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Role of gay neighborhood status and other neighborhood factors in racial/ethnic disparities in retention in care and viral load suppression among men who have sex with men, Florida, 2015

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Abstract

This study's objective was to examine the role of gay neighborhood residence and other neighborhood factors in racial/ethnic disparities in retention in HIV care and viral load suppression during 2015. Florida residents diagnosed 2000–2014 with HIV infection and with transmission mode of men who have sex with men (MSM) were included in multi-level logistic regression models. Of 29,156 MSM, 29.4% were not retained and 34.2% were not virally suppressed. Non-Hispanic Blacks (NHB) had a higher likelihood of not being retained (adjusted prevalence ratio [aPR]=1.31, 95% confidence interval [CI] =1.24–1.38, p value<0.0001) and not being virally suppressed (aPR=1.82, 95% CI=1.67–1.98, p value<0.0001) compared with non-Hispanic Whites (NHW). Among NHBs, rural residence was protective for both outcomes. Although gay neighborhood residence was not associated with either outcome, the role of other neighborhood factors suggests that individual and neighborhood barriers to HIV care and treatment should be addressed among MSM.

Keywords

retention in care; viral suppression; MSM; racial/ethnic disparities; gay neighborhood residence

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Compliance with Ethical Standards

Conflict of Interest: The authors have no conflicts of interest to report.

Ethical approval: The Florida International University Institutional Review Board (IRB) approved this study and the Florida Department of Health IRB designated this study to be non-human subjects research. This study used de-identified HIV surveillance records of Florida residents. Informed consent was not required for this secondary data analysis.

INTRODUCTION

Over 1.1 million people over 13 years old were living with human immunodeficiency virus (HIV) in the United States (US) at the end of 2014 (1). Among these people, 76.9% were male, and of the men, 72.3% had infections attributed to male-to-male sexual contact (1). Gay, bisexual, and other men who have sex with men (MSM) make up approximately 2% of the population of the United States (US), but comprised 70% of new HIV infections during 2015 (2). Non-Hispanic Black (NHB) and Hispanic MSM, who belong to both a racial/ethnic and sexual minority group, have been disproportionately affected by HIV (3). During 2016, 38.5% of MSM with new HIV infections were Black, 27.9% were Hispanic, and 27.8% were White (4). Among young people, Black and Hispanic MSM are also overrepresented. During 2016, 14.0% of all MSM with new HIV infections were 13–24 year-old Blacks, 6.3% were 13–24 year-old Hispanics, and 4.1% were 13–24 year-old Whites (4).

Neighborhood factors, including gay neighborhoods, have been associated with HIV infection. Gay neighborhoods can be defined as visible places within a city that have residences composed of a higher proportion of gay men, businesses owned by or supportive of gay men, and provide a center for social life, all of which fosters a sense of community for gay men (5). Of the few studies that have assessed the effect of gay neighborhood residence on HIV risk behaviors, the findings vary in terms of risk and protective factors (5). Neighborhood gay presence, defined by percent of households headed by same-sex partners in the 2000 US Census, was found to be a protective factor in New York City (NYC) for consistent condom use during insertive and receptive anal intercourse, possibly due to men perceiving greater risk and taking protective measures in response to their environment (6). In contrast, two other studies in NYC had different findings. One found that using drugs to enhance sexual experiences was associated with living in a gay neighborhood (7), and another found that methamphetamine and ecstasy use, having networks composed mainly of other gay men, and increased socialization with gay men were associated with living in a gay neighborhood (8). Both studies defined gay neighborhoods using the percentage of male same-sex partner households from the 2010 US Census and ethnographic social mapping (7, 8). In South Florida, methamphetamine use, elevated rates of unprotected anal intercourse, and low levels of social engagement were found to be risk factors associated with living in a gay neighborhood, defined as living in one of the zone improvement plan (ZIP) codes comprising Wilton Manors, Florida, which was named the “second gayest city” in the US based on data from the 2010 Census (5, 9). The proposed mechanisms for increased risk behaviors in gay neighborhoods in these three studies include neighborhoods shaping sexual behaviors via social networks, and that residence in a gay neighborhood could be associated with greater risk of drug use due to community norms that promote unhealthy activities (5, 7, 8). All the above-mentioned studies of gay neighborhood residence have mainly looked at outcomes related to drug use or risky sexual behaviors that facilitate HIV transmission; none has examined the HIV care continuum.

Neighborhoods, including gay neighborhoods, can also be a source of social support (10). Disclosure of HIV status to more social network members was associated with greater retention in care in a study among Hispanic and NHB MSM in Los Angeles County (11).

Worse outcomes for retention in care have been noted in people with higher levels of stigma among MSM, and interventions that help HIV-infected individuals disclose their status to more members of their social network may improve retention in HIV medical care (11). Black and Hispanic MSM participants of the Multicenter AIDS Cohort Study reported lower social support than White counterparts (12). Medium and high social support levels were associated with greater viral load suppression in that study (12). Thus, it has been suggested that Black and Hispanic MSM could benefit from interventions that improve social support (12). A study using state-level data found that living in states with a higher density of lesbian, gay, bisexual, and transgender persons was associated with lower AIDS diagnosis rates among MSM (13). This finding suggests that these communities might be protective for MSM by providing greater social support and increased resource availability (13). If MSM live in an environment with higher levels of social support, such as a gay neighborhood, health outcomes could potentially be improved and disparities reduced. Gay neighborhoods may act as a safe space for MSM and could be a place for targeted outreach for HIV prevention and for interventions along the HIV care continuum.

Other neighborhood characteristics have been associated with HIV. Low and very low socioeconomic status was associated with not being virally suppressed in a study conducted between 2004 and 2013 in Tennessee (14). In New England, the risk of mortality was higher among rural patients with HIV infection compared to urban residents and remained so after adjusting for age, sex, race, HIV risk factors, year of diagnosis, travel time, lack of insurance, and receipt of antiretroviral treatment among patients seen between 1995 and 2005 (15). A South Carolina study conducted between 2005 and 2012 among HIV infected adults found that rural residence was associated with lower mean viral load difference between the baseline and the last measurement in the dataset (16). Among patients of an STD clinic in North Carolina, higher levels of racial residential segregation were associated with not being tested for HIV during 2003 (17). Risky sexual behavior was associated with neighborhoods with high concentrations of NHBs and accumulation of NHBs living in urban areas in the US (18).

The HIV care continuum consists of HIV diagnosis, linkage to care, retention in care, and viral load suppression (19). Among MSM, retention in care and viral suppression has been lower among NHBs than other racial/ethnic groups (2, 20–22). Racial/ethnic disparities in HIV outcomes could be reduced with increased efforts at each step of the HIV care continuum, resulting in improved survival and reduced transmission of HIV to others (21). The US National HIV/AIDS Strategy, updated to 2020, calls for the percentage of newly diagnosed persons retained in HIV medical care to increase to at least 90% and viral suppression to increase to at least 80% (23). It also seeks to intensify HIV prevention efforts and reduce HIV-related disparities in communities where HIV is most concentrated (23). The US National HIV/AIDS Strategy also highlights the high burden of HIV among MSM of all races/ethnicities, with a particular emphasis on reducing new HIV infections among Black MSM (23). Therefore, the purpose of this study was to examine the role of neighborhood-level factors, including gay neighborhood status, in explaining racial/ethnic disparities in retention in care and viral load suppression among individuals with mode of HIV transmission listed as MSM and MSM/injection drug use (IDU) in Florida.

