

ORIGINAL RESEARCH

Trends in Delayed Engagement for Those Living with Human Immunodeficiency Virus

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Background

Mississippi continues to experience high rates of Human Immunodeficiency Virus diagnoses. While there are national declines in Human Immunodeficiency Virus incidence, the rates in Mississippi remain unchanged. The University of Mississippi Medical Center is home to the Adult Special Care Clinic, which serves 2,450 individuals each year with a comprehensive infectious disease program, including the treatment and management of Human Immunodeficiency Virus. This study examines the factors influencing engagement in Human Immunodeficiency Virus care and provides quality improvement recommendations for physicians.

Methods

A retrospective review of 557 individuals linked to care from 2019 to 2023 was conducted. SPSS version 29 was utilized for all statistical analysis, including descriptive analysis and logistic regression. The analysis examined characteristics, risk factors, and clinical markers, insurance coverage specifically CD4 count at diagnosis and its relationship to mortality and late-stage presentation. Logistic regression analyzed predictors of late-stage diagnosis and mortality.

Results

Black/African Americans comprised 82.41% of cases, and 24.1% had an acquired immunodeficiency syndrome diagnosis (CD4 <200 cells/mm³). Older age (aOR 7.572, $p < .001$) and female gender (aOR .507, $p = .024$) were significant predictors of late-stage presentation. Acquired Immunodeficiency Syndrome diagnosis was associated with higher mortality risk (aOR 3.369, $p = .006$).

Conclusion

Improved Human Immunodeficiency Virus management involves routine screening, provider education and training, and increased pre-exposure prophylaxis access are essential to reducing health disparity and improving patient outcomes in Mississippi.

Introduction

In the United States, the incidence of HIV continues to decrease steadily. However, incidence in Mississippi has remained relatively stable. Mississippi ranks 5th for new HIV diagnoses within the 14 Southern region states.¹ Despite accounting for 35.6% of Mississippi's population, Black/African American residents accounted for 71.1% of the state's 2023 incidence of HIV diagnoses.^{2,3} In 2022, the HIV prevalence rate in the Southern United States was 466 cases per 100,000, and the HIV incidence rate was 18 cases per 100,000, compared to the US prevalence and incidence rates of 388 cases per 100,000 and 13 cases per 100,000, respectively.¹ The University of Mississippi Medical Center's (UMMC) Adult Special Care Clinic (ASCC) is the largest Ryan White-funded clinic in Mississippi, maintaining an active patient cohort of roughly 2,250 people with HIV and providing HIV services to around 2,450 individual people with HIV annually. This study examines barriers to HIV care engagement in Mississippi, identifies predictors of late-stage diagnosis, and provides physician-centered quality improvement recommendations.

Methods

CAREWare, a Health Resources and Services Administration-supported database, is used to prospectively collect data on all people with HIV who receive HIV care and services in Mississippi. The data analyzed in this study was obtained from the CAREWare database. Requested variables included HIV diagnosis date, race, gender, age at HIV diagnosis, reported HIV risk factor, insurance coverage, baseline CD4 count, vital status, and date of death if applicable. After the initial query, the medical record number of all patients with missing data elements (e.g., HIV diagnosis date, baseline CD4 count, etc.) were sent to ASCC staff who maintain the data integrity of the CAREWare database. The staff member reviewed a patient's electronic health record, extracted the missing data elements, and entered them into the CAREWare database for inclusion in the final data report, ensuring compliance with institutional privacy protocols.

The final sample included 557 individuals who received an HIV diagnosis between January 1, 2019, and December 31, 2023, and linked to care at ASCC. Descriptive statistics were used to summarize baseline characteristics. Logistic regression was performed to analyze the relationship between a baseline classification of acquired immunodeficiency syndrome and death during the review period. The model included five covariates to adjust for race, gender, reported HIV risk factor, insurance coverage, and age. SPSS version 29 was employed for all statistical analyses.⁴ This study was conducted and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational research.⁵ This study obtained approval from the UMMC Institutional Review Board (UMMC-IRB-2024-471).

