factor determining the regularity of the monthly appointments for the renewal of treatment during the first months of treatment initiation. These results are not in line with our expectations; however, they corroborate those of Konin et al. (2007) in Côte d'Ivoire. This could be explained by the low level of education among women added to the occupation status of most of them as shopkeepers or housewives.

Occupancy status has been a determining factor in the regularity of patients attending the appointment. As a result, all other things being equal, the likelihood is higher for a security officer and a private sector worker to attend all their treatment appointments than for a patient who is a farmer for example. These results corroborate those of Braithwaite (2007). This would mean that a stable professional status makes the patient confident about his or her future and therefore motivates him or her to adhere to the ARV treatment. In addition, for the most part, there is the existence of health services within the army and in some private companies.

Patients in stage 2 of the disease have a low probability of meeting medical appointments. These results are contrary to our expectations. In other words, the more the patient feels a deterioration of his state of health, the more he or she is discouraged to regularly ask for treatment. At this stage, he or she finds it less useful to continue a treatment that does not improve his or her state of health since already in stage 2 of WHO. Consequently, the patient begins to feel the complications of the disease with the manifestation of opportunistic infections. These results corroborate those of Phatak, who challenged the patient's belief in the success of his or her

treatment (Phatak, 2006). This would mean that patients are often discouraged by their first therapeutic failure.

Whatever the age of the patient, his or her behavior is not significantly different in terms of compliance. These results are in line with those of the MANIFF cohort in 2000 (Marimoutou et al., 2003). The age range of our sample being between 15 and 80 years would suggest that the patients who started the treatment are all aware and find useful the need to respect the appointments especially those who are in the first year.

Marital status is a determining factor in compliance. Monogamous and cohabiting patients are more likely to be less observant than singles. This would mean that if the couples are discordant or have not shared their status with their spouse, it leads them to hide to take the drugs. This situation compromises compliance with medical prescriptions resulting in daily drug jumps.

Regarding the administrative region of residence, the patients of the maritime regions, the plateaux, the Kara and the savannas have a probability of being less observant than those of the Lomé region. This could be due to the lower level of development of these regions compared to Lomé commune. The consequence of the weight of cultural influences as well as the probability of being identified as PLHIV in its localities or care centers are not numerous; especially considering the low density of the population. The geographic accessibility of medical care centers becomes problematic as we move further away from the Lomé Commune region.

Conclusions

The irregularity of attendance at monthly anti-retroviral treatment renewal appointments for people living with HIV / AIDS is growing in sub-Saharan Africa and remains one of the main challenges for its African countries, particularly Togo. This study shows that patients become non-observant day-to-day to fully subsidized treatment. Prior to developing policy mechanisms to encourage the maintenance and regularity of patients on treatment, it would be necessary to understand the factors that lead to non-compliance with medical appointments. This paper focuses on finding the determinants of adherence to ARV treatment in PLHIV in Togo. From a logistic regression, we analyzed the determinants of regularity at monthly ARV renewal appointments in 2269 patients in Togo. The patients concerned are those who were initiated to treatment between January 1st and December 31st, during their first year of treatment. Our

results showed that gender, professional status, WHO stage of the disease, marital status and administrative region of patients influence the respect of ARV treatment appointments in Togo. From these results, some coherent conclusions emerge.

Strengthening the delegation of work policies in the medical care of PLHIV is important. This will provide a solution to the problem of the availability of human resources at the national level to extend the medical care of HIV / AIDS throughout the country. The development and popularization of the individualized follow-up approach for patients is desired. This approach will allow the provision of differentiated service to patients considering their context (case management).

It is crucial to strengthen the psychosocial and community support of patients, especially for those who are in treatment failure situations. The personalized psychosocial support preserves the future of treatment and especially reinforces the acceptance of the new molecules relative to the change of the therapeutic line. There must be increased efforts to reduce HIV-related stigma and discrimination to reduce the stress of treatment conditions. Stigma and discrimination are factors that always affect PLHIV to the respect of hours of medication, especially when the patient is not living alone. At the pharmacological level, it is also important to work to reduce the number of tablets per dose for certain combinations; and to mitigate side effects. One of the reasons for the postponement of hours of medication and even stopping treatment is the manifestation of side effects.

