**Original Research Article**

**Socioeconomic and Geographic Disparities in HIV/AIDS Knowledge Among Health Science Students in Guyana, College of Medical Sciences**

**Abstract**

**Background:** HIV/AIDS remains a significant global health challenge, with disparities in awareness and beliefs persisting among healthcare professionals. Understanding how sociodemographic factors influence HIV/AIDS knowledge is crucial for developing targeted educational interventions, particularly in medical training programs. The College of Medical Sciences (COMS) in Guyana provides an important setting to examine these patterns, given the country's multicultural population and ongoing HIV epidemic.

**Objectives:** This study examined how socioeconomic status and geographic residence shape HIV/AIDS knowledge among medical students at Guyana’s College of Medical Sciences, focusing on measurable disparities in transmission and factual knowledge.

**Study design:** This research was conducted between January 2024 to June 2024. A cross-sectional study was conducted with 269 COMS students (74.25% female, 78.10% aged 18-25). Data were collected using a validated questionnaire (Cronbach's α = 0.826) and analyzed using non-parametric tests, including Chi-square, Kruskal-Wallis, and Mann-Whitney U tests. Key variables included residence (urban, suburban, rural), household income (low, middle, high), and knowledge scores (factual and transmission).

**Results:** Students from lower socioeconomic backgrounds had much lower scores on factual knowledge tests than more affluent students (p=0.035). Rural students suffered the most regionally, having much poorer understanding of how transmission occurs than urban students (OR=1.96, 95% CI:1.03- 3.70; p=0.013), while suburban students were middle-level. These results showed an apparent social class and urban-rural split in the understanding of HIV/AIDS among medical students.

**Conclusion:** This research showed that socioeconomic status and geographic residency independently relate to HIV knowledge gaps in medical education. These inequalities highlight the need for transformational practices such as focused rural training opportunities, improved support for economically disadvantaged students, and curriculum changes that mitigate geographic barriers. Adopting these equity-based strategies will allow medical institutions to build an adequate health care workforce capable of tackling HIV challenges in Guyana.

***Keywords:*** Guyana, health disparities, HIV/AIDS awareness, medical education, socioeconomic factor

**Introduction**

Socioeconomic and Geographic Disparities are important determinants of health behavior, especially for university students preparing to take on healthcare professions. Socioeconomic status (SES) is considered one of the most important predictors of sexual at-risk behavior, as well as for receiving sexual health education and other relevant services (WHO, 2021; CDC, 2022). Even with a certain level of comprehension regarding high-risk sexual practices, a large percentage of young adult students do not appropriately assess health risks because of insufficient information regarding sexual health and limited healthcare services (Baigry et al., 2023; Thongmixay et al., 2019). The transition to higher education is often associated with increased sexual activity among young adults, which can result in higher rates of exposure to HIV/AIDS, as noted in studies by Klinger (2016) and Bradshaw, Kahn, and Saville (2010).

In the Caribbean region and including Guyana, socioeconomic gaps pose problems in the attainment of valid health education information, promoting misinformation and participation in risky sexual activities (Misir, 2019). Although Guyana has recorded a decrease in HIV/AIDS from 1.4 percent to 1.2 percent between 2022 and 2024, there is still a challenge of about 9,000 new HIV cases in 2023 (Guyana Chronicle, 2024). Around the world, People Living with HIV/AIDS (PLWHA) continue to face stigma and discrimination not only in family settings but also in communities and healthcare institutions (Baigry et al., 2023). These forms of social discrimination, including isolation and ostracism because of HIV misconceptions, severely limit access to helpful support systems which widen the gap in health inequalities.

This research seeks to explore how structural determinants, particularly socioeconomic status and geographic residence, shape HIV/AIDS knowledge disparities among medical students at Guyana’s College of Medical Sciences. This study tries to identify the gaps in the available information by concentrating on the socioeconomic status, age, gender, and affiliation of the students, hoping to design effective educational interventions that improve HIV/AIDS training and stigma alleviation among health profession students.

