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Factors Affecting Racial Disparities in Viral Suppression between Black and White MSM

By

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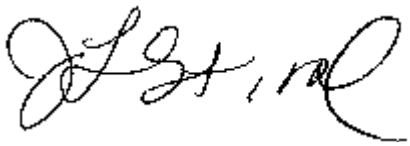
Master of Public Health

Global Epidemiology



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Factors Affecting Racial Disparities in Viral Suppression between Black and White MSM

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B.S.
Texas A&M University
2018

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Abstract

Factors Affecting Racial Disparities in Viral Suppression between Black and White MSM

By Sarah Moreland

HIV disproportionately impacts men who have sex with men (MSM) in measures of incidence and prevalence. Despite efforts to reduce racial disparities in HIV incidence and prevalence between Black and White MSM, White MSM continue to have a significantly higher prevalence of viral suppression than their Black counterparts. A deeper understanding of the individual, social, and cultural factors contributing to or inhibiting viral suppression is required to improve HIV interventions.

A prospective cohort of 400 Black and white MSM living with HIV were enrolled through time-space venue sampling and various online recruitment methods. Participants completed behavioral surveys at baseline and at 3, 6, 12, 18, and 24-month follow-up visits. Laboratory measures were taken at baseline, 12, and 24 months. Bivariate and multivariate analyses were performed on baseline, 24-month, and longitudinal measures to explore factors contributing to the significant difference in viral suppression between black and white MSM.

Fifty-two percent of participants were black and 48% were white. The median age was 40 years old; most participants were living above the poverty line (71%) had some form of health insurance (71%) and had previously been engaged in HIV care (97%). Black MSM were significantly more likely to have less than a college degree ($p=0.005$), have measurable amounts of THC in their blood ($p<0.0001$), have missed antiretroviral therapy in the last 30 days ($p<0.0001$), and were less likely to be stably housed ($p=0.0051$), be taking HIV medications ($p=0.024$), and be engaged in care ($p=0.0082$). Disparities in health outcomes were attributable to age, substance use, social support and stigma, and housing quality.

Individual, social, and cultural factors contributing to racial disparities in viral suppression at different levels of the HIV care continuum were identified in this study. Understanding the unique needs of subgroups of MSM, including black and young MSM, at each stage will allow interventions to better target these barriers preventing MSM from achieving positive HIV health outcomes.

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BACKGROUND

The key goals of The National HIV/AIDS Strategy include reducing HIV-related health disparities. This includes improving access to health and care outcomes such as universal viral suppression for people living with HIV within all minority and risk groups (1). Men who have sex with men (MSM) are disproportionately affected in terms of both HIV prevalence and incidence. The majority of new infections in the United States occur in MSM despite the declining incidence among other risk groups in recent years (2). This increased incidence is especially prominent among young MSM and Black MSM. Historically, there has been a vast disparity in antiretroviral therapy (ART) prescription, adherence, and viral suppression between White MSM and Black MSM (2, 3). Recent studies have found increases in ART prescription and usage in all racial/ethnicity groups, significantly decreasing the disparity between Black and White MSM (2-4). Despite successful efforts to increase viral suppression and decrease overall disparity, or inequities, in viral suppression levels among all racial/ethnic groups, the decrease in disparity has not been shown significant between White and Black MSM. Adherence to treatment and sustained viral suppression are necessary to achieve the individual level and public health benefits of HIV treatment (5, 6).

There are a complex series of factors that may impact a person's ability or motivation to partake in HIV treatment, many of which have been previously studied, but the extent by which they affect healthcare engagement have not been fully understood by the literature. Linkage with a provider is established to initiate HIV treatment, promote adherence, and increase likelihood of viral suppression (5, 7-9). Recent studies show that

Black MSM are less likely to be formally diagnosed with HIV, sustain care with a health provider, be prescribed ART, and achieve viral suppression, illustrating the disparity at every level of the continuum (10). Structural factors, such as income level, employment status, and access to transportation, have been associated with lower measures of healthcare engagement, treatment, and viral suppression, especially among Black MSM (3, 11-13). In an Atlanta based study, cost and transportation were among the top barriers to care reported by MSM not engaged in HIV care (7). Among men enrolled in care, MSM, and particularly Black MSM face barriers to communication and trust with their healthcare provider. These barriers include but are not limited racism, homonegativity, and HIV-related stigma and may be self-perceived or expressed by external parties (7, 10, 12). The role of insurance in linkage to care is unclear as the availability of HIV care continues to rise through clinics offering free services to those in need (3). However, adherence to treatment and viral suppression may be influenced by whether or not one has insurance and whether it is public or private. In a study of Black MSM, type of insurance one has is associated with the level of care and self-reported provider communication one will receive (7).

The entirety of the HIV care continuum, consisting of diagnosis, linkage to care, retention in care, and viral suppression, has been shown to be influenced by a variety of individual, social, structural, and community-level factors (5). Recent studies have documented consistent racial differences and disparities at each step of HIV care resulting in lower levels of viral suppression among HIV-positive Black MSM (14). Sexual risk behaviors such as unprotected anal intercourse (UAI) are known to increase likelihood of HIV transmission. Black MSM consistently report lower levels of UAI than

white MSM, however are twice as likely to report serodiscordant UAI while virally unsuppressed (11). Black MSM report shorter relationship durations and are less likely to report discussion of HIV status with partners which may contribute to this racial difference in serodiscordant UAI (11, 12). Individual psychologic factors such as poor mental health have been associated with engagement in sexual risk behaviors, poor treatment adherence, and a positive HIV viral load (13). Additionally, substance abuse, including alcohol, marijuana, and other drugs, has been associated with missed ART doses and healthcare visits (6, 10, 11). Previous studies have shown social support to be a potential, yet less explored factor in adherence to HIV care in MSM. In addition to individual mental health or substance abuse situations, homonegativity, HIV-related stigma, and racial discrimination have been shown to impact engagement with care and adherence to treatment in MSM, particularly MSM of color (2). However, those with histories of any kind of support at all parts of the care cascade had reports of better engagement and health outcomes (7).

Previous research on this topic has been heavily limited to samples of men already connected to some form of HIV care. The results from these studies do not take into account care continuum progression of men who may be diagnosed but not yet linked to any form of treatment or consistent care. Recruitment through a vast array of community-based avenues allow sampling from a more representative and diversified cohort. Additionally, the sampling frame of many previous studies has consisted primarily of cross-sectional studies. Temporal prospective data allows insight into how treatment adherence, attitudes, individual circumstances, and other factors change along the course of the HIV care continuum.

