Changes In Demographics and Risk Factors Among Persons Living With HIV In an Academic Medical Center From 2003-2007

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National epidemiological data indicate that the HIV epidemic in the United States has been continually changing since its initial recognition in 1981. There has been no decrease in the incidence of HIV infection in the US for over a decade, and over 55,400 individuals were newly infected with HIV in the US in 2007. Of these new infections, 62% contracted their infection through sex with other men (MSM) compared with 44% a decade ago.2,3 Gradual annual increases in the proportion of incident infections in women in the US have been observed for the past 15 years, with the great majority acquired via heterosexual contact. During this period, the number of HIV infections attributable to injection drug use (IDU) for both men and women dramatically declined, with estimates of a 42% overall reduction between 1994 and 2000 and continued decreases in many areas through 2007. There has been no significant improvement in the early diagnosis of HIV among newly infected individuals, either nationally or in Rhode Island, since the 1990s.6

The Samuel and Esther Chester Immunology Center at The Miriam Hospital track changes in demographics, risk factors, and clinical markers in order to evaluate the changing environment, and accessibility and adherence to care in the Rhode Island community. The Immunology Center, located on the campus of The Miriam Hospital (TMH), is the largest HIV care provider in Rhode Island, with roughly 1,200 active HIV/AIDS patients in 2007, greater than 75% of the total known HIV/AIDS cases in the state. The proportion of Rhode Islanders known to be living with HIV who receive care at the Immunology Center has been consistently between 75 and 80% from 2003 through 2008.

Created in 1987, the Center was originally designed to fill a gap in care for HIV-positive women; but the composition of the clinic has gradually shifted to reflect the statewide epidemic. The Center now offers comprehensive health care for all Rhode Islanders living with HIV. Since 1994, a federal Ryan White Part C (Title III) grant has supported primary care and early intervention services. The Center provides multiple supportive services onsite including free HIV counseling and testing (rapid blood and oral antibody testing), social services, laboratory testing, antiretroviral adherence training, limited psychiatric care, viral hepatitis testing and treatment, and a substance use treatment referral system. It has served as the base site for past and current controlled clinical trials through the NIH AIDS Clinical Trials Group, and the USPHS Centers for Disease Control and Prevention.

Materials and Methods

Study Design

This evaluation examines data from the Immunology Center database (ICDB) for patients actively receiving care at the Immunology Center between January 1, 2003, and December 31, 2007. The ICDB system was created with funding from the NIH-supported Lifespan/Tufts/Brown Center for AIDS Research (LTBCFAR). This system was designed after visiting several other CFARs, which had created electronic database systems that facilitated clinical research and enhanced the medical management of HIV/AIDS patients. This database, updated daily, assists physicians in patient management and enables researchers to access clinical data. At each visit, clinicians use the data base, allowing them to make corrections promptly.

The 18 physicians who provide HIV care for patients in the Immunology Center provide the patients’ histories of treatment, laboratory results, and antiretroviral regimens, as well as other clinical and risk factor information.

Target Population

The Immunology Center provides care to any Rhode Island adult with HIV, and has targeted women, minorities, ex-offenders, and substance users for its services. For detailed analyses, we organized patients into four groups: Baseline group: all active patients who were enrolled and active in care on January 1, 2003 are included in the Baseline group. Exiting group: patients who died, moved away, transferred care or were lost-to-follow-up during each year (2003 to 2007). Entering group: all newly diagnosed patients registering to receive care from the Immunology Center, patients transferring care from another provider, and patients who were reactivated into care. Patients newly diagnosed for a specific year are defined as patients who were registered at the Immunology Center within that calendar year and who had been diagnosed with HIV within the previous twelve months. The “newly registered but not newly diagnosed” patients have transferred their care to the Center from any other medical facility and were diagnosed more than twelve months before registration date at the Immunology Center. Reactivated patients were discharged from the Immunology Center before 2003 and were reactivated during the time of the study. The End Group includes all patients alive, active, and in-care at the end of 2007.

