THE INFLUENCE OF SOCIO-ECONOMIC, DEMOGRAPHIC, BEHAVIOR, AND REGIONAL FACTORS OF THE ON THE KNOWLEDGE ABOUT HIV/AIDS IN BRAZIL

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Resumo
Este artigo procurou traçar um perfil da sociedade brasileira em idade sexualmente ativa a respeito do conhecimento sobre HIV/AIDS utilizando fatores socioeconômicos, demográficos, comportamentais e de localização, fornecidos pela pesquisa "Comportamento Sexual da População Brasileira e Percepções do HIV/AIDS". Neste sentido, procuramos identificar diferentes grupos de risco que possam ser alvo de campanhas de prevenção mais eficazes. Para desenvolver a análise empírica utilizamos o Modelo Logit Ordenado, pois a escala de conhecimento da pesquisa segue um ordenamento crescente. A partir desta análise, verificamos que o processo de "pauperização" da AIDS pode ser explicado por um desnível significativo no nível de conhecimento sobre HIV/AIDS, que favorece aqueles com melhor educação e nível social. Também verificamos que a região Nordeste apresentou o menor nível de conhecimento, sendo a região Sudeste a que teve o melhor desempenho. Ainda observamos que o conhecimento é mais perceptível em mulheres heterossexuais do que em homens heterossexuais ou homossexuais/bi. Um possível desencontro entre informações de qualidade e grupos potenciais de risco nos leva a questionar a eficácia de campanhas de prevenção generalistas. Embora o efeito da mídia no conhecimento tenha sido estatisticamente significante, principalmente para rádio e televisão, ele foi de magnitude reduzida.
Palavras-Chave: HIV/AIDS, População Brasileira, Grupos de Risco, Fatores Socioeconômicos e Demográficos, Modelo Logit Ordenado.

Abstract
This article aimed to analyze the profile of the Brazilian Society with respect to its knowledge about HIV/AIDS using socio-economic, demographic, behavioral and regional data supplied by the survey intitled "Sexual Behavior of the Brazilian Population and Perceptions about HIV/AIDS". This way, we identified different risk groups which could be targeted in more effective prevention campaigns. In the empirical analysis, we used the Ordered Logit Model due to the ordered nature of the index of knowledge provided by the survey. We verified that the "impoverishment" process of the AIDS can be explained by the unbalance knowledge among groups, favoring those with better education and economic achievements. We also verified that the Northeast region presented the lowest level of knowledge, and the Southeast had the best performance. Yet, we observed that level of knowledge is higher among heterosexual women when compared to the group formed by heterosexual men or homosexual/bi. A possible mismatch between quality information and potential groups of risk led us to questioning the effectiveness of generalized prevention campaigns. Although the

media effect was statistically significant, especially through radio and TV, it was of reduced magnitude.
Key Words: HIV/AIDS, Brazilian Society, Risk groups, Socioeconomic and Demographic Factors, Ordered Logit Model.

JEL classification: **I10, I18, C35.**

I – Introduction

The syndrome of Acquired Immunodeficiency Deficiency (AIDS) emerged on a large scale at the end of the seventies through contamination by the Human Immunodeficiency Virus (HIV). This agent, when entering the bloodstream, attacks the immune system by reducing the body's resistance, turning the infected person into an easy prey for diseases/infections such as flu, fever, pneumonia, tuberculosis, herpes, candida, toxoplasmosis among others. The patient carrying the HIV is diagnosed as an AIDS patient when his immune system is low, or when displacement to work becomes a difficult task.

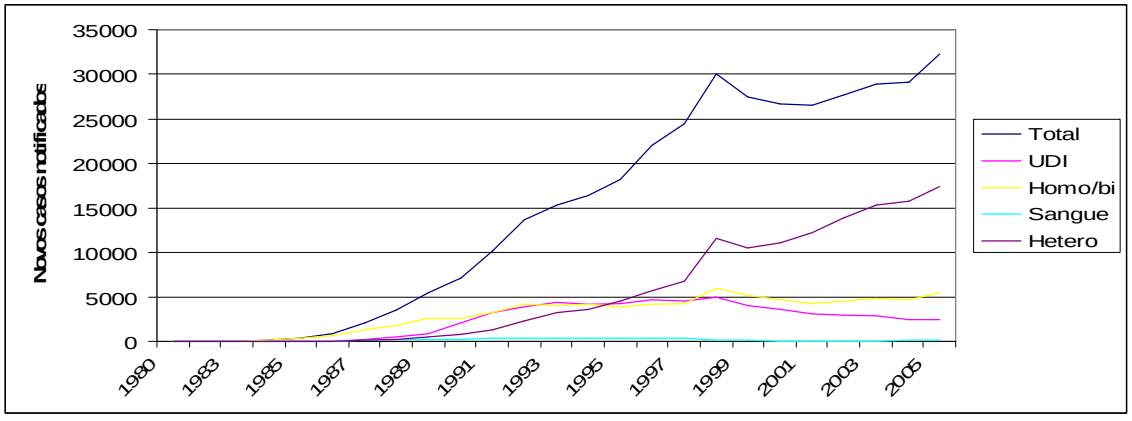
According to estimations of UNAIDS (2006), 36.6 million people live with HIV worldwide, while 11,000 people are contaminated with the virus every day. Furthermore, most cases are observed in the world's poorest nations according to the National Institute of Allergy and Infectious Disease (NIAID). In Latin America, the estimate of AIDS victims reveals 1.6 million people infected, and Brazil accounts for almost 40% of this universe.