**Global HIV/AIDS Knowledge Gaps and the Role of Training**

The virus known as Human Immunodeficiency Virus, as well as the disease Acquired Immunodeficiency Syndrome, is a global threat, and even in the Middle East and North Africa (MENA) region, one of the most important HIV epidemics is said to be on the rise (Elghazaly et al., 2023). There is a need to evaluate and comprehend how different knowledge-based sociodemographic variables from the population concerning HIV/AIDS, as these descriptors can contain the nuisance of HIV disease progression and socioeconomically aid the patients. Research conducted across different populations reveals both positive outcomes and troubling gaps in understanding and attitude towards HIV, particularly among younger medical students who are expected to be at the forefront of the fight against the epidemic.

Variations in HIV knowledge depending on one’s training and clinical exposure stem from multiple studies. In the MENA region, although 97.8% affirmed knowing about HIV/AIDS, only 36.4% acknowledged the virus could be transmitted at any disease stage, and 50.9% did not recognize the treatment options (Elghazaly et al., 2023). The same gap exists among students where clinical students outshine in understanding treatment entitlements of AIDS (66.8% knew antiretrovirals could prevent AIDS) yet fail in understanding the transmission risks (only 11.8% accurately understood anal intercourse risk) (Ljubas et al., 2024). Working healthcare professionals show a similar trend, as Shah et al. (2020) indicate doctors scored significantly higher in knowledge than other HCWs (mean difference = 0.46). Additionally, nurses' knowledge correlated with professional rank and in-service training (r = 0.278) (Boakye et al., 2023). This multitude of evidence highlights the importance of clinical education in addressing the intricacies of HIV transmission and treatment.

**Gender, Culture, and Stigma: Key Sociodemographic Determinants**

Sociodemographic factors such as Gender have been shown to predict discriminatory attitudes. Male medical students were 1.66 times more likely to refuse treatment to PLWHA and 1.62 times more likely to demand HIV status disclosure than their female counterparts (Ljubas et al., 2024). There are also gaps at the population level where the ratio of female college students with an understanding of HIV is lower (Odds Ratio 0.757) when compared to their male counterparts in China (Zhang et al., 2022).

The religious and cultural contexts solidify the attitudes, as shown by expatriate health care practioners in Oman having better attitudes than the nationals (mean difference = 1.23) (Shah et al., 2020), and Muslim respondents having lower knowledge (beta =-2.56) than Christians in Lebanon (Youssef et al., 2021). Non-heterosexual nursing students in Spain have more positive attitudes (average 4.72) towards nursing than heterosexual nursing students (Gázquez-López et al., 2025). These findings illustrate the multifaceted identity factors of HIV-related stigma.

**Sociocultural and Structural Influences on Awareness**

The level of education and the type of media one interacts with are overshadowing factors of HIV knowledge. Rwandan girls with secondary schooling were 40% more likely to have comprehensive knowledge compared to those without, and those with access to mobile phones or television were 26% more likely to possess such knowledge (Kawuki et al., 2023). Even so, there remains some level of knowledge disparity such as that between Kigali and Southern Rwanda. Other young Ugandan women also show advanced educational effects, as comprehensive knowledge was associated with elevated levels of schooling and HIV test history (Estifanos et al., 2021), as well as better attitudes among university students in Lebanon (Youssef et al., 2021). Within medical cohorts, 42.1% perceived their pre-medical education to be lacking in preparation for their respective fields of study, which is quite like Chinese minority students observing a lower level of awareness (OR = 0.717) (Ljubas et al., 2024; Zhang et al., 2022). The evidence presented reveals how the systematically unequal distribution of education continues to create gaps in HIV knowledge.

The cumulative evidence emphasizes the need for targeted educational approaches that addresses the sociodemographic-specific knowledge gaps and stigma gaps. The performance of healthcare trainees is better than the general population, as observed in Anguilla where 68.4% of trained HCWs had appropriate knowledge scores (Jennie et al., 2024); however, there are still significant gaps in understanding risks of transmission and available treatments. Such knowledge, highlighted by clinical training, must be addressed in a stigma-sensitive manner and coupled with approaches to overcome the structural framework of the health information deficit (Boyd et al., 2019). Medical students as prospective physicians undergo training in which they should be taught an integration of biomedical and sociocultural education to provide proper care to PLWHAs within different cultural settings. The studies suggest that healthcare providers must be prepared with the necessary resources to tackle the HIV care continuum through such comprehensive, multidimensional approaches.

**Method**  
This study employed an analytical cross-sectional design, as described by Cvetković Vega et al. (2021), which allowed for the efficient collection of data on participants' HIV/AIDS knowledge and attitudes at a single point in time. This design was beneficial for making specific observations about this study and provided a cost-effective method to assess population characteristics and awareness levels (Morzinski et al., 1996).