METHODS

Study Population

Data included de-identified records of Florida residents age 13 and older who were diagnosed with HIV infection during 2000–2014, had a mode of HIV transmission listed as MSM or MSM/IDU, and were reported to the Florida Department of Health (DOH) enhanced HIV/AIDS Reporting System (eHARS), a passive and active surveillance system that uses the Centers for Disease Control and Prevention (CDC) HIV case definition (24–28). Data in eHARS are sourced primarily from health care provider reports, laboratory reports, and data extracted from medical records by county health department staff. Those whose most recent address was not in Florida and those who died before 2015 were excluded from the analysis.

Individual-level Variables

Individual-level variables from eHARS included year of HIV diagnosis, year of AIDS diagnosis (if applicable), year of death (if applicable), age at HIV diagnosis, race/ethnicity, country of birth, mode of HIV transmission, retention in HIV care during 2015, viral load suppression during 2015, current ZIP code, current state, and whether the person was diagnosed in a correctional facility. Race/ethnicity data were classified into four groups: non-Hispanic Blacks (NHBs), non-Hispanic Whites (NHWs), Hispanics, and “other.” “Other” race was excluded as it was small (n=662) and heterogeneous (multiracial [n=404], Asian [n=186], Native Hawaiian/Pacific Islander [n=43], and American Indian [n=29]).

Retention in HIV care during 2015 was defined as engagement in care two or more times, separated by at least three months, during 2015. Engagement in care was defined by the Florida DOH as having at least one documented viral load or CD4 laboratory test, prescription pickup through the AIDS Drug Assistance Program (ADAP), or physician visit documented in one of the Ryan White Program databases during 2015. Viral load suppression in 2015 was defined as a viral load less than 200 copies per milliliter for the last laboratory test performed in 2015, and it was examined for only those engaged in care at least once during 2015.

Neighborhood-level Variables

The US Census Bureau’s 2009–2013 American Community Survey (ACS) was used to obtain neighborhood-level data using zone improvement plan (ZIP) code tabulation areas (ZCTAs) (29). ZCTAs are used by the US Census Bureau to tabulate summary statistics and approximate US postal service ZIP codes by aggregating Census Bureau blocks based on the ZIP code of addresses in these blocks (30).

The percent of households that are composed of male-male unmarried partners within each ZCTA in the 2009–2013 ACS was used to classify neighborhoods as “gay” or “not gay”. There is no standard definition of gay neighborhoods; however, the percent of households that are male-male unmarried partners has been used in other studies (6–8). The range of the percent of households that are composed of male-male unmarried partners in the Florida ZCTAs was 0.0% to 8.1%. After examining the distribution of the data, a break was noted at

the 99th percentile. Thus, if the percent of households that are composed of male-male unmarried partners was greater than or equal to 1%, the neighborhood was classified as "gay" in this study. Otherwise, it was classified as "not gay."

Thirteen neighborhood-level socioeconomic (SES) indicators were obtained from the 2009–2013 ACS for all Florida ZCTAs (29). An SES index of Florida neighborhoods (ZCTAs) were calculated using methods previously developed (31, 32) and detailed here. The index included percent of households without access to a car, percent of households with ≥1 person per room, percent of population living below the poverty line, percent of owner-occupied homes worth ≥$300,000, median household income in 2013, percent of households with annual income <$15,000, percent of households with annual income ≥$150,000, income disparity (derived from percent of households with annual income <$10,000 and percent of households with annual income ≥$50,000), percent of population age ≥25 with less than a 12th grade education, percent of population age ≥25 with a graduate or professional degree, percent of households living in rented housing, percent of population age ≥16 who were unemployed, and percent of population aged ≥16 years employed in high working-class occupation (ACS occupation group: managerial, business, science, and arts occupations). Income disparity was calculated as the logarithm of 100 times the percent of households with annual income less than $10,000 divided by the percent of households with annual income greater than or equal to $50,000 and was used as a proxy for the Gini coefficient. All neighborhood-level indicators were coded so that higher scores corresponded with higher SES; they were then standardized. To calculate the SES index, a reliability analysis was first conducted. Cronbach's alpha for all 13 indicators was 0.93. Seven indicators were selected based on the correlation of the indicator with the total index (high correlation), and Cronbach's alpha if the item was deleted (low alpha). The other six indicators were not included because the coefficients were lower than 0.7 (32). The seven indicators selected were percent below poverty, median household income, percent of households with annual income <$15,000, percent of households with annual income ≥ $150,000, income disparity, percent of population age ≥25 with less than a 12th grade education, and high-class work. The resulting Cronbach's alpha increased (0.94). Second, a principal component analysis was conducted with and without varimax rotation, which revealed one factor with an eigenvalue greater than the cutoff value of one (5.14). This factor accounted for 73.5% of the variance in the indicators. Because all the factor loadings were high (between 0.80 and 0.93), all seven indicators were retained in the final index. Finally, the standardized scores for the seven variables were added and the scores were categorized into quartiles.

Rural/urban status of the ZIP code was based on categorization C of Version 2.0 Rural-Urban Categorization (RUCA) data codes (33, 34). The percentage of NHB population within each ZCTA was used to measure racial composition (35–37). The percent NHB population was grouped into three categories: <25%, 25–49%, and ≥50% (35).

Analysis

Individual- and neighborhood-level data were merged by matching the current ZIP code of each case in eHARS with the ZIP code's corresponding ZCTA. Individual- and

neighborhood-level characteristics were compared by race/ethnicity, and then by retention in care and viral load suppression status. The Cochran-Mantel-Haenszel general association statistic for individual-level variables controlling for ZCTA and the chi-square test for neighborhood-level variables were used. Crude prevalence ratios (PR), adjusted prevalence ratios (aPR), 95% confidence intervals (CI), and p values for not being retained in care in 2015 and not being virally suppressed during 2015 were estimated. Multi-level (Level 1: individual; Level 2: neighborhood) logistic regression modeling was used to account for correlation among cases living in the same neighborhood.

To estimate the contribution of individual and neighborhood factors on racial/ethnic disparities, crude PRs were estimated (Model 1), followed by PRs adjusted for individual factors (Model 2), PRs adjusted for individual factors and SES index, rural/urban status, and percent NHB population (Model 3), PRs adjusted for both individual and neighborhood factors plus gay neighborhood residence (Model 4), and PRs adjusted for both individual and all neighborhood factors plus an interaction term for race/ethnicity and US/foreign-born statuses (Model 5). Model 4 was then stratified by race/ethnicity. Prevalence ratios were adjusted for year of HIV diagnosis, age group, US/foreign-born status, mode of HIV transmission, whether the person met the AIDS case definition by December 31, 2015, neighborhood socioeconomic status (index of seven indicators), rural/urban status, percent NHB in the neighborhood, and gay neighborhood residence. Version 9.4 of SAS software was used to conduct analyses (38). The GENMOD procedure with binomial distribution and log link function was used for the multi-level modeling for not being retained in care in 2015 and not being virally suppressed in 2015. The hypothesis was that gay neighborhood residence would be associated with higher retention in care and viral suppression. The Florida International University Institutional Review Board (IRB) approved this study, and the Florida Department of Health IRB designated this study to be non-human subjects research.

