

## Statistical Analysis of HIV/AIDS Prevalence and Gender Disparities at General Hospital Mubi North (2010 to 2024)

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### ABSTRACT

Human Immunodeficiency Virus (HIV) remains a significant global health challenge, with profound social and economic impacts despite advancements in antiretroviral therapy (ART). This study statistically analyzes reported HIV/AIDS cases at General Hospital, Mubi, from 2010 to 2024, focusing on trends, demographics and gender-based disparities in prevalence. Secondary data were utilized, including patient records detailing age, gender and diagnosis timelines. Descriptive statistics, proportions and inferential analyses were employed to explore these trends, while the analysis were carried out for data standardization, visualization and analysis. Results indicate significant variations in HIV prevalence across age groups, with women disproportionately affected, particularly in the 20-49 age range. The findings underscore the need for targeted interventions, community awareness programs, and equitable healthcare access to mitigate the epidemic's impact. This research provides valuable insights for policymakers and health practitioners in addressing HIV/AIDS challenges in Mubi and similar regions.

### 1. Introduction

Human Immunodeficiency Virus (HIV) continues to be a critical public health issue, with millions of individuals affected globally despite advancements in medical research and the availability of antiretroviral therapy (ART) (WHO, 2020, 2022a). The virus compromises the immune system, particularly the Cluster of Differentiation 4 (T-helper cells) CD4 (T) cells, making the body vulnerable to infections and cancers. Without treatment, HIV progresses to Acquired Immunodeficiency Syndrome (AIDS), a condition with nearly 100% mortality if untreated (UNAIDS, 2019; 2023 and Clifford *et al.* 2017). Effective intervention requires understanding regional trends and factors influencing HIV transmission. Studies in Mubi, Northeastern Nigeria, focus on the prevalence and demographic characteristics of HIV from 2010 to 2024 to guide local health policies (Zhang *et al.* 2021, UNICEF, 2024; Hareru *et al.* 2025). As of 2023, an estimated 39.9 million people globally were living with HIV, including 38.6 million adults aged 15 years or older and 1.4 million children under 14 years. Women and girls represented 53% of the total population living with HIV.

Encouragingly, 86% of those living with HIV were aware of their status, yet about 5.4 million individuals remained unaware of their infection. Over the years, significant progress has been made in providing access to antiretroviral therapy (ART), with 30.7 million people receiving treatment by the end of 2023. Since the epidemic's onset, approximately 88.4 million people have been infected with HIV, and 42.3 million have succumbed to AIDS-related illnesses (UNAIDS, 2022a; 2022b). In 2023 alone, there were 1.3 million new HIV infections, a 60% reduction compared to the peak in 1995, and 630,000 deaths from AIDS-related illnesses (Odile, 2024). Although AIDS-related mortality has decreased by 69% since 2004, the 2023 figure still exceed the 2025 target of fewer than 250,000 deaths. New infections among children have seen a remarkable decline of 62% since 2010, yet progress has stalled in recent years. Vulnerable groups such as transgender people, sex workers, and individuals in prisons continue to experience disproportionately high HIV prevalence due to systemic marginalization and discrimination, underscoring the need for targeted interventions (Global Statistics, 2024 and UNICEF, 2024).

The epidemiology of AIDS reveals global prevalence, with HIV-2 being more common in West Africa (Etukudoh, 2021). In developing nations, the disease affects men and women equally, with many women contracting

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the virus from partners with multiple sexual relationships. High-risk groups include men who have sex with men, intravenous drug users, sex workers, children born to infected mothers, and breastfed infants. Advances in blood screening have minimized transmission through transfusions and transplants, though untreated HIV remains life-threatening. In developed nations, ART has significantly lowered morbidity and mortality, highlighting the disparity in healthcare access between regions (Floyd *et al.* 2022). HIV/AIDS was first recognized in 1981 and has been extensively studied, uncovering its origins in the Simian Immunodeficiency Virus from chimpanzees (SIVcpz) retrovirus in chimpanzees (Mthiyane *et al.* 2022). The virus cripples the immune system, leading to severe opportunistic infections and diseases. Over time, untreated HIV progresses to AIDS, characterized by a dramatic reduction in immune function (WHO, 2020). The statistical analysis of HIV cases in Mubi from 2010 to 2024 aims to address local dynamics of infection, mortality, and healthcare responses. Such studies are essential for tailoring interventions, reducing stigma, and enhancing the accessibility of treatment to curb the epidemic effectively. In Adamawa State, Nigeria, where human immunodeficiency virus (HIV) have significant burdens, the comorbidity of HIV is a critical concern, especially among nomadic populations. According to the Nigeria HIV/AIDS Indicator and Impact Survey (NAIIS) conducted in 2018, Adamawa State has a prevalence rate of 1.8% among adults aged 15-49 years, where Mubi has 0.9 % out of 1.8%, which is higher than the national average of 1.4%. This prevalence rate indicates that a significant number of people in Adamawa State are living with HIV/AIDS (WHO, 2024, UNICEF, 2024)