The Brazilian government, through the Ministry of Health, has put forward a program to combat the epidemic through preventive and treatment policies. For instance, we can highlight a treatment policy that mandates free supply of 16 anti-retroviral (ARV, henceforth) to patients served by the public health system (*Sistema Único de Saúde*, SUS). In 2000 this policy benefited 163 thousand patients. This policy has been seen by many as an effective action that shows government commitment in facilitating access to treatment.

A significant reduction in AIDS statistics (mortality from AIDS, number of hospitalizations and infections by opportunistic diseases) has been attributed to the program. In the period ranging from 1995 and 1999 there was a decline of approximately 50% in the death rate among men, while the number of hospitalizations by opportunistic diseases such as tuberculosis and pneumonia was reduced by 80%. From 1997 to 2001, an estimated 358 thousand hospitalizations by opportunistic diseases were avoided, which generated a saving of approximately $ 1.1 billion, according to the Ministry of Health. These results support the view of Brazil as an international reference in the treatment of HIV/AIDS patients.

Regarding prevention, however, the Brazilian case does not seem to be as effective as expected. This can be verified in Figure 1 below, where it can be seen that, although there is a small reduction in the number of new cases reported after 1998, the numbers are still very high and show upward trends after 2001.

Grafic 1 – Number of news case for year notification



Source: Ministry of Health (DATASUS)

The main (and perhaps only) preventive measure to fight the AIDS epidemics is the awareness of the population about the behaviors that facilitate the transmission of the virus. In this sense, the Brazilian government is investing considerably in increasing people's level of information on AIDS through extensive advertising campaigns in different media channels.

Between 1994 and 2002, for example, more than 30 campaigns have been launched with different contents and focus concerning behavior.

The effectiveness of prevention campaigns against AIDS can be measured by the extent to which they sequentially: i) improve the access and/or the quality of information about the means of transmission of the disease, and ii) change the patterns of behavior that facilitate contamination. According to the economic literature, these two effects respectively help solving the problems stemming from asymmetric information and negative externalities, which characterize a context of proliferation of HIV [GAFFEO (2003)].

In this work, we try to measure the magnitude and especially the impact of one source of the problems aforementioned: information asymmetry in Brazil. That is, this research examines the determinants of knowledge on the ways AIDS is transmitted. Thus, we are able to identify potential risk groups, which in the absence of better information can be more exposed to risk of infection or transmission. The identification of groups more or less informed is a major input for many campaigns aimed to prevent the disease, since the campaign is able to target certain groups that are exposed to higher risk of infection.

We use socio-economic, demographic and behavioral variables to identify different groups and compare their levels of knowledge about the means of transmission and preventive measures regarding AIDS contamination. The dataset in this study comes from the survey intitled "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS", which will be detailed in the next section.

In addition to the data base description (section II), this work has five more sections. The third section describes other references in the literature concerning AIDS. The fourth section presents the Ordered Logit Model (OLM, henceforth), the econometric model that will be employed to measure the degree of knowledge on HIV/AIDS from different socio-economic groups. This model is suitable for this study due to the qualitative nature of the dependent variable (scale of knowledge). In the fifth section, we discuss the regression results and, finally, we discuss possible policies suggested by our results in the sixth section.

II – Database

The database comes from the survey intitled "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS" conducted by the Brazilian Center of Analysis and Planning. This survey was requested by the Ministry of Health with the purpose of identifying general representations, behaviors, attitudes and sexual practices of the Brazilian population as well as the degree of knowledge about HIV/AIDS. Thus, we expect to establish more precise strategies for the improvement of policies aimed to combat the HIV.

The survey was conducted in the period ranging from December 1997 to December 1998, with a group composed of individuals of both sexes, from 16 to 65 years, residents in urban areas of 169 micro-regions of Brazil. The sample was selected out of 3600 potential interviewees, however, only 3324 people were interviewed and the analysis was carried out with 3161 individuals.

According to the survey, we found that 46.1% of respondents reported that there is no risk of contracting AIDS, while 46.6% declared that the risk of contracting AIDS in his city is high. Furthermore, 16.5% of the participants said they do not use condoms because they know their partner. These statistics illustrate the potential risk of spreading the disease because of the gap of knowledge about HIV/AIDS.