Patient data for each year of the study period were aggregated and contingency table analyses were performed to compare demographics and HIV related risk behaviors. Contingency table analyses were also used to assess potential differences in important demographic characteristics. All 95% confidence intervals (CI) and associated p-values for the observed categorical, dichotomous outcomes were calculated using Cochrane-Mantel-Haenszel (CMH) chi-square tests. For variables that are not dichotomous (have more than two outcome levels and values in each cell are not large), Fisher Exact tests were used to examine statistical significance. Continuous variables were tested using Cochrane and Cox (1950) approximations examining whether the mean or median values of any two groups differ significantly. All tests are two-sided and p-values <= 0.05 were con-
considered statistically significant. To investigate trends/association between the specific years and different covariates, normal chi-square tests were performed and score tables were used to analyze the trend/associations. All statistical analyses were performed using SAS version 9.1. The Miriam Hospital Institutional Review Board (IRB) approved all aspects of this study.

**RESULTS**

Table 1a presents overall demographic data for the total number of active patients for 2003 to 2007. The clinic population has not changed significantly over the five-year period with respect to gender, race/ethnicity or age. However, important differences have occurred in the modes of transmission. (Table 1b). The proportion of transmissions via IVDU decreased significantly in both men and women from 2003 to 2007, while the proportion of sexual transmissions (including both MSM and heterosexual transmission in men) increased in both men and women. The risk factor data reported here are based on self-reports by the patients during their intake interviews with social workers.

Table 2a presents the demographic data for all newly diagnosed patients. The proportion of newly diagnosed non-Hispanic white patients increased significantly during that time period. The observed sharp increase in total HIV cases in 2004 may have been influenced by the introduction of rapid testing to the community by the largest AIDS Service Organizations (ASOs) in the greater Providence area. The proportion of AIDS diagnoses at entry into care at The Immunology Center rose from 28% to 37% during 2002-2007.

Table 2b presents transmission modes by gender of all newly diagnosed patients. A significant change has occurred in the mode of transmission for newly diagnosed women from 2003 to 2007. Prior to 2003, one third of Rhode Island women living with HIV had acquired the infection via IV drug use. Since 2003, women have seldom acquired HIV by this route. Since 2005, no newly diagnosed woman has had history of exposure by any route other than heterosexual sex.

Tables 3a and 3b provide CD4 categories (CD4 < 200, CD4 between 200 and 350, and CD4 > 350) and median CD4 values for existing and newly diagnosed patients each year of the study period. A CD4 count of <200 meets the CDC criteria for the diagnosis of AIDS. The median CD4 of the total clinic population gradually increased between 2005 and 2007. As anticipated because of the effectiveness of antiretroviral therapy, median CD4 counts among newly diagnosed patients were generally lower than CD4 counts among patients already in care at the Immunology Center, with the largest difference (110 cells/µL) observed in 2007 (p= 0.001).

Table 3b shows the CD4 counts of newly diagnosed patients by gender. In 2007, nearly 40% of both women and men entering into care met the CDC criteria for the diagnosis of AIDS, indicating an increasing delay in diagnosis and entry into care of Rhode Islanders living with HIV infection.

Overall, there were remarkably few differences between the Baseline and the End groups in relation to age, partnership status, primary language spoken and age at diagnosis. With respect to insurance status, more clinic patients had private insurance at the end of 2007 than in 2003 (22% vs. 32%). The proportion of patients receiving Ryan White Part C funded free care more than doubled during this period.

**DISCUSSION**

The changes observed in the HIV epidemic in Rhode Island are generally similar to nationwide changes. Among new infections, African Americans and Hispanics accounted for 46% of all new HIV cases in Rhode Island despite the fact that these two groups comprise only 14% of the state's total population. Nationally, the CDC estimates that 67% of all new HIV infections in 2006 were among African Americans and Hispanics. With respect to new registrations in the Immunology Center at The Miriam Hospital, the proportion of African American patients remained relatively stable, while the
The proportion of Hispanic patients increased steadily between 2003 and 2007.