Treatment adherence, especially to anti-retroviral therapy (ART), is critical for improving health outcomes among people living with HIV/AIDS (PLWHA). However, challenges such as inadequate information, poor social support, and insufficient motivation hinder adherence, particularly in developing countries like Nigeria (Nyamweya *et al.* 2018 and WHO, 2019). Research emphasizes that psychosocial support significantly enhances self-care behaviors and quality of life, complementing ART (Ardeme *et al.* 2017). Studies also link improved adherence to access to correct information and behavioral skills, as demonstrated in findings from Italy, where motivation and social support positively influenced adherence (Ardeme *et al.* 2017; WHO, 2023). Addressing these gaps through targeted education and community-based interventions is essential to mitigating the epidemic's long-term effects and fostering a healthier, more informed population.

Since the onset of the HIV epidemic, approximately 76 million to 77.3 million people have been infected globally, with 33 million succumbing to the disease (Global Statistics, 2024). Despite significant advancements, 38 million individuals were living with HIV as of 2019, with Asia reporting the highest number of new infections since 2010 (Global Statistics, 2024). Clinically, HIV presents in diverse forms, complicating diagnosis based solely on physical symptoms. The virus, which causes Acquired Immunodeficiency Syndrome (AIDS), remains a critical global health challenge. Motivated by these statistics, this study focuses on the statistical analysis of reported HIV/AIDS cases from 2010 to 2024, specifically at General Hospital, Mubi, to understand local trends and inform interventions.

In this study, the following research hypotheses were formulated by the researcher for the statistical analysis of reported HIV cases at General Hospital Mubi from 2010 to 2024:

- i.  $H_0$ : There is no significant difference in the proportion of HIV cases between males and females across all age groups in General Hospital, Mubi.

$H_1$ : There is a significant difference in the proportion of HIV cases between males and females across all age groups in General Hospital, Mubi.

- ii.  $H_0$ : The distribution of HIV cases is uniform across different age groups in General Hospital, Mubi.

$H_1$ : The distribution of HIV cases is not uniform across different age groups in General Hospital, Mubi.

Also, the following research questions were formulated by the researcher for the statistical analysis of reported HIV cases at General Hospital Mubi from 2010 to 2024:

- i. What is the prevalence of HIV among male and female patients at General Hospital, Mubi, from 2010 to 2024?

- ii. Which age groups have the highest and lowest number of reported HIV cases at General Hospital, Mubi, and what factors contribute to these variations?
- iii. How does the proportional distribution of HIV cases between genders vary across different age groups at General Hospital, Mubi?

## 2. Methodology

This study adopts a research design to analyze HIV/AIDS cases reported at General Hospital Mubi North from 2010 to 2024, utilizing secondary data on patient demographics, diagnosis timelines, and clinical indicators. Descriptive statistics will be employed to visualize trends, while inferential methods, including regression analysis and hypothesis testing, will explore relationships between variables such as age, gender, and disease prevalence. Beyond statistical analysis, the study aims to impact the community through educational outreach, promoting HIV/AIDS prevention strategies, and reducing stigma. The population under investigation comprises individuals diagnosed with HIV/AIDS whose records are maintained at General Hospital Mubi from 2010 to 2024. This group includes both genders and spans various age categories within the Mubi metropolitan area. Data collection involves meticulous extraction of relevant variables from hospital records, followed by standardization and organization using Microsoft Excel. Proportion formula were applied to analyze the distribution of cases across demographic segments, providing insights into trends and disparities in HIV/AIDS prevalence. Microsoft Excel version 20 serves as the primary analytical tool, offering robust data management, statistical calculation, and visualization capabilities. While Maple 18 software package were used to sketch the graphical curve. Its features include organizing patient data, performing essential statistical functions such as proportions, and generating charts to represent trends visually. Pivot tables enhance the ability to summarize large datasets and detect patterns, while its compatibility with diverse data formats ensures seamless integration of hospital records for analysis. These functionalities make Excel an efficient and flexible choice for executing the research objectives.