When questioned on who or where he or she would like to receive information about AIDS, only 5.7% of the respondents felt sufficiently informed. Most people (24.4%) would like to receive information from tradition media channels (Radio, TV and Movie). Approximately 23.8% of respondents would like to be informed about AIDS by a medical doctor. The Newspapers and Magazines are also cited by 13.2% of interviewees.

Therefore, we can verify that people have not assimilated very well the available information on HIV/AIDS. Reinforcing this perception, we verify, for example, that 16.9% of respondents fully agreed that people can get AIDS by using public bathrooms. While 14.9% completely disagreed that people can catch the disease through oral sex. In addition, 16.9% agreed fully that it is possible to contract AIDS using disposable syringe.

Considering these results, the Brazilian Ministry of Health designed the survey to include different criteria in order to identify the quality of information about the disease, using several questions to construct a scale of knowledge about HIV/AIDS.

This paper seeks to explain the knowledge about the disease using this scale. The scale is ordinal and quantitative and falls within the range of 0 to 9. Zero means that the interviewee does not have any knowledge about HIV/AIDS while nine predicts that it has full knowledge of the forms the disease/infection is transmitted.

This scale has been built according to the number of consistent answers regarding the forms of transmission and the number of correct answers. The following questions about how people can get AIDS were posed: removing the penis before the end of the relationship?; Doing oral sex?; Avoiding sharing or using syringes / needles already used?; Using disposable syringe?; Using female condom?; Using condom in sexual relations?; sharing food in the same dish with HIV/AIDS patients?; touching people with HIV/AIDS?; using public toilets?.

This methodology to construct this scale of knowledge about AIDS transmission was also used by Aggarwal and Rous (2004) in their study about married women in India.

In an attempt to draw a profile of the Brazilian population concerning knowledge about HIV/AIDS, we consider various socio-economic, demographic and behavior factors as the determinants of knowledge. Furthermore, we use information provided by the Ministry of Health (DATASUS) and the Brazilian Institute of Geography and Statistics (IBGE) to create a variable that expresses the average rate of incidence (10 thousand inhabitants) of HIV/AIDS by Federal Unit (FU). This value is represented by the ratio of the number of new cases identified between 1995 and 1996 at the FU level to the resident population (only presumed sexually active individuals were included).

In short, we are interested in assessing the influence of variables such as income, Age, Gender, Newspaper and/or Magazine reading , TV watching, Radio listening, sexual orientation, level of education, among other factors, on the quality of knowledge about HIV/AIDS.

Table 1 presents the variables and a summary of the database in which descriptive statistics are displayed. For binary variables, the average represents the proportion of respondents in the sample of each variable. For instance, 56% are married, 48% are white. The average knowledge of the white population is higher than the national average. For married individuals the average knowledge is approximately equal to the national level. The average age of respondents is 35 years and 4 months.

The inclusion of squared age (Age2) is to test the hypothesis of a quadratic function for age, meaning to capture the conjecture that younger people (for lack of accumulated knowledge) and older people (by the inertia of habits) have lower levels of knowledge about HIV/AIDS.

It was observed that 53.1% of respondents do not have the full primary education, while 6.48% have a college degree. It is expected that the higher the level of education of the respondent, the greater is the number of right answers and consequently the higher his or her level of knowledge about AIDS In average this expectation holds true, corroborating the results presented by Fonseca et al. (2000).

Individuals in all macro-Brazilian regions were selected in the survey sample. The northern region presents the smallest proportion of respondents, 8.13%, the Southeast region

is the most representative geographic area in the sample with 34.58% of the interviews conducted, exhibiting the highest level of knowledge (6.10 in average). The North East, meanwhile, showed an average of knowledge (5.49) well below the national average (5.85).

The State of Acre presents the lowest average rate of incidence of new cases identified (per 10 thousand inhabitants), 0.10, while the State of Sao Paulo has the highest rate, 3.60.

Regarding the behavioral variables - magazine reading, newspaper reading, radio listening, TV watching - it appears that approximately 96% of respondents watch TV, 88.61% listen to radio, 68.33% have access to newspapers and 55.33% read magazine. Thus, mass communication outlets are perhaps the most suitable channels of communication if one is willing to disseminate the campaigns of prevention against HIV/AIDS. When comparing the different media channels, people who read magazine showed the highest level of knowledge in average. From this description it appears that this study is in line with other work in the area of health economics. The next section presents a brief literature review.

III – Theoretical Review

Perhaps the cure of AIDS is the most desired scientific achievement in modern society. In parallel with the sizeable efforts undertaken by the scientific community to achieve this goal, researchers also developed a variety of works in different fields of knowledge emphasizing issues such as the spread of the epidemic of HIV/AIDS, drug consumption, inequality (e.g. gender, race, ethnicity), level of health care, "impoverishment" of HIV/AIDS, conduct towards the risk of STD infections, access to ARV for people with HIV AIDS, and efficient mechanisms to disseminate information on health.

Gaffeo (2003) produces an interesting review of literature that, in general, addresses the issues cited above under the logic of Economic Health. The author argues for the need of public policies to combat problems stemming from asymmetric information (different groups at risk) and negative externalities (the contagion itself), since these are factors of AIDS proliferation.