RESULTS

Study Participant Characteristics

There were 41,152 HIV cases reported in Florida between 2000 and 2014 among people with a reported mode of HIV transmission of MSM or MSM/IDU. Of those cases, 4,522 (11.0%) had moved out of state; 2,772 (6.7%) had a missing or invalid current ZIP code or lived in a ZIP code with a total population of zero according to ACS estimates; 2,735 (6.6%) died prior to January 1st, 2016; 1,304 (3.2%) were diagnosed in a correctional facility; 662 (1.6%) were classified as “other” race; and one (0.002%) had missing data on retention in care during 2015.

Of the 29,156 people remaining in the final dataset after exclusions, 40.1% were NHW, 31.0% were Hispanic, and 28.9% were NHB (Table I). The highest proportion of people were in the 25–49 age group (69.8%) (Table I). The majority of individuals lived in non-gay neighborhoods (78.3%) (Table I). The group with the highest percentage of people living in gay neighborhoods was NHWs (29.8%), followed by Hispanics (21.5%) and NHBs (10.6%) (Table I). The majority of NHBs (50.1%) lived in the lowest SES quartile compared with 35.3% of Hispanics and 19.4% of NHWs (Table I).

Living in gay neighborhoods was more common among people living in urban areas compared with rural areas (21.8% and 18.2% respectively) (data not shown in table). Of residents in the lowest SES quartile, 10.6% lived in gay neighborhoods. In the second lowest SES quartile, 25.2% lived in gay neighborhoods. In the third lowest SES quartile, 34.2% lived in gay neighborhoods, and in the highest SES quartile, 18.3% lived in gay neighborhoods (data not shown in table).

Of all the ZCTAs in Florida, 4.3% were classified as gay (percent of households that are composed of male-male unmarried partners was greater than or equal to 1%). Of those ZCTAs with any HIV cases, 4.5% were classified as gay in this study (data not shown in table).

Racial/Ethnic Disparities in Retention in HIV Care During 2015

Overall, 29.4% of the cohort was not retained in care in 2015 (Table I). The highest percentage of people not retained in care was among NHBs (34.2%), followed by Hispanics (28.8%) and NHWs (26.5%) (Table I). Non-Hispanic Blacks had a higher likelihood of not being retained in care (aPR=1.31, 95% CI=1.24–1.38, p value<0.0001) compared to NHWs after adjusting for available individual- and neighborhood-level factors (Table II, model 4). Gay neighborhood status was not associated with being retained in care for the entire group (Table II). An interaction between US born status and race/ethnicity was observed. Among US born, Hispanics had a higher likelihood of not being retained in care compared with NHWs (aPR=1.10, 95% CI=1.02–1.18, p value=0.0087) while among foreign born, Hispanics had a lower likelihood of not being retained in care compared with NHWs (aPR=0.89, 95% CI=0.82–0.98, p value=0.0180) (Table II, model 5). The NHB to NHW aPR were significant for US-born and foreign-born, but the confidence intervals overlapped (Table II, model 5).

When stratifying by race/ethnicity, NHBs living in rural relative to urban areas had a lower likelihood of not being retained in care (Table III). Gay neighborhood status was not associated with being retained in care for any racial/ethnic group (Table III). Among NHBs and NHWs, being US compared to foreign born was protective (Table III). Older age was protective for all racial/ethnic groups (Table III).

Racial/Ethnic Disparities in HIV Viral Load Suppression During 2015

Overall, 14.4% of those engaged in care were not virally suppressed (Table I). This percentage was highest among NHBs (24.8%), followed by Hispanics (11.0%) and NHWs (10.0%) (Table I). Non-Hispanic Blacks and Hispanics had a higher likelihood of not being virally suppressed compared to NHWs even after controlling for available individual- and neighborhood-level factors (NHB: aPR=1.82, 95% CI=1.67–1.98, p value<0.0001; Hispanic: aPR=1.13, 95% CI=1.02–1.24, p value=0.0152) (Table II, model 4). Although the Hispanic to NHW aPR was significant among the US born but not the foreign born, the confidence intervals overlapped for the interaction between race/ethnicity and US born status (Table II, model 5). The NHB to NHW aPR was significantly elevated for both US born and foreign born (Table II, model 5).

When stratifying by race/ethnicity, rural compared to urban residence was a protective factor for viral suppression among NHBs (Table IV). Gay neighborhood residence was a protective factor for viral suppression in the crude model, but was not significant in the adjusted models (Table II, model 4) or when stratifying by race/ethnicity (Table IV). US compared to foreign birth was a risk factor among Hispanics and NHBs, but was not significant among NHWs in the stratified models (Table IV). Earlier year of HIV diagnosis was protective for not being virally suppressed in the stratified models for Hispanics and NHWs (Table IV). Not having an AIDS diagnosis by December 31, 2015 was a protective factor for not being virally suppressed in 2015 in the stratified models for all races/ethnicities (Table IV). The MSM/IDU mode of transmission compared to MSM only was a risk factor for NHBs and NHWs, but not for Hispanics (Table IV).

DISCUSSION

The current study has four major findings. First, among MSM, NHBs compared to NHWs had a higher likelihood of not being retained in care in 2015, and Hispanics and NHBs compared to NHWs had a higher likelihood of not being virally suppressed. Second, gay neighborhood residence was not a significant predictor for either retention in care or viral suppression for the total group or among each of the racial/ethnic groups. Third, rural compared to urban residence was a protective factor for not being retained in care for all individuals and among NHB. Rural compared to urban residence was also a protective factor among NHBs for not being virally suppressed. Finally, US compared to foreign birth was a protective factor for not being retained in care and a risk factor for not being virally suppressed.

In the current study in Florida, 29.4% of the study population was not retained in care during 2015. This percentage is better than the 42.3% of MSM not retained in care during 2014 in 37 states and the District of Columbia in the US (1). However, the 37-state study defined retention in care as two or more CD4 or viral load tests performed at least three months apart during 2014 (1), and the current study had a more sensitive definition including two or more CD4 or viral load tests performed at least three months apart, prescription pickups through ADAP, or physician visits documented in one of the Ryan White databases during 2015. A study of MSM in 38 jurisdictions found that Black MSM had the highest percentage of non-retention in care in 2014 (46.4%), followed by Hispanic MSM (41.6%) and White MSM (40.6%) (2). Findings from the current study follow the same trend as the 38 jurisdiction study where the highest percentage of not being retained in care was among NHB MSM (34.2%), followed by Hispanic MSM (28.8%) and NHW MSM (26.5%). In this study, 14.4% of MSM engaged in care were not virally suppressed in 2015. In a study using national surveillance data from people diagnosed with HIV by 2013, 17.4% of MSM engaged in care were not virally suppressed (2). Non-Hispanic Black MSM had the highest percentage of not being virally suppressed (24.8%), followed by Hispanic MSM (11.0%) and NHW MSM (10.0%) in the current study. This is consistent with national surveillance data from 2014 when Black MSM had the highest percentage of not being virally suppressed among those engaged in care (26.0%), followed by Hispanic MSM (14.9%) and White MSM (12.9%) (2). The current study had a more sensitive definition of engaged in care including at least one CD4 or viral load tests performed, prescription pickups through

ADAP, or physician visits documented in one of the Ryan White databases during 2015. Engaged in care was defined as one or more CD4 or viral load test in the study using national surveillance data (2). Non-Hispanic Black MSM and Hispanic MSM compared to NHW MSM had a higher likelihood of not being virally suppressed after controlling for individual and neighborhood factors.