To understand and address the specific factors contributing to disparities in viral suppression in MSM, The Engagement study was developed as a multilevel, longitudinal cohort study of Black and White MSM in Atlanta, Georgia. This study was guided by Bronfenbrenner's ecological systems model to account for individual, social, cultural, and structural factors contributing to differences in HIV care and disease outcomes between Black and White MSM. The goal of the Engagement study is to understand how these factors interact and identify key events that represent lapses in effective HIV care and prevention. Additionally, we will identify those participants whose progress through the treatment cascade represent "success" to characterize factors likely to lead to viral suppression. Using temporal, linked qualitative and quantitative data, this framework aids us to examine how these multi-level factors that shape progression towards or avoidance of these key events and how this process differs between Black and White MSM. Understanding the factors contributing to racial disparity in progression through the HIV care cascade and towards viral suppression allow us to target interventions for factors that might explain racial disparity in care outcome among MSM in Atlanta.

METHODS

This study was reviewed and approved by the institutional review board of Emory University.

Study Sample

EngageMENt is a longitudinal cohort of 400 black and white HIV-positive MSM in Atlanta, Georgia designed to understand the gaps in HIV prevention, care, and health outcomes. To adequately describe HIV incidence among the groups, the study was designed to enroll approximately an equal number of HIV-positive Black and White MSM with 80% diagnosed prior to the last 90 days and 20% newly diagnosed.

Based on the successful protocols from InvolveMENt, participants were recruited over a period of 1.5 years through time-space venue sampling supplemented by convenience sampling through Facebook and other internet sources (15). Participants were recruited from a sample of venues where Black and White HIV-positive men are known to frequent, such as bars, clubs, parks, shopping malls, and events such as Gay Pride. At the venue, study staff systematically approached men using a brief recruitment script where they obtained consent and administered screening questions. After physical recruitment, men were asked to complete a more detailed screening survey to determine study eligibility. Participants were given the option to receive the full screening survey by email or to be contacted by phone by study staff. Internet recruitment included targeted advertisements to adult men in Atlanta whose profiles denote an interest in men. Men who click the banner are directed to an online screening survey which includes questions from both the preliminary and full eligibility screening survey. In order to recruit an

adequate sample of newly diagnosed MSM, health departments and providers were provided with flyers to give to MSM after diagnosis or early in care. These men are directed to the same survey as those sampled from internet sites. HIV-positive MSM were also recruited from prior study banks of men who consented to be contacted for future studies by the study staff. Individuals were eligible if they were male at birth and currently identify as male, self-reported race as black or white, at least 16 years of age, had a self-reported HIV-positive status, are able to complete the survey instruments in English, live in the Atlanta MSA and not planning to exclusively receive HIV care outside of metro Atlanta in the next two years, and had at least one male sex partner in the 12 months before the baseline interview

Men consented to the study prior to being screened, regardless of the mode in which they were recruited. Individuals recruited from physical venues were first verbally consented to be asked a small number of questions. They were again offered to consent when they complete the full screening survey either online or over the phone.

Survey Measures

Men who screened eligible were contacted by study staff via their preferred method and invited to schedule a baseline enrollment visit at one of the study's clinical sites. The baseline visit began with confirmation the participants' eligibility and consent and lasted no more than 3 hours in its entirety. Those who proceeded completed a computer-assisted self-interview (CASI) behavioral survey to assess demographics, HIV care engagement, STIs, drug use, HIV disclosure and condom use with anal sex partners, and healthcare utilization.

Eligible participants were followed prospectively for two years. Online CASI surveys were completed by participants at months 3, 6, and 18. Participants completed in-person follow-up study visits at months 12 and 24 to where they completed additional behavioral surveys lasting no more than 2 hours per visit. Surveys were administered at 6-month intervals with the aim to capture incident sentinel events in HIV care and prevention. The purpose of the month 3 survey is to assess linkage to care outcomes among those newly diagnosed or recently enrolled in care.

All participants met with a staff counselor at their baseline visit to assess HIV prevention, treatment, and care needs. Counselors made appropriate referrals based on the assessment and shared resources with the participant. Patients testing positive for sexually transmitted infections (STIs) were referred for evaluation or free treatment at AID Atlanta. Counselors also provided information to uninsured participants as to where they could enroll in state health insurance or directly link them to care. Participants were again offered counseling and linkage services at their 12 and 24-month visits and at the end of their 3, 6, and 18-month online surveys.

Measures of characteristics, such as perceived mental health, were measured by checked indicator questions. Variables were created ranking the number of poor mental health indicators checked by each participant at each time point ranging from “any indication” to “moderate indication”. Measures of HIV stigma, racism, health care experiences, and homophobia were measured on scales ranging from “Strongly Disagree” to “Strongly Agree”. Responses to the questions were translated into numeric variables representing a positive or negative agreement with the statements and assessed based on “have experienced” or “have not experienced”.

Laboratory Measures

All participants were tested using blood, urine, and rectal swab specimen samples to test for HIV, STIs, plasma antiretroviral drugs (ARVs), alcohol and drug use, and CD4 viral load. A 4th generation antigen/antibody combination immunoassay was used to confirm HIV-positive status at baseline. Results were reported to the participants via their preferred mode of contact. Laboratory measures are repeated at month 24. Screening for drugs and alcohol abuse, CD4 count, and viral load measures are also repeated at month 12. Plasma viral load was measured using Abbott RealTime HIV-1Assay, an in vitro reverse transcription-polymerase chain reaction (RT-PCR). The range of detection was between 40 to 10,000,000 copies/mL plasma with less than 40 copies/mL being defined as having an undetectable viral load. The presence of C. trachomatous (CT) and N. gonorrhea (NG) were measured using urethral and rectal specimens with Abbott RealTime CT/NG assays. Syphilis screening was conducted on serum using rapid plasma reagin (RPR) tests. Hepatitis C was tested using RNA detection by polymerase chain reaction (PCR) quantitative assays at the baseline and 24-month visit. Positive STI test results were provided to participants over the phone by a study staff member who referred them to free treatment. Validation of self-reported non-prescription drug, heavy alcohol, and ARV use were measured through blood and serum samples.

Medical records of participants were abstracted as a method for validation of self-reported information in the information study surveys. It will also serve as a method to enrich the data collected about HIV care and treatment at time points throughout the study period.

Statistical Analysis

Men were excluded from analyses if they were found to have missing values for viral load at any time point (n=2). Variables representing demographic characteristics, engagement in care, sexual behavior, self-reported substance use, mental health indicators, and perceptions of stigma were descriptively summarized. Differences in variable distributions between Black and White MSM were assessed using chi-square and t-tests. HIV viral load measures were compared by race using risk ratios (RR) and 95% confidence intervals (CI). Longitudinal changes in viral load at each measurement was assessed using chi square test stratified by participant race. Variables measured at more than one study visit were also assessed for longitudinal changes among each racial group using chi-square tests to assess time-dependency. Fisher's Exact Test was used in any calculation where an expected cell had less than 5 observations.