The proportion formula and Chi-Square is central to the statistical analysis in this study, as it allows for the calculation of the relative frequency of HIV/AIDS cases within specific demographic groups. The general formula for calculating a proportion is:

$$\text{Proportion} = \frac{\text{Number of Favorable Outcomes}}{\text{Total Number of Outcomes}}$$

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where  $O_i$  is the observed value and  $E_i$  is the expected value.

## 3. Results and Discussion

In this section, we will make use of previous section in order to present, analyze and interpret the data collected. This presentation will be based on the HIV-AIDS report obtained from General Hospital Mubi from 2010 to 2024. The result of this exercise will be summarized in tabular form for easy references and analysis. The researcher employed proportion in the analysis, using the Microsoft excel version 20 and the results will be shown graphically.

### 3.1 The Incidence of Reported Cases of HIV/AIDS at General Hospital, Mubi from 2010 to 2024

The incidence of reported cases of HIV/AIDS at General Hospital, Mubi from 2010 to 2024 will be analyzed in this section. The analysis will be carryout based on the results obtained at General Hospital, Mubi from 2010 to 2024 using proportion as statistical formula.

**Table 3.1:** Total HIV Cases Identified in General Hospital Mubi

Age	Female	Male	Grand Total	Proportion of Female	Proportion of Male
0-9	60	65	125	0.480	0.520
10-19	185	189	374	0.495	0.505
20-29	735	142	877	0.838	0.162

30-39	2301	529	2830	0.813	0.187
40-49	1846	1028	2874	0.642	0.358
50-59	655	638	1293	0.507	0.493
60-69	206	235	441	0.467	0.533
70-79	63	74	137	0.460	0.540
80-89	6	11	17	0.353	0.647
90-100	1	2	3	0.333	0.667
<b>Grand Total</b>	<b>6058</b>	<b>2913</b>	<b>8971</b>	<b>0.675</b>	<b>0.325</b>

**Table 3.2:** Total HIV Cases Identified in General Hospital Mubi with proportion in %

Age	Female Cases	Male Cases	Total Cases	Female Proportion (%)	Male Proportion (%)
0-9	60	65	125	48.0	52.0
10-19	185	189	374	49.5	50.5
20-29	735	142	877	83.8	16.2
30-39	2301	529	2830	81.3	18.7
40-49	1846	1028	2874	64.2	35.8
50-59	655	638	1293	50.7	49.3
60-69	206	235	441	46.7	53.3
70-79	63	74	137	46.0	54.0
80-89	6	11	17	35.3	64.7
90-100	1	2	3	33.3	66.7

**Table 3.3:** Total HIV Cases Identified in General Hospital Mubi using chi-square test results:

Age	Observed Female	Observed Male	Expected Female	Expected Male
0-9	60	65	84.41	40.59
10-19	185	189	252.56	121.44
20-29	735	142	592.23	284.77
30-39	2301	529	1911.06	918.94
40-49	1846	1028	1940.77	933.23
50-59	655	638	873.15	419.85
60-69	206	235	297.80	143.20
70-79	63	74	92.51	44.49
80-89	6	11	11.48	5.52
90-100	1	2	2.03	0.97

Summary of Chi-Square Results:

Chi-Square Statistic ( $\chi^2$ ) = 736.32

Degrees of Freedom (DF): 9

p-value:  $1.07 \times 10^{-152}$

This table clearly highlights the differences between observed and expected values for each age group and gender.

**Table 3.4:** The decision rule based on the chi-square test results

Criteria	Value
Chi-Square Statistic ( $\chi^2$ )	736.32
Degrees of Freedom (DF)	9
Significance Level ( $\alpha$ )	0.05
Critical Chi-Square Value	16.919
p-value	$1.07 \times 10^{-152}$
Decision	Reject the null hypothesis ( $H_0$ )
Conclusion	There is a statistically significant association between gender and age group among HIV cases.