From this observation several policies can be assessed in light of methods of cost-benefit and/or cost-effectiveness. A recurring question, especially in countries with greater budgetary restrictions, is the allocation of resources for prevention and treatment of disease. However, to have a more precise analysis of effectiveness in allocating resources for prevention of a disease we need to have a better knowledge about the quality of information on the disease available to different groups of risk.

Walque (2006) and Aggarwal and Rous (2004), based on traditional models of demand and production of health, Grossman (1972) and Rosenzweig and Shultz (1983), observe how different behavioral factors and socio-economic variables influence respectively attitudes and quality of the information individuals have on the means of infection of HIV/AIDS. One socio-economic factor of emphasis in these and other studies is education.

There is empirical evidence establishing that the level of education is positively correlated with good health. With respect to the incidence of HIV/AIDS, however, one interesting phenomenon occurred. In the 80s and early 90s, however, education was usually positively related to the infection of HIV/AIDS. Fonseca et al. (2000), for example, analyzing the temporal incidence of cases by level of education observes that the epidemic in Brazil began in the social strata of higher education, with a gradual spread to the lower educational stratus. This change of incidence in disadvantaged groups has been associated to the so-called "impoverishment" (term coined by Bastos and Szwarcwald, 2000) of HIV/AIDS given the high correlation between education and income.

Education plays a key role in facilitating the penetration of information campaigns and on propensity to change habits and social behavior. Walque (2006) notes, however, that education is consistent with safer behavior as the use of condoms, or the use of advice and

experience. He adds that education can also determine a high level of infidelity and a low level of abstinence. These contradictory results suggest an empirical investigation to determine the direct effects and also the implications of other factors (controls) associated to access to better health information.

Aggarwal and Rous (2004) used count models to investigate the exact effect of various behavioral and socio-economic (including education) factors on the quality of knowledge about AIDS among married women in India. The authors identify that there are considerable differences between having some information of the type "already heard" (awareness) and having accurate information on the means of contagion of the disease. The influence of the media on the first type of information, for example, is much more significant than on the latter. This result and the influence of educational, cultural and religious factors on the level of knowledge on AIDS led the authors to question the effectiveness of advertising campaigns as the only (or most important) mechanism to prevent the disease.

This study brings other contributions with respect to the article of Rous and Aggarwal (2004). First, it is an attempt to identify the effect of various behavioral and socio-economic factors on the quality of knowledge of AIDS in Brazil. Moreover, it is wider with respect to groups of focus because it includes all compositions of gender (men and women) of marriage status (married or unmarried) and sexual orientation. This larger scale is particularly important in Brazil, due to the disproportionate growth in the number of incidents in certain demographic groups. We find, for example, that the participation of women (declared heterosexual) has been growing constantly over the years. The identification of the various groups of risks is critical to the design of efficient preventive policies.

Another contribution of this article is methodological. As shown in the previous section, the survey "Sexual Behavior of the Brazilian Population" reports the quality of knowledge of individuals about AIDS through an ordinal scale, built from answers about different possibilities of contagion. The existence of an ordered variable led us to choose the Ordered Logit Model (OLM, henceforth) as the method of estimation. The advantage of this model is that the estimation of the scale of knowledge can be differentiated. That is, the model allows the distance between scale values 6 and 7 to be greater than the distance between 2 and 3. This is appropriate since the various questions on the forms of contagion posed in the survey possess different degrees of difficulty. It is easier to learn, for example, that sharing the same dish with HIV carriers does not transmit the disease than knowing that the use of the female condom in normal conditions is also an effective method to avoid contagion. The next section, therefore, shows more details on the OLM.

IV – Econometrics Methods

The econometric model used in this study to obtain estimates of the degree to which the behavioral and socio-economic variables affect the degree of knowledge about AIDS is the OLM. This methodology is appropriate given that there is an ordering for the dependent variable (degree of knowledge), and that this ordering has more than two levels.

The OLM is based on the logistic c.d.f, which has the following analytical form:

(1) $$P_i = F(K_i) = F(a + bX_i) = \frac{1}{1+e^{-K_i}} = \frac{1}{1+e^{-(a+bX_i)}}$$

K_i is the dependent variable, i.e., the scale of knowledge about AIDS described in the Section II The scale assigns 0 to individuals with knowledge and at 9 to individuals with full knowledge.

Thus, the rule used to relate the latent variable to the observed response (summarized by the scale) is described as:

(2) $$K = i \quad se \quad q_i \leq K^* < q_{i+1} \quad para \qquad i = 0,1, ..., 9$$

In turn, the vector X_i of explanatory variables contains individual-level data. Some variables composing this vector are qualitative (ordered and dummy variables) while others are continuous. In this work this vector is composed of variables that can be classified into several groups: socio-economic and demographic (sex, race, education, marital status, family income per capita, socio economic class, worship services attendance, religion and sexual orientation), media exposure (TV, Radio, Newspaper and Magazine) and regional factors (state rate of incidence of new cases and fixed effects for macro regions).