Stable socioeconomic status promotes adherence. To do this, the combination of treatment and economic support is important; because it is easier for a patient to cancel his medical appointment for an economic activity allowing him to satisfy his or her vital needs, especially considering that it is impossible to take this treatment without a good diet. However, a thorough theoretical and quantitative analysis of other additional channels that may affect the decision to stop or postpone a medical appointment with appropriate data is an important opportunity for future research.

List of abbreviations

ERECI: Research Team in Institutional Economics

ARV: Antiretrovirals

WHO: World Health Organization

HIV: Human Immunodeficiency Virus

AIDS: Acquired immunodeficiency syndrome

UNAIDS: United Nations Program on AIDS UNAIDS

PNLS : Programme National de Lutte contre le Sida

SDG: Sustainable Development Goals

REDES: Report on AIDS Resources and Expenditures

PLHIV: People Living with HIV

Declarations

- Ethics approval and consent to participate
 - Approval of the bioethics committee of the Ministry of Health and Public Hygiene in Togo. Executive Secretary of the Committee: M. ALEZA; 00228 90106734
- Consent for publication
 - Done
- Availability of data and materials
 - The datasets generated and/or analyzed during the current study are not publicly available due Because it's the data of people living with HIV but are available from the corresponding author on reasonable request to the National AIDS Control Program
- Competing interests
 - The authors declare that they have no competing interests" in this section.
- Funding
 - There is no funding for research because this paper is the first article of a doctoral thesis under preparation
- Authors' contributions

- - "BB analyzed and interpreted the patient data regarding the demand of health care HIV disease. OM helped in discussions and conclusion. All authors read and approved the final
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References

- Araujo, R. C. ; Pires A. V. ; Susin I. ; Mendes, C. Q. ; Rodrigues, G.H. ; Packer, I. U. ; Eastridge, M. L. 2008.** « Milk yield, milk composition, eating behavior, and lamb performance of ewes fed diet containing soybean hulls replacing coastcross» (*Cynodon species*) hay. J. Anim. Sci., 86 (12): 3511-3521
- Bayle F.J.; Misdrahi D. 2002.** « Observance- Facteurs d'observance- Comment l'améliorer ? »
- Beninguisse G. 2003.** « Entre tradition et modernité : Fondements sociaux et démographiques de la prise en charge de la grossesse et de l'accouchement au Cameroun », *Academia/bruyant, Institut de Démographie*, UCL, Louvain-La-Neuve, p 297.
- Bessette D, Bunguener M, Costagliola D, Flori Y, Matheron S, Morin M. 2001.** « Observance aux traitements contre le VIH/SIDA : Mesure, déterminants, évolution » Paris. *ANRS*. P 87-98
- Bonnell R, "HIV/AIDS. 2000.** Does it increase or decrease growth in Africa?" ACTAfrica, Banque mondiale, nov.
- Broers B. and al.1994.** « A cohort study of drug user's compliance with zidovudine treatment» *Archives of Internal Medicine*, 154(10) :1121_27
- Cardarelli R, Weis S, Adams E, Radaford D, Vecino I, Munguia G. 2008** « General health status and adherence to antiretroviral therapy». *J Int Assoc Physicians AIDS Care*.7:123-9.
- Catz L, Kelly J, Bogart L, and al. 2000.** « Patterns, correlates and barriers to medication adherence among persons prescribed new treatments for HIV disease». *Health Psychology*, 19:124_33.
- Chesney E, Goodwin GM, Fazel S. 2014.** « Risks of all-cause and suicide mortality in mental disorders: a meta-review» *World Psychiatry*. 2014 Jun;13(2):153-60. doi: 10.1002/wps.20128
- Chesney M. A., Morin M, Sherr L. 2000.** « Adherence to HIV combination therapy » *Social science & medicine* 2000 DOI:10.1016/S0277-9536(99)00468-2

CNLS. 2016. Rapport sur l'évaluation des flux des ressources et les dépenses consacrées à la réponse nationale au VIH sida au Togo (REDES). <http://cnlstogo.org/download/rapports/RAPPORT-REDES-2016.pdf>

Dieng M., Audibert M., Le Hesran, Anta Ta Dial. 2014. « Déterminants de la demande de soins en milieu péri-urbain dans un contexte de subvention à Pikine, Sénégal ». Etudes et Documents n° 15. July.

