**Distribution Agreement**

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

__________________ April 30th, 2021

Simone Shire Wien Date

Racial differences in the association between transportation mode and HIV viral suppression among men who have sex with men in Atlanta, Georgia

By

Simone Shire Wien
Master of Public Health

Department of Epidemiology

_________________________________________

Jodie L. Guest PhD MPH
Committee Chair

Racial differences in the association between transportation mode and HIV viral suppression among men who have sex with men in Atlanta, Georgia

By

Simone Shire Wien

Bachelor of Arts
Dartmouth College
2016

Thesis Committee Chair: Jodie L. Guest PhD MPH

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology
2021

# Abstract

Racial differences in the association between transportation mode and HIV viral suppression among men who have sex with men in Atlanta, Georgia
By Simone Shire Wien

There is a well-documented disparity in HIV outcomes among Black men who have sex with men (Black MSM) compared to MSM overall. While transportation has been cited as a barrier to HIV care, and that Black MSM face persistent disparities in HIV outcomes, no transportation estimates or associations have been studied for Black MSM. The purpose of this study is to assess the relationship between mode of transportation and HIV viral suppression among Black and white MSM living with HIV in Atlanta, Georgia.

This cross-sectional analysis consisted of Black and white MSM living with HIV. Participants were classified as either using "independent" or "dependent" transportation based on survey results. Viral load was obtained via testing. Participants were excluded if they did not have an HIV provider or listed one outside of Georgia. Logistic regression was performed to assess the association between independent transportation and viral suppression.

Our sample included 170 Black and 175 white MSM. More Black MSM had a detectable viral load (25% vs. 15%) and took a dependent mode of transportation (37% vs. 18%) compared to white MSM. We found a weak positive association between independent transportation mode and viral suppression for Black MSM (cOR 1.18, 95% CI 0.50, 2.24), and a stronger positive association for white MSM (cOR 3.61, 95% CI 1.45, 8.97). For white MSM this association remained but was weaker after controlling for recent HIV diagnosis and income (aOR 2.54, 95% CI 0.85, 7.59).

Our results highlight racial differences in viral suppression and transportation mode used for MSM living with HIV. One explanation for the weaker association for Black MSM this is that barriers to HIV care are greater for Black MSM than white MSM. Limitations include restricting the analysis to participants who had an HIV provider in Georgia, which limits generalizability to MSM currently engaged in care. Interventions to improve viral suppression for Black MSM must address fundamental causes of health inequalities and include more than transportation services. Future studies examining racial and ethnic differences in transportation and viral suppression should explore how this relationship changes in areas with more public transportation infrastructure.

Racial differences in the association between transportation mode and HIV viral suppression among men who have sex with men in Atlanta, Georgia

By

Simone Shire Wien

Bachelor of Arts
Dartmouth College
2016

Thesis Committee Chair: Jodie L. Guest PhD MPH

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology
2021

**Acknowledgements**

I would like to first and foremost thank Dr. Jodie Guest, my faculty thesis advisor, for her expertise and guidance throughout this thesis and my MPH program, as well Nicole Luisi and Dr. Michael Kramer for their subject matter expertise.

I would also like to thank Emma Butturini and Sagarika Das for providing valuable feedback and encouragement during our thesis writing sessions, and my partner and family for their unwavering support.

## Table of Contents

**Introduction**

There is a long-standing and well-documented disparity in HIV incidence and HIV care outcomes among Black/African American gay, bisexual, and other sexual minority men who have sex with men (Black MSM) compared to MSM overall [1-6]. Black MSM accounted for 26% of all new HIV diagnoses and 37% of new diagnoses among MSM in the United States in 2018 [4]. National HIV Surveillance System estimates of consistent racial disparities at each step of the HIV treatment cascade culminate in a 30% lower likelihood of viral suppression among Black compared to white persons living with HIV [5]. This disparity in viral suppression extends to Black and white MSM [7].

Research on this disparity in HIV incidence and care outcomes among Black MSM has historically focused on individual-level factors. However, there is evidence that Black MSM do not have higher individual risk behaviors than white MSM [1, 2]. Millet *et al.* found that Black MSM in the US were more likely to report preventative HIV behaviors even though they had a two-fold greater odds of facing a strucutral barrier that increased HIV risk [2]. This suggests that structural factors rather than indiviudal ones may play a greater role in this disparity. Additionally, citing a modified social ecological model for HIV, researchers have increasingly argued that individual-level factors that are associated with HIV care management are impacted by structural factors [8]. For instance, the built environment can have neighborhood characteristics such as social capital, violence, clinic density, access to transportation, and other features that affect HIV treatment uptake and adherence, and disproportionately have an effect on communities of color [1, 9, 10]. To better understand these social determinants of health, there have been calls to increase the number of studies and surveillance efforts to better understand the drivers of HIV and relatively lower rates of care among Black MSM [8], some of which are currently underway [11-13].

Of these built environmental factors, access to transportation to an HIV provider has been identified as an issue for engagement and retention in care among persons living with HIV [14-24]. Several studies have investigated the impact of providing private transportation services to an HIV clinic. Access to private transportation was associated with an improved HIV care engagement across a variety of populations [16, 17, 20]. One study noted a greater effect among non-white participants compared to white participants. However, Philbin *et al*. found that a clinics' ability to provide transportation may be resource dependent [18]. Because of this, structural, as opposed to individual- or clinic-based interventions, may be more effective. Access to public transportation has been identified as a major issue for people living with HIV in both urban and rural settings in the U.S. [14, 15, 18, 19, 21, 24]. Of two ecologic studies assessing residential physical proximity to HIV care in Atlanta, Georgia, one study found a positive correlation between low community linkage to care and low viral suppression [22]. The second study found that the concentration of HIV providers available dramatically decreased if individuals were traveling by public transportation as opposed to using a car [22, 23].