Therefore, the structural model to be estimated is described by the following equality between the latent variable and the explanatory variables,

(3) $$K^* = Xb + x$$

Equation (3) can the be represented in terms of probabilities,

(4) $$\Pr(K = i \mid X) = \Pr(q_i < K^* \leq q_{i+1} \mid X)$$

Combining (3) and (4), we have:

(5) $$\Pr(K = i \mid X) = \Pr(q_i < xb \leq q_{i+1} \mid X)$$

So rewriting (5) in terms of a c.d.f involves:

(6) $$\Pr(\mathrm{K} = \mathrm{i} \mid \mathrm{X}) = \mathrm{F}(q_{\mathrm{i}+1} - \mathrm{x}b) - \mathrm{F}(q_i - xb)$$

Estimates of the parameters are determined from the log of the Likelihood function,

(7) $$\sum_{i=0}^{9} \sum_{K=i} \ln\left[\mathrm{F}(q_{i+1} - \mathrm{x}b) - \mathrm{F}(q_i - xb)\right]$$

Once we obtain estimates of the coefficients (b's) by Maximum Likelihood we are able to calculate the marginal effects (also known as elasticity's).

The marginal effects allow for a clearer interpretation of the results with respect to the effect of each explanatory variable on the scale of knowledge about HIV/AIDS. For ordered regression models, measuring a marginal change is much more informative [LONG, (1997)].

The marginal effect for a discrete variable is calculated as the variation in the predicted probability due to a given change in X_j from an initial value x_i to a final value x_{i+1}. For example, a change in an ordered or binary explanatory variable x_j from 0 to 1, is calculated as follows,

(8) $$\frac{\Delta P(k = i \mid X)}{\Delta xj} = \Pr(k = i \mid X, x_j = 1) - \Pr(k = i \mid X, x_j = 0).$$

Where i represents the scale of knowledge that goes from 0 to 9, while j is associated one of the ordered explanatory variable in the analysis. The marginal effects for continuous variables (e.g. age) are calculated by partial differentiation of $\Pr(k = i \mid X)$. Following this explanation of the OLM, we present the empirical analysis in order to establish a profile of Brazilian people concerning their knowledge of the means of contracting HIV/AIDS.

V – Results

To check whether the OLM is an appropriate methodology we must also estimate the equation using the traditional method of Ordinary Least Squares (OLS). Estimates generated by the latter method are distorted (biased) when the distances between the levels of knowledge are different [LONG, (1997)]. As we can see in Table 2, the distances (the difference) estimated between two cut-offs points (μ) in the OLM increase with the level of knowledge, reflecting the fact that the questions on AIDS that led to the formation of the index of knowledge correspond to different degrees of difficulty. Thus, we use the estimates of OLM to examine the effects of various factors on the quality of information on HIV/AIDS.

Socio-Economics and Demographics Factors

According to Table 2, education is an important determinant of the quality of knowledge about HIV/AIDS. A higher educational level stimulates demand for specific knowledge about the disease and facilitates the understanding of the risks of contagion when the information is provided through the media, relatives or other persons. This result when combined with those of Fonseca et al. (2000), who observe lower growth rate of new cases of AIDS among people with a higher educational level in the 1990's in Brazil, leads us to infer that a higher level of knowledge about AIDS has a significant impact on reducing in the number of new cases identified.

Although the implications of the level of education identify the phenomenon of the "impoverishment" of AIDS in Brazil with respect to the quality of knowledge, the results for different income classes are less accurate. It is interesting to note that, with respect to the lowest income class (Class 5 – reference category) the intermediate classes (classes 2 to 4) in fact have a higher level of knowledge about the modes of infection of HIV. However, when the more antagonistic classes are compared (Classes 1 and 5) it is not possible to find a significant difference in the quality of information on HIV/AIDS. One interpretation consistent with this finding is that for the highest income class the level of knowledge (Table 1) is conditioned by the educational factor.

Therefore, we estimated the model (Annex I) excluding educational variables and then found a significant knowledge gap between these two extremes classes, which corroborates the hypothesis suggested above.

Age also seems to be determinant factor of knowledge about HIV / AIDS. Among the respondents, middle-aged people tend to be better informed on the means of contagion. It is possible to observe a quadratic relationship between age and knowledge, suggesting that not only the young, but also the elderly are less informed.

It is interesting to note that married individuals have a marginal advantage over unmarried ones (single). Although this advantage is significant only at 10% level of significance it serves as an alert for groups exposed to higher risk of contagion (single people tend to have more sexual partners). The same warning is warranted to the homosexual groups. Heterosexual men and gay/bi overall (men or women) have a lower quality of information than heterosexual women. This result, i.e., potential risk groups lack information on AIDS, call for targeted public policies.

