

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:

Savannah Harris

05/03/2021
Date

"Exploring the Relationship Between Access to Wraparound Care Coordination and
Viral Load Levels in Youth Living With HIV"

By

Savannah Harris
Master of Public Health

Global Epidemiology

Jeb Jones
Committee Chair

Christina Woodhouse
Committee Chair

Exploring the Relationship Between Access to Wraparound Care Coordination and Viral Load
Levels in Youth Living With HIV

By

Savannah Harris

B.S., Stetson University, 2018

Thesis Committee Chairs:

Jeb Jones, PhD, MPH, MS

Christina Woodhouse, MPH, CHES

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 Global Epidemiology
2021

Abstract

Exploring the Relationship Between Access to Wraparound Care Coordination and Viral Load Levels in Youth Living With HIV
By Savannah Harris

Viral suppression and undetectable viral load levels are indicators of successful adherence to treatment in people living with HIV. These outcomes are essential to global efforts in HIV treatment and prevention, with the ultimate end goal of HIV elimination. LGBTQ+ youth living with HIV are at an increased risk of poor treatment outcomes and retention in care. Care coordination and patient navigation are some strategies known to mitigate the existing barriers to successful treatment adherence. Publications on how different services within care coordination and patient navigation can improve HIV treatment outcomes in high-risk populations such as LGBTQ+ youth are limited by broad study populations and care coordination service definitions. We analyzed care coordination service histories and HIV lab results data from clients enrolled in HIV care coordination at an LGBTQ+ youth resource organization. This analysis found that different care coordination service types associated with viral suppression and undetectable viral loads in youth living with HIV were financial support, logistical support, and HIV-specific social support. Expansion of our understanding about which types of care coordination services improve HIV outcomes in high-risk populations is needed to promote and fund interventions that support national and international HIV treatment and prevention goals.

Exploring the Relationship Between Access to Wraparound Care Coordination and Viral Load
Levels in Youth Living With HIV

By

Savannah Harris

B.S., Stetson University, 2018

Thesis Committee Chairs:

Jeb Jones, PhD, MPH, MS

Christina Woodhouse, MPH, CHES

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 or Master of Science in Public Health
in Global Epidemiology
2021

Throughout the entirety of this project, I have received a great deal of support and encouragement.

I would first like to thank my faculty advisor, Jeb Jones, whose insight and expertise was invaluable in giving this research project direction and clarity. Your adept feedback made it possible to unite passion for this subject with sharp thinking that brought my work to a higher level.

I would also like to thank my field advisor, Christina Woodhouse, whose enthusiasm for and expert knowledge of the study population, exposures, and outcomes made the methodology of this project both possible and proficient.

I would like to acknowledge my friends and former colleagues from JASMYN for their collaboration. I want to thank Emily Rokosch for inspiring the development of our research questions, and I want to thank Sabrina Cluesman for pushing me to a more profound understanding of syndemic theory that gave this project depth.

In addition, I would like to thank my parents, Greg and Melanie Harris, and my friends, who know who they are, for always providing both technical and emotional support throughout this project. Without the help from all of you, I would have had fewer happy distractions, and more poorly formatted documents.

Table of Contents

Background	1
Methods	8
Results	11
Discussion	15
<i>Strengths and Limitations</i>	17
<i>Future Directions</i>	18
References	20
Tables	26

Background

HIV is a substantial public health problem that has impacted life in every country on Earth for over forty years. UNAIDS, an organization leading the global effort to end AIDS as a public health threat by 2030 as part of their Sustainable Development Goals set a goal in 2017 that by 2020, 90% of all people living with HIV will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy, and 90% of all people receiving antiretroviral therapy will have viral suppression. This report purported that “ending the AIDS epidemic will inspire broader global health and development efforts, demonstrating what can be achieved through global solidarity, evidence-based action and multisectoral partnerships” (1). As of 2018, 85.7% of people living with HIV (PLWH) in the United States knew that they had the virus, 65% received at least some HIV care, 50% were retained in care, and 56% were virally suppressed (2).

The US Department of Health & Human Services’ “Ending the HIV Epidemic” (EHE) initiative goal is to increase the percentage of people with diagnosed HIV who are virally suppressed to 95% by 2025 and to maintain that level of viral suppression through 2030 by linking and retaining newly diagnosed individuals to early HIV treatment (3). Although HIV incidence in the United States is slowing, stark disparities still exist, especially in the United States Southeast. In the Southeast, resources to mitigate these circumstances are often underfunded, difficult to access, or both, and the American Southeast carries some of the heaviest burden of HIV. The Southeastern region of the United States made up 51% of new HIV diagnoses in the United States in 2018 and has the highest rate of new HIV diagnoses at 15.6 per 100,000 people. For comparison, the

rate of new HIV diagnoses in the Northeast region was 9.9, the West was 9.7, and the Midwest was 7.2 per 100,000 people (4). These numbers indicate that significant improvements are needed in HIV treatment and prevention strategies before national goals can be met.

