

Case-Control Study on the Vulnerability of Women to HIV, Kaolack, 2019

Abdoul Aziz Ndiaye¹, Alioune Badara Tall¹, Awa Ba¹, Diya Diop¹, Ndeye Fatou Ngom¹, Papa Gallo Sow¹, Martial Coly Bop¹, Anta Tal Dia²

¹Université Alioune Diop de Bambey, Bambey, The Republic of Senegal

²Université Cheikh Anta Diop Dakar, Dakar, The Republic of Senegal

Email: abdoulaziz.ndiaye@uadb.edu.sn

How to cite this paper: Ndiaye, A.A., Tall, A.B., Ba, A., Diop, D., Ngom, N.F., Sow, P.G., Bop, M.C. and Dia, A.T. (2022) Case-Control Study on the Vulnerability of Women to HIV, Kaolack, 2019. *Open Journal of Epidemiology*, **12**, 355-366. <https://doi.org/10.4236/ojepi.2022.123029>

Received: July 5, 2022

Accepted: August 8, 2022

Published: August 11, 2022

Copyright © 2022 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: Despite a low prevalence that hides disparities between regions and genders, HIV infection in Senegal is progressing. Women are more vulnerable. The objective was to study the determinants of women's vulnerability to HIV/AIDS infection. **Methodology:** This was a case-control study carried out at the Kasnack Health Center, Kaolack in 2019. And 80 HIV-positive cases and 240 HIV-negative controls participated in the study. A questionnaire was administered to the selected women after their consent. Data were entered and analyzed using Epi Info and Stata software. **Results:** the mean age of the cases was 32 ± 9.7 years and that of the controls was 29.5 ± 8.5 years. Women were often housewives or traders; half of them had no schooling. Care was accessible for 74.4% of women. The level of knowledge of means of HIV prevention was medium in 71.3% of cases and 0.8% of controls. That of the modes of transmission was medium in 47.5% of cases and 0.8% of controls. The majority of controls (99.2%) had a low level of knowledge of means of prevention and modes of HIV transmission. Risky practices were 40% and 7.9% among cases and controls, respectively, and vulnerability was 40% and 7.9%, respectively. **Conclusion:** The level of HIV knowledge is low among most women. It is better in HIV-positive women who are more exposed to risky practices that increase their vulnerability. Reducing this vulnerability requires improving their knowledge and their empowerment.

Keywords

HIV, Case-Control, Knowledge, Vulnerability

1. Introduction

Human Immunodeficiency Virus (HIV) infection is a public health issue and a

brake on development [1] [2].

Isolated in 1983 [3], HIV has spread widely among men and women with multiple partners in East and Central Africa, as well as among the homosexual and bisexual male population, but also among drug users in certain urban areas of the Americas, Western Europe, Australia and New Zealand [4].

Nowadays, the virus is spreading in all countries and the majority of cases are heterosexual individuals.

In 2020, UNAIDS estimated the number of people living with HIV (PLHIV) at 37.7 million, with 1.5 million new infections and 680,000 deaths worldwide [5]. In 2020, among all PLHIV, 84% knew their serological status, 73% had access to treatment and 61% had an undetectable viral load [5]. Sub-Saharan Africa is by far the most affected region of the world with 25.1 million people infected. It also accounts for more than two-thirds of new infections worldwide [6]. Women are more infected than men: they represent 60% of PLHIV [6]. In West and Central Africa, access to treatment is 73% among all PLHIV and 56% among pregnant women [5].

Three out of four new infections among adolescents aged 15 to 19 are girls. Young women aged 15 to 24 are twice as likely to be infected with the Human Immunodeficiency Virus (HIV) compared to men of the same age. More than a third (35%) of women worldwide has experienced physical or sexual violence at some point in their lives [7] [8]. In some regions, women who are victims of physical or sexual violence are one and a half times more likely to be infected with HIV [5].

Africa south of the Sahara is the region of the world most heavily affected by the pandemic, where two-thirds of all people living with HIV are found, as well as 77% of all HIV-positive women [5]. The combined effect of harmful customary practices, the absence of early detection of the virus and the lack of information among the populations would partly explain this high prevalence, a real public health and reproductive health problem. Available data show that the HIV epidemic has affected more and more women over time [5] [6].