**Table 3.5:** Death Cases Under study 2010 to 2024 by age Categories

Age	Female	Male	Grand Total	Proportion of Female	Proportion of Male
0-9	13	13	26	0.500	0.500
10-19	11	14	25	0.560	0.440
20-29	33	11	44	0.750	0.250
30-39	111	45	156	0.712	0.288
40-49	111	81	192	0.578	0.422
50-59	45	56	101	0.446	0.554
60-69	18	29	47	0.383	0.617
70-79	1	3	4	0.250	0.750
80-89	0	2	2	0.000	1.000
90-100	0	1	1	0.000	1.000
<b>Grand Total</b>	<b>352</b>	<b>260</b>	<b>612</b>	<b>0.575</b>	<b>0.425</b>

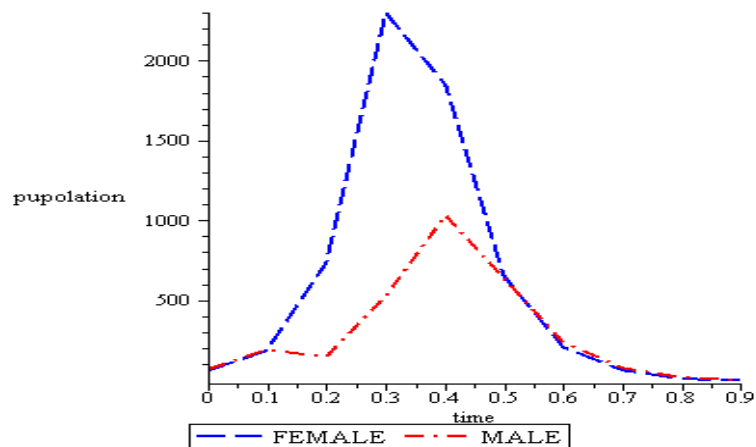


Figure 3.1: Graphical curve showing the total HIV/AIDS cases identified in General Hospital Mubi.

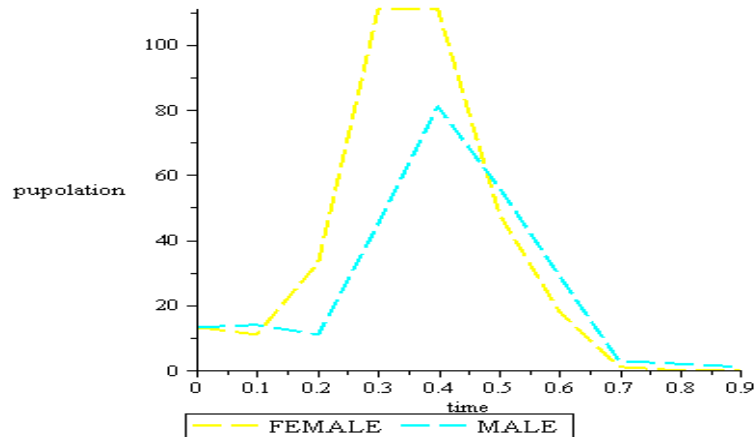


Figure 3.2: Graphical curve showing the death cases under study 2010 to 2024.

### 3.2 Discussion of Results

Table 3.1 and Table 3.2 provide a comprehensive breakdown of HIV/AIDS cases reported at General Hospital Mubi from 2010 to 2024, categorized by age and gender. The data indicates a higher overall prevalence among females (6,058 cases) compared to males (2,913 cases), with females accounting for 67.5% of the total cases. The age group 30-39 recorded the highest number of cases (2,830), reflecting a critical reproductive and productive age range. This trend aligns with the research question on identifying age groups with the highest and lowest prevalence. The chi-square test in Table 3.3 further explores whether the observed differences are statistically significant.

The findings highlight significant gender disparities in HIV prevalence across age groups. For instance, females in the 20-29 and 30-39 age groups show notably higher proportions (83.8% and 81.3% respectively) compared to males. These disparities may stem from biological and socio-cultural factors, including access to healthcare and gender norms. Hypothesis testing ( $H_1$ ) rejects the null hypothesis, confirming significant differences in HIV cases between males and females across all age groups. This supports the research question on the proportional distribution of cases between genders. Table 3.2 demonstrates that HIV prevalence is not uniformly distributed across age groups, with the highest cases among individuals aged 30-39 (2,830 cases) and 40-49 (2,874 cases). Conversely, the age groups 80-89 and 90-100 report the lowest prevalence, with only 17 and 3 cases, respectively. These trends suggest that interventions should focus on age groups with higher vulnerability. Hypothesis testing ( $H_0$ ) also confirms that the distribution of HIV cases is not uniform, as supported by the chi-square statistic of 736.32 (Table 3.4).