Log binomial regression models were built for baseline and 24 months to relate both time-independent and time-dependent predictors to viral suppression. Adjusted prevalence ratios (PR) were compared to quantify the disparity in the outcome between black and white MSM. Covariates measured from the behavioral surveys and laboratory measures that were associated with participant race and health outcomes were considered for inclusion to the model. Predicters were removed from the model due to issues with collinearity with other predictors. Factors that meaningfully impact the association between race and viral suppression status were chosen in a stepwise fashion based on those that produced less than a 10% change in the PR from the fully adjusted model. The final model for each study interval was chosen through a combination of statistical tests

and evidence from prior literature and adjusted for predictors such that there was no significant difference in risk of achieving viral suppression between black and white MSM. All associations were considered significant at a level of alpha = 0.05.

RESULTS

Baseline characteristics of Engagement study participants are presented in Table 1. Of the 398 eligible participants, 192 (48%) are white and 206 (52%) are black. The median age of enrollment was 40 years old (Interquartile range (IQR) 31-50) with 23% being ≤ 30 years old, 27% were 31-39 years old, 25 % were 40-49 years old, and 26% were ≥ 50 years old. According to the Federal Poverty Guidelines, 29% of participants are living below the poverty line based on annual income and number of household dependents (16). Seventy one percent of participants had any form of health insurance. Three percent of participants were newly diagnosed with HIV within the last 90 days, while 97% had been diagnosed previously. In the 6 months prior to enrollment, the median number of sexual partners reported by participants was 3 (IQR 1-6) with 82% of participants having had unprotected anal intercourse with at least one partner. 97% of participants had ever been engaged in HIV care.

Demographic characteristics significantly differed between Black and White MSM at baseline on all measures except for baseline employment status and homelessness (Table 1). At baseline, Black MSM were significantly younger, less likely to have a college degree, health insurance, or stable housing, and more likely to be living in poverty or have been arrested than White MSM. There was no significant difference in the proportion of Black MSM and White MSM experiencing homelessness at baseline (3.38% and 1.05%, $p = 0.1784$). Sixty-three percent of Black MSM were employed at least part time at baseline, which did not significantly differ from the 70% of White MSM ($p = 0.1309$). More than two-thirds of Black MSM reported having less than a college degree ($p=0.005$), 37% reported living below the poverty line ($p= 0.0002$), 38% had

health insurance ($p<0.0001$), and more than a quarter reported not having a stable housing situation ($p=0.0051$).

Among male partnerships reported, Black MSM were more likely to have reported a sexual partner as a main partner, or someone to which they felt committed ($p = 0.0003$) and were more likely to discuss with a partner whether or not they were taking HIV medications ($p = 0.0306$). Black MSM were also more likely to be in a partnership with someone of the same race ($p < 0.0001$) and report using a condom during the entirety of insertive anal intercourse ($p <0.0001$).

Over the study period, the proportion of Black MSM having an undetectable viral load, defined as <40 copies per ml, significantly increased ($p = 0.0352$), however, the significant difference in the proportion of virally suppressed participants in each racial group existed at each study visit. At baseline, the prevalence of having an undetectable viral load was 74% overall with an 81% prevalence in White MSM and 67% prevalence in Black MSM ($p = 0.0012$). Among white participants, the prevalence of having an undetectable viral load increased to 85% by month 12. Among black participants, the prevalence of undetectable viral load increased to 72% ($p = 0.0026$). At month 24, the prevalence of having an undetectable viral load was 91% in White MSM and 79% in Black MSM ($p = 0.0049$).

Since baseline, there was a significant increase in Black MSM taking HIV medications ($p = 0.0108$) from 90% at baseline to 95% after 24 months. Over the two-year follow up, prevalence of participants actively engaged in HIV care, defined as having engaged in care since the last survey, significantly increased ($p = 0.0001$) for both Black MSM (75% to 95%) and White MSM (74% to 99%). Black MSM reporting greater

than 5 indicators of poor mental health significantly decreased from 34% to 21% (p = 0.0055).

At baseline, there was no significant difference in the prevalence of having a suppressed viral load between Black MSM and White MSM when adjusting for missing ARV in the last 30 days, having a detectable blood level of THC, being out about their HIV status to at least half of their friends, family, and acquaintances, and having had unprotected anal intercourse in the last 6 months (PR=1.03; 95% CI = 0.86, 1.22). After 24 months of follow-up, there was no significant difference in the prevalence of having a suppressed viral load between Black MSM and White MSM when adjusting for having stable housing, weekly alcohol usage, being under 30 years of age, experiencing stigma related to one's HIV status, and experiencing stigma relating to one's sexuality (PR = 0.92; 95% CI = 0.83, 1.01).

DISCUSSION

These results reveal a combination of factors and characteristics along the HIV care continuum contributing to the disparity in HIV outcomes between Black and White MSM. At baseline, 67% of Black MSM had an undetectable viral load compared with 81% of white MSM. Additional statistically significant differences between the Black MSM and the White MSM in the cohort included Black MSM were more likely to have missed ARVs in the last 30 days, have detectable blood levels of THC, and have unprotected anal intercourse in the last 6 months. Black MSM were also more likely to be out about their HIV status to at least half of their friends, family, and acquaintances. At the 24th month of follow up, 79% of Black MSM and 91% of White MSM had an undetectable viral load accounting for a 24-month difference in risk of not having an undetectable viral load. Having stable housing, weekly alcohol usage, being under 30 years of age, experiencing stigma related to one's HIV status, and experiencing stigma relating to one's sexuality were all correlated to undetectable viral load levels. The findings from this analysis allow us to understand the factors contributing to the significant disparity between virally suppressed Black and White MSM over 24 months of follow up and engagement in care. Understanding and addressing these factors at each stage of the HIV care continuum is critical in achieving the goals of The National HIV/AIDS Strategy to HIV-related health disparities for people within all minority and risk groups (1).

Substance Use

Substance use, including marijuana and alcohol, were found to be factors contributing to racial disparities during all stages of follow-up. At baseline, positive blood THC levels, representative of currently using marijuana, were found to be a factor affecting the association between race and achieving viral suppression. Much of the existing literature does not back this claim, having found marijuana usage has no significant relationship on HIV health outcome (17-19). However, many studies have explored the association between marijuana use and other factors contributing to HIV health outcomes, such as depression, anxiety, and adherence to HIV care and medication. There is evidence that among MSM, specifically young, Black MSM, that those with anxiety and depression are more likely to use marijuana (18). In a different study, the most common reasons for marijuana usage were relaxation, social situations, alleviation of HIV symptoms, physical pain relief, and mental health reasons (20). As previously discussed, poor mental health, such as anxiety and depression, have been associated with engagement in sexual risk behaviors, poor treatment adherence, and a positive HIV viral load among MSM (13). A study by Chukwuemeka, et. al. found that those engaged in daily marijuana use were less likely to have durable viral suppression, however, when adjusting for factors such as race and depressive symptoms the association was no longer significant, strengthening the argument that mental health factors play an important role in the association between marijuana use and viral suppression. Additionally, a study of young Black MSM found that those with no signs or history of depression were more likely to adhere to HIV care (21). It is established that adherence to care is a critical component on the HIV care continuum leading to viral suppression (5, 6). In a study by

Heightow-Weidman, it was found that no marijuana use was associated with engagement in care and fewer missed visits, however no association was found with usage and ARV-uptake or viral suppression (21). The associations of marijuana use and steps along the HIV care continuum supports our findings that marijuana plays a greater role in the earlier stages of HIV care engagement and adherence rather than in the later stages of achieving viral suppression.