The HIV/AIDS epidemic disproportionately impacts men who have sex with men (MSM) and trans women. In 2018, MSM made up 69% of the 37,968 new HIV diagnoses in the United States. Despite only making up 1% of new HIV diagnoses, laboratory-confirmed HIV prevalence was 14.1% for transgender women (5). There are several reasons for these disparities. MSM and transgender women are exposed to stigma, discrimination, criminalization, violence, economic insecurity, and housing instability, which in turn mediate and moderate mental health and substance use comorbidities as well as sexual risk behaviors that lead to increased HIV risk (6, 7). These disparities highlight the importance of considering LGBTQ+ people when strategizing for HIV prevention, treatment, and eventual elimination.

Compared to all people living with HIV, transgender women are more likely to have missed at least 1 medical appointment in the past year, experience homelessness/housing instability, be treated for anxiety and depression, and experience more personal and social HIV stigma. They are also less likely to report having taken all of their HIV medication doses within the last 30 days (2).

In addition to the aforementioned disparities, MSM and transgender women of color are at an even more particularly high risk of HIV. Among both transgender women and MSM, HIV prevalence is elevated among racial/ethnic minority individuals, who experience more severe forms of marginalization and intersectional stigma (8, 9). The

CDC reported that 37% of new HIV diagnoses in 2018 were among Black/African-American people, and 30% were among Hispanic/Latino people (2). A systemic review also found that mean HIV prevalence was 44.2% among African American transgender women and 25.8% among Hispanic/Latina transgender women, compared to 6.7% among white transgender women (5). In addition to consideration of LGBTQ+ people, prioritizing communities of color in HIV prevention and treatment will be key to meeting EHE goals.

Another group that experiences unique challenges in HIV is youth/adolescents. In 2018, youth aged 13 to 24 made up 21% of the 37,832 new HIV diagnoses in the United States (10). Out of all age groups, youth with HIV are the least likely of to be retained in care or have a suppressed viral load. Disparities observed among PLWH overall are also reflected among young PLWH. Over 90% of new HIV diagnoses among young natal-sex men in 2018 were from male-to-male sexual contact, and 55% of new HIV diagnoses among young MSM (YMSM) were among Black/African-American YMSM and 24% were among Hispanic/Latino YMSM (10).

Several factors influence why risk of HIV is increased in youth. Gay and bisexual students are more likely than heterosexual youth to experience rejection, bullying, and diagnosis with a sexually transmitted infection (STI), which also can lead to mental distress and increased engagement in risk behaviors that are associated with HIV, such as condomless sex and sex while intoxicated (10, 11, 12). YLWH also have lower rates of viral suppression and higher rates of virologic rebound when compared to adults (13). Among PLWH receiving medical care, young people aged 18-24 are more likely than their older counterparts to be living in low-income households and to recently have been

homeless, incarcerated, or uninsured. All of these factors pose barriers to achieving viral suppression and highlight the need for youth-specific support for HIV care retention and medication adherence. In order to address HIV treatment and prevention in youth/adolescents, young people must have access to the information and tools they need to make healthy decisions and reduce their risk for getting HIV and to get treatment and stay in care if they have HIV.

Adherence to daily medication is necessary for people living with HIV to achieve a suppressed viral load, the ultimate goal of antiretroviral therapy (ART). Viral load suppression both improves health outcomes for individuals living with HIV and prevents onward transmission of HIV to their sexual partners (14). In addition to viral load suppression, successful adherence to ART is associated with fewer HIV/AIDS-related hospitalizations and mortality, slowed HIV disease progression, improved likelihood of having an undetectable viral load that is untransmissible to partners, and improved quality of life (15).

People living with HIV can be nonadherent in their treatment regimen for a variety of reasons that often interact with one another. Well-documented direct barriers to HIV care include racism within healthcare settings, financial challenges such as poverty, difficulty or inability to obtain insurance coverage, mental health struggles such as depression and anxiety, social stigma associated with HIV, not accepting their diagnosis, housing insecurity/homelessness, and lack of food needed to eat when taking medication (15, 16). Barriers such as these stand between PLWH and adherence to ART in multi-faceted ways: lack of insurance coverage, lack of expendable income from poverty, and instability from insecure housing or food are prohibitive to quality access to healthcare

and maintenance of a medication regimen. Social stigma including non-acceptance of diagnosis, mental health struggles, and racism in healthcare settings can further discourage someone living with HIV to seek out and succeed in staying on a treatment plan.