Media Exposure

While the socio-economic factors of individuals shape the demand for information about HIV / AIDS, campaign advertising through traditional media (TV, Radio, Newspaper and Magazine) generally constitutes most of the supply of such information. If you assume that at the time of the survey (1998) there was intense advertising warning about AIDS, it is possible to infer that access to the media should be an important determinant of the quality of information people receive about the contagion. Therefore, the effect of the different channels of communication represents, in some sense, their effectiveness.

We can see that access to magazines, radio and television has a positive effect on knowledge about AIDS, which is evidence of the efficiency of these media channels in providing specific information concerning health issues. More specifically, TV watching has a greater effect on the degree of awareness people have about AIDS prevention. This result was also found in Aggarwal and Rous (2004). Despite being significant, the effect of the media does not seem to be meaningful. In order to better understand the quantitative effect of the media on the degree of knowledge, we can use the estimates of marginal effects for discrete changes as shown in Long (1997).

From Table 3 we observe that the marginal effects begin to be positive for high levels of knowledge, that is, the probability of finding a person with a high level of knowledge is

higher among those who are frequently exposed to traditional media. The likelihood, however, seems low.

The probability of having a level of knowledge 7, for example, is only (0.04) greater for those who watch TV frequently, compared to those who do not. The marginal effect is even lower for other media, suggesting an apparently small impact of campaigns informing about AIDS. Some possibilities can be evaluated from this evidence. First, one possibility is that access to media also represent budgetary restrictions that are not entirely captured by the variables included in the model. Thus, we also estimate the model without the variables education and income class. Since the marginal effect significantly increased, this possibility seems unlikely. Another possible explanation may be related to the possibility that society was already well informed about AIDS at the time of the survey, or alternatively, low quality of advertising on multiple possibilities of contagion or prevention. While we can understand that the average level of knowledge among various social strata are not as differentiated, and that the time of the survey coincided with a rather aggressive advertising policy, a more precise analysis of these two situations would not be possible with the available data, and will be left for future work.

Regional Factors

It is likely that a greater concern with the knowledge about AIDS emerge when there is a greater perception of contagion in the region. Thus, if the rate of infection is higher in a particular region, we expect people to have greater knowledge about the disease. On the other hand, the rate of infection may be high because individuals did not receive necessary information on the forms of contagion. So, to avoid endogeneity of the variable measuring the average rate of incidence, this variable if lagged in order to capture the response effect and not the reverse effect. The years 1995 and 1996 were selected for the calculation because they are representative of a period when the epidemic was spreading rapidly, which should lead to a greater degree of awareness and care. The relationship between the average rate of incidence and social perception, however, may not be linear. Thus, we include the squared average rate in the model.

Firstly, we estimate the model excluding the effects of macro-regions to observe the effect of the rate of incidence. This effect was very significant presenting a well-defined quadratic form (Annex I). This result might suggest that the proximity of the phenomenon at the local level would leave the public more alert on the possibilities of contagion. While this possibility is not eliminated completely, we noticed that the effect of the rate of incidence loses much of its explanatory power when the dummy variables of macro-region are included in the model (Table 2). This reduction leads us to believe that other regional factors may be key to explain the first result, i.e., the effect of the variable average rate of incidence is more likely to be reflecting regional disparities, than the effect of increased perception due to high incidence rates. This analysis is reinforced by coefficients found for macro-regions. As the Southeast is reference macro-region, the negative coefficients for the variables defining the other macro-regions may reflect other externalities derived from socio-economic differences in health conditions between the macro-regions.

When compared to the Southeast the Northeast is the region that presents the largest difference in the quality of knowledge about AIDS. Difficulties of access to health services, given the high percentage of families living in rural areas, high concentrations of poverty and even cultural factors may help explaining this distinction. The insignificant coefficient on the North macro-region was a bit surprising despite the correct sign. This implies that, once we control for several socio-economic factors and behavior, other differences at the regional level between the Southeast and North, do not help explain the gap in the average quality of information on HIV/AIDS.

VI – Conclusions

This work tries to identify the influence of socio-economic, behavioral and regional factors on the knowledge on the forms of infection by HIV/AIDS. Differences in information levels may be at the origin of the formation of distinct groups of risks. In this paper, we try to differentiate these groups according to their levels of knowledge about AIDS. Applying OLM to a scale of knowledge about AIDS, and the information contained in the survey "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS" (Ministry of Health), we find several interesting results.

On a scale from 0 to 9, the average level of knowledge about the ways of transmission of HIV in Brazil in 1998 was 5.85. This level, however, differs significantly between different groups. Considering socio-economic factors, for example, we found that individuals with more experience (older), with better education, and belonging to high income brackets have a higher quality of information on AIDS prevention. This result helps explaining the process of "impoverishment" of AIDS in Brazil reported by Bastos and Szwarcwald (2000).

Another important result that calls for a close look concerns possible lack of knowledge of individuals belonging to potential risk groups. Single people and gay/bi possess a smaller level of knowledge about HIV/AIDS than married individuals and heterosexual women respectively. The latter group, were also significantly more aware of the disease than heterosexual men. If we consider that single people and/or gay/bi have a more risky sexual behavior, lack of better information do not only increase the possibility of contagion but also amplify this effect due to externalities.