While these studies assess the relationship between access to transportation and access to an HIV provider or other care-related outcomes, neither explicitly aim to assess differences in transportation and HIV outcomes by race and ethnicity in any population, including MSM [20, 21]. Lo *et al.* in Boston found that among those receiving transportation services, the outcome of higher mean number of primary care visits per year was stronger for non-white compared to white participants living with HIV [20]. However, this was a 75% white, 93% MSM study population. Sagrestano *et al.* found that more Black participants reported using public transportation to travel to their HIV provider as well as using more modes of transportation overall in a study population consisting 76% Black participants living with HIV in the Southeast. [21]. While these studies discuss how access to an HIV provider differs by race, there is a need to translate this relationship to specific health outcomes, such as viral suppression.

The disproportionate burden of health outcomes associated with race and structural barriers has been longstanding in the U.S., particularly in the South. While not exclusively limited to Black MSM living with HIV, Atlanta and other urban areas have both historical and contemporary political and economic processes that can serve as the root of racial health disparities [25]. These processes negatively affect both where Black communities live in Atlanta (e.g., historical and contemporary red lining), the availability of transportation frequently used by Black communities (e.g., policies to not adequately fund or expand public transportation), and health outcomes related to both, including HIV care outcomes [23, 26-30].

While transportation has been cited as a major barrier to care for persons living with HIV, and that Black MSM face persistent disparities in HIV care outcomes, no population-specific transportation estimates or associations have been studied for Black MSM. The purpose of this study is to assess the relationship between mode of transportation and HIV viral suppression among Black and white MSM living with HIV using detailed survey and clinical data from the EngageMENt Study in Atlanta [7]. We aim to assess this relationship by describing the distribution of clinical and transportation characteristics among Black and white MSM and assess the association of mode of transportation and HIV viral suppression.

## Methods

### *Recruitment*

This cross-sectional analysis used baseline data from the EngageMENt Study consisting of Black (n=200) and white (n=200) MSM who have either recently (≤90 days) or previously (>90 days) been diagnosed with HIV [7]. Participants were recruited via community venues, advertisements in gay-oriented magazines, and on public transportation. Data were collected from June 2016 to May 2017, and participants were compensated $60 for the completed baseline visit.

### *Inclusion, exclusion criteria*

Enrollment inclusion criteria consisted of self-reported positive HIV status (which was confirmed during the baseline visit by HIV antibody testing), male at birth who currently identifies as a male, 16 years of age or older, self-identifies as Black, non-

Hispanic or white, non-Hispanic, able to complete survey instruments in English, lives in the Atlanta metropolitan statistical area, was not planning to exclusively receive HIV care outside of metro Atlanta for the duration of the 2-year study, and had at least one male sex partner in the 12 months before the baseline interview. Exclusion criteria for enrollment consisted of those who were determined to not be living with HIV after confirmatory testing, those who were currently enrolled in another HIV prevention or treatment clinical trial, or were planning to receive HIV care outside of metro Atlanta area in the next two years.

Analysis-specific exclusion criteria included those who did not list a provider (n=32) and those who listed a provider whose address was outside of Georgia (n=21) (Figure 1). Additional participants were removed from the analysis due to missing race (n=1), and inability to ascertain the exact location of the provider due to participant listing a clinic name that has multiple locations in Atlanta (n=1).

***Variable collection***

All variables with the exception of viral load were self-reported by the participant in the form of a survey. For this analysis only survey information from the demographic, clinical, and provider portions were analyzed.

Demographic variables included age (continuous), recent HIV diagnosis (dichotomous, considered recent if diagnosis was (≤90 days from the time of survey), highest level of education (categorical), employment status (categorical, where each participant could select more than one option), yearly income (categorical), housing (categorical), and health coverage (categorical). Health coverage was the only demographic variable that was recategorized after data collection using information on health insurance and supplemental assistance. It was recategorized as a 4-level categorical variable ("insurance, no supplemental assistance", "insurance, with supplemental assistance", "no insurance, with supplemental assistance", and "no insurance, no supplemental assistance").

Participants were allowed to list up to 5 HIV care providers and were asked a number of questions about each provider, including services received and mode of transportation used to travel to each provider. For this analysis, participants were matched with the first provider listed that they reported receiving CD4 and/or HIV viral load tests from, which was the first provider listed for all except one participant, who reported receiving CD4 and/or HIV viral load tests from their second provider listed. Transportation mode to HIV care provider, the exposure variable, was recategorized as a dichotomous variable ("independent transportation" or "dependent transportation") using mode of transportation information asked during the survey. The mode of transportation was a 8-level categorical variable where participants could select more than one option ("I drive", "A friend or family member drives me", "I ride the MARTA train", "I take the bus", "I take a Taxi/Uber/Lyft", "I ride a bicycle", "I walk", or "Other"): participants were considered taking independent transportation if they reported driving themselves, regardless of what other modes of transportation they took, or reported only walking or biking to their HIV provider. Participants were considered taking a dependent mode of transportation if they did not report any driving and reported either a friend or family member driving them, taking the MARTA (Metropolitan Atlanta Rapid Transit Authority) train, bus, or using a rideshare app (Uber or Lyft) or taxi. One participant reported "Other", and reported using US Veterans Affairs transportation, and was classified as using dependent transportation. Average one-way time, distance, and cost (all categorical) were also collected.

Viral suppression was ascertained via laboratory baseline testing through the Emory University Center for AIDS Research CLIA-certified Kraft Laboratory using Abbott RealTime HIV-1 assay. A participant was considered virally suppressed if their HIV viral load test reported <200 copies of HIV RNA/ml blood and not virally suppressed if their HIV viral load test reported ≥200 copies of HIV RNA/ml blood.

This analysis was conducted using a prospective analysis plan. Frequencies and proportions were calculated for the entire sample to describe demographic, transportation, and clinical characteristics. Multivariable logistic regression models adjusting for age, recent HIV diagnosis, and income were used to assess the association of transportation dependency on HIV viral suppression. All analyses were stratified by race. All descriptive and regression analyses were performed with SAS 9.4 (SAS Institute, Cary, NC).

**Results**

***Descriptive statistics***

A total of 345 participants identifying as MSM living with HIV were in our analytic sample (Table 1). Of these, 49% (n=170) identified as Black, non-Hispanic MSM, and 51% (n=175) identified as white, non-Hispanic MSM. The median age of Black study participants was 36 years, which was younger than the median age for white participants (46 years). Compared to white participants, fewer Black participants had completed college (Black 35%, white 50%), lived in their own house or apartment (Black 72%, white 87%) and had health insurance, regardless of supplemental assistance (Black 68%, white 85%) at the time of the survey. Black participants also reported lower income.