There may be many factors contributing to the racial disparities observed among MSM for not being retained in care and not being virally suppressed in 2015. Racial disparities in HIV have been recognized for many years. Black MSM are less likely to be diagnosed with HIV if infected, be retained in care, initiate or adhere to antiretroviral therapy (ART), and be virally suppressed compared to white MSM or other MSM (39–41). A qualitative study among Black MSM found that HIV-related stigma and homophobia were related to reluctance to be tested for HIV, less readiness to obtain care, and lower adherence to antiretroviral medication (42). The MSM population also experiences stigma, discrimination, and inadequate access to culturally competent services (43). Twenty-nine percent of Black MSM report experiencing racial and sexual orientation stigma from health care providers; these experiences were associated with longer time gaps since last HIV care visit (44). Stigma has also been associated with antiretroviral medication adherence, which affects viral load suppression. Lower levels of adherence have been associated with higher levels of depressive symptoms and stigma (45). People with high levels of HIV-related stigma are over three times more likely not to adhere to ART regimens (46). Fear of being stigmatized for having HIV can lead to avoidance of HIV testing, which can lead to inadvertent transmission of HIV and delays in initiating HIV treatment (47). Stigma at any stage of the HIV care continuum could lead to lower use of HIV care or treatment services and result in poorer health outcomes. Intersectionality theory has been used to explain racial disparities in MSM. Black MSM experience both sexual and racial stigma, and these influence each other (48). Black and White MSM may also view the gay community differently; black MSM may feel more isolated from the gay community, and may feel that affiliation with the gay community is less positive than White MSM (48). All of these barriers could affect the likelihood of a person entering and maintaining HIV care.

A higher percentage of NHWs (29.8%) lived in gay neighborhoods than Hispanics (21.5%) or NHBs (10.6%) in the present study, but residence in a gay neighborhood was not associated with retention in care or viral suppression. Thus, in this study there was no evidence that residence in a gay neighborhood was protective as hypothesized. However, it should be noted that there is no standard definition of gay neighborhood, which was based off the percentage of same sex unmarried partner households in each ZCTA from the 2009–2013 American Community Survey. Behavioral data on MSM is not routinely collected in the US Census (49). Defining gay neighborhoods using data collected by the US Census Bureau on male-male unmarried partner households has been the predominate method used in other studies on gay neighborhoods, but this method is not without limitations (6–8). Misclassification in the measurement of same-sex households in the ACS has been reported (50). It has been estimated that 7% of all same-sex unmarried partner households in the 2010 ACS were likely to be opposite-sex households (51). This misclassification of opposite-sex households as same-sex households could explain why gay neighborhood residence was not significant in the adjusted models for either study outcome.

Neighborhood SES did not appear to have a large effect in this study. However, rural residence compared to urban residence was a protective factor for not being retained in care in this study. Among NHBs, rural compared to urban residence was a protective factor for not being retained in care and for not being virally suppressed in 2015. This finding on rural residence as a protective factor differs from the literature in this area. A study using National HIV Surveillance System data from 28 US jurisdictions found lower percentages of retention in care and viral suppression among rural residents than urban and metropolitan residents (52). In South Carolina, there was no difference between rural and urban areas in undetectable viral load at one year (<400 copies per milliliter) after HIV diagnosis among people with newly diagnosed HIV infections between 2005 and 2011 (53). However, these studies were not exclusively among MSM. While studies have found that discrimination, stigma, and loneliness are higher for MSM in rural areas (54), the lower likelihood of not being retained in care and not being virally suppressed in Florida in rural areas may reflect the greater and combined effects of housing, crime, stress, and drug use associated with urban residence (55). This finding needs further study.

In the current study, US compared to foreign birth was a protective factor for not being retained in care and a risk factor for not being virally suppressed. At first glance, this seems inconsistent. However, viral suppression was only measured among those in care. The foreign-born MSM who were not in care were not considered in the viral suppression measurement. Therefore, it would appear that if foreign-born MSM are engaged in care, they are not disadvantaged with respect to viral suppression. However, they appear to have difficulty being engaged in care. Studies conducted in New York and Texas have shown that undocumented Hispanics enter HIV care with lower CD4 counts but achieve similar or higher rates of retention and viral suppression as documented Hispanics or White patients (56, 57). Efforts should be made to improve retention among foreign-born individuals, especially in gaining access to and navigating health care systems that may be unfamiliar. Documentation status can also affect access to health care. A study among documented and undocumented immigrants in California found that undocumented immigrants were less likely to have a physician visit in the last year compared to documented immigrants from Mexico (58). A Massachusetts study found worse care retention among US-born people than foreign-born people (59), but that study was in a clinic and was not a population-based study and thus would not have included people who were never in care. Being US born compared to foreign born was protective among NHB and NHW MSM for not being retained in care, but was not significant among Hispanic MSM. Being US born compared to foreign born was a risk factor among NHB and Hispanic MSM for not being virally suppressed, but was not significant among NHW MSM. A lack of trust in the physician has been associated with a drop-off in adherence to ART (60). Distrustful patients also have shorter relationships with their doctor (60). Patients with more trust in their provider are more likely to be retained in care (60). Satisfaction with the provider for HIV care at the initial visit has been associated with retention in care (61). A lack of trust and/or satisfaction with the HIV provider among US-born participants in this study could explain the lower likelihood of not being retained in care and the higher likelihood of not being virally suppressed, but these findings merit further study.

Limitations

One limitation to this study is that there was no precedent in the literature for determining cutoff points in classifying a neighborhood as “gay” or “not gay”. The cutoff value of 1% was made by examining the distribution of the male-male unmarried partner data. A reasonable break was noted at the 99th percentile. The data, however, were reanalyzed with cutoffs of 2% and 5%, and the findings did not change significantly (aPR for retention for 1% cutoff=0.99 [95% CI=0.87–1.12], p value=0.8475; 2% cutoff=0.98 [95% CI=0.80–1.19], p value=0.8217; 5% cutoff=1.12 [95% CI=0.99–1.26], p value=0.0657; aPR for viral suppression for 1% cutoff=1.08 [95% CI=0.98–1.18], p value=0.1110; 2% cutoff=1.10 [95% CI=0.97–1.24], p value=0.1431; 5% cutoff=1.06 [95% CI=0.97–1.16], p value=0.1971). Further work needs to be done to develop a systematic, validated way of classifying neighborhoods as “gay” or “not gay” that includes additional types of data, such as venues. There was no information about availability of HIV care in the data set, which would influence retention in care. However, MSM in rural areas tended to have lower likelihood of not being retained in care, which would suggest that availability of HIV specialty care was not a major factor in not being retained. Non-Hispanic Blacks in rural areas also had lower likelihood of not being retained in care and not being virally suppressed in the models that were stratified by race. Another limitation is that there was no information about psychosocial factors, which could play a role in retention in care and viral load suppression. Finally, it would have been better to have a smaller geographic unit such as a census tract or census block group as the unit of analysis as there is likely to be demographic heterogeneity within a ZCTA, but ZCTA was the smallest geographic unit that was available.