After twenty-four months of follow-up, weekly alcohol consumption was found to be an influential factor in the association between race and viral suppression. The existing literature supports the claim that alcohol consumption at various levels is associated with HIV engagement and health outcomes (11, 13, 19, 22). In a study investigating substance use and HIV treatment outcomes, increased frequency of alcohol usage was associated with decreased usage of ART (19). Additionally, the paper found that those using alcohol two or more times a week were less likely to adhere to ART regiments (19). Alcohol has been linked to poor health outcomes among those taking ART including liver cirrhosis and impeding medication metabolism and absorption (23). A study by Kalichman explored the association between alcohol-related behaviors and ART usage warnings from providers and found that many choose to skip medications while drinking to avoid interactions rather than not drinking while adhering to medications (24). These findings highlight the significant role substance usage plays along the HIV care continuum and to achieve the desired outcome of viral suppression, one must differently combat the factors associated with all stages of care engagement and HIV treatment.

Social support

Being open about one's HIV status to at least half of their friends, family, and acquaintances was found to impact the association between race and HIV viral load suppression at baseline. After twenty-four months of follow-up, this association was affected by perceived stigma in regard to one's HIV status or sexuality. The role social support plays on the HIV care continuum has not been thoroughly researched or well defined (25). However, definitions including acceptance by friends and family, perceived stigma, and homonegativity, have been shown to impact engagement with care and adherence to treatment in MSM, particularly MSM of color (2, 21). A study by Friedman, et. al. found that Black MSM were likely to have lower social support than their white counterpart. Additionally, those with higher levels of social support were found to have lower mean viral load measurements and higher levels of viral suppression (25). A study of HIV stigma among MSM explained how perceived, internalized, and anticipated stigma can impede HIV care and treatment. Men who have experienced or are afraid of HIV-related stigma from society, peers, and others, may be less likely to disclose their HIV status to others, including sexual partners. Additionally, these men may be less likely to seek and adhere to care regiments due to fear of others finding out their status or potential negative reactions about their status. These findings highlight the importance of understanding and support for MSM living with HIV, both as a society and in immediate functional support.

Age

Black MSM in our cohort were significantly younger than their white counterparts ($p < 0.0001$). Being under 30 years of age was found to impact the disparity

viral suppression levels between black and white MSM. According to a report from CDC, young MSM are less likely to be linked with care within one moth of HIV diagnoses and less likely to be virally suppressed (26). These findings are supported by the existing literature which finds younger MSM to account for a higher proportion of new cases than older MSM (13, 26, 27). A study by Brown, el al. found that younger MSM were more likely to report substance use and less likely to report being virally suppressed (27). As discussed, substance abuse is associated with lower adherence to ART which is a critical component of achieving viral suppression (19). Another study found that older men were more likely to be virally suppressed and a significant association between retention in care and viral suppression exited only in those aged 18-39 (28). These findings suggest there are differences in retention in care an ART adherence in old and young MSM living with HIV. Additionally, they highlight importance of retention in care and ART adherence as it relates to HIV health outcomes among younger age groups.

This study is subject to several limitations. This study consisted of Black and White MSM in Atlanta, Georgia and therefore may not be generalizable to other groups of MSM in the United States or elsewhere. Distributions of age, race, stigma towards HIV and homosexuality, and urbanization varies in other locations (12). The use of venue-time-space sampling to recruit an equal number of Black and White MSM ensured a consistent, systematic, and reproducible method of recruitment, however, our participants are not representative of all HIV positive MSM in Atlanta where HIV prevalence is different in White and Black MSM (26). Our results are further limited by the enrollment criteria excluding men who do not identify as male or were not male at birth. Factors

affecting HIV outcomes among transgender individuals has not been heavily researched and understood (29). Additionally, study enrollment was focused on men who identify as being homosexual or bisexual and had at least one male sex partner in the prior 12 months, excluding men who may not identify as such and may be subject to a lower level of social support in their sexual behaviors (25). Self-reported behaviors, such as those related to drug and alcohol use, may be subject to desirability bias, but are verified through laboratory measures. At baseline, this study had a high prevalence of ever having been engaged in HIV care and taking ART. This created very small sample sizes among the factors exploring non-engagement or ART adherence. Additionally, questions framed as "checked all that apply" cannot be discerned between missing responses and "none of the above were checked". Finally, potential bias is introduced by 83 participants lost to follow up over the study period. Because this study aids participants in linkage and retention to care, those who do not continue may be more subject to poor HIV health outcomes(19).

Despite these limitations, our results have implications for future research and interventions to improve HIV outcomes. Our findings highlight the need to target the individual, social, and cultural factors contributing to poor HIV health outcomes at all stages of the care continuum. Factors identified in this study, such as substance use, HIV stigmatization and homophobia, age, and sexual behaviors, have been linked to poor retention in care, adherence to ART and HIV health outcomes in other studies focusing on racial disparities in the HIV continuum (2, 11, 24, 28). We recommend these factors be explored and targeted in combination rather than being treated as individual

components as our finding suggest they may have a cumulative outcome on those living with HIV, specifically Black MSM. The study's findings suggest that substance abuse and mental health counseling should be integrated into HIV intervention programs, especially those that target young, Black, MSM. Addressing challenges specific to this group, such as linkage to care, social isolation, and use of substances as a coping mechanism, may lead to higher levels of viral suppression (27). Additionally, promotion of support networks between MSM living with HIV could create a space, free from stigma and judgment, which some may not have in other areas of their lives. In addition, we recommend extending education and support to family and friends of those living with HIV so that they may be better equipped to understand the disease, the care continuum, and how to better support those living with it rather than further perpetuating stigma. Future studies should focus on men not engaged in care or adhering to ART regiments to understand more specific challenges for MSM in these high-risk groups.

Men who have sex with men continues to be the subgroup with the highest incidence and prevalence of HIV infection (2). Black MSM continue to face significantly lower rates of positive HIV outcomes, such as achieving a suppressed viral load (5, 6). The goals of The National HIV/AIDS Strategy to end HIV-related health disparities among minority and risk groups cannot be met without innovative programs to target the unique challenges faced by Black MSM along the HIV care continuum (1). The results from this study reveal individual, social, and cultural barriers along the HIV care continuum contributing to decreased levels of viral suppression. Programs targeted to increase social

support, mental health services, and to destigmatize HIV, specifically among young or Black MSM, may significantly improve HIV health outcomes among these groups.