In Senegal, the epidemic has a concentrated profile [9]. HIV infection progresses especially in high-risk groups such as sex workers (SW), MSM (Men having Sex with Men) [10] [11].

The prevalence of 0.7% observed in the general population actually hides disparities between regions but also between the sexes [9] [12].

Women are more vulnerable to HIV than men in Senegal. Among PLHIV aged 15 and over, 64% are women with a prevalence of 0.8% versus 0.5% for men, the sex ratio women/men is 1.6 [9]. According to Spectrum estimation data (UNAIDS, 2018), 1442 new infections were declared in 2018, including 838 among women and 604 among men, attesting to a persistent feminization of the epidemic [13] [14].

Kaolack, a crossroads and central region which is vulnerable due to its geographical position, notes a prevalence of 1.1% [13]. In this region, the epidemic

affects women more than men. In the Kaolack Health District area, in 2016, out of an active cohort of 1559 infected people, 1075 were women [15].

These disparities which are thus observed in the epidemiology of HIV have motivated the curiosity to explore the vulnerability of women to this disease. The purpose is to contribute to reducing the prevalence of HIV in the general population, particularly among women in Kaolack.

2. Methodology

2.1. Type of Study

This was a case-control study carried out at the Kasnack Health Center, Kaolack district, between January and April 2019.

2.2. Study Population

The study population consisted of women aged 15 and over, living in the geographical area of the Kaolack Health District and attending the Kasnack Health Center.

2.2.1. Study Unit

- The Case: she is a woman living with HIV and living in the area of the District.
- The Control: this is any HIV-negative woman living in the area of the District.

2.2.2. Inclusion Criteria

Any woman aged at least 15, whether or not infected with HIV, residing in the area of the Kaolack Health District, attending the Kasnack Health Center.

2.2.3. Non-Inclusion Criteria

These were women meeting the inclusion criteria but who refused to participate in the study or who were unable to answer the questions due to illness or unavailability.

2.3. Sampling

2.3.1. Sampling Method: [16]

The cases, *i.e.* HIV-positive women who came for an appointment during the data collection period, were selected with the support of the Health Center mediator.

The controls, *i.e.* HIV-negative women who came to the Health Center for various reasons, were enrolled in the study.

Each case was matched with 3 controls of the same age, or more or less 5 years old.

2.3.2. Sample Size

The number of cases was estimated using the following formula [17].

$$n \geq \frac{p(1-p) \left(1 + \frac{1}{c}\right) (Z_{\alpha} + Z_{2\beta})^2}{(p_0 - p_1)^2}$$

- n : the number of cases;
- c : the number of witnesses per case ($c = 3$);
- p_0 : proportion of controls exposed ($p_0 = 0.35$);
- Z_{α} : the value of Z for the first kind risk (for $\alpha = 0.05$, $Z_{\alpha} = 1.96$);
- $Z_{2\beta}$: value of Z for a power of $1 - \beta$ (for a power of 80%, $\beta = 20\%$ and $Z_{2\beta} = 0.84$);
- OR: Minimum OR that we set for the study to be of public health interest OR = 2;
- P_1 : proportion of cases exposed ($p_1 = 0.51$);
- P : proportion of subjects exposed in the two case and control groups ($p = 0.39$);

Two groups were identified.

- The cases: 80 HIV-positive women;
- Controls: 240 HIV-negative women;

A total of 320 women participated in the study.

2.4. Data Collection

Collection Tool

A questionnaire consisting of 3 parts was developed.

The first part took into account the demographic and socio-economic characteristics of the respondents (age, ethnicity, profession, educational level, marital status).

The 2nd part made it possible to measure the level of knowledge of the means of prevention (abstinence, fidelity, condom) and modes of transmission (sexual, blood, vertical) of HIV.

The 3rd part dealt with risky practices (sharing of sharp or prickly objects, non-use of condoms during sexual intercourse).