CONCLUSIONS

This study suggests that among those with a mode of HIV transmission of MSM and MSM/IDU, there are barriers to retention in care and viral suppression for NHB MSM, and that these may be at least partially due to neighborhood factors. Furthermore, the findings highlight the need for interventions including those involving social support to improve retention in care and viral suppression specifically focusing on NHB MSM, urban residents, and foreign-born individuals.

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Table I

Characteristics of those diagnosed with HIV in Florida between 2000 and 2014 who have a mode of HIV transmission listed as MSM or MSM/IDU, by race/ethnicity.

	Total, n (%)	Hispanic, n (column %)	Non-Hispanic Black, n (column %)	Non-Hispanic White, n (column %)	P-value
Total	29,156	9,044 (31.0)	8,431 (28.9)	11,681 (40.1)	
Individual-level variables *					
Year of HIV diagnosis					<0.0001
2000–2003	7,097 (24.3)	2,102 (23.2)	1,887 (22.4)	3,108 (26.6)	
2004–2007	7,607 (26.1)	2,231 (24.7)	1,982 (23.5)	3,394 (29.1)	
2008–2011	8,024 (27.5)	2,452 (27.1)	2,537 (30.1)	3,035 (26.0)	
2012–2014	6,428 (22.1)	2,259 (25.0)	2,025 (24.0)	2,144 (18.4)	
Age group at diagnosis					<0.0001
13–24 years	5,096 (17.5)	1,242 (13.7)	2,914 (34.6)	940 (8.1)	
25–49 years	20,345 (69.8)	6,881 (76.1)	4,846 (57.5)	8,618 (73.8)	
50 years or older	3,715 (12.7)	921 (10.2)	671 (8.0)	2,123 (18.2)	
US- vs. foreign-born					<0.0001
US-born	20,798 (71.3)	3,226 (35.7)	7,270 (86.2)	10,302 (88.2)	
Foreign-born	8,358 (28.7)	5,818 (64.3)	1,161 (13.8)	1,379 (11.8)	
Mode of HIV transmission					0.1056
MSM/IDU	1,315 (4.5)	323 (3.6)	413 (4.9)	579 (5.0)	
MSM	27,841 (95.5)	8,721 (96.4)	8,018 (95.1)	11,102 (95.0)	
AIDS[a]					<0.0001
No	17,105 (58.7)	5,576 (61.7)	4,546 (53.9)	6,983 (59.8)	
Yes	12,051 (41.3)	3,468 (38.4)	3,885 (46.1)	4,698 (40.2)	
In care, 2015					<0.0001
No	6,756 (23.2)	2,151 (23.8)	2,250 (26.7)	2,355 (20.2)	
Yes	22,400 (76.8)	6,893 (76.2)	6,181 (73.3)	9,326 (79.8)	
Retained in care, 2015					<0.0001
No	8,573 (29.4)	2,601 (28.8)	2,879 (34.2)	3,093 (26.5)	
Yes	20,583 (70.6)	6,443 (71.2)	5,552 (65.9)	8,588 (73.5)	
Suppressed viral load, 2015					<0.0001

	Total, n (%)	Hispanic, n (column %)	Non-Hispanic Black, n (column %)	Non-Hispanic White, n (column %)	P-value
No	9,977 (34.2)	2,910 (32.2)	3,784 (44.9)	3,283 (28.1)	
Yes	19,179 (65.8)	6,134 (67.8)	4,647 (55.1)	8,398 (71.9)	
Suppressed viral load if in care=yes					<0.0001
No	3,221 (14.4)	759 (11.0)	1,534 (24.8)	928 (10.0)	
Yes	19,179 (85.6)	6,134 (89.0)	4,647 (75.2)	8,398 (90.0)	
ZCTA-level variables **					
Percent households with male same-sex partners					<0.0001
<1% (classified as “not gay”)	22,818 (78.3)	7,095 (78.5)	7,523 (89.4)	8,200 (70.2)	
≥1% (classified as “gay”)	6,315 (21.7)	1,947 (21.5)	894 (10.6)	3,474 (29.8)	
SES index, quartiles					<0.0001
1 (lowest SES)	9,689 (33.2)	3,194 (35.3)	4,225 (50.1)	2,270 (19.4)	
2	7,465 (25.6)	2,135 (23.6)	2,167 (25.7)	3,163 (27.1)	
3	7,620 (26.1)	2,523 (27.9)	1,346 (16.0)	3,751 (32.1)	
4 (highest SES)	4,382 (15.0)	1,192 (13.2)	693 (8.2)	2,497 (21.4)	
RUCA classification					<0.0001
Rural	902 (3.1)	104 (1.2)	333 (4.0)	465 (4.0)	
Urban	28,254 (96.9)	8,940 (98.9)	8,098 (96.1)	11,216 (96.0)	
Percent population non-Hispanic Black					<0.0001
0–24%	19,172 (65.8)	6,798 (75.2)	3,286 (39.0)	9,088 (77.8)	
25–49%	5,411 (18.6)	1,390 (15.4)	2,325 (27.6)	1,696 (14.5)	
50% or greater	4,573 (15.7)	856 (9.5)	2,820 (33.5)	897 (7.7)	

IDU, injection drug use; MSM, men who have sex with men; HIV, human immunodeficiency virus; AIDS, acquired immune deficiency syndrome; US, United States; ZCTA, ZIP code tabulation area; SES, socioeconomic status; RUCA, Rural-Urban Commuting Area. Percentages may not add up to 100 due to rounding.

[a] Met AIDS case definition by December 31, 2015.

[*] Cochran-Mantel-Haenszel general association statistic was used to compare individual-level variables by race/ethnicity controlling for ZCTA.

[**] Chi-square test was used to compare neighborhood-level variables by race/ethnicity.

Table II

Factors associated with not being retained in HIV medical care and not being virally suppressed during 2015 among MSM diagnosed with HIV between 2000 and 2014 in Florida.

			Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Not retained in care Individual-level variables	Total, n	Not retained in care, n (row %)	Crude PR for non–retention in care (95% CI; p value)	Adjusted PR for non–retention in care (95% CI; p value)	Adjusted PR for non–retention in care (95% CI; p value)	Adjusted PR for non–retention in care (95% CI; p value)	Adjusted PR for non–retention in care (95% CI; p value)
Race/ethnicity							
Hispanic	9,044	2,601 (28.8)	**1.09 (1.04–1.14; 0.0003)**	1.01 (0.96–1.06; 0.6556)	1.01 (0.95–1.08; 0.6744)	1.01 (0.95–1.08; 0.6502)	**0.89 (0.82–0.98; 0.0180)**
Non-Hispanic Black	8,431	2,879 (34.2)	**1.29 (1.24–1.35; <0.0001)**	**1.28 (1.22–1.34; <0.0001)**	**1.30 (1.23–1.38; <0.0001)**	**1.31 (1.24–1.38; <0.0001)**	**1.24 (1.12–1.38; <0.0001)**
Non-Hispanic White	11,681	3,093 (26.5)	Referent	Referent	Referent	Referent	Referent
Year of HIV diagnosis							
2000–2003	7,097	2,247 (31.7)	**1.30 (1.23–1.38; <0.0001)**	**1.56 (1.48–1.65; <0.0001)**	**1.56 (1.44–1.69; <0.0001)**	**1.56 (1.44–1.69; <0.0001)**	**1.57 (1.45–1.70; <0.0001)**
2004–2007	7,607	2,354 (31.0)	**1.27 (1.21–1.34; <0.0001)**	**1.47 (1.39–1.55; <0.0001)**	**1.46 (1.38–1.55; <0.0001)**	**1.47 (1.38–1.55; <0.0001)**	**1.47 (1.39–1.55; <0.0001)**
2008–2011	8,024	2,409 (30.0)	**1.23 (1.17–1.30; <0.0001)**	**1.30 (1.23–1.37; <0.0001)**	**1.29 (1.23–1.36; <0.0001)**	**1.30 (1.23–1.36; <0.0001)**	**1.29 (1.23–1.36; <0.0001)**
2012–2014	6,428	1,563 (24.3)	Referent	Referent	Referent	Referent	Referent
Age group at diagnosis							
13–24 years	5,096	1,864 (36.6)	Referent	Referent	Referent	Referent	Referent
25–49 years	20,345	5,897 (29.0)	**0.79 (0.76–0.83; <0.0001)**	**0.82 (0.79–0.86; <0.0001)**	**0.82 (0.78–0.86; <0.0001)**	**0.82 (0.78–0.86; <0.0001)**	**0.82 (0.78–0.86; <0.0001)**
50 years or older	3,715	812 (21.9)	**0.60 (0.56–0.64; <0.0001)**	**0.66 (0.62–0.71; <0.0001)**	**0.66 (0.61–0.72; <0.0001)**	**0.66 (0.61–0.72; <0.0001)**	**0.66 (0.61–0.72; <0.0001)**
US- vs. foreign-born							
US-born	20,798	6,011 (28.9)	**0.94 (0.91–0.98; 0.0029)**	**0.88 (0.84–0.92; <0.0001)**	**0.88 (0.84–0.93; <0.0001)**	**0.88 (0.84–0.93; <0.0001)**	**0.79 (0.73–0.86; <0.0001)**
Foreign-born	8,358	2,562 (30.7)	Referent	Referent	Referent	Referent	Referent
Mode of HIV transmission							
MSM/IDU	1,315	380 (28.9)	0.98 (0.90–1.07; 0.6809)	1.00 (0.92–1.09; 0.9619)	1.01 (0.92–1.11; 0.8601)	1.01 (0.92–1.11; 0.8348)	1.01 (0.92–1.11; 0.8694)
MSM	27,841	8,193 (29.4)	Referent	Referent	Referent	Referent	Referent
AIDS [a]							
No	17,105	5,832 (34.1)	**1.50 (1.44–1.56; <0.0001)**	**1.61 (1.55–1.68; <0.0001)**	**1.61 (1.53–1.68; <0.0001)**	**1.61 (1.54–1.68; <0.0001)**	**1.60 (1.54–1.67; <0.0001)**
Yes	12,051	2,741 (22.8)	Referent	Referent	Referent	Referent	Referent
ZCTA-level variables							

			Model 1	Model 2	Model 3	Model 4	Model 5
Percent households with male same-sex partners							
<1% (classified as “not gay”)	22,818	6,710 (29.4)	1.00 (0.96–1.04; 0.9810)			0.99 (0.87–1.12; 0.8475)	0.99 (0.88–1.13; 0.9149)
≥1% (classified as “gay”)	6,315	1,858 (29.4)	Referent			Referent	Referent
SES index, quartiles							
1 (lowest SES)	9,689	2,900 (29.9)	1.01 (0.95–1.06; 0.7933)		0.95 (0.87–1.04; 0.2340)	0.95 (0.86–1.03; 0.2174)	0.95 (0.87–1.04; 0.2786)
2	7,465	2,050 (27.5)	**0.92 (0.87–0.98; 0.0084)**		**0.90 (0.83–0.98; 0.0172)**	**0.90 (0.83–0.98; 0.0135)**	**0.90 (0.83–0.98; 0.0164)**
3	7,620	2,321 (30.5)	1.03 (0.97–1.09; 0.3915)		1.02 (0.90–1.15; 0.8061)	1.01 (0.90–1.13; 0.8324)	1.02 (0.91–1.14; 0.7966)
4 (highest SES)	4,382	1,302 (29.7)	Referent		Referent	Referent	Referent
RUCA classification							
Rural	902	204 (22.6)	**0.76 (0.68–0.86; <0.0001)**		**0.77 (0.67–0.89; 0.0002)**	**0.79 (0.69–0.90; 0.0004)**	**0.79 (0.69–0.90; 0.0004)**
Urban	28,254	8,369 (29.6)	Referent		Referent	Referent	Referent
Percent population non–Hispanic Black							
0–24%	19,172	5,551 (29.0)	Referent		Referent	Referent	Referent
25–49%	5,411	1,591 (29.4)	1.02 (0.97–1.06; 0.5195)		0.99 (0.91–1.08; 0.8462)	0.99 (0.91–1.08; 0.8719)	0.99 (0.91–1.08; 0.8297)
50% or greater	4,573	1,431 (31.3)	**1.08 (1.03–1.13; 0.0016)**		1.00 (0.91–1.09; 0.9218)	1.00 (0.91–1.09; 0.9303)	0.99 (0.91–1.08; 0.8130)
Interaction between race/ethnicity and US born							
US-born							
Hispanic to NHW							**1.10 (1.02–1.18; 0.0087)**
NHB to NHW							**1.32 (1.24–1.40; <0.0001)**
Foreign-born							
Hispanic to NHW							**0.89 (0.82–0.98; 0.0180)**
NHB to NHW							**1.24 (1.12–1.38; <0.0001)**

Not virally suppressed * **Individual-level variables**	Total, n	Not virally suppressed, n (row %)	**Model 1** Crude PR for non–viral suppression (95% CI; p value)	**Model 2** Adjusted PR for non–viral suppression (95% CI; p value)	**Model 3** Adjusted PR for non–viral suppression (95% CI; p value)	**Model 4** Adjusted PR for non–viral suppression (95% CI; p value)	**Model 5** Adjusted PR for non–viral suppression (95% CI, p value)
Race/ethnicity							