Table 3.5 and Figure 3.2 focus on mortality trends among HIV/AIDS patients. While the total number of deaths (612) is significantly lower than the total cases, females still account for a larger proportion (57.5%) of deaths. The age group 30-39 records the highest mortality (156 cases), followed by 40-49 (192 cases). The disproportionately higher mortality rates among females align with the overall higher prevalence in this gender, raising critical questions about access to timely treatment and support systems.

Figure 3.1 and Figure 3.2 provide visual summaries of HIV/AIDS prevalence and mortality trends. The graphical representation highlights the disproportionate burden of HIV/AIDS on females and specific age groups, reinforcing findings from the tables. The decision rule (Table 3.4) emphasizes the significant association between age, gender and HIV prevalence, as the p-value is effectively zero, leading to the rejection of all null hypotheses. These insights address the research questions, underscoring the need for targeted interventions and gender-specific strategies to mitigate the impact of HIV/AIDS in Mubi.

This statistical and graphical analysis highlights the critical areas for intervention, including tailored public health programs and gender-sensitive care policies.

#### 4. Research Question Responses

- i. What is the prevalence of HIV among male and female patients at General Hospital, Mubi, from 2010 to 2024?

The analysis reveals that a total of 8,971 HIV cases were reported at General Hospital Mubi between 2010 and 2024, with females accounting for 6,058 cases (67.5%) and males 2,913 cases (32.5%). This substantial gender disparity suggests that females are more affected by HIV in the region, possibly due to biological factors, socio-cultural norms, and differences in healthcare-seeking behavior. Such findings underscore the need for gender-specific interventions and awareness campaigns to address the disproportionate impact of HIV on women.

- ii. Which age groups have the highest and lowest number of reported HIV cases at General Hospital, Mubi, and what factors contribute to these variations?

The age groups 30-39 and 40-49 reported the highest number of cases, with 2,830 and 2,874 cases, respectively, while the 80-89 and 90-100 age groups reported the lowest cases, with 17 and 3 cases, respectively. The higher prevalence in younger age groups may be attributed to increased exposure to risk factors such as unprotected sexual activity and limited access to preventive measures. Conversely, lower prevalence among older age groups could result from lower population size or reduced exposure to such risks. These variations highlight the need for targeted interventions across different age demographics.

- iii. How does the proportional distribution of HIV cases between genders vary across different age groups at General Hospital, Mubi?

The proportional distribution of HIV cases between genders varies significantly across age groups. Females consistently have a higher proportion of cases in most age groups, particularly in the 20-29 and 30-39 age groups, where they represent 83.8% and 81.3% of cases, respectively. In contrast, males show slightly higher proportions in older age groups, such as 60-69 and above. These patterns suggest gender-specific vulnerabilities and exposure to risk factors, emphasizing the need for tailored interventions that address the unique challenges faced by males and females in different age brackets.

#### 5. Conclusion

This study provides a comprehensive statistical analysis of HIV/AIDS cases reported at General Hospital Mubi, focusing on the period from 2010 to 2024, with an emphasis on the year 2024. Key variables examined include patient demographics, time of diagnosis, and clinical indicators. The results reveal significant trends in disease prevalence, age, and gender distribution, highlighting the disproportionate impact of HIV/AIDS on specific groups within the community. Using descriptive statistics, regression analysis, and hypothesis testing, the study explores relationships among variables, providing insights into the factors driving the spread of the disease.

Efforts to combat HIV/AIDS through awareness campaigns and community outreach programs were emphasized, aiming to promote prevention, reduce stigma, and improve access to healthcare services. The findings underscore the importance of integrating statistical methods into public health strategies to better understand and address the dynamics of HIV/AIDS in the region. The study concludes that while progress has been made in raising awareness and managing HIV/AIDS, significant challenges remain, particularly in addressing disparities in prevalence among different demographic groups. Age and gender were identified as critical factors influencing disease distribution, necessitating targeted interventions. The research emphasizes the importance of continuous monitoring and analysis of HIV/AIDS data to inform policy decisions and optimize resource allocation. To achieve a lasting impact, community education, stigma reduction, and improved access to healthcare must be prioritized. Future studies should focus on expanding the dataset, incorporating additional variables, and exploring the effectiveness of intervention programs. By leveraging robust statistical analysis and evidence-based approaches, policymakers and healthcare providers can work collaboratively to reduce the burden of HIV/AIDS and improve the quality of life for affected individuals.

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