2.5. Data Entry and Analysis

Data were entered and analyzed using Epi-Info software. The results were presented using tables and graphs. The qualitative variables were presented as a proportion with a 95% confidence interval and an alpha error risk of 5%. Quantitative variables were presented using position (mean, median) and dispersion (standard deviation) parameters. A McNemar's Chi² test, appropriate for matched case-control studies, was used to compare proportions.

The data analysis made it possible to assess the level of knowledge of the means of prevention and modes of transmission as well as risky practices and finally the vulnerability of women to HIV.

The main ways to prevent HIV transmission are abstinence, being faithful, using condoms and not sharing unsterilized sharp or prickly objects. In this

study, three levels of knowledge were identified:

- Good level: if the woman can name 3 or more means of preventing HIV;
- Medium level: if the woman is able to name 2 means of preventing HIV;
- Low level: if the woman does not know any means of HIV prevention or is able to name only one of them.

The main modes of HIV transmission are sexual transmission (unprotected intercourse), vertical transmission (mother to child during pregnancy, childbirth or breastfeeding) and blood transmission (transfusion of infected blood, use of dirty sharp or prickly objects).

- Good level: if the person knows the 3 modes of HIV transmission;
- Medium level: if the person knows at least 2 modes of HIV transmission;
- Low level: if the person knows only one mode of HIV transmission or does not know any.

Risky practices designate all the behaviors leading to risk-taking for health. In this context, risky practices can be cited as unprotected intercourse (linked to the non-availability of condoms, or ignorance of the use of condoms as a means of protection or of the demands of the sexual partner), the use and/or sharing unsterilized sharp or prickly objects.

A woman's vulnerability defines the characteristics that influence her ability to anticipate, cope with, resist and recover from the impact of a hazard [18]. Operationally, in this study, vulnerability is defined based on the level of knowledge of modes of transmission, means of prevention and risky practices.

- Low vulnerability: if the respondent has a good level or an average level of knowledge of means of prevention and modes of transmission with no risky practices;
- Medium vulnerability: if the respondent has a low level of knowledge of means of prevention and modes of transmission with no risky practices;
- High vulnerability: if the respondent has a risky practice regardless of the level of knowledge of the means of prevention and modes of transmission of HIV.

2.6. Ethical Considerations

The protocol was submitted to the national ethics committee for approval. The Chief Medical Officer of the District had authorized the collection of data after having informed the heads of the care units. The free and informed consent of the participants was obtained before the administration of the questionnaire. The information was handled confidentially, and no identifying information was entered into the database. The database has been archived.

3. Results

3.1. Sociodemographic Characteristics

Table 1 presents the socio-demographic characteristics. The average age of the cases was 32 ± 9.7 years with a minimum of 16 years and a maximum of 58

years. Most cases were between 35 and 44 years old (38%); 33% were between 45 and 58 and only 5% were between 15 and 24. Regarding the controls, the average age was 29.5 ± 8.5 years with a minimum of 16 years and a maximum of 52 years. The majority were between 25 and 34 years old (36%), 34% were between 15 and 24. Only 4% of the controls were between 45 and 58 years old.

In terms of ethnicity, 33% of cases were Wolof, 26% Serer, 22.5% Alupular and 17.5% others. For the controls, 46% were Ouolof, 23% Alupular and 20% Serer.

As for the income-generating activity, 33% of cases and 25% of controls were traders, 3% of cases and 7% of controls were hairdressers or seamstresses and the majority of cases (38%) and controls (54%) did not have a profession (house-keeping).

The other professions section was mainly composed of sex workers ($n = 6$) and housekeepers in the cases. The controls were mainly pupils and students.

Table 1. Sociodemographic characteristics.