For mode of transportation used to attend appointments to their HIV care provider, a higher proportion of white participants reported using an independent mode of transportation (81%) compared to Black participants (62%), with Black participants using more modes of transportation compared to white participants (Table 2). For dependent modes of transportation, Black participants reported using public transportation via train (Black 44%, white 17%), and bus (Black 23%, white 12%), as well as utilize taxi and rideshare services (Uber, Lyft) (Black 15%, white 8%) in higher proportions compared to white participants. Black participants' average distance and time to provider appeared to skew farther and longer, respectively, compared to white participants.

For HIV care outcomes, 99% (n=341, 99% of Black, 100% of white) participants received receipt of care, defined as receiving either one or more CD4 or viral load tests within the past year at the time the baseline survey was administered (Table 2) [4]. For HIV viral suppression, 80% (n=276) of participants had an undetectable HIV viral load, which included 75% (n=127) of Black participants and 85% (n =149) of white participants.

***Measures of association for HIV viral suppression***

Black participants who took an independent mode of transportation were 18% more likely to achieve viral suppression compared to those who took a dependent mode of transportation to their HIV provider (cOR 1.18, 95% CI 0.58, 2.42), though this association was weak. (Table 3A). There was no indication of confounding by age (aOR 1.21, 95% CI 0.58, 2.52), recent HIV diagnosis (aOR 1.17, 95% CI 0.57, 2.4), or income (aOR 1.09, 0.51, 2.34). Odds ratios controlling for the aforementioned covariates did not result in an odds ratio greater than 10% of the crude estimate.

Conversely, there was a positive and strong association between using an independent mode of transportation to an HIV provider and viral suppression for white participants (Table 3B). White participants who took an independent mode of transportation were 3.6 times more likely to achieve viral suppression compared to white participants who took a dependent mode of transportation to their HIV provider (cOR 3.61 95% CI 1.45, 8.97) (Table 3). There was no indication of confounding by age (aOR 3.43, 95% CI 1.37, 8.59). However, odds ratios controlling for recent HIV diagnosis (aOR 4.09, 95% CI 1.62, 10.36) and income (aOR 1.16, 0.95, 1.40) resulted in more than a 10% change from the crude estimate, meeting the definition for confounding. After adjusting for recent HIV diagnosis and income, white MSM who took an independent mode of transportation to their HIV care provider were more than twice as likely to achieve viral suppression compared to those taking a dependent mode of transportation, though this was a weaker association (aOR 2.54, 95% CI 0.85, 7.59).

## Discussion

### *Key findings*

The purpose of this study was to describe mode of transportation used to travel to an HIV provider and test the association between mode of transportation and viral suppression among Black and white MSM. In this analysis of Black and white MSM living in metro Atlanta, a quarter of Black MSM had a detectable viral load, which was higher than white MSM in this analysis (15%). For the parameter receipt of care, 99% of Black and 100% of white MSM met this definition. We found a positive but weak association between independent transportation mode and viral suppression for Black MSM (cOR 1.18, 95% CI 0.50, 2.24), which remained after controlling separately for age, recent HIV diagnosis, and income. Independent transportation was more strongly associated with viral suppression for white MSM (cOR 3.61, 95% CI 1.45, 8.97). Recent HIV diagnosis and income were found to be confounding variables in this relationship. After controlling for both, there remained a large difference in undetectable viral load levels by transportation method but this association was weak (aOR 2.54, 95% CI 0.85, 7.59).

### *Limitations*

There were several limitations to this study. First, this analysis was restricted to participants who listed an HIV care provider. By restricting this analysis to only participants who listed an HIV care provider in Georgia, 14% (n=55) of the original study population was excluded from this analysis. Of those removed who listed an HIV care provider outside of Georgia (n=21), approximately 42% (n=9) were not virally suppressed, and 57% (n=12) were Black. Of those removed for not listing any HIV care provider (n=32), the majority were not virally suppressed (84%, n = 27), and Black (78%, n = 25). Participants who did not list an HIV provider may not have a provider to list, which is consistent with the higher rates of no viral suppression among those excluded from the analysis. This limits the generalizability of our study to MSM with HIV who see their HIV provider at least once a year for CD4 and/or viral load tests.

We have evidence to suggest that participants in our restricted sample met the definition of "engaged in care" as opposed to "receipt of care", though we were unable to confirm this. Our proportions of Black and white MSM participants who are virally suppressed are similar to proportions of those virally suppressed among those retained in care reported by the Georgia Department of Public Health in 2014 [31]. For the Atlanta eligible metropolitan area, viral suppression among those retained in care was

92% for white MSM (compared to 85% in our study), 79% for Black MSM (compared to 75% in our study), and a difference of 13 percentage points for viral suppression between white and Black MSM (compared to 10 in our study). While we feel that this sample is likely more representative of Black and white MSM in metro Atlanta who are "retained in care", defined as receiving at least 2 CD4 or 2 viral load tests within the past year at least 3 months apart from each other, we can only determine that they had a receipt of care due to how baseline data were collected. We think this population is "retained in care" as opposed to having a "receipt of care" for three reasons: first, as discussed above, almost the entire cohort met the criteria for receipt of care [32]. Second, as discussed above, proportions of viral suppression in our sample are similar to those who are retained in care and virally suppressed in metro Atlanta. Third, while the data at baseline were collected in such a way that we could not verify the time period between CD4 and viral load tests, 90% (n = 153) of Black and 93% (n = 163) of white participants had received at least 2 CD4 or 2 viral load tests within the past year at the time of the survey.

Our second limitation was selection bias from study recruitment. Study recruitment included physical venues, events with a high-volume of MSM attendees, internet venues, incentivized recruitment in healthcare settings, previous HIV study engagement, mass transportation venues, and peer referral forms. Because of this, participants who had more positive HIV outcomes, such as being retained in care, may have been more easily contacted during recruitment and may have been more likely to participate in the study than those who were unable to be retained in HIV care or achieve HIV viral suppression.