Grossman M. 1972. « On the concept of health capital and the demand for health », *Journal of Political Economy*, vol. 80, n°2, 223-255. Stoddart et Barrer (1980)

Jane M. Simoni, Ann E. Kurth, Cynthia R. Pearson, David W. Pantalone, Joseph O. Merrill, Pamela A. Frick. 2006. «Self-Report Measures of Antiretroviral Therapy Adherence : A Review with Recommendations for HIV Research and Clinical Management», *AIDS Behav.* 2006 May; 10(3): 227–245. doi: 10.1007/s10461-006-9078-6

Konin C, Adoh, Coulibaly, Kramoh, Safou, N'Guetta, N'Djessan, Koffi. 2007. « L'observance thérapeutique et ses facteurs chez l'hypertendu noir africain » Archives des maladies du Coeur et des vaisseaux Vol 100, N° 8 - août 2007 pp. 630-634

Lamiraud Karine. 2004 : « Méthodes d'évaluation de l'utilité du patient. Une analyse économique et économétrique du comportement d'observance dans un essai clinique » Thèse : décembre 2004, <https://www.theses.fr/150215983>

Marimoutou et al. 2003 : « Causes of hospitalization and death in the MANIF 2000 cohort, composed of HIV-infected patients contaminated by intravenous drug use, 1995-1999». Presse Médicale (La) (Vol.32, n°13, 5 avril)

Nachega JB, Hislop M, Dowdy DW, et al. 2006. « Adherence to highly active antiretroviral therapy assessed by pharmacy claims predicts survival in HIV-infected South African adults ». *J Acquir Immune Defic Syndr.* 2006 Sep;43(1):78–84.

Nanfosso, R.T., Kasiwa, J.M. 2013. « Les déterminants de la demande de soins prénataux en République démocratique du Congo : Approche par données de comptage », *African evaluation journal* #26, 9 pages. <http://dx.doi.org/10.4102/aej.v1i1.26>

ONUSIDA. 2017. Rapport mondial d'avancement sur la lutte contre le sida 2017 [http://www.unaids.org/sites/default/files/20181122 PR WAD Report fr.pdf](http://www.unaids.org/sites/default/files/20181122_PR_WAD_Report_fr.pdf)

Oumar AA, Dao S, Diamoutene A, Coulibaly S. et al. 2007 « Factors associated with antiretroviral treatment observance at Point “G” hospital». *Mali Med.* 2007;22(1):18–2.

Phatak. 2006. «Relationships between beliefs about medications and nonadherence to prescribed chronic medications». *Ann Pharmacother.* 2006 Oct;40(10):1737-42. Epub 2006 Sep 19.

Phelps. E. 1995. « Perspective in health economics» *health economics*, VOL. 4: 335353

PNLS. 2015. Rapport annuel du Programme National de Lutte contre le Sida (PNLS) et IST, 2015, <http://www.pnls.tg/rapports/RAPPORT%20ANNUEL%20PNLS%202015.pdf>

Puig-Junoy. J, Pérez. 2002. « Integración vertical y contratación externa en los servicios generales de los hospitales españoles» *Gaceta Sanitaria*, 16(2) : 145-155.

Shin, D., Lee, Y., Poss, K.D., and Stainier, D. Y. 2011 « Restriction of hepatic competence by Fgf signaling». *Development (Cambridge, England)* 138(7): 1339-1348 (Journal)

TenoRes Study Group. 2016. « Global epidemiology of drug resistance after failure of WHO recommended first-line regimens for adult HIV-1 infection: a multi centre retrospective cohort study» *Lancet Infect Dis.* 2016 May;16(5):565-575.

Tenthani L, Cataldo F, Chan AK, Bedell R, Martiniuk AL, van Lettow M. 2012 « Involving expert patients in antiretroviral treatment provision in a tertiary referral hospital HIV clinic in Malawi». *BMC Health Services.* 2012 ;12 :140. doi: 10.1186/1472-6963-12-140.

Tesfaye A and Abdulhamid BK. 2010. «The Demand for Curative Health Care in Jimma town: Choosing between health care providers» *VDM Verlag Paperback* – June 11

Valerie Braithwaite. 2007. « Responsive Regulation and Taxation: Introduction» Dans *Baldy Center for Law and Social Policy (Buffalo, N.Y.), Wiley*

Figures

Figure 1

Kernel density function Sources: Estimated results, 2017