Variable	Cases (n = 80) Number (%)	Controls (n = 240) Number (%)	Overall (n = 320) Number (%)
Age class			
15 - 24	4 (5.00)	82 (34.17)	86 (26.88)
25 - 34	18 (22.50)	87 (36.25)	105 (32.81)
35 - 44	31 (38.75)	61 (25.42)	92 (28.75)
45 - 58	27 (33.75)	10 (4.17)	37 (11.56)
Ethnic group			
Ouolof	27 (33.75)	111 (54.25)	138 (43.13)
Pulaar	18 (22.50)	56 (23.33)	74 (23.13)
Serrer	21 (26.25)	50 (20.83)	71 (22.19)
Other	14 (17.50)	23 (9.58)	37 (11.56)
Profession			
Household	31 (38.75)	130 (54.17)	161 (50.31)
traders	27 (33.75)	61 (25.42)	88 (27.50)
Hairdressers/seamstress	3 (03.75)	18 (7.50)	21 (6.56)
Others	19 (23.75)	31 (12.92)	50 (15.63)
Schooling in FRenc			
-None	41 (51.25)	113 (47.08)	154 (48.12)
-Primary level	32 (40.00)	64 (26.67)	96 (30.00)
-Secondary level an above et	7 (8.75)	63 (26.25)	70 (21.88)
Marital status			
- Bride	38 (47.50)	221 (87.90)	249 (77.81)
- Divorced	21 (26.25)	9 (3.80)	30 (9.37)
- Widow	15 (18.75)	7 (2.90)	22 (6.88)
- Single	6 (7.50)	13 (5.40)	19 (5.94)
Difficulties accessing care			
yes	18 (22.50)	64 (26.67)	82 (25.62)

In terms of schooling in French, the majority of respondents (Cases and Controls) had no schooling, 40% of cases and 26.7% of controls have a primary level, 8.8% of cases and 26.3% of controls had secondary, university or post-university level.

Considering marital status, 47.5% of cases were married, 26.3% divorced, 18.8% widowed and less than 7.5% single. As for the controls, more than three quarters were married (87.9%); 5.4% single, 3.8% divorced (3.8%) and 2.9% widowed.

3.1.1. Level of Knowledge of Means of Prevention and Modes of Transmission of HIV

Graph 1 shows that 22.5% of cases had a good level of knowledge of the means of HIV prevention and 47.5% had a good level of knowledge of the modes of HIV transmission. On the other hand, among the controls, none of the respondents was able to cite 3 means of prevention and 3 modes of transmission.

The level of knowledge of means of HIV prevention was medium in 71.3% of cases and 0.8% of controls. Concerning the modes of transmission, the level was medium in 47.5% of the cases and 0.8% of the controls (**Graph 1**).

The majority of the controls (99.2%) had a low level of knowledge of the means of prevention and modes of transmission of HIV. Concerning the cases, 6.3% had a low level of knowledge of the means of prevention and 5% a low level of knowledge of the modes of HIV transmission (**Graph 1**).

3.1.2. Risky Practices

More than half of the sample said they used a toothbrush (60% among cases and 68% among controls); more than a quarter used a toothpick (38% in cases and 31% in controls). Only 1 case and 2 controls shared the material used to clean their teeth.

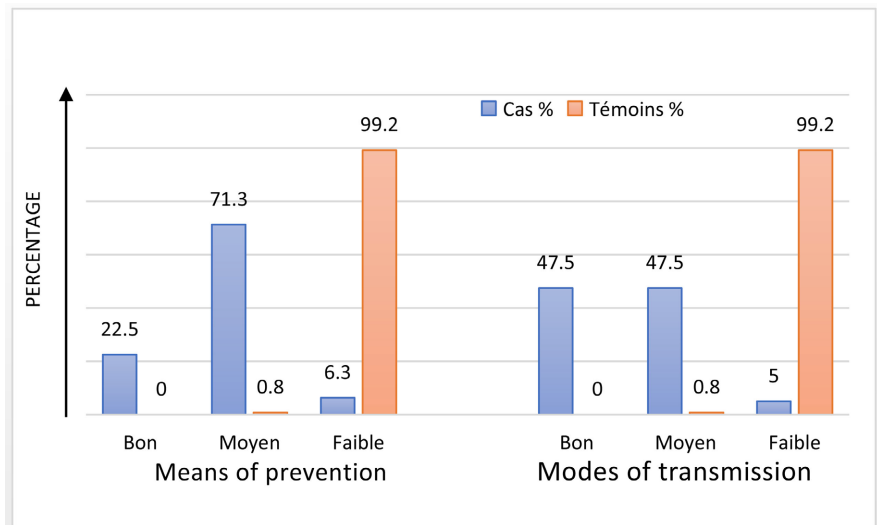
Regarding shaving equipment, 1 case and 7 controls claimed to share shaving equipment. With regard to sharp objects, none of the respondents confirmed having shared a syringe. For risky sexual practices, 27.5% of cases have a risky sexual practice compared to 3.33% among controls. Regarding the use of non-sterilized material, 23.7% of cases used non-sterilized material during scarification or gingival tattooing, compared to 1.3% in controls. In sum, 40% of cases and 7.9% of controls had a risky practice (**Table 2**).