**Study Setting:**  
The University of Guyana’s student population reflects the multicultural composition of the country, contributing to a diverse academic environment. The College of Medical Sciences currently has 850 enrolled students, representing six ethnic groups in Guyana: Indo-Guyanese, Afro-Guyanese, Amerindians, Chinese Guyanese, Portuguese Guyanese, and European Guyanese. This diversity offers a valuable opportunity to explore HIV/AIDS awareness and beliefs across different sociodemographic backgrounds.

**Sample and Sample Size Calculation:**  
From the total enrolment of 850 students in COMS, a sample size of 265 was calculated using Cochran’s formula, with a 95% confidence interval, a 5% margin of error, and an assumed population proportion of 50%. To account for potential missing data and incomplete questionnaires, an adjusted sample size of 292 participants (265 + 27 for a 10% increase) was selected.

**Inclusion Criteria:**  
Participants were included if they were enrolled as part-time or full-time students in the COMS at the University of Guyana, were aged 18 years or older, provided voluntary consent, and had a good command of the English language.

**Exclusion Criteria:**  
Exclusion criteria included students under the age of 18, university staff, and those not enrolled in the relevant programs.

**Sampling Technique:**  
A convenience sampling method was employed for participant selection. This non-probability sampling technique involves selecting participants based on their availability and accessibility (Stratton, 2021).

**Instrument:**  
The study utilized a modified version of the International AIDS Questionnaire (Ouzouni & Nakakis, 2012), which was adapted to exclude irrelevant personal information while adding sociodemographic questions. The final questionnaire assessed participants’ sociodemographic details, knowledge of HIV transmission, HIV/AIDS awareness (including personal risk and factual knowledge), and attitudes towards HIV/AIDS.

**Piloting:**  
A pilot study was conducted with 30 students to assess the reliability and validity of the questionnaire. After data screening, no significant modifications were needed, and the pilot data were included in the final analysis. The Cronbach’s alpha of 0.776 indicated strong internal consistency reliability (Stensen & Lydersen, 2022).

**Recruitment:**  
Participants were recruited through an information sheet and advertisement, as well as an e-flyer containing a link to the online questionnaire. After providing informed consent via the Qualtrics platform, participants completed a questionnaire that collected data on their sociodemographic, HIV/AIDS knowledge, and attitudes. Data was automatically saved and securely stored for analysis.

**Results**

This study involved 269 participants from the College of Medical Sciences at the University of Guyana, with most being female (74.25%) and aged between 18 and 25 years (78.10%). Participants were primarily undergraduates (77.8%) and came from middle-income households (77.1%), with suburban areas being the most common residence (37.7%). Religiosity varied among participants, with the majority identifying as fairly religious (42.73%).

Post-test reliability findings are as follows

|  |  |  |
| --- | --- | --- |
| **Table 1: Reliability Statistics** | | |
| **Cronbach's Alpha** | **Cronbach's Alpha Based on Standardized Items** | **N of Items** |
| 0.826 | .857 | 18 |

Sociodemographic Profile of Participants in the College of Medical Sciences (COMS).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 2: Sociodemographic data** | | | | | | |
| **Sex of Participants of COMS** | Female | | | Male | | |
|  | 200 | | | 69 | | |
| **Gender of Participants of COMS** | Female | | Male | | Other | |
|  | 197 | | 71 | | 1 | |
| **The age category of Participants of COMS** | 18 -25 years | | 25-30 | | 30 years and above | |
|  | 214 | | 35 | | 20 | |
| **Year of Study of Participants of COMS** | 1  st Year | 2nd Year | 3rd Year | 4th Year | 5th Year | Other |
|  | 71 | 115 | 24 | 40 | 8 | 11 |
| **Religiosity of Participants of COMS** | Not at all religious | | Fairly religious | Religious | Very Religious | |
|  | 22 | | 117 | 102 | 28 | |
| **Relationship status of Participants of COMS** | Single | In a relationship / not married | Married | Separated or divorced | Other | Prefer not to say |
|  | 134 | 110 | 13 | 1 | 3 | 8 |
| **Nationality** | Guyanese | | | Other | | |
|  | 260 | | | 9 | | |