Regarding the effectiveness of media exposure as a factor affecting the population level of information about AIDS, we found that radio, television, and with a smaller impact, magazines contributed to spread information on AIDS. The magnitude of this contribution however proved to be limited in advertising campaigns, which calls for campaigns with a more precise message about the multiple forms of prevention.

Finally, different regional effects were found. Southeast region showed the best results while the Northeast the lowest level of knowledge about AIDS. Therefore, the results point to the existence of groups (in the socio-economic and demographic dimension) and regions of risk. Therefore, preventive campaigns should target these groups, using the channels provided by the mass media. This policy, however, must be complemented by local policies aimed to spread information for people in the lower income brackets, and to counter cultural factors that facilitate the existence and development of asymmetric information and the negative externalities in an epidemic environment.

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Table 1 – Descriptive Statistics of Variables

Variables	Minimum	Maximum	Average	Standart Erro	Average of Knowledge
Age	16	65	35.35	13.25	-
Age2	256	4225	1425.41	1031.40	-
White	0	1	0.4837	0.4998	6.01
Married	0	1	0.5609	0.4964	5.86
Heterosexual – woman	0	1	0.5432	0.4982	6.17
Gay/bi	0	1	0.0108	0.1032	5.85
Complete elementary school	0	1	0.1114	0.3146	5.95
Incomplete High School	0	1	0.1016	0.3021	6.17
Complete High School	0	1	0.1613	0.3679	6.26
Incompleto Under-graduate	0	1	0.0304	0.1716	6.35
Complete Under-graduate	0	1	0.0648	0.2463	6.50
Income Class 1	0	1	0.3258	0.1776	6.23
Income Class 2	0	1	0.1762	0.3811	6.26
Income Class 3	0	1	0.3135	0.4640	6.07
Income Class 4	0	1	0.3641	0.4813	5.74
Newspaper reading?	0	1	0.6833	0.4653	6.05
Magazine reading?	0	1	0.5533	0.4972	6.15
Radion listening?	0	1	0.8861	0.3177	5.91
Tv watching?	0	1	0.9589	0.1986	5.89
State Rate of Incidence of New Cases	0.10	3.60	1.4612	0.9956	-
State Rate of Incidence of New Cases2	0.01	12.96	3.1259	3.9111	-
North	0	1	0.0813	0.2733	5.86
Northeast	0	1	0.2442	0.4297	5.49
South	0	1	0.1591	0.3659	5.93
Middle-West	0	1	0.1696	0.3753	5.80
Scale of Knowledge about HIV/AIDS	0	9	5.8538	1.7501	-

Source: Produced by the authors on the research "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS".

Table 2 –Estimated Models for the Level of Knowledge about AIDS

Models	**OLS**	**OLM**
Dependent Variable: Scale of Knowledge about HIV/AIDS	**(1)**	**(2)**
Limits		
Level of Knowledge 1 (μ_1)	-	-2.8673**
		(-6.87)
Level of Knowledge 2 (μ_2)	-	-2.1510**
		(-5.44)
Level of Knowledge 3 (μ_3)	-	-1.3030**
		(-3.40)
Level of Knowledge 4 (μ_4)	-	-0.3118
		(-0.83)
Level of Knowledge 5 (μ_5)	-	0.6314
		(1.67)
Level of Knowledge 6 (μ_6)	-	1.6517**
		(4.37)
Level of Knowledge 7 (μ_7)	-	2.6112**
		(6.88)
Level of Knowledge 8 (μ_8)	-	3.8282**
		(10.02)
Level of Knowledge 9 (μ_9)	-	5.3816**
		(13.81)
Socio-Economics and Demographics Factors		
Age	0.0361**	0.0317*
	(2.58)	(2.09)
Age2	-0.0007**	-0.0006**
	(-3.95)	(-3.34)
White	0.1277*	0.1032
	(1.99)	(1.50)
Married	0.1058	0.1261^{+}
	(1.62)	(1.77)
Woman – Heterosexual	0.4521**	0.5006**
	(7.51)	(7.64)
Homosexual – bi	-0.0179	-0.0515
	(-0.06)	(-0.18)
Complete elementary school	0.1206	0.0739
	(1.19)	(0.68)
Incomplete High School	0.2413*	0.2595*
	(1.62)	(2.20)
Complete High School	0.3307**	0.3481**
	(7.51)	(3.35)
Incomplete Under-graduate	0.3986*	0.3836*
	(2.15)	(1.97)
Complete Under-graduate	0.6101**	0.7075**
	(4.18)	(4.46)
Income Class 1	0.4157^{+}	0.3449
	(1.95)	(1.52)
Income Class 2	0.6429**	0.6451**
	(4.68)	(4.36)
Income Class 3	0.6566**	0.6618**
	(5.57)	(5.17)
Income Class 4	0.5703**	0.5773**
	(5.41)	(5.00)
Media Exposure		
Newspaper reading?	0.0976	0.1037
	(1.27)	(1.25)
Magazine reading?	0.1707**	0.1518*
	(2.31)	(1.91)