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Table 1. Baseline characteristics of cohort of men who have sex with men

Patient Characteristics	Overall (n=398)	Black (n=206)	White (n=192)	p-value	PR	95% Lower Confidence Limit (LL)	95% Upper Confidence Limit (UL)
Undetectable viral load, n (%) [1]							
Baseline	294 (73.87)	138 (66.99)	156 (81.25)	0.0012	0.8245	0.7331	0.9273
Age, years, median (IQR)	40 (31, 50)	35 (29, 45)	45 (37, 52)	<0.0001			
Age group, years, n (%)				< 0.0001			
Less than 31	90 (22.50)	63 (30.43)	27 (13.99)		2.1402	1.4248	3.215
31 -39	109 (27.25)	72 (34.78)	37 (19.17)		1.8641	1.3157	2.6411
40-49	98 (24.50)	41 (19.81)	57 (29.53)		0.6704	0.4725	0.9513
50 and above	103 (25.75)	31 (14.98)	72 (31.31)		0.4013	0.2765	0.5823
Sexual Identity, n (%)				< 0.0001			
Homosexual/gay	366 (91.50)	177 (85.51)	189 (97.93)				
Bisexual	28 (7.00)	24 (11.59)	4 (2.07)				
Other	6 (1.50)	6 (12.90)	0 (0.00)				
Education, n (%)				0.005			
College, post-graduate, or professional school	162 (40.50)	67 (32.37)	95 (49.22)		0.6573	0.5155	0.8383
Some college, associate degree, and/or technical school	169 (42.25)	101 (48.79)	68 (35.23)		1.344	1.0929	1.7535
High school or GED	59 (14.75)	32 (15.46)	27 (13.99)		1.1113	0.6858	1.8008
Less than high school	10 (2.5)	7 (3.38)	3 (1.55)		2.1748	0.5705	8.29
Living below the poverty line, n (%) [2]	115 (29.19)	76 (37.44)	39 (20.42)	0.0002	1.8335	1.316	2.5546
Employed at least part time, n (%)	264 (66.33)	129 (62.62)	135 (70.31)	0.1309	0.8906	0.7743	1.0244
Housing, n (%)	9 (2.25)	7 (3.38)	2 (1.05)				
Homeless	9 (2.25)	7 (3.38)	2 (1.05)	0.1784	0.9764	0.9479	1.0056
Stable Housing	301 (75.82)	145 (70.05)	156 (82.11)	0.0051	0.8469	0.7579	0.9464
Health insurance, n (%)	284 (71.72)	128 (62.44)	156 (81.68)	< 0.0001	0.7645	0.6742	0.8668
Arrested, ever, n (%)	224 (56.28)	130 (63.11)	94 (48.96)	0.0045	1.3024	1.089	1.5575

Male sex partners [3]							
Total partners, median (IQR)	4 (2, 8)	2 (2, 6)	4 (2, 10)	<0.0001			
Any unprotected anal intercourse, n (%)	302 (81.84)	143 (74.09)	159(90.34)	<0.0001	0.8249	0.7494	0.9081
Unprotected anal intercourse partners, median (IQR)	2 (1, 4)	1 (0, 3)	2 (1, 6)	<0.0001			
Mental Health Diagnosis, n (%)							
Diagnosed depression	174 (43.61)	78 (37.86)	96 (49.74)	0.0168	0.769	0.6136	0.9637
Diagnosed anxiety	139 (34.84)	60 (29.13)	79 (40.37)	0.0134	0.7205	0.5483	0.9466
Mental Health Indicators							
Any level of indication, n (%)	287 (72.47)	143 (69.76)	144 (75.39)	0.2095	0.9249	0.8187	1.0448
Moderate level of indication, n (%) [4]	125 (31.57)	70 (34.15)	55 (28.8)	0.2523	1.1854	0.8846	1.5585
Smoking, n (%)							
Cigarettes, ever	196 (49.12)	94 (45.63)	102 (52.85)	0.1495			
Cigarettes, current [5]	121 (63.35)	65 (70.65)	56 (56.57)	0.0435	1.2727	1.0234	1.5828
Any smoking (non-marijuana), daily [5]	83 (42.35)	44 (46.81)	39 (38.24)	0.2249			
Drug Test, n (%)							
THC	108 (27.14)	77 (37.38)	31 (16.15)	<0.0001	2.3914	1.647	3.4723
Cocaine	30 (7.54)	25 (12.14)	5 (2.60)	0.0003	4.6585	1.8202	11.9226
Other [6]	63 (15.83)	20 (9.71)	43 (22.40)	0.0005	0.4437	0.2705	0.7276
Substance frequency, n (%) 3							
Alcohol, n =310							
Daily	24 (7.74)	8 (4.82)	16 (11.11)	0.0387	0.4333	0.1911	0.9825
Weekly	161 (51.94)	76 (45.78)	85 (59.03)	0.0199	0.7519	0.5895	0.9591
Marijuana, n = 198							
Daily	55 (27.78)	40 (31.25)	15 (21.43)	0.1402	1.4488	0.8646	2.4271
Weekly	100 (50.51)	66 (51.56)	34 (48.57)	0.6874	1.0547	0.7876	1.4123
HIV Diagnosis n (%)							
Within 90 days	14 (3.50)	10 (2.50)	4 (1.00)		2.3301	0.7432	7.3057
Longer than 90 days	386 (96.5)	197 (49.25)	189 (47.25)		0.9717	0.9363	1.0084

HIV Care							
Ever seeking care, n (%)	388 (97.24)	196 (95.15)	192 (99.48)	0.0082	0.9562	0.9255	0.9879
Days from diagnosis to entering HIV care, median (IQR)	29.5 (12, 111)	31 (14, 189)	15 (10, 87)	0.0468			
Taking HIV Medications n (%)	348 (90.86)	169 (87.56)	179 (94.21)	0.024	0.9288	0.8712	0.9902
HIV Medication, last 30 days, n (%)							
Missed any medication dose	212 (60.92)	124 (73.37)	88 (49.16)	< 0.0001	1.4892	1.2504	1.7737
Self-rated good job taking medication	307 (88.99)	139 (84.24)	167 (93.30)	0.0079	0.903	0.8362	0.975
Transportation to care difficulty, n (%)	78 (20.58)	46 (23.83)	32 (17.20)	0.1105	0.9135	0.8246	1.012

[1] as defined by <40copies/ml

[2] as defined by Federal Poverty Guide for Georgia, baseline

[3] among those reporting any in past 6 months

[4] greater than 5 indicators

[5] among ever-smokers n = 196

[6] Other drugs include: Amphetamines, Barbiturates, Benzodiazepine, Methamphetamines, Methylenedioxymethamphetamine, Methadone, Opiates, Phencyclidine

Table 2. Factors associated with viral suppression among men who have sex with men