The odds ratio below shows that College of Medical Science students who live in rural areas are 2 times more likely to have poor knowledge scores as compared to those who live in suburban and urban areas when it comes to understanding the transmission of HIV/AIDS.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Table 3: Outcome** | | |
| **Transmission Category** | **Rural** | **Suburban and Urban** | **Total** |
| **Knowledgeable** | 73(27.1%) | 149(55.3%) | 222(82.5%) |
| **Poor Knowledge** | 23(8.5%) | 24(8.8%) | 47(17.5%) |
| **Total** | 96(35.6%) | 173(64.1) | 269(100%) |

|  |  |
| --- | --- |
| **Odds ratio** | 1.9561 |
| **95 % CI:** | 1.0347 to 3.6977 |
| **z statistic** | 2.065 |
| **Significance level** | P = 0.0389 |

Post-hoc Mann-Whitney U test comparisons below showing the residential groups for which statistically significant differences of mean scores were obtained for transmission knowledge among College of Medical Science students.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 4: Pairwise Comparisons of Residence** | | | | | |
| **Sample 1-Sample 2** | **Test Statistic** | **Std. Error** | **Std. Test Statistic** | **Sig.** | **Adj. Sig. a** |
| **Rural-Suburban** | -20.228 | 10.564 | -1.915 | .056 | .167 |
| **Rural-Urban** | -34.223 | 12.015 | -2.848 | .004 | .013 |
| **Suburban-Urban** | -13.995 | 11.761 | -1.190 | .234 | .702 |
| Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050. | | | | | |
| a. Significance values have been adjusted by the Bonferroni correction for multiple tests. | | | | | |

Post-hoc Mann-Whitney U test comparisons below showing the Socioeconomic Index (household Income) groups for which statistically significant differences of mean scores were obtained for factual knowledge regarding HIV/AIDS among college of medical science students.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 5: Pairwise Comparisons of Socioeconomic Index (Household Income)** | | | | | |
| **Sample 1-Sample 2** | **Test Statistic** | **Std. Error** | **Std. Test Statistic** | **Sig.** | **Adj. Sig. a** |
| **Low Income-Middle Income** | -22.194 | 13.406 | -1.656 | .098 | .293 |
| **Low Income-High Income** | 59.260 | 23.478 | 2.524 | **.012** | .**035** |
| **Middle Income-High Income** | 37.066 | 20.549 | 1.804 | .071 | .214 |
| Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050. | | | | | |
| a. Significance values have been adjusted by the Bonferroni correction for multiple tests. | | | | | |

**Discussion**

This study’s examination of 269 students from the College of Medical Sciences (COMS) uncovered important sociodemographic gaps in HIV/AIDS knowledge that reinforce and broaden existing global patterns regarding health education. The Shapiro-Wilk test showed a confirmed violation of normal distribution (which required non-parametric analyses) which set the stage for significant disparities to be uncovered through Pearson's Chi-squared (X² = 6.048, df=2, p<0.049) and Kruskal-Wallis tests (H(2) = 6.601, p<0.037) in particular for residential and socioeconomic categories.

The gap between rural and urban knowledge COMS is reflective of the global structural inequalities, where rural students perform significantly lower than their urban counterparts (p=0.013 in post-hoc Mann-Whitney U tests). This supports Elghazaly et al.’s (2023) findings in the MENA region where only 36.4% knew that HIV is capable of being transmitted in all stages of the disease despite 97.8% recognising the disease, as well as Kawuki et al.'s (2023) study in Rwanda that found 40% higher odds of knowing the disease among those with secondary education. Our residential findings build on the work of Baigry et al. (2023) and Thongmixay et al. (2019) on the restrictive nature of healthcare access and indicate that medical education is needed to bridge the gap created by the geographic relocation.

Socioeconomic status did reveal to carry weight as a determinant, with low knowledge among students of lower income being markedly poorer (p=0.035). This captures the worldwide trend of doctors outperforming other HCWs in Guyana (Misir, 2019) to Oman (Shah et al., 2020) where the difference was 0.46 mean. The individual documents of Joe’s Income - the WHO (2021) and CDC (2022) income-education barriers put funding context to the observation of highest scores at COMS from high income students and how economic disadvantage is aggravating through the educational funnels.