3.1.3. Vulnerability Level

Table 2 shows that 60% of the cases and less than 1% of the controls had a low level of vulnerability, no case had a medium level of vulnerability, unlike the controls where 91.7% had a medium level of vulnerability. On the other hand, 40% of the cases and 7.9% of the controls had a high level of vulnerability.

4. Discussion

This study focused on the determinants of women's vulnerability to HIV/AIDS infection in Kaolack in relation to their knowledge, attitudes and practices.



Graph 1. Level of knowledge of means of prevention and modes of transmission of HIV.

Table 2. Frequency of risky practices and vulnerability.

	Cases n (%)	Controls n (%)	Overall N (%)
Sharing material for cleaning teeth	1 (1.3)	2 (0.8)	3 (0.9)
Sharing shaving equipment	1 (1.3)	7 (2.9)	8 (2.5)
Risky sexual practice	22 (27.5)	8 (3.3)	30 (9.4)
Use of non-sterilized equipment	19 (23.7)	3 (1.3)	22 (6.9)
Risky practices	32 (40.0)	19 (7.9)	51 (15.9)
Vulnerability			
- Low vulnerability	48 (60.0)	1 (0.4)	49 (15.3)
- Medium vulnerability	0 (0.0)	220 (91.7)	220 (68.8)
- High vulnerability	32 (40.0)	19 (7.9)	51 (15.9)

In relation to socio-cultural characteristics, the majority of respondents were Wolof (43%), followed by Alpular 23% and Serer 22%. Also with regard to the level of education, 48% of women were not educated. Those with a primary level represented 30% of the participants and those with a secondary level 21%. These results are comparable on the one hand to those of the report on the economic and social situation of the Kaolack region [19] where the Wolofs represented more than 60% of the population, the Alpular nearly 20% and the Serers about 10% , and on the other hand to data from the 2017 Continuous Demographic and Health Survey (DHS-C) [9] where the percentage of women with no schooling was 58.4%, that of women who had completed the primary cycle was 23.8% and 1, 1% for the incomplete primary cycle. Culturally, girls did not go to school. They stayed at home and helped their mothers with the housework. The few girls who went to school had difficulty completing primary school for the same reasons. And since the girls did not often attend school, they were given in

marriage once they reached the age of majority. Not having done advanced studies, they stayed at home as housewives or practiced informal trade.

The high proportion of traders (27%) is justified by the economic characteristics of the region. Kaolack, in fact, is a place of transit and sale of goods. Because of its crossroads position Kaolack is a very important commercial center and trade is very developed there. Also the “heart of Kaolack” project has made the city one of the most important centers of commercial exchange in Senegal with the organization of the Kaolack International Fair every year. These statistics are confirmed in the DHS-Continue 2017 report where 42% of women in Kaolack work in commerce and services [9].

Regarding care, it was accessible to about three quarters of the sample (74%), given the presence of many health service delivery points in the municipality. Among the 29 service delivery points in the health district, 19 are located in the municipality in addition to those of the private sector which is strongly represented there with private health centers and medical clinics. Care is slightly more accessible in cases (77.5%) and this could be explained by the free care for PLHIV through the CMV+ (Medical Coverage for PLHIV). The few difficulties in accessing health care mentioned in both cases and controls were more related to financial inaccessibility. The WHO recommends the removal of structural barriers to reduce vulnerability to HIV [20].