Lastly, there may be information bias from the administered survey. This could have resulted in potential misclassification of the exposure and covariates due to both recall bias and the categorical nature of available answers for participants. With the exception of HIV viral load, all participant responses were obtained via a survey. Answers to these survey questions may have equally biased our results towards or away from the null.

***Interpretation of findings***

Our study found that independent transportation was weakly associated with viral suppression for Black MSM, and more strongly associated with viral suppression among white MSM. One possible explanation for this result is that for white MSM, the number and magnitude of barriers faced to access to care may be smaller compared to the number of barriers Black MSM face [2, 33-35]. Because of this, one factor changing (in this case going from dependent to independent transportation) may have a notable impact and therefore the association was observed in this study for white MSM, whereas for Black MSM a multitude of factors need to be changed in order to achieve viral suppression. In a sensitivity analysis using income as the exposure, similar results were seen in both strength and magnitude (data not shown). Additionally, a collinearity assessment determined no collinearity for models that included mode of transportation and income. For white MSM, the attenuation of the effect of transportation mode on viral suppression after controlling for income may be explained by income and other forms of social capital affecting what mode of transportation is used, as well as viral suppression and other HIV care outcomes [24, 36-41].

### *Generalizability*

Our results are generalizable to Black and white MSM living with HIV and in urban areas where public transportation is available and who have access to an HIV provider. While important to understand differences in rates of viral suppression for MSM in care, there are still many people for whom access to care, regardless of transportation, is an issue and therefore these results are not necessarily generalizable to this group [22]. Recent findings from Sangaramoorthy *et al.* suggest that while transportation barriers are a concern across the HIV care continuum, it may be a higher priority concern among those who are out of care as opposed to those who are in care, or even sporadically in care [42].

### *Conclusion*

Our results highlight racial differences in viral suppression for MSM living with HIV living in metro Atlanta as well as differences in mode of transportation used to HIV providers. We found that access to independent transportation was predictive of viral suppression among white MSM but was not as predictive for Black MSM. This study addresses gaps in the literature by investigating the association between mode of transportation used to an HIV care provider and viral suppression for MSM by race. This study demonstrated for a population with substantial differences in viral suppression by race and ethnicity how Black and white MSM travel to their HIV provider is meaningfully different, and how that impacts their likelihood of being virally suppressed is also different by race. These differences are likely a result of a multitude of factors related to how societal oppression affects Black MSM's daily experiences that may include transportation to their HIV provider, but also pertain to where Black MSM live, travel, and how they navigate their HIV care [10, 43-47]. This study demonstrates that while improved dependent transportation, such as investments in public transportation infrastructure, may improve outcomes for all MSM, one single intervention may not be enough to improve viral suppression for Black MSM [48]. Interventions to improve viral suppression for Black MSM need to address fundamental causes of health inequalities and include more than transportation services, such expanded or universal health coverage, housing stability, and reparations [49-51]. Future studies examining racial and ethnic differences in transportation to an HIV healthcare provider should also expand beyond Black and white MSM, as well as explore how the relationship between mode of transportation and viral suppression changes in urban areas where there is more investment in the public transportation infrastructure.

## Figures and Tables

*Figure 1. Analytic Study Sample*

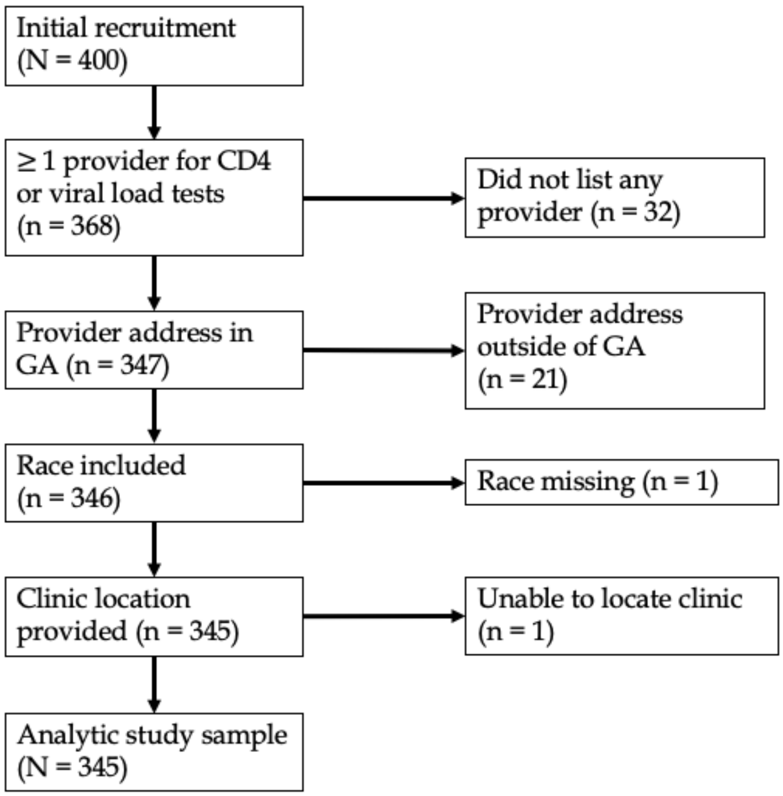

*Table 1. Demographic Characteristics of MSM enrolled in EngageMENt Study, 201 7 [1, 2, 3]*