Results

[Table 1](#) shows the select demographic characteristics of people who received a new diagnosis of HIV and were linked to care during the review period. Of the 557 individuals, the majority (82.41%, $n = 459$) were Black/African American, male (69.66%, $n = 388$), and reported male-to-male sexual contact as their HIV risk factor (50.6%, $n = 282$). Additionally, a quarter (24.1%, $n = 134$) were classified as having acquired immunodeficiency syndrome (AIDS), defined by an absolute CD4 count of less than 200 cells/mm³, at the time of diagnosis.

A total of 26 people included in this retrospective analysis also had a vital status of deceased and a date of death during the review period of January 1, 2019, and December 31, 2023. Over half, 57.7% ($n = 15$), of those identified as deceased were classified as having AIDS at the time of HIV diagnosis.

[Table 2](#) shows the adjusted odds ratio (*aOR*), 95% confidence intervals (CI), and significance of each variable included in the model associated with mortality. The full logistic regression model was statistically significant, $\chi^2(18) = 37.637$, $p = .004$. Of the six variables included in the model, only the absolute CD4 count at diagnosis was significant. A comparison between individuals without AIDS and those with AIDS at the time of their HIV diagnosis revealed that individuals with AIDS had higher odds of dying during the review period (*aOR* 3.369, 95% CI 1.426–7.958, $p = .006$).

Logistic regression was performed to analyze the relationship between a baseline classification of AIDS and five variables, including race, gender, reported HIV risk factor, insurance coverage, and age, displayed in [Table 3](#). In binomial logistic regression, reporting an HIV risk factor of male-to-male sexual contact was associated with a significantly decreased likelihood of being classified as having AIDS at initial diagnosis, (OR .563, 95% CI .378 – .838, $p = .005$). However, significance was lost in the adjusted model.

The final model was statistically significant, $\chi^2(17) = 62.068$, $p < .001$. Of the five variables included in the model, only age and gender added significantly to the model. [Table 3](#) shows the *aOR*, 95% CI, and the significance of each variable included in the final model. A significant increase in the likelihood of being diagnosed with AIDS and increasing age was noted, with the most significant increase found in the 55-to-64-year-old age group. Compared to individuals with HIV aged 18 to 24, those aged 55 to 64 had 7.57 times higher odds of being classified as having acquired immunodeficiency syndrome at the time of diagnosis (*aOR* 7.572, 95% CI 2.735 – 20.959, $p < .001$). Compared to males, females had 49.3% lower odds of being classified as having AIDS at the time of diagnosis (*aOR* 0.507, 95% CI 0.281 – 0.915, $p = .024$).

Table 1. Demographics of people diagnosed with HIV and linked to care at ASCC during the period of 01 January 2019 to 31 December 2023

Demographics	n=557	
	n	%
<u>Baseline Absolute CD4</u>		
CD4 < 200 cells/mm ³	134	24.057
CD4 ≥ 200 cells/mm ³	423	75.943
<u>Vital Status</u>		
Deceased at Endpoint	26	4.668
Alive at Endpoint	531	95.332
<u>Gender</u>		
Male	388	69.659
Female	153	27.469
Transgender Female	16	2.873
<u>Race</u>		
Black/African American	459	82.406
White	84	15.081
Other	14	2.513
<u>Insurance Coverage</u>		
None	144	25.853
Medicaid	109	19.569
Medicare	48	8.618
Private-Individual	169	30.341
Private-Employer	81	14.542
Other	6	1.077
<u>HIV Risk Factor</u>		
Heterosexual	256	45.961
Male to Male Sexual Contact	282	50.628
IV Drug Use	17	3.052
Other	2	0.359
<u>Age Range</u>		
18-24 years	81	14.542
25-34 years	190	34.111
35-44 years	148	26.571
45-54 years	68	12.208
55-64 years	55	9.874
≥ 65 years	15	2.693

Discussion

These findings highlight the importance of normalizing and integrating routine HIV testing into the standard of care. Individuals identified to be at-risk for HIV (e.g., younger age, higher risk sexual practices, etc.) may benefit from earlier screening and diagnosis, leading to improved outcomes. Unfortunately, individuals not identified as at-risk are not being screened. Failure to screen and diagnose increases opportunities for HIV transmission and delayed diagnosis and treatment.