The risk factors are self-reported at clinic intake. Some patients changed, or added to, the list of risk factors they initially reported. A number of men initially reported only heterosexual contact as their risk factor at the first interview, but later indicated that they were engaged primarily in MSM sexual contact. Initial reluctance to report MSM behavior may be attributed to cultural stigma. We observed a substantial increase in the number of new MSM clinic patients during the past three years reflects a substantial change in the HIV epidemic in Rhode Island. From the 1980s through the early 1990s, 50% of all new HIV infections in the state were attributable to IDU. Since 2000, with the development of clean needle exchange laws, injection drug use (IDU) as a primary risk factor for HIV transmission in Rhode Island has decreased markedly. The decline in incident HIV cases attributable to IDU has been well documented in other states as well. MSM has become the major risk factor among men for acquiring HIV infection in Rhode Island.

While evidence suggests that MSM sexual risk behavior has decreased in certain regions in the US in recent years, this has not been the case in Rhode Island. In a recent population based, cross sectional community health survey conducted in New York City, 60% of MSM reported not using a condom during the last sexual encounter. Marks et al report that among a total sample of 2,205 MSM of color recruited from three urban areas in the US between 2005 and 2006, nearly one in four HIV positive MSM had engaged in risky sexual behavior with at least one partner.

While many individuals living with HIV infection in the US have greatly benefited from advances in highly active antiretroviral therapy (HAART), data from Baltimore indicate that many persons initially presenting with HIV infection have a greater severity of immunocompromise in recent years of the epidemic. In Rhode Island, a greater severity of HIV disease was observed in newly diagnosed women over the past five years, but not in men.

### Limitations

While our data are from the Immunology Center, which provides care to over 75% of Rhode Islanders living with HIV, the data may not be generalizable to all HIV clinical settings in the state. Our database records only those risk factors which are self-reported at the time of clinic intake. Data from patients who later report additional risk factors are not presently captured in our Center database.

### Conclusion

The CDC estimates that over 250,000 people living with HIV/AIDS in the US are either: 1) unaware of their status and therefore are not receiving care and/or HIV treatment; 2) are aware of their status but not receiving HIV care. In the Immunology Center in 2007, 26 patients had advanced to AIDS at time of diagnosis: 48% were non-Hispanic white, 38% were non-Hispanic black and 14% were Hispanic. Among Rhode Island women newly diagnosed in 2007, 39% had progressed to AIDS by the time of diagnosis; reflecting the fact that most women had not been tested earlier, because they were not aware that they had been exposed to a partner living with HIV infection. These data indicate the urgent need for a more effective statewide opt-out HIV screening program, an approach recommended by the CDC.
Table 3a: CD4 levels of Existing versus Newly Diagnosed patients by Year

<table>
<thead>
<tr>
<th>CD4 Cell Count Range</th>
<th>2003</th>
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<td>Existing patients</td>
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<tr>
<td>% &lt;200</td>
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<td>17</td>
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<tr>
<td>% 200-350</td>
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<td>24</td>
<td>25</td>
<td>22</td>
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<td>59</td>
<td>59</td>
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<td>Median CD4 cell count</td>
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<td>432</td>
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<td>Newely diagnosed</td>
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Table 3b: CD4 Levels of Newly Diagnosed Patients by Gender

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<tr>
<td>% 200-350</td>
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<td>21</td>
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<td>Median CD4 cell count</td>
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<td>306</td>
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<tr>
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<tr>
<td>% &lt;200</td>
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<td>% &gt;350</td>
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<td>Median CD4 cell count</td>
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REFERENCES


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Disclosure of Financial Interests

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Fizza S. Gillani, PhD, Nickolas D. Zaller, PhD, Kimberly Zeller, MD, Josiah D. Rich, MD, and Charles CJ Carpenter, MD, have no financial interests to disclose.

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