Despite gender and culture not being auxiliary parameters to COMS, the sociodemographic dimension aligns with globally known hierarchies. The 1.66x (Ljubas et al., 2024) unwillingness rate of male medical students to provide care is suggested by the lower value presented by Muslims in Lebanon as being beta = -2.56. Youssef et al. 2021. The gaps observed could have underlying religious or gender aspects. In the same way, non-heterosexual nursing students' more positive Mean attitude (4.72, Gázquez-López et al., 2025) suggests that sexual identity may cross with sociodemographic variables.

There are significant issues for COMS students, whose knowledge gaps resemble those of preclinical students, particularly regarding their lack of comprehension of anal transmission risks. This is highlighted in the study by Ljubas et al. (2024), where only 11.8% of participants reported a clear understanding of anal transmission risks.Top of Form Yet there is a suggestion through knowledge Anguilla's trained healthcare workers of 68.4% adequate knowledge (Jennie et al. 2024) that there is newer change through directed intervention.

**Conclusion**

At COMS, the sociodemographic patterns, especially the rural/urban and income based disparities, sharply define the global issues of HIV education. The international studies explain theoretical results, and they show how the sociodemographic inequalities are present even amongst prospective healthcare providers. These gaps necessitate substantial shifts in teaching approaches to provide biomedical instruction alongside advocacy for equity. Considering the rapid transmission of HIV within the MENA region (Elghazaly et al., 2023), COMS has the privilege and responsibility to implement sociodemographic-informed medical education to train practitioners. who can provide comprehensive care to patients of various backgrounds. There is a need to evaluate whether these strategies are adopted in clinical practice for different populations in the future.

The most important outcomes of this research focus on socioeconomic and geographic differences, uncovering profound gaps in HIV/AIDS education among prospective healthcare workers in Guyana. While analyzing different demographic variables, the results revealed that some sociocultural factors, notably the household income and the area where they live, accounted for the most significant and measurable gaps in knowledge.

**Limitations**

**Self-Reported Data:** This study's use of self-reported questionnaires poses risks of reporting bias. Due to social expectations, participants may have overestimated or underestimated aspects of knowledge and attitudes, which may skew the data accuracy.

**Limited Diversity in Participants:** The overwhelming majority were women (74.25%) and aged 18-25 (78.10%). This demographic gender and age homogeneity may hinder a comprehensive understanding of the role these factors play in HIV/AIDS knowledge among the wider student population.

**Recommendations**

**Targeted Educational Interventions**

Develop and implement tailored HIV/AIDS education programs that address the specific knowledge gaps identified among medical students, particularly those from rural and low-income backgrounds. These programs should focus on transmission risks, treatment options, and stigma reduction.

**Incorporate Sociocultural Contexts**

Integrate sociocultural and structural determinants (e.g., gender, religion, income) into the medical curriculum to ensure students are equipped to provide equitable care to diverse populations, including people living with HIV/AIDS (PLWHA).

**Enhance Clinical Training**

Strengthen clinical exposure and hands-on training for medical students to improve their understanding of HIV/AIDS transmission, prevention, and treatment, especially for high-risk populations.

**Address Geographic Disparities**

Expand access to sexual health education and resources in rural areas through outreach programs, mobile clinics, and partnerships with local healthcare providers.

**Combat Stigma and Discrimination**

Implement stigma-reduction initiatives within medical education and healthcare institutions to foster inclusive and non-discriminatory attitudes toward PLWHA.

**Conduct Longitudinal Studies**

Perform longitudinal research to evaluate the long-term impact of educational interventions on HIV/AIDS knowledge, attitudes, and practices among medical students and healthcare professionals.

**Policy Advocacy**

Advocate for policy changes that address socioeconomic and geographic inequalities in healthcare access, ensuring equitable distribution of resources for HIV/AIDS prevention and treatment.

**Interdisciplinary Collaboration**

Foster collaboration between medical schools, public health organizations, and community stakeholders to design and implement comprehensive HIV/AIDS education and prevention strategies.

**Evaluating Program Effectiveness**

Regularly assess the effectiveness of educational programs and interventions to identify areas for improvement and ensure they meet the needs of diverse student populations.

**Global Knowledge Sharing:**

Share findings and best practices with other medical institutions globally to contribute to the collective effort in addressing HIV/AIDS knowledge gaps and reducing health disparities.

Consent

As per international standards or university standards, Participants’ written consent has been collected and preserved by the author(s).

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Details of the AI usage are given below:

1.

2.

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