| | Black Participants | | | | | | White Participants | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total n = 170 | | Independent n = 106 | | Dependent n = 63 | | Total n = 175 | | Independent n = 143 | | Dependent n = 32 | |
| | **N** | % | N | % | N | % | **N** | % | N | % | N | % |
| **Age** | | | | | | | | | | | | |
| Mean Age (SD)[4] | 38.1 | 10.4 | 37.8 | 10.0 | 38.3 | 10.9 | 44.6 | 11.1 | 45.2 | 11.0 | 42.2 | 11.0 |
| Median Age | 36 | | 36 | | 36 | | 46 | | 47 | | 45 | |
| Minimum, Maximum Age | 22, | 64 | 22, | 62 | 23, | 64 | 18, | 71 | 20, | 71 | 18, | 58 |
| **Recent HIV Diagnosis** | | | | | | | | | | | | |
| ≤90 days | 3 | 2% | 1 | 1% | 2 | 3 | 3 | 2% | 3 | 2% | 0 | 0% |
| >90 days | 167 | 98% | 105 | 99% | 61 | 97 | 172 | 98% | 140 | 98% | 32 | 100% |
| **Highest Level of Education** | | | | | | | | | | | | |
| College, post graduate, or professional school | 60 | 35% | 42 | 40% | 18 | 29 | 88 | 50% | 80 | 56% | 8 | 25% |
| Some college, Associate's and/or Technical School | 84 | 49% | 54 | 51% | 29 | 46 | 62 | 35% | 48 | 34% | 14 | 44% |
| High school or GED | 22 | 13% | 9 | 8% | 13 | 21 | 22 | 13% | 14 | 10% | 8 | 25% |
| Did not finish high school | 4 | 2% | 1 | 1% | 3 | 5 | 3 | 2% | 1 | 1% | 2 | 6% |
| Currently enrolled in high school | 0 | 0% | - | - | - | - | 0 | 0% | - | - | - | - |
| Don't know | 0 | 0% | - | - | - | - | 0 | 0% | - | - | - | - |
| **Employment Status** | | | | | | | | | | | | |
| Employed full-time | 84 | 49% | 59 | 56% | 25 | 40% | 103 | 59% | 97 | 68% | 6 | 19% |
| Employed part-time | 24 | 14% | 89 | 84% | 7 | 11% | 22 | 13% | 12 | 8% | 10 | 31% |
| A full-time student | 9 | 5% | 5 | 5% | 4 | 6% | 6 | 3% | 3 | 2% | 3 | 9% |
| A part-time student | 6 | 4% | 6 | 6% | 0 | 0% | 3 | 2% | 3 | 2% | - | - |
| Active duty in US Armed Forces, Reserves, or National Guard | 1 | 1% | 0 | 0% | 1 | 2% | 0 | 0% | | | | |
| Unable to work for health reasons | 20 | 12% | 8 | 8% | 11 | 17% | 19 | 11% | 12 | 8% | 7 | 22% |
| Unemployed | 27 | 16% | 14 | 13% | 13 | 21% | 16 | 9% | 9 | 6% | 7 | 22% |
| Other | 12 | 7% | 5 | 5% | 7 | 11% | 12 | 7% | 10 | 7% | 2 | 6% |
| Don't know | 0 | 0% | - | - | - | - | 0 | 0% | - | - | - | - |
| **Yearly Income** | | | | | | | | | | | | |
| 0-$4,999 | 17 | 10% | 6 | 6% | 11 | 18% | 7 | 4% | 4 | 3% | 3 | 9% |
| $5,000-$9,999 | 17 | 10% | 9 | 8% | 8 | 13% | 5 | 3% | 0 | 0% | 5 | 16% |
| $10,000 to $14,999 | 27 | 16% | 10 | 9% | 17 | 28% | 21 | 12% | 9 | 6% | 12 | 38% |
| $15,000 to $19,999 | 14 | 8% | 9 | 8% | 4 | 7% | 14 | 8% | 9 | 6% | 5 | 16% |
| $20,000 to $29,999 | 33 | 20% | 23 | 22% | 10 | 16% | 17 | 10% | 15 | 11% | 2 | 6% |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $30,000 to $39,999 | 19 | 11% | 14 | 13% | 5 | 8% | 20 | 11% | 19 | 13% | 1 | 3% |
| $40,000 to $49,999 | 13 | 8% | 12 | 11% | 1 | 2% | 14 | 8% | 13 | 9% | 1 | 3% |
| $$50,000 to $74,999 | 14 | 8% | 12 | 11% | 2 | 3% | 23 | 13% | 23 | 16% | 0 | 0% |
| $75,000 or more | 10 | 6% | 9 | 8% | 1 | 2% | 51 | 29% | 48 | 34% | 0 | 0% |
| Don't know | 4 | 2% | 2 | 2% | 2 | 3% | 2 | 1% | 2 | 1% | 3 | 9 |
| **Housing** | | | | | | | | | | | | |
| Own house or apartment | 123 | 72% | 82 | 77% | 41 | 65% | 152 | 87% | 129 | 90% | 23 | 72% |
| Temporarily in home with friends or relatives | 34 | 20% | 20 | 19% | 13 | 21% | 18 | 10% | 13 | 9% | 5 | 16% |
| Hotel | 2 | 1% | 0 | 0% | 2 | 3% | 0 | 0% | - | - | - | - |
| Car | 1 | 1% | 1 | 1% | 0 | 0% | 0 | 0% | - | - | - | - |
| Shelter | 0 | 0% | - | - | - | - | 0 | 0% | - | - | - | - |
| Group home | 0 | 0% | - | - | - | - | 3 | 2% | 1 | 1% | 2 | 6% |
| Supportive services housing | 10 | 6% | 3 | 3% | 7 | 11% | 1 | 1% | 0 | 0% | 1 | 3% |
| "On the street" | 0 | 0% | - | - | - | - | 1 | 1% | 0 | 0% | 1 | 3% |
| With a parent or guardian | 0 | 0% | - | - | - | - | 0 | 0% | - | - | - | - |
| **Healthcare Coverage** | | | | | | | | | | | | |
| Insurance, no supplemental assistance | 58 | 35% | 39 | 38% | 19 | 32% | 56 | 33% | 47 | 33% | 9 | 30% |
| Insurance, with supplemental assistance | 55 | 33% | 37 | 36% | 17 | 28% | 89 | 52% | 79 | 56% | 10 | 33% |
| No insurance, with supplemental assistance | 42 | 25% | 22 | 21% | 20 | 33% | 23 | 13% | 13 | 9% | 10 | 33% |
| No insurance, no supplemental assistance | 10 | 6% | 6 | 6% | 4 | 7% | 4 | 2% | 3 | 2% | 1 | 3% |

[1] Reported as n, % unless otherwise specified
[2] Column percent unless otherwise stated
[3] Percentages rounded to the nearest whole percent; due to rounding, percentages may not sum to 100%
[4] Rounded to one decimal place