Regarding the level of knowledge of means of prevention and modes of transmission of HIV, no control had a good level of knowledge (99.2% had a low level of knowledge), while 22.5% of cases had a good level of knowledge of the means of HIV prevention and 47.5% a good level of knowledge of the modes of HIV transmission. These rates were respectively low in 6.3% of cases for means of prevention and 5% of cases for modes of transmission. This is because cases are being treated at the health center and with the support of the mediator, they are sensitized during appointments and they often ask clarifying questions about rumors, which reinforces their knowledge about the disease. In order to reduce the epidemiological burden of HIV, UNAIDS recommends combating the ignorance of girls, particularly through access to schooling [21]. In the 2017 DHS-Continue in Senegal [9], 68% of women knew of two means of preventing HIV (limiting sexual intercourse to an uninfected partner and the use of condoms to reduce the risk of contracting HIV). In Chad, this rate was 27% in the 2014-2015 Multiple Indicator Demographic Health Survey (DHS-MICS) report [22].

For risky sexual practices, our study revealed that overall, 79.4% of respondents did not use a means of protection during sexual intercourse (51.3% in cases and 88.8% in controls). These results are comparable to those of the DHS-MICS 2014-2015 of Chad where 80% of women with two partners had not used condoms during sexual intercourse during the 12 months preceding the study [22]. In Senegal, 59% of women revealed during the DHS-Continue in 2017 [9] that they had not used a condom during their last sexual intercourse

with a person who was neither their husband nor the partner with whom they lived. Furthermore, the lack of economic autonomy makes women more vulnerable to the sexual transmission of HIV. Studies in low- and middle-income countries have shown that financially empowered women are more likely to negotiate condom use [23].

This study had limitations such as: matching cases to controls, by age. Each case had to be matched with 3 controls of the same age or a difference of more or less 5 years which hasn't been easy at times. Also the reluctance of some witnesses in relation to certain questions such as average monthly income, occasional unprotected sex, had sometimes made it difficult to collect data.

5. Conclusion

The design of the study made it possible to compare knowledge, perception and risky practices in relation to HIV. PLHIV have a better knowledge of the modes of transmission and the means of prevention of HIV despite their higher risk practices, compared to HIV-negative subjects. This vulnerability highlights the problem of interrupting HIV transmission. Other research, especially socio-anthropological, will help to understand the basic factors that would probably be economic.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] FAO (Food and Agriculture Organization of the United Nations) (1997) Impact du VIH/SIDA sur les systèmes de production agricole et l'environnement rural au Burkina Faso et en Côte d'Ivoire (Projet RAF/94/01T) [Andrée Black-Michaud]. Food and Agriculture Organization of the United Nations, Rome, 97.
- [2] PANOS (1993) *Le vrai coût du SIDA: Un nouveau défi au développement*. L'Harmattan, Paris, 237.
- [3] Barré-Sinoussi, F., Chermann, J.C., Rey, F., Nugeyre, M.T., Chamaret, S., Gruest, J., *et al.* (1983) Isolement d'un rétrovirus T-lymphotrope d'un patient à risque de syndrome d'immunodéficience acquise (SIDA). *Science*, **220**, 868-871. <https://doi.org/10.1126/science.6189183>
- [4] UNAID [Joint United Nations Programme on HIV/AIDS] (2012) Report on the Global AIDS Epidemic. Joint United Nations Programme on HIV/AIDS (UNAIDS), Geneva. https://www.unaids.org/sites/default/files/media_asset/20121120_UNAIDS_Global_Report_2012_with_annexes_en_1.pdf
- [5] UNAID [Joint United Nations Programme on HIV/AIDS] (2021) Statistique mondiale sur le VIH 2021. Estimations épidémiologiques de l'ONUSIDA 2021. <https://www.unaids.org/fr/resources/fact-sheet>
- [6] UNAID (Joint United Nations Programme on HIV/AIDS) and OMS (World Health Organization) (2006) Programme commun des Nations Unies sur le VIH /SIDA: Le point sur l'épidémie de SIDA. Rapport spécial sur la prévention du VIH.