Table 2. Adjusted logistic regression models examining factors associated with mortality following HIV diagnosis

		95% CI		
	aOR	Lower	Upper	p
Baseline Absolute CD4				
Absolute CD4 < 200 cells/mm ³	Referent	–	–	–
Absolute CD4 ≥ 200 cells/mm ³	3.369	1.426	7.958	.006*
HIV Risk Factor				
Heterosexual Male	Referent	–	–	–
Male-to-Male Sexual Contact	1.832	.570	5.891	.310
IV Drug Use	.000	.000	.	.998
Other	.000	.000	.	.999
Insurance Coverage				
None	Referent	–	–	–
Medicaid	1.922	.549	6.727	.306
Medicare	.510	.090	2.882	.446
Private-Individual	.841	.230	3.076	.794
Private-Employer	.395	.068	2.298	.301
Other	.000	.000	.	.999
Gender				
Male	Referent	–	–	–
Female	1.897	.591	6.084	.282
Transgender Female	2.748	.265	28.470	.397
Race				
Black/African American	Referent	–	–	–
White	.371	.081	1.700	.202
Other	1.739	.179	16.854	.633
Age Range				
18-24 years	Referent	–	–	–
25-34 years	.000	.000	.000	.997
35-44 years	.271	.021	3.498	.317
45-54 years	.864	.078	9.528	.905
55-64 years	1.129	.099	12.834	.922
≥ 65 years	2.150	.206	22.459	.522

aOR= adjusted odds ratio, CI confidence interval. Bolded *p* value=significant at *p* < .05

The Affordable Care Act (ACA) expanded access to HIV screening. Under the ACA which follows recommendations from the U.S. Preventive Services Task Force (USPSTF), most health insurance plans are required to cover screening for sexually transmitted infections, including HIV, without additional cost-sharing.⁶ Additionally, HIV pre-exposure prophylaxis (PrEP) is also a covered preventive service per the ACA. Although Mississippi remains a Medicaid non-expansion state, many at-risk individuals can gain access to screening for sexually transmitted infections to access pre-exposure prophylaxis coverage through the Mississippi Medicaid Family Planning Waiver.⁷

Table 3. Adjusted logistic regression models examining factors associated with baseline AIDS classification at diagnosis

	<u>aOR</u>	<u>95% CI</u>		<u>p</u>
		<u>Lower</u>	<u>Upper</u>	
<u>HIV Risk Factor</u>				
Heterosexual	Referent	–	–	–
Male-to-Male Sexual Contact	0.646	0.378	1.105	0.111
IV Drug Use	0.143	0.017	1.195	0.073
Other	2.087	0.12	36.242	0.613
<u>Insurance Coverage</u>				
None	Referent	–	–	–
Medicaid	1.436	0.736	2.799	0.289
Medicare	1.26	0.526	3.019	0.604
Private- Individual	1.071	0.587	1.953	0.823
Private- Employer	1.569	0.786	3.133	0.202
Other	2.293	0.328	16.015	0.403
<u>Gender</u>				
Male	Referent	–	–	–
Female	0.507	0.281	0.915	0.024
Transgender Female	0.803	0.169	3.824	0.783
<u>Race</u>				
Black/African American	Referent	–	–	–
White	0.796	0.428	1.481	0.472
Other	1.28	0.344	4.764	0.713
<u>Age Range</u>				
18-24 years	Referent	–	–	–
25-34 years	1.713	0.703	4.173	0.236
35-44 years	4.271	1.764	10.342	.001*
45-54 years	6.369	2.402	16.891	<.001*
55-64 years	7.572	2.735	20.959	<.001*
≥ 65 years	7.058	1.63	30.567	.009*

aOR= adjusted odds ratio, CI confidence interval. Bolded *p* value=significant at *p* <.05

The Mississippi State Department of Health has accomplished tremendous work expanding access to HIV testing services through collaborative partnerships. However, receipt of testing through these collaborative organizations may be stigmatizing for older individuals.⁸ Mississippi physicians, especially those providing primary and preventive care services, are essential to ending the HIV epidemic.