*Table 2. Clinical Outcomes and Transportation to HIV Provider among MSM enrolled in EngageMENt Study, 2017* [1, 2, 3]

| | Black Participants | | | | | | White Participants | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | Independent | | Dependent | | Total | | Independent | | Dependent | |
| | n = 170 | | n = 106 | | n = 63 | | n = 175 | | n = 143 | | n = 32 | |
| | **N** | % | N | % | N | % | **N** | % | N | % | N | % |
| **HIV Viral Load** | | | | | | | | | | | | |
| Virally Suppressed | 127 | 75% | 80 | 76% | 46 | 73% | 149 | 85% | 127 | 89% | 22 | 69% |
| Not Virally Suppressed | 42 | 25% | 25 | 24% | 14 | 27% | 26 | 15% | 16 | 11% | 10 | 31% |
| **Receipt of HIV Care** | | | | | | | | | | | | |
| Yes | 166 | 99% | 104 | 98% | 62 | 100% | 175 | 100% | | | | |
| No | 2 | 1% | 2 | 2% | 0 | 0 | | | | | | |
| **Number of Modes of Transportation** | | | | | | | | | | | | |
| 1 | 103 | 61% | 78 | 74% | 25 | 40% | 143 | 82% | 130 | 91% | 13 | 41% |
| 2 | 39 | 23% | 13 | 12% | 26 | 41% | 19 | 11% | 9 | 6% | 10 | 31% |
| 3 | 17 | 9% | 4 | 4% | 12 | 19% | 7 | 4% | 3 | 2% | 4 | 13% |
| 4 | 7 | 4% | 7 | 7% | 0 | 0% | 3 | 2% | 0 | 0% | 3 | 9% |
| 5 | 3 | 2% | 3 | 3% | 0 | 0% | 1 | 1% | 0 | 0% | 1 | 3% |
| 6 | 1 | 1% | 1 | 1% | 0 | 0% | 2 | 1% | 1 | 1% | 1 | 3% |
| **Mode of Transportation** | | | | | | | | | | | | |
| Drive, self | 101 | 60% | 101 | 95% | 0 | 0% | 141 | 81% | 141 | 99% | 7 | 22% |
| Drive, friend or family member | 16 | 9% | 11 | 10% | 5 | 8% | 11 | 6% | 4 | 3% | 24 | 75% |
| MARTA train | 77 | 45% | 21 | 20% | 56 | 89% | 29 | 17% | 5 | 4% | 24 | 75% |
| Bus | 39 | 23% | 12 | 11% | 27 | 43% | 21 | 12% | 3 | 2% | 18 | 56% |
| Taxi or rideshare app | 27 | 15% | 13 | 12% | 14 | 22% | 14 | 8% | 4 | 3% | 10 | 31% |
| Bike | 2 | 1% | 1 | 1% | 1 | 2% | 5 | 3% | 3 | 2% | 2 | 6% |
| Walk | 15 | 8% | 6 | 6% | 9 | 14% | 10 | 6% | 3 | 2% | 7 | 22% |
| Other | 1 | 1% | 0 | 0% | 1 | 2% | 0 | 0% | | | | |
| **Average Time, One-Way** | | | | | | | | | | | | |
| Less than 5 minutes | 3 | 2% | 3 | 3% | 0 | 0 | 4 | 2% | 4 | 3% | 0 | 0% |
| 5 to 15 minutes | 28 | 17% | 21 | 21% | 7 | 11% | 55 | 32% | 52 | 37% | 3 | 10% |
| 16 to 30 minutes | 73 | 43% | 53 | 53% | 20 | 32% | 65 | 38% | 56 | 39% | 9 | 29% |
| 31 minutes to 1 hour | 47 | 28% | 24 | 24% | 23 | 37% | 37 | 21% | 22 | 15% | 15 | 48% |
| More than 1 hour | 17 | 10% | 4 | 4% | 13 | 21% | 12 | 7% | 8 | 6% | 4 | 13% |
| **Average Distance, One-Way** | | | | | | | | | | | | |
| 5 miles or less | 24 | 14% | 14 | 14% | 10 | 16% | 53 | 31% | 43 | 31% | 10 | 31% |
| 6 to 10 miles | 48 | 29% | 24 | 23% | 24 | 38% | 59 | 34% | 45 | 32% | 14 | 44% |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 to 20 miles | 56 | 34% | 38 | 37% | 18 | 29% | 34 | 20% | 30 | 21% | 4 | 13% |
| 21 to 30 miles | 25 | 15% | 19 | 18% | 6 | 10% | 12 | 7% | 10 | 7% | 2 | 6% |
| 31 to 40 miles | 11 | 7% | 7 | 7% | 4 | 6% | 7 | 4% | 7 | 5% | 2 | 6% |
| More than 40 miles | 2 | 1% | 1 | 1% | 1 | 2% | 8 | 5% | 6 | 4% | | |
| **Average Cost, One-Way** | | | | | | | | | | | | |
| Less than a dollar | 7 | 8% | 2 | 8% | 5 | 8% | 2 | 6% | 1 | 14% | 1 | 3% |
| $1 to $5 | 60 | 71% | 14 | 54% | 46 | 78% | 21 | 58% | 1 | 14% | 20 | 69% |
| $6 to $10 | 10 | 12% | 6 | 23% | 4 | 7% | 11 | 31% | 4 | 57% | 7 | 24% |
| $11 to $20 | 4 | 5% | 2 | 8% | 2 | 3% | 2 | 6% | 1 | 14% | 1 | 3% |
| $21 to $40 | 4 | 5% | 2 | 8% | 2 | 3% | 0 | 0% | | | | |
| More than $40 | 0 | 0% | | | | | 0 | 0% | | | | |

[1] Reported as n, % unless otherwise specified
[2] Column percent unless otherwise stated
[3] Percentages rounded to the nearest whole percent; due to rounding, percentages may not sum to 100%