			Model 1	Model 2	Model 3	Model 4	Model 5
Hispanic	6,893	759 (11.0)	**1.11 (1.01–1.21; 0.0287)**	**1.17 (1.05–1.29; 0.0030)**	**1.13 (1.03–1.25; 0.0095)**	**1.13 (1.02–1.24; 0.0152)**	0.98 (0.80–1.20; 0.8400)
Non-Hispanic Black	6,181	1,534 (24.8)	**2.49 (2.31–2.69; <0.0001)**	**1.99 (1.84–2.16; <0.0001)**	**1.84 (1.70–2.00; <0.0001)**	**1.82 (1.67–1.98; <0.0001)**	**1.72 (1.37–2.16; <0.0001)**
Non-Hispanic White	9,326	928 (10.0)	Referent	Referent	Referent	Referent	Referent
Year of HIV diagnosis							
2000–2003	5,191	681 (13.1)	**0.83 (0.75–0.91; <0.0001)**	**0.83 (0.76–0.92; 0.0002)**	**0.83 (0.75–0.91; 0.0001)**	**0.83 (0.76–0.91; 0.0001)**	**0.83 (0.76–0.92; 0.0002)**
2004–2007	5,717	786 (13.8)	**0.87 (0.79–0.95; 0.0021)**	**0.90 (0.82–0.99; 0.0220)**	**0.90 (0.82–0.99; 0.0317)**	**0.91 (0.82–0.99; 0.0383)**	0.91 (0.83–1.00; 0.0418)
2008–2011	6,160	910 (14.8)	0.93 (0.86–1.02; 0.1163)	0.92 (0.85–1.00; 0.0637)	0.93 (0.85–1.01; 0.0758)	0.93 (0.85–1.01; 0.0883)	0.93 (0.85–1.01; 0.0877)
2012–2014	5,332	844 (15.8)	Referent	Referent	Referent	Referent	Referent
Age group at diagnosis							
13–24 years	3,676	1,001 (27.2)	Referent	Referent	Referent	Referent	Referent
25–49 years	15,646	1,973 (12.6)	**0.46 (0.43–0.50; <0.0001)**	**0.60 (0.56–0.64; <0.0001)**	**0.60 (0.56–0.65; <0.0001)**	**0.60 (0.56–0.65; <0.0001)**	**0.60 (0.56–0.65; <0.0001)**
50 years or older	3,078	247 (8.0)	**0.29 (0.26–0.34; <0.0001)**	**0.40 (0.35–0.45; <0.0001)**	**0.40 (0.34–0.46; <0.0001)**	**0.40 (0.34–0.46; <0.0001)**	**0.40 (0.34–0.46; <0.0001)**
US- vs. foreign-born							
US-born	16,231	2,581 (15.9)	**1.53 (1.41–1.66; <0.0001)**	**1.27 (1.16–1.39; <0.0001)**	**1.28 (1.17–1.39; <0.0001)**	**1.27 (1.16–1.39; <0.0001)**	1.13 (0.93–1.38; 0.2010)
Foreign-born	6,169	640 (10.4)	Referent	Referent	Referent	Referent	Referent
Mode of HIV transmission							
MSM/IDU	1,005	202 (20.1)	**1.42 (1.25–1.62; <0.0001)**	**1.41 (1.25–1.60; <0.0001)**	**1.41 (1.24–1.61; <0.0001)**	**1.42 (1.24–1.61; <0.0001)**	**1.42 (1.24–1.61; <0.0001)**
MSM	21,395	3,019 (14.1)	Referent	Referent	Referent	Referent	Referent
AIDS [a]							
No	12,345	1,597 (12.9)	**0.80 (0.75–0.85; <0.0001)**	**0.81 (0.76–0.86; <0.0001)**	**0.81 (0.76–0.87; <0.0001)**	**0.82 (0.76–0.87; <0.0001)**	**0.82 (0.76–0.87; <0.0001)**
Yes	10,055	1,624 (16.2)	Referent	Referent	Referent	Referent	Referent
ZCTA-level variables							
Percent households with male same-sex partners							
<1% (classified as “not gay”)	17,573	2,696 (15.3)	**1.41 (1.29–1.54; <0.0001)**			1.08 (0.98–1.18; 0.1110)	1.08 (0.99–1.18; 0.0964)
≥1% (classified as “gay”)	4,806	522 (10.9)	Referent			Referent	Referent
SES index, quartiles							
1 (lowest SES)	7,406	1,341 (18.1)	**1.70 (1.52–1.90; <0.0001)**		**1.21 (1.06–1.38; 0.0051)**	**1.21 (1.05–1.38; 0.0063)**	**1.21 (1.06–1.39; 0.0052)**
2	5,851	838 (14.3)	**1.35 (1.20–1.51; <0.0001)**		1.14 (1.00–1.30; 0.0542)	1.14 (1.00–1.31; 0.0494)	1.14 (1.00–1.31; 0.0461)
3	5,790	685 (11.8)	1.11 (0.98–1.25; 0.0869)		1.10 (0.97–1.26; 0.1439)	1.11 (0.97–1.27; 0.1183)	1.11 (0.97–1.27; 0.1135)
4 (highest SES)	3,353	357 (10.7)	Referent		Referent	Referent	Referent

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			Model 1	Model 2	Model 3	Model 4	Model 5
RUCA classification							
Rural	749	110 (14.7)	1.02 (0.86–1.22; 0.8074)		0.87 (0.72–1.06; 0.1709)	0.87 (0.71–1.07; 0.1812)	0.87 (0.71–1.07;0.1812
Urban	21,651	3,111 (14.4)	Referent		Referent	Referent	Referent
Percent population non-Hispanic Black							
0–24%	14,758	1,771 (12.0)	Referent		Referent	Referent	Referent
25–49%	4,181	710 (17.0)	**1.42 (1.31–1.53; <0.0001)**		1.07 (0.97–1.18; 0.1864)	1.07 (0.97–1.18; 0.1533)	1.07 (0.97–1.18; 0.1671)
50% or greater	3,461	740 (21.4)	**1.78 (1.65–1.93; <0.0001)**		**1.11 (1.01–1.23; 0.0334)**	**1.12 (1.02–1.23; 0.0213)**	**1.12 (1.01–1.23; 0.0274)**
Interaction between race/ethnicity and US born							
US-born							
Hispanic to NHW							**1.18 (1.05–1.33; 0.0054)**
NHB to NHW							**1.83 (1.68–2.00; <0.0001)**
Foreign-born							
Hispanic to NHW							0.98 (0.80–1.20; 0.8400)
NHB to NHW							**1.72 (1.37–2.16; <0.0001)**

PR, prevalence ratio; CI, confidence interval; IDU, injection drug use; MSM, men who have sex with men; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; US, United States; ZCTA, ZIP code tabulation area; SES, socioeconomic status; RUCA, Rural-Urban Commuting Area; NHB, non-Hispanic Black; NHW, non-Hispanic White.

[a]Met AIDS case definition by December 31, 2015.

Bold text indicates significant findings.

[*]Non-viral suppression only among those engaged in care

Model 1: Crude prevalence ratios.

Model 2: Controlling for individual-level variables.

Model 3: Controlling for individual-level variables, SES index, rural-urban residence, and percent non-Hispanic Black population density.

Model 4: Controlling for individual level variables, SES index, rural-urban residence, percent non-Hispanic Black population density, and percent households with male same-sex partners.

Model 5: Model includes all variables in Model 4 plus race/ethnicity*US born interaction term.