Table 2 – Continue

Radio listening?	0.2398**	0.2916**
	(2.54)	(2.83)
TV watching?	0.3953**	0.37128*
	(2.57)	(2.20)
Regional Factors		
State Rate of Incidence of New Cases	0.2268	0.3802^{+}
	(1.14)	(1.78)
State Rate of Incidence of New Cases2	-0.0543	-0.0888^{+}
	(-1.20)	(-1.81)
North	-0.2867*	-0.2596
	(-1.92)	(-1.61)
Northeast	-0.4132**	-0.4264**
	(-3.47)	(-3.34)
South	-0.2658**	-0.2440*
	(-2.73)	(-2.30)
Middle-West	-0.3357**	-0.3778**
	(-3.56)	(-3.72)
Constant	3.8316**	-
	(11.05)	-
Observations	3161	3161

Source: Produced by the authors on the research "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS".
Note: absolute value of z-statistic in parentheses.
(+) significant at 10%; (*) significant at 5%; (**) significant at 1%.

Table 3 – Marginal Effects of the Media on the Level of Knowledge about HIV/AIDS

Media	Level of Knowledge									
	0	1	2	3	4	5	6	7	8	9
Newspaper	-0.0007	-0.0007	-0.0018	-0.0046	-0.0080	-0.0088	0.0005	0.0111	0.0096	0.0036
Magazine	-0.0010	-0.0011	-0.0026	-0.0067	-0.0116	-0.0130	0.0006	0.0161	0.0141	0.0053
Radio	-0.0022	-0.0023	-0.0056	-0.0140	-0.0233	-0.0234	0.0044	0.0316	0.0254	0.0092
TV	-0.0030	-0.0030	-0.0075	-0.0186	-0.0301	-0.0284	0.0079	0.0405	0.0312	0.0112

Source: Produced by the authors on the research "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS".

ANNEX 1

Table 4 – Control Models

Models	**OLM**	**OLM**
Dependent Variable: Scale of Knowledge about HIV/AIDS	**(3)**	**(4)**
Socio-Economics and Demographics Factors		
Age	0.0424**	0.0330*
	(2.86)	(2.18)
Age2	-0.0008**	-0.0007**
	(4.13)	(3.41)
White	0.1153+	0.1011
	(1.67)	(1.52)
Married	0.1009	0.1081
	(1.43)	(1.53)
Heterosexual - Womam	0.5016**	0.5042**
	(7.66)	(7.70)
Homosexual/bi	0.0043	0.0071
	(0.01)	(0.02)
Complete elementary school	-	0.0642
	-	(0.59)
Incomplete High School	-	0.2310+
	-	(1.96)
Complete High School	-	0.3353**
	-	(3.23)
Incomplete Under-graduate	-	0.3368+
	-	(1.74)
Complete Under-graduate	-	0.6803**
	-	(4.30)
Income Class 1	0.7490**	0.3587
	(3.54)	(1.58)
Income Class 2	0.8886**	0.6776**
	(6.40)	(4.61)
Income Class 3	0.7709**	0.6886**
	(6.21)	(5.42)
Income Class 4	0.6001**	0.5912**
	(5.21)	(5.15)
Media Exposure		
Newspaper reading?	0.1419+	0.1106
	(1.74)	(1.34)
Magazine reading?	0.2205**	0.1390+
	(2.82)	(1.75)
Radio listening?	0.2616*	0.2926**
	(2.55)	(2.84)
TV watching?	0.3506*	0.3689*
	(2.07)	(2.18)
Regional Factors		
State Rate of Incidence of New Cases	0.4024+	0.5757**
	(1.88)	(4.02)
State Rate of Incidence of New Cases2	-0.0949+	-0.1132**
	(1.94)	(3.15)
North	-0.2226	-
	(1.39)	-
Northeast	-0.3830**	-
	(3.01)	-
South	-0.2492*	-
	(2.35)	-

Table 4 - Continue

Middle-West	-0.3591**	-
	(3.55)	-

Observations	3161	3161

Source: Produced by the authors on the research "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS".
Note: absolute value of z-statistic in parentheses.
(+) significant at 10%; (*) significant at 5%; (**) significant at 1%.

ANNEX 2

Table 5 – Exclusion of observations (missing value)

Variables	**Motive**	Remarks excluded
Scale of Knowledge about HIV/AIDS	Missing value	26
Newspaper reading?	Not answer	15
Magazine reading?	Not answer	11
Radio listening?	Not answer	8
TV watching?	Not answer	4
Race	Do not know	81
	Not answer	0
State conjugal	-	0
Regularity that attends worship and religious services	Do not know	12
	Not answer	6

Source: Produced by the authors on the research "Sexual Behavior and Perceptions of the Brazilian population of HIV/AIDS".