Patient Characteristics	Overall (n=398)	Undetectable (n=294) [1]	Detectable (104)	p-value	PR	95% LL	95%UL
Age, years, median (IQR)	40 (31, 50)	42 (33, 56)	36 (28, 44.5)	<0.0001			
Age, years, n (%)				<0.0001			
Less than 31	90 (22.50)	52 (17.69)	36 (35.85)	0.0002	0.4972	0.3478	0.7107
31 -39	109 (27.25)	77 (26.19)	30 (30.19)	0.4758	0.8786	0.618	1.2492
40-49	98 (24.50)	74 (25.17)	24 (22.64)	0.6702	1.0907	0.7293	1.6311
50 and above	106 (11.32)	91 (30.95)	103 (25.75)	0.0001	2.6825	1.534	4.6909
Diagnosis n (%)				0.0004			
Within 90 days	14 (3.52)	4 (1.36)	10 (9.62)		0.1415	0.0454	0.4414
Longer than 90 days	384 (98.48)	290 (98.64)	94 (90.38)		1.0913	1.0236	1.1636
Education				0.0008			
College, post-graduate, or professional school	162 (40.50)	133 (45.24)	29 (27.36)	0.002	1.6223	1.162	2.2649
Some college, associate degree, and/or technical school	169 (42.25)	122 (41.50)	47 (44.34)	0.5122	0.9182	0.7141	1.1807
High school or GED	59 (14.75	34 (11.56)	25 (23.58)	0.0083	0.5229	0.3237	0.8447
Less than high school	10 (2.50)	5 (1.70)	5 (4.72)	0.1358	0.3537	0.1045	1.1973
Below poverty line, n (%) [2]	115 (29.19)	72 (24.74)	43 (41.75)	0.0011	0.5927	0.4375	0.8029
Employed at least part time, n (%)	265 (66.25)	200 (68.03)	65 (61.32)	0.2106	1.1054	0.9317	1.3115
Housing							
Homeless, n (%)							
Baseline	9 (2.28)	2 (0.69)	7 (6.73)	0.0017	0.1021	0.0216	0.4837
Month 24	16 (5.25)	10 (3.88)	6 (12.77)	0.0232	0.3036	0.1159	0.7955
Stable Housing, n (%)							
Baseline	300 (75.95)	235 (80.76)	65 (62.50)	0.0002	1.2921	1.1021	1.5149
Month 24	256 (82.58)	221 (84.35)	35 (72.92)	0.0548	1.1568	0.9661	1.3851
Health insurance, n (%)							
Baseline	284 (71.36)	228 (78.08)	56 (52.83)	<0.0001	1.4501	1.2015	1.7501
Month 24	220 (72.13)	198 (76.4)	22 (47.83)	<0.0001	1.5985	1.1732	2.1779

Arrested, ever, n (%)							
Baseline	223 (56.31)	154 (52.74)	69 (66.35)	0.0163	0.7949	0.6675	0.9467
Month 24	179 (57.01)	145 (54.72)	34 (69.39)	0.0567	0.7886	0.6355	0.9785
Male sex partners [3]							
Total partners, median (IQR)							
Baseline	4 (2, 8)	4 (2, 8)	4 (2, 9)	0.3359			
Month 24	2 (1, 4)	2 (1,4)	2 (1, 5)	0.69			
Unprotected anal intercourse, n (%)							
Baseline	301 (82.02)	219 (81.72)	82 (82.83)	0.8056	0.9866	0.8873	1.097
Month 24	195 (81.59)	162 (80.60)	33 (86.84)	0.3623	0.9281	0.8059	1.0688
Unprotected anal intercourse partners, median (IQR)							
Baseline	2 (1, 4)	2 (1, 4)	1 (1, 5)	0.3264			
Month 24	1 (1, 3)	1 (1, 3)	2 (1, 3)	0.7329			
Mental Health Diagnosis, n (%)							
Diagnosed depression	173 (43.58)	123 (41.98)	50 (48.08)	0.2813	0.8732	0.6863	1.111
Diagnosed anxiety	138 (34.76)	98 (33.45)	40 (38.46)	0.3563	0.8696	0.6495	1.1644
Mental Health Indicators							
Any, n (%)							
Baseline	285 (72.34)	204 (70.34)	81 (77.88)	0.1403	0.9032	0.7956	1.0253
24 Months	202 (64.54)	167 (63.02)	35 (72.92)	0.1872	0.8643	0.7108	1.0509
Moderate, n (%) [4]							
Baseline	125 (31.57)	81 (27.93)	44 (41.51)	0.0101	0.6602	0.4936	0.883
24 Months	81 (25.31)	63 (23.77)	18 (32.73)	0.1646	0.7608	0.4746	1.2193
Smoking, n (%)							
Cigarettes, current 5	120 (63.49)	76 (57.58)	44 (77.19)	0.0101	0.7459	0.6086	0.9141
Any smoking (non-marijuana), daily [5]	82 (42.27)	51 (37.50)	31 (53.45)	0.0395	0.7016	0.5076	0.9698
Drug Test, n (%)							
THC							
Baseline	107 (27.02)	67 (22.87)	40 (38.83)	0.0017	0.5888	0.4272	0.8116

Month 24	92 (29.68)	71 (27.00)	21 (44.68)	0.0145	0.6042	0.4152	0.8792
Cocaine							
Baseline	30 (7.54)	18 (6.14)	12 (11.43)	0.0784	0.5273	0.2631	1.0566
Month 24	25(8.06)	19 (7.22)	6 (12.77)	0.1987	0.5659	0.2386	1.3424
Other							
Baseline	62 (15.66)	37 (12.63)	25 (24.27)	0.0052	0.5203	0.3301	0.8201
Month 24	43 (13.87)	29 (11.03)	14 (29.79)	0.0006	0.3702	0.212	0.6463
Substance frequency, n (%) [3]							
Alcohol, daily							
Baseline n = 310	24 (7.74)	20 (8.85)	4 (4.76)	0.2504	1.8142	0.6391	5.1499
Month 24 n=258	16 (7.08)	13 (6.77)	3 (8.82)	0.715	0.4595	0.1032	2.0463
Alcohol, weekly							
Baseline n = 310	161 (52.27)	126 (55.75)	35 (42.68)	0.0424	0.772	0.6089	0.9787
Month 24 n=258	124 (54.87)	110 (57.29)	14 (41.18)	0.0818	1.1158	0.5727	2.1742
Marijuana, daily							
Baseline n = 198	47 (26.70)	28 (23.93)	19 (32.20)	0.2416	0.7431	0.4546	1.2147
Month 24 n=143	35 (29.17)	22 (22.00)	13 (65.00)	0.0001	0.3385	0.2075	0.5522
Marijuana, weekly							
Baseline n = 198	87 (49.43)	53 (45.30)	34 (57.63)	0.1225	0.7861	0.5848	1.0567
Month 24 n=143	58 (48.33)	41 (41.00)	17 (85.00)	0.0003	0.4824	0.3578	0.6502
Taking HIV Medications n (%)							
Baseline	347 (90.84)	291 (99.32)	56 (62.92)	<0.0001	1.5784	1.3454	1.8519
Month 24	300 (95.24)	265 (99.62)	35 (71.43)	<0.0001	1.3947	1.1682	1.6652
HIV Care							
Seeking care ever, since last survey, n (%)							
Baseline	386 (97.23)	292 (99.66)	94 (90.38)	<0.0001	1.1026	1.0352	1.1744
Month 24	306 (97.14)	261 (98.12)	45 (91.84)	0.036	1.0684	0.9812	1.1633
Days from diagnosis to entering HIV care, median (IQR)	29.5 (12, 111)	21.5 (10, 92)	39 (14, 171)	0.3311			
Stigma Indicators							