*Table 3A. Odds Ratios for HIV Viral Suppression by Mode of Transportation to HIV Provider, Black MSM enrolled in EngageMENt Study, 2017* [1]

| | **Virally Suppressed** n = 127 | | **Not Virally Suppressed** n = 42 | | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| | **N** | % | N | % | | |
| **Independent Transportation** | 80 | 63% | 25 | 60% | 1.18 | (0.58, 2.24) |
| **Dependent Transportation** | 46 | 35% | 14 | 33% | Reference | |
| Adjusted for age | | | | | 1.21 | (0.58. 2.52) |
| Adjusted for recent HIV diagnosis | | | | | 1.17 | (0.57, 2.40) |
| Adjusted for income | | | | | 1.09 | (0.51, 2.34) |
| Adjusted for recent HIV diagnosis and income | | | | | NA | NA |

[1] Percentages rounded to the nearest whole percent; odds ratios rounded to the second decimal place

*Table 3B. Odds Ratios for HIV Viral Suppression by Mode of Transportation to HIV Provider, White MSM enrolled in EngageMENt Study, 2017* [1]

| | **Virally Suppressed** n = 149 | | **Not Virally Suppressed** n = 26 | | **Odds Ratio** | **95% CI** |
|---|---|---|---|---|---|---|
| | N | % | N | % | | |
| **Independent Transportation** | 127 | 85% | 16 | 62% | 3.61 | (1.45, 8.97) |
| **Dependent Transportation** | 22 | 15% | 10 | 38% | Reference | |
| Adjusted for age | | | | | 3.43 | (1.37, 8.59) |
| Adjusted for recent HIV diagnosis | | | | | 4.09 | (1.62, 10.38) |
| Adjusted for income | | | | | 1.16 | (0.95, 1.40) |
| Adjusted for recent HIV diagnosis and income | | | | | 2.54 | (0.85, 7.59) |

[1] Percentages rounded to the nearest whole percent; odds ratios rounded to the second decimal place

**References**


1. Millett, G.A., et al., *Explaining disparities in HIV infection among black and white men who have sex with men: a meta-analysis of HIV risk behaviors.* Aids, 2007. **21**(15): p. 2083-2091.
2. Millett, G.A., et al., *Comparisons of disparities and risks of HIV infection in black and other men who have sex with men in Canada, UK, and USA: a meta-analysis.* The Lancet, 2012. **380**(9839): p. 341-348.
3. Centers for Disease Control and Prevention, *HIV surveillance report: Diagnoses of HIV infection in the United States and dependent areas, 2015.* Atlanta, GA, 2015. **500**: p. 25.
4. Centers for Disease Control and Prevention, *HIV and African American Gay and Bisexual Men*. HIV 2020 [cited 2020]; Available from: https://www.cdc.gov/hiv/group/msm/bmsm.html.
5. Hall, H.I., et al., *Differences in human immunodeficiency virus care and treatment among subpopulations in the United States.* JAMA internal medicine, 2013. **173**(14): p. 1337-1344.
6. Sullivan, P.S., et al., *Explaining racial disparities in HIV incidence in black and white men who have sex with men in Atlanta, GA: a prospective observational cohort study.* Annals of epidemiology, 2015. **25**(6): p. 445-454.
7. Sullivan, P.S., et al., *Understanding disparities in viral suppression among Black MSM living with HIV in Atlanta Georgia.* Journal of the International AIDS Society, 2021. **24**(4): p. e25689.
8. Carter, J.W. and S.A. Flores, *Improving the HIV prevention landscape to reduce disparities for Black MSM in the South.* AIDS and Behavior, 2019. **23**(3): p. 331-339.
9. Baral, S., et al., *Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics.* BMC public health, 2013. **13**(1): p. 1-8.
10. Duncan, D.T., et al., *Neighborhood-Level Structural Factors, HIV, and Communities of Color*, in *HIV in US Communities of Color*. 2020, Springer. p. 147-168.
11. Duncan, D.T., et al., *The social context of HIV prevention and care among black men who have sex with men in three US Cities: the neighborhoods and networks (N2) cohort study.* International journal of environmental research and public health, 2019. **16**(11): p. 1922.
12. Duncan, D.T., et al., *Assessment of spatial mobility among young men who have sex with men within and across high HIV prevalence neighborhoods in New York city: The P18 neighborhood study.* Spatial and Spatio-temporal Epidemiology, 2020. **35**: p. 100356.
13. Timmins, L., et al., *Sexual Identity, Sexual Behavior and Pre-exposure Prophylaxis in Black Cisgender Sexual Minority Men: The N2 Cohort Study in Chicago.* AIDS and Behavior, 2021: p. 1-10.
14. Andersen, M., et al., *HIV health care access issues for women living with HIV, mental illness, and substance abuse.* AIDS Patient Care & STDs, 2005. **19**(7): p. 449-459.