- [7] WHO (World Health Organization) (2021) Estimations de la prévalence de la violence contre les femmes, 2018. Estimations de la prévalence mondiale, régionale et nationale de la violence conjugale à l'égard des femmes et estimations de la prévalence mondiale et régionale de la violence sexuelle non conjugale à l'égard des femmes. World Health Organization, Genève.
- [8] WHO (World Health Organization) (2021) Violence against Women. <https://www.who.int/news-room/fact-sheets/detail/violence-against-women>
- [9] ANSD (National Agency of Statistics and Demography) (2018) Enquête Démographique et de Santé Continue (EDS-Continue 2017). National Agency of Statistics and Demography, Dakar. http://www.ansd.sn/index.php?option=com_content&view=article&id=409:eds-continue-
- [10] CNLS (Conseil National de Lutte contre le SIDA) (2017) Enquête nationale de surveillance combinée des IST et du VIH/Sida (ENSC 2015). <https://www.cnls-senegal.org/wp-content/uploads/2018/06/RAPPORT-DE-SYNTH ESE-ENSC-2015-1.pdf>
- [11] CNLS (Conseil National de Lutte contre le SIDA) (2019) Situation épidémiologique du VIH au Sénégal 2017-2018. https://www.unaids.org/sites/default/files/country/documents/SEN_2019_countryreport.pdf
- [12] ANSD (National Agency of Statistics and Demography) (2010-2011) Enquête Démographique et de Santé à Indicateurs Multiples au Sénégal 2010-11 (EDS-MICS). <http://www.ansd.sn/ressources/rapports/EDSMICS2010-2011-Principaux-Resultats.pdf>
- [13] CNLS (Conseil National de Lutte contre le SIDA) (2018) Plan Stratégique National de Lutte contre VIH/SIDA 2018-2022. <https://www.cnls-senegal.org/wp-content/uploads/2018/07/PSN-2018-2022.pdf>
- [14] UNAID (Joint United Nations Programme on HIV/AIDS) (2018) Fichier national des estimations du VIH (Spectrum ONUSIDA). <https://www.unaids.org/en/dataanalysis/datatools/spectrum-epp>
- [15] Région Médicale Kaolack (2016) Base de données du Centre de Santé Kasnack et du Pavillon de Traitement Ambulatoire du CHREIN de KI Année 2016.
- [16] Lwanga, S.K. and Lemeshow, S. (1991) Détermination de la taille d'un échantillon dans les études sanométriques. Manuel pratique. OMS, Geneva. http://apps.who.int/iris/bitstream/handle/10665/36881/9242544051_fre.pdf;jsessionid=0E57DE26BC0118293031E69A69498B93?sequence=1
- [17] Ancelle, T. (2015) Statistique épidémiologique, 3rd Edition, Collection sciences fondamentales. Edition Maloine.
- [18] Blaikie, P., Cannon, T., Davis, I. and Wisner, B. (1994) At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge, London.
- [19] ANSD (National Agency of Statistics and Demography) (2008) Service Régional de la Statistique et de la Démographie de Kaolack. Situation économique et sociale régionale 2008. http://www.ansd.sn/ressources/ses/SES_Kaolack_2008.pdf
- [20] OMS (World Health Organization) (2014) Vulnérabilité face à l'épidémie de VIH/sida en Europe.
- [21] UNAID (Joint United Nations Programme on HIV/AIDS) (1997) Les femmes et le SIDA: Point de vue ONUSIDA. https://www.unaids.org/sites/default/files/media_asset/women-pov_fr_0.pdf
- [22] INSEED Tchad (2016) Enquête démographique de santé à indicateurs multiples

(EDS-MICS) 2014-2015. <https://microdata.worldbank.org/index.php/catalog/2668>

- [23] UNAID (Joint United Nations Programme on HIV/AIDS) (2012) Le rôle des femmes vivant avec le VIH dans la lutte mondiale contre le VIH. <https://www.unaids.org/fr/resources/presscentre/featurestories/2012/december/201211womenoutloud>