HIV, n (%)	144 (36.65)	109 (37.20)	35 (33.65)	0.518	1.1054	0.8123	1.5043
Homosexuality, n (%)	301 (75.82)	225 (76.79)	76 (73.08)	0.4472	1.0508	0.9204	1.1998
From Health Care Providers	61 (16.67)	46 (16.55)	15 (17.05)	0.9129	0.9707	0.5707	1.6511
Social Support, n (%)							
Out about HIV status							
Any	385 (98.97)	286 (100)	99 (96.12)	0.0047	1.0404	1.0008	1.0816
Half	74 (22.77)	52 (21.58)	22 (26.19)	0.3852	0.8238	0.5347	1.2693
All	13 (3.34)	7 (2.45)	6 (5.83)	0.102	0.4202	0.1446	1.2212
Out about sexual orientation							
Any	384 (99.74)	283 (99.65)	101 (100)	1	0.9965	0.9896	1.0034
Half	211 (54.81)	153 (53.87)	58 (57.43)	0.5378	0.9381	0.7685	1.1452
All	28 (7.27)	16 (5.63)	12 (11.88)	0.0378	1.0709	0.9915	1.1567
Healthcare provider experiences, median (IQR)							
Trust in healthcare provider	326 (86.70)	251 (87.46)	75 (84.27)	0.4392	1.0378	0.9392	1.1468
Poor experiences due to race	26 (6.12)	18 (6.27)	5 (5.62)	0.8221	1.1164	0.4267	2.921
Poor experiences due to sexual orientation	27 (7.18)	20 (6.97)	7 (7.87)	0.7747	0.886	0.3874	2.0263
HIV Medication, last 30 days							
Missed any medication dose							
Baseline	211 (60.81)	165 (56.70)	46 (82.14)	0.0004	0.6903	0.5893	0.8085
Month 24	178 (59.33)	153 (57.74)	25 (71.43)	0.1212	0.8083	0.64	1.0209
Self-rated good job taking medication							
Baseline	306 (88.95)	267 (92.07)	39 (72.22)	<0.0001	1.2748	1.0768	1.5093
Month 24	262 (88.51	240 (91.95)	22 (62.86)	<0.0001	1.4629	1.1312	1.892
Transportation to care difficulty, n (%)	77 (20.42)	48 (16.67)	29 (32.58)	0.0011	0.6903	0.5893	0.8085

[1] as defined by <40copies/ml

[2] as defined by Federal Poverty Guide for Georgia, baseline

[3] among those reporting any in past 6 months

[4] greater than 5 indicators

[5] among ever-smokers n = 196

[6] Other drugs include: Amphetamines, Barbiturates, Benzodiazepine, Methamphetamines, Methylenedioxymethamphetamine, Methadone, Opiates, Phencyclidine

Table 3. Characteristics of male partnerships among men who have sex with men

Partner Characteristics	Missing	Overall (n=398)	Black (n=206)	White (n=192)	p-value	PR	95% LL	95%UL
At time of sex with partner								
You were HIV positive	790	1042 (95.60)	457 (95.81)	585 (95.43)	0.7648	1.0039	0.9786	1.0299
Partner knew participant's HIV status	118	1293 (75.61)	578 (73.82)	715 (77.13)	0.1121	0.9571	0.9063	1.0107
Discussed participant taking HIV medication	871	787 (78.00)	362 (81.17)	425 (75.49)	0.0306	1.0752	1.0076	1.1473
Partner aware participant is taking meds	871	753 (74.63)	352 (78.92)	401 (71.23)	0.0053	1.1081	1.032	1.1897
Discussed own viral suppression status	870	786 (77.82)	342 (77.20)	444 (78.31)	0.6746	1.051	0.8334	1.3254
Partner was aware of participant being virally suppressed	870	745 (26.24)	326 (73.59)	419 (73.90)	0.911	0.9958	0.9246	1.0725
A condom was used the whole time during IAI	578	74 (19.47)	46 (31.08)	28 (12.07)	<0.0001	2.5753	1.6885	3.9278
Partners race	82							
Same as Participant		1307 (71.89)	673 (82.48)	634 (63.27)	<0.0001	1.3035	1.2315	1.3796
Different from Participant		511 (28.11)	143 (17.52)	368 (36.73)		0.4772	0.4027	0.5654
Main partner	24	304 (16.90)	164 (20.45)	140 (14.04)	0.0003	1.4563	1.1858	1.7884

Table 4. Longitudinal Measures of Cohort of MSM

Patient Characteristics	Missing	Overall	Black	White	p-value	Time Dependent p-value - Black	Time Dependent p-value - White
Study Population							
Baseline		398	206	192			
Month 3		376	191	185			
Month 6		379	194	185			
Month 12		347	178	169			
Month 18		356	185	171			
Month 24		315	167	148			
Undetectable viral load, n (%) [1]						0.0352	0.0566
Baseline		294 (73.87)	138 (66.99)	156 (81.25)	0.0012		
Month 12		272 (78.93)	128 (71.91)	144 (85.21)	0.0026		
Month 24		266 (84.44)	132 (79.04)	134 (90.54)	0.0049		
Homeless, n (%)						0.2408	0.3163
Baseline	3	9 (2.25)	7 (3.38)	2 (1.05)	0.1784		
Month 3	3	12 (3.22)	10 (5.24)	2 (1.10)	0.0362		
Month 6	10	17 (4.61)	14 (7.41)	3 (1.67)	0.0112		
Month 12	11	16 (4.73)	11 (6.37)	5 (3.03)	0.2012		
Month 18	13	22 (6.41)	16 (8.94)	6 (3.66)	0.0499		
Month 24	10	16 (5.13)	10 (6.10)	6 (4.05)	0.4138		
Stable Housing, n (%)						0.2265	0.9732
Baseline	3	301 (75.82)	145 (70.05)	156 (82.11)	0.0051		
Month 3	3	296 (79.36)	141 (73.82)	155 (85.16)	0.0068		
Month 6	6	296 (79.36)	141 (73.44)	155 (85.64)	0.0036		
Month 12	5	276 (80.23)	135 (76.27)	141 (84.43)	0.0575		
Month 18	8	278 (79.89)	138 (76.24)	140 (83.83)	0.0777		