Table III

Factors associated with not being-retained in HIV medical care during 2015 among those with mode of transmission listed as MSM or MSM/IDU who were diagnosed with HIV between 2000 and 2014 in Florida, by race/ethnicity

	Hispanic, Adjusted PR (95% CI; p-value)	Non-Hispanic Black, Adjusted PR (95% CI; p-value)	Non-Hispanic White, Adjusted PR (95% CI; p-value)
Individual-level variables			
Year of HIV diagnosis			
2000–2003	**2.01 (1.79–2.26; <0.0001)**	**1.36 (1.23–1.50; <0.0001)**	**1.45 (1.30–1.61; <0.0001)**
2004–2007	**1.87 (1.69–2.06; <0.0001)**	**1.33 (1.22–1.45; <0.0001)**	**1.32 (1.19–1.46; <0.0001)**
2008–2011	**1.42 (1.28–1.58; <0.0001)**	**1.26 (1.17–1.35; <0.0001)**	**1.21 (1.10–1.32; <0.0001)**
2012–2014	Referent	Referent	Referent
Age group at diagnosis			
13–24 years	Referent	Referent	Referent
25–49 years	**0.80 (0.74–0.87; <0.0001)**	**0.87 (0.81–0.92; <0.0001)**	**0.78 (0.71–0.85; <0.0001)**
50 years or older	**0.67 (0.58–0.78; <0.0001)**	**0.79 (0.70–0.90; 0.0003)**	**0.59 (0.52–0.67; <0.0001)**
US- vs. foreign-born			
US-born	0.97 (0.91–1.05; 0.4648)	**0.86 (0.79–0.93; 0.0002)**	**0.77 (0.71–0.84); <0.0001**
Foreign-born	Referent	Referent	Referent
Mode of HIV transmission			
MSM/IDU	1.12 (0.95–1.32; 0.1787)	0.91 (0.79–1.05; 0.2106)	1.02 (0.87–1.19; 0.8131)
MSM	Referent	Referent	Referent
AIDS [a]			
No	**1.45 (1.34–1.57; <0.0001**)	**1.96 (1.83–2.11; <0.0001)**	**1.40 (1.30–1.51; <0.0001)**
Yes	Referent	Referent	Referent
ZCTA-level variables			
Percent households with male same-sex partners			
<1% (classified as “not gay”)	0.96 (0.80–1.15; 0.6696)	1.00 (0.90–1.11; 0.9639)	1.00 (0.87–1.15; 0.9753)
≥1% (classified as “gay”)	Referent	Referent	Referent
SES index, quartiles			
1 (lowest SES)	**0.86 (0.74–0.99; 0.0368)**	1.10 (0.96–1.27; 0.1833)	1.02 (0.91–1.16; 0.6941)
2	**0.82 (0.71–0.94; 0.0044)**	1.06 (0.92–1.23; 0.3970)	**0.89 (0.80–0.99; 0.0372)**
3	0.97 (0.82–1.15; 0.7093)	**1.17 (1.02–1.34; 0.0215)**	0.97 (0.84–1.11; 0.6445)
4 (highest SES)	Referent	Referent	Referent
RUCA classification			
Rural	0.98 (0.61–1.59; 0.9415)	**0.68 (0.53–0.86; 0.0016)**	0.81 (0.63–1.05; 0.1127)
Urban	Referent	Referent	Referent
Percent population non-Hispanic Black			
0–24%	Referent	Referent	Referent
25–49%	0.97 (0.84–1.13; 0.7304)	1.01 (0.91–1.12; 0.8963)	0.95 (0.84–1.08; 0.4417)
50% or greater	1.00 (0.85–1.17; 0.9810)	0.98 (0.89–1.09; 0.7671)	0.94 (0.79–1.13; 0.5096)

PR, prevalence ratio; CI, confidence interval; IDU, injection drug use; MSM, men who have sex with men; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; US, United States; ZCTA, ZIP code tabulation area; SES, socioeconomic status; RUCA, Rural-Urban Commuting Area.

[a] Met AIDS case definition by December 31, 2015.

Bold text indicates significant findings.

Table IV

Factors associated with not being virally suppressed during 2015 among those with mode of transmission listed as MSM or MSM/IDU diagnosed with HIV between 2000 and 2014 in Florida, by race/ethnicity

	Hispanic, Adjusted PR (95% CI; p-value)	Non-Hispanic Black, Adjusted PR (95% CI; p-value)	Non-Hispanic White, Adjusted PR (95% CI; p-value)
Individual-level variables			
Year of HIV diagnosis			
2000–2003	**0.80 (0.67–0.95; 0.0129)**	0.91 (0.80–1.03; 0.1317)	**0.73 (0.61–0.89; 0.0015)**
2004–2007	0.85 (0.68–1.04; 0.1183)	1.02 (0.89–1.16; 0.8087)	**0.78 (0.65–0.93; 0.0067)**
2008–2011	**0.71 (0.59–0.86; 0.0005)**	1.09 (0.98–1.21; 0.1190)	**0.81 (0.69–0.96; 0.0143)**
2012–2014	Referent	Referent	Referent
Age group at diagnosis			
13–24 years	Referent	Referent	Referent
25–49 years	**0.53 (0.45–0.62; <0.0001)**	**0.64 (0.59–0.70; <0.0001)**	**0.55 (0.46–0.65; <0.0001)**
50 years or older	**0.33 (0.25–0.45; <0.0001)**	**0.44 (0.36–0.54; <0.0001)**	**0.37 (0.29–0.47; <0.0001)**
US- vs. foreign-born			
US-born	**1.36 (1.18–1.57; <0.0001)**	**1.22 (1.07–1.39; 0.0023)**	1.11 (0.91–1.35; 0.3254)
Foreign-born	Referent	Referent	Referent
Mode of HIV transmission			
MSM/IDU	1.20 (0.85–1.70; 0.3078)	**1.31 (1.09–1.58; 0.0034)**	**1.67 (1.36–2.05; <0.0001)**
MSM	Referent	Referent	Referent
AIDS [a]			
No	**0.77 (0.67–0.90; 0.0007**)	**0.87 (0.80–0.95; 0.0021)**	**0.75 (0.66–0.86; <0.0001)**
Yes	Referent	Referent	Referent
ZCTA-level variables			
Percent households with male same-sex partners			
<1% (classified as “not gay”)	0.91 (0.77–1.08; 0.2810)	1.14 (0.96–1.34; 0.1297)	1.12 (0.98–1.29; 0.0973)
≥1% classified as “gay”)	Referent	Referent	Referent
SES index, quartiles			
1 (lowest SES)	**1.36 (1.03–1.79; 0.0299)**	1.18 (0.96–1.46; 0.1094)	1.19 (0.96–1.49; 0.1166)
2	1.18 (0.89–1.56; 0.2408)	1.14 (0.92–1.41; 0.2198)	1.13 (0.94–1.37; 0.1909)
3	1.19 (0.91–1.56; 0.1954)	1.13 (0.92–1.40; 0.2458)	1.04 (0.86–1.26; 0.6741)
4 (highest SES)	Referent	Referent	Referent
RUCA classification			
Rural	1.28 (0.77–2.13; 0.3367)	**0.66 (0.50–0.87; 0.0039)**	1.16 (0.92–1.46; 0.2152)
Urban	Referent	Referent	Referent
Percent population non-Hispanic Black			
0–24%	Referent	Referent	Referent
25–49%	1.09 (0.91–1.31; 0.3449)	1.08 (0.95–1.23; 0.2292)	1.01 (0.84–1.21; 0.9140)
50% or greater	1.23 (0.99–1.54; 0.0619)	1.09 (0.97–1.23; 0.1342)	1.21 (0.95–1.53; 0.1205)

PR, prevalence ratio; CI, confidence interval; IDU, injection drug use; MSM, men who have sex with men; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; US, United States; ZCTA, ZIP code tabulation area; SES, socioeconomic status; RUCA, Rural-Urban Commuting Area.

[a]Met AIDS case definition by December 31, 2015.

Non-viral suppression only among those engaged in care

Bold text indicates significant findings.