Integrating several practices into primary and preventive healthcare environments is necessary to ensure that Mississippians know their HIV status and are expeditiously linked to appropriate HIV care if applicable. The following recommendations may alleviate physicians' discomfort associated with the discussion of sexual health, reduce the stigma associated with HIV screening, and improve long-term health outcomes.⁸

Adoption of universal/opt-out HIV screening. The universal/opt-out HIV screening approach allows the provider to notify the patient they will be conducting HIV testing unless the patient refuses. This method can be especially effective in primary and preventive health practices where patients are present for annual wellness exams. Adoption of this approach can normalize the concept of routine HIV testing as part of preventive/primary care, decreasing discomfort that may be associated with the perception of risk. Universal HIV screening should be a proactive clinical consideration in all healthcare settings, with physicians recognizing that transmission risk factors exist throughout the life course. Given the long latency between infection and immunocompromise, routine screening, especially in older adults, can facilitate the reduction of late-stage diagnoses. Screening should be expanded to all settings where patients receive care, such as home health services and emergency departments, to ensure comprehensive access.

Integration of routine clinical discussion of sexual health and substance use. Routine discussion of sexual health and substance use allows for the identification of HIV risk, but also other patient concerns that impact treatment adherence and quality of life, such as erectile dysfunction.⁸ Evaluation of substance use may identify behaviors that impact long-term health and decrease inhibition, which may increase the risk of HIV infection. Integrating routine evaluation and discussion of these two sensitive but important aspects of care can strengthen the patient-provider relationship by increasing patient trust and allowing the physician to provide the most appropriate care by utilizing accurate information.

Recognition and response to HIV indicator conditions. Physicians' and practitioners' familiarity with HIV indicator conditions can prompt HIV testing, expediting diagnosis and linkage to specialty care. Physicians are often familiar with AIDS-defining conditions but are less likely to identify HIV indicator conditions.⁹ These indicator conditions are associated with HIV infections resulting from immunodeficiency. Common presentations in primary and preventive practices include intractable seborrheic dermatitis or psoriasis, chronic diarrhea, cervical or vaginal intraepithelial neoplasia, fever of unknown origin, and any unexplained blood dyscrasia, lymphadenopathy, or retinopathy. Given the polysystem manifestations of HIV/AIDS and the low risk and expense of testing, HIV screening is reasonable in the clinical evaluation of almost all new unexplained symptoms, even in those without apparent HIV risk factors.

Awareness of HIV pre-exposure prophylaxis (PrEP) and available resources. PrEP is a low-risk and straightforward preventive measure that reduces the risk of HIV infection when taken as prescribed. Although PrEP falls within the scope of primary and preventive medicine, physicians may be reluctant to initiate conversations about or prescribe PrEP. The reasons

surrounding this reluctance are varied. However, physicians can play a crucial role in increasing access by familiarizing themselves with organizations that provide PrEP services.

Limitations

While this study adds to the growing body of research on the clinical care of individuals with HIV, limitations exist. First, it is susceptible to selection bias because it only included individuals who were diagnosed and then linked to care at ASCC. Therefore, these findings may not be reflective of people with HIV who have not yet been diagnosed or those who were diagnosed and subsequently linked to care at other HIV clinics in Mississippi. Additionally, while our analysis includes mortality data, we cannot determine whether deaths were directly attributable to HIV-related outcomes. The presence of a severely compromised immune system impacts a patient's overall health status, increasing vulnerability to opportunistic infections, chronic disease progression, and other health complications. The lack of cause-of-death data limits our ability to distinguish between HIV-specific mortality and deaths due to other comorbidities.

Although ASCC deploys multiple strategies to ensure the integrity of all data collected in the CAREWare database, we must acknowledge the potential for information bias that is characteristic in retrospective study designs. Stigma and recall limitations may have influenced the accuracy of reported risk behaviors, which could impact the completeness and reliability of the data. Additionally, unmeasured confounding variables, such as socioeconomic status and healthcare access barriers, may influence an individual's likelihood of receiving a late-stage HIV diagnosis. Future research should adopt prospective study designs that include a broader population to improve generalizability and address these limitations.

Conclusions

Mississippi continues to experience high rates of new HIV diagnoses. Advances in prevention strategies and increased access to testing provide powerful tools to decrease HIV transmission and improve health outcomes. However, these tools are rendered useless if they are not utilized. Physicians must remain cognizant of Mississippi's current HIV epidemic and use that knowledge to provide holistic, individualized patient care.

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Conflicts of Interest

Thomas Dobbs, MD, MPH, serves on the editorial board of the JMSMA but was not involved in any of the decisions regarding review of the manuscript or its acceptance.

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