Month 24	5	261 (82.33)	135 (81.33)	126 (83.44)	0.6214		
Health insurance, baseline, n (%)						0.9942	0.9919
Baseline	2	284 (71.72)	128 (62.44)	156 (81.68)	< 0.0001		
Month 3	2	272 (72.73)	122 (64.21)	150 (81.52)	0.0002		
Month 6	11	269 (73.10)	120 (63.83)	149 (82.78)	< 0.0001		
Month 12	10	248 (73.16)	112 (64.74)	136 (81.93)	0.0004		
Month 18	19	246 (73.00)	112 (64.74)	134 (81.71)	0.0005		
Month 24	10	226 (72.67)	107 (65.64)	119 (80.41)	0.0035		
Arrested, ever, n (%)						0.9965	0.9919
Baseline	2	224 (56.28)	130 (63.11)	94 (48.96)	0.0045		
Month 3	2	213 (56.95)	122 (64.21)	91 (49.46)	0.004		
Month 6	2	212 (56.23)	121 (62.69)	91 (49.46)	0.0096		
Month 12	2	197 (56.77)	112 (63.28)	85 (50.00)	0.0126		
Month 18	1	200 (56.34)	112 (60.87)	88 (51.46)	0.0741		
Month 24	1	185 (57.63)	105 (62.87)	80 (51.95)	0.0478		
Male sex partners [2]							
Unprotected anal intercourse, n (%)						0.1267	0.1537
Baseline	31	302 (81.84)	143 (74.09)	159(90.34)	< 0.0001		
Month 6	71	226 (73.38)	102 (64.56)	124 (82.67)	0.0003		
Month 12	79	213 (79.18)	100 (74.43)	113 (87.60)	0.0011		
Month 18	96	217 (83.46)	111 (77.08)	106 (91.38)	0.002		
Month 24	76	199 (81.56)	96 (73.85)	103 (90.35)	0.002		
Mental Health Indicators, median (IQR)							
Baseline		0 (0, 3)	0 (0, 4)	0 (0, 2)	0.4047		
24 Months		0 (0, 2)	0 (0, 0)	0 (0,3)	0.0701		
Any, n (%)						0.116	0.1184
Baseline	4	287 (72.47)	143 (69.76)	144 (75.39)	0.2095		
24 Months	2	206 (64.38)	102 (61.45)	104 (67.53)	0.256		

Moderate, n (%) [3]						0.0055	0.9829
Baseline	4	125 (31.57)	70 (34.15)	55 (28.8)	0.2523		
24 Months	2	81 (25.31)	35 (21.08)	46 (29.87)	0.0709		
Drug Test, n (%)							
THC						0.4171	6497
Baseline	2	108 (27.14)	77 (37.38)	31 (16.15)	<0.0001		
Month 12	2	92 (26.59)	59 (33.33)	33 (19.53)	0.0037		
Month 24	5	92 (29.58)	61 (37.20)	31 (21.09)	0.0019		
Cocaine						0.7863	0.8424
Baseline	2	30 (7.54)	25 (12.14)	5 (2.60)	0.0003		
Month 12	2	22 (6.36)	18 (10.17)	4 (2.37)	0.0029		
Month 24	5	25 (8.04)	20 (12.20)	5 (3.40)	0.0044		
Other [4]						0.2633	0.1877
Baseline	2	63 (15.83)	20 (9.71)	43 (22.40)	0.0005		
Month 12	2	68 (19.65)	27 (15.27)	41 (24.26)	0.0351		
Month 24	5	44 (14.15)	20 (12.20)	24 (16.33)	0.2966		
Substance frequency, n (%) [2]							
Alcohol, weekly						0.6291	0.4948
Baseline n = 310	1	161 (51.94)	76 (45.78)	85 (59.03)	0.0199		
Month 6 n=216	7	119 (55.09)	64 (47.76)	55 (67.07)	0.0056		
Month 12 n=54	3	30 (55.56)	17 (45.95)	13 (76.47)	0.036		
Month 18 n = 245	3	144 (58.78)	74 (54.41)	70 (64.22)	0.1211		
Month 24 n=258	0	125 (54.82)	62 (50.82)	63 (59.43)	0.1924		
Marijuana, weekly						0.2672	0.3413
Baseline n = 198	0	100 (50.51)	66 (51.56)	34 (48.57)	0.6874		
Month 6 n=119	3	71 (59.66)	55 (67.07)	16 (43.24)	0.0142		
Month 12 n=39	1	21 (67.74)	15 (65.22)	6 (75.00)	0.6102		
Month 18 n = 139	1	79 (56.83)	52 (58.23)	27 (54.00)	0.6131		
Month 24 n=143	0	73 (51.05)	50 (57.47)	23 (41.07)	0.0555		
Taking HIV Medications n (%)						0.0108	0.6487

Baseline	16	348 (90.86)	169 (87.56)	179 (94.21)	0.024		
Month 3	2	343 (91.71)	168 (88.42)	175 (95.11)	0.019		
Month 6	2	345 (91.51)	170 (88.08)	175 (95.11)	0.0144		
Month 12	0	329 (94.54)	163 (91.57)	166 (97.65)	0.0127		
Month 18	1	340 (95.77	175 (95.11)	165 (96.49)	0.5176		
Month 24	0	316 (95.25)	160 (95.81)	141 (94.63)	0.6231		
HIV Care, ever, since last survey, n (%)						<0.0001	<0.0001
Baseline	1	388 (97.24)	196 (95.15)	191 (99.48)	0.0082		
Month 3	0	281 (74.73)	144 (75.39)	137 (74.05)	0.7652		
Month 6	1	287 (75.93)	139 (72.02)	148 (80.00)	0.0697		
Month 12	0	337 (96.84)	173 (97.19)	164 (96.47)	0.701		
Month 18	1	320 (90.14)	165 (89.67)	155 (90.64)	0.7595		
Month 24	0	307 (97.15)	160 (95.81)	147 (98.66)	0.1285		
Missed any med, last 30 days						0.9409	0.8844
Baseline	51	212 (60.92)	124 (73.37)	88 (49.16)	< 0.0001		
Month 3	33	195 (56.85)	105 (62.50)	90 (51.43)	0.0385		
Month 6	34	197 (57.01)	106 (62.35)	91 (52.00)	0.0521		
Month 12	19	184 (55.93)	105 (64.42)	79 (47.59)	0.0021		
Month 18	17	191 (56.34)	107 (61.49)	84 (50.91)	0.0495		
Month 24	15	179 (59.47)	110 (68.75)	69 (48.94)	0.0005		

[1] as defined by <40copies/ml

[2] among those reporting any in past 6 months

[3] greater than 5 indicators

[4] Other drugs include: Amphetamines, Barbiturates, Benzodiazepine, Methamphetamines, Methylenedioxymethamphetamine, Methadone, Opiates, Phencyclidine