15. Kempf, M.-C., et al., *A qualitative study of the barriers and facilitators to retention-in-care among HIV-positive women in the rural southeastern United States: implications for targeted interventions.* AIDS patient care and STDs, 2010. **24**(8): p. 515-520.
16. Andersen, M., et al., *Retaining women in HIV medical care.* Journal of the Association of Nurses in AIDS Care, 2007. **18**(3): p. 33-41.
17. Ashman, J., R. Conviser, and M. Pounds, *Associations between HIV-positive individuals' receipt of ancillary services and medical care receipt and retention.* AIDS care, 2002. **14**(sup1): p. 109-118.
18. Philbin, M.M., et al., *Linking HIV-positive adolescents to care in 15 different clinics across the United States: creating solutions to address structural barriers for linkage to care.* AIDS care, 2014. **26**(1): p. 12-19.
19. Fortenberry, J.D., et al., *Linkage to care for HIV-positive adolescents: a multisite study of the adolescent medicine trials units of the adolescent trials network.* Journal of Adolescent Health, 2012. **51**(6): p. 551-556.
20. Lo, W., T. MacGovern, and J. Bradford, *Association of ancillary services with primary care utilization and retention for patients with HIV/AIDS.* AIDS care, 2002. **14**(sup1): p. 45-57.
21. Sagrestano, L.M., et al., *Transportation vulnerability as a barrier to service utilization for HIV-positive individuals.* Aids Care, 2014. **26**(3): p. 314-319.
22. Goswami, N.D., et al., *Understanding local spatial variation along the care continuum: the potential impact of transportation vulnerability on HIV linkage to care and viral suppression in high-poverty areas, Atlanta, Georgia.* Journal of acquired immune deficiency syndromes (1999), 2016. **72**(1): p. 65.
23. Dasgupta, S., et al., *Development of a comprehensive measure of spatial access to HIV provider services, with application to Atlanta, Georgia.* SpringerPlus, 2016. **5**(1): p. 984.
24. Walcott, M., et al., *Structural community factors and sub-optimal engagement in HIV care among low-income women in the Deep South of the USA.* Culture, health & sexuality, 2016. **18**(6): p. 682-694.
25. Sewell, A.A., *The racism-race reification process: A mesolevel political economic framework for understanding racial health disparities.* Sociology of Race and Ethnicity, 2016. **2**(4): p. 402-432.
26. Peipins, L.A., et al., *Racial disparities in travel time to radiotherapy facilities in the Atlanta metropolitan area.* Social science & medicine, 2013. **89**: p. 32-38.
27. Collin, L.J., et al., *Neighborhood-level redlining and lending bias are associated with breast cancer mortality in a large and diverse metropolitan area.* Cancer Epidemiology and Prevention Biomarkers, 2021. **30**(1): p. 53-60.
28. Nardone, A., J. Chiang, and J. Corburn, *Historic Redlining and Urban Health Today in US Cities.* Environmental Justice, 2020. **13**(4): p. 109-119.
29. Peipins, L.A., et al., *Time and distance barriers to mammography facilities in the Atlanta metropolitan area.* Journal of community health, 2011. **36**(4): p. 675-683.
30. Dasgupta, S., et al., *The effect of commuting patterns on HIV care attendance among men who have sex with men (MSM) in Atlanta, Georgia.* JMIR public health and surveillance, 2015. **1**(2): p. e10.

31. Georgia Department of Public Health, *HIV Epidemiologic Profile, Georgia: Excerpted from the Georgia Integrated HIV Care and Prevention Plan*. 2016.
32. Centers for Disease Control and Prevention, *Continuum of Care*. 2020; Available from: https://www.cdc.gov/hiv/policies/continuum.html.
33. Saleska, J.L., et al., *A tale of two cities: exploring the role of race/ethnicity and geographic setting on PrEP use among adolescent cisgender MSM.* AIDS and Behavior, 2021. **25**(1): p. 139-147.
34. Bailey, Z.D., et al., *Structural racism and health inequities in the USA: evidence and interventions.* The Lancet, 2017. **389**(10077): p. 1453-1463.
35. Sullivan, P.S., et al., *Understanding racial HIV/STI disparities in black and white men who have sex with men: a multilevel approach.* PloS one, 2014. **9**(3): p. e90514.
36. Ludema, C., et al., *Impact of health insurance, ADAP, and income on HIV viral suppression among US women in the Women's Interagency HIV Study, 2006–2009.* Journal of acquired immune deficiency syndromes (1999), 2016. **73**(3): p. 307.
37. Kalichman, S., et al., *Income inequality, HIV stigma, and preventing HIV disease progression in rural communities.* Prevention Science, 2019. **20**(7): p. 1066-1073.
38. Holtgrave, D.R. and R.A. Crosby, *Social capital, poverty, and income inequality as predictors of gonorrhoea, syphilis, chlamydia and AIDS case rates in the United States.* Sexually transmitted infections, 2003. **79**(1): p. 62-64.
39. Frederick, C. and J. Gilderbloom, *Commute mode diversity and income inequality: an inter-urban analysis of 148 midsize US cities.* Local Environment, 2018. **23**(1): p. 54-76.
40. Wolfe, M.K., N.C. McDonald, and G.M. Holmes, *Transportation barriers to health care in the United States: findings from the national health interview survey, 1997–2017.* American journal of public health, 2020. **110**(6): p. 815-822.
41. Syed, S.T., B.S. Gerber, and L.K. Sharp, *Traveling towards disease: transportation barriers to health care access.* Journal of community health, 2013. **38**(5): p. 976-993.
42. Sangaramoorthy, T., et al., *Measuring Unmet Needs among Persons Living with HIV at Different Stages of the Care Continuum.* AIDS and Behavior, 2021: p. 1-14.
43. Feelemyer, J., et al., *Longitudinal associations between police harassment and experiences of violence among Black men who have sex with men in six US cities: the HPTN 061 study.* Journal of urban health, 2021: p. 1-11.
44. Levy, M.E., et al., *Understanding structural barriers to accessing HIV testing and prevention services among black men who have sex with men (BMSM) in the United States.* AIDS and Behavior, 2014. **18**(5): p. 972-996.
45. da Silva, D.T., et al., *Social networks moderate the syndemic effect of psychosocial and structural factors on HIV risk among young black transgender women and men who have sex with men.* AIDS and Behavior, 2020. **24**(1): p. 192-205.
46. Arrington-Sanders, R., et al., *Role of structural marginalization, HIV stigma, and mistrust on HIV prevention and treatment among young Black Latinx men who have sex with men and transgender women: perspectives from youth service providers.* AIDS patient care and STDs, 2020. **34**(1): p. 7-15.

47. Phillips, G., et al., *Structural Interventions for HIV Prevention and Care Among US Men Who Have Sex with Men: A Systematic Review of Evidence, Gaps, and Future Priorities.* AIDS and Behavior, 2021: p. 1-13.
48. Ludema, C., et al., *Comparing neighborhood and state contexts for women living with and without HIV: understanding the Southern HIV epidemic.* AIDS care, 2018. **30**(11): p. 1360-1367.
49. Phelan, J.C., B.G. Link, and P. Tehranifar, *Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications.* Journal of health and social behavior, 2010. **51**(1_suppl): p. S28-S40.
50. Buchanan, D., et al., *The health impact of supportive housing for HIV-positive homeless patients: a randomized controlled trial.* American journal of public health, 2009. **99**(S3): p. S675-S680.
51. Williams, D.R. and C. Collins, *Reparations: a viable strategy to address the enigma of African American health.* American Behavioral Scientist, 2004. **47**(7): p. 977-1000.