Strategies such as care coordination within social services exist to address and attempt to mitigate these challenges. Understanding and implementing strategies that are effective in reducing barriers to HIV management is critical in ensuring the health and lives of those living with HIV and reducing the spread of HIV globally. Patient navigation, also known as care coordination, is described as a model of care that shares some characteristics with advocacy, health education, case management, and social work (17). Several studies have found that patient navigation/care coordination is positively associated with HIV care continuum outcomes, especially in linkage to and maintained retention in ART and viral suppression (18, 15). Rapid linkage to care is not sufficient to mitigate barriers to viral suppression, and research on the key characteristics of patient navigation services and patient populations is necessary to better serve at-risk communities (18, 19). Several research studies have found that care coordination services such as financial support, transportation support, and social communities for PLWH can have positive impacts on viral suppression (20, 21, 22, 23, 24, 25, 26). All of these studies indicate a hopeful future for effective patient navigation strategies to work to resolve the many known different barriers to care such as poverty, stigma, and other systemic and internal struggles that PLWH face in their relationship with HIV.

Identifying care coordination strategies that are effective in improving viral suppression in populations like young people, LGBTQ+ populations, and racial/ethnic

minorities is essential. Existing literature supports the idea that YLWH may require carefully integrated, community-wide services to fully realize the benefits of contemporary HIV-related care (27). A meta-analysis of global treatment of adolescents living with HIV found that in North America, programs that address culturally specific barriers to HIV medication adherence may have the best potential impact on the future incidence of HIV and health outcomes in YLWH (28). However, existing literature still lacks information on how these strategies influence outcomes in LGBTQ+ youth living with HIV.

In this analysis, I will assess important patterns in types of care that are received and CD4 cell count levels, viral suppression status, and undetectable viral loads within the context of patients enrolled in care coordination at an LGBTQ+ youth resource center in Jacksonville, Florida. JASMYN is the only LGBTQ+ youth resource center in Northeast Florida, and they are a nonprofit that serves LGBTQ+ individuals ages 13-29, with a focus on care for Black and Latinx MSM, trans women, and nonbinary people.

When clients accessing HIV testing at JASMYN's sexual health clinic receive a positive HIV test result, they are enrolled in HIV care coordination. JASMYN clients in care coordination are encouraged to access JASMYN's general services and are also given access to specialized assistance programs and social support groups. JASMYN implements a type of care coordination/patient navigation model that they refer to as "wraparound care," in which JASMYN care coordinators navigate many types of systems with the goal to better facilitate quality care in those enrolled in care. These include financial support, legal/employment support, transportation support, and social support. Understanding the relationship between access to different care coordination services and

viral suppression in youth LWH can help to inform care plans and funding opportunities to better serve this community's health. Achieving viral suppression in vulnerable populations such as Black and Latinx MSM and trans women will help to reduce disparities in health outcomes and reduce the spread of HIV to achieve EHE treatment goals.

Methods

Study population

In this cross-sectional analysis, we sought to assess the relationship between access of certain wraparound social services and CD4 count and viral load levels in youth living with HIV. We studied 92 gay and bisexual men, trans women, and nonbinary individuals aged 18-29 who were enrolled in HIV care coordination services at JASMYN between 2017 and 2020. When clients accessing HIV testing at JASMYN's sexual health clinic receive a positive HIV test result, they are enrolled in HIV care coordination. JASMYN clients in care coordination are encouraged to access JASMYN's general services and are given access to specialized assistance and social support groups. We used JASMYN's internal record keeping system, ClientTrack, to acquire de-identified patient HIV lab data and service history records.

Measures

Clients' access and use of available services were obtained from the ClientTrack service history for each client. Gender identity, race, ethnicity, CD4 count, and viral load count were obtained from demographic data and lab reports within ClientTrack.

For each client, dichotomous variables were generated to indicate uptake of each available service and the occurrence of a low CD4 count, viral suppression, and undetectable viral load. Financial support included rent assistance, utility assistance, or other monetary assistance such as JASMYN's "Kicked Out Fund." Logistical support included medication delivery, bus passes, legal/employment support coordination, or "non face-to-face" resource coordination. "Non face-to-face" resource coordination is

defined as additional time spent by a care coordinator/patient navigator outside of direct meeting times that serve to improve the quality of care of the patient, such as extensive record review to create an improved care plan or collaboration with other service/healthcare providers to coordinate linkage to additional services that may benefit the patient. HIV-specific support program attendance included attendance at any programs designed to support those living with HIV such as “Healthy Relationships,” “Positive Connections,” or the “Antiretroviral Treatment and Access to Services (ARTAS)” intervention. Risk factor support included housing services coordination, crisis intervention, sexual health clinic services, or access to the food/hygiene supply pantry on site at JASMYN. General support services included attendance of social groups open to all JASMYN youth such as open access time on JASMYN campus, JASMYN Prom, Pride, yoga, Zumba, Youth Advisory Board, and others.

A low CD4 count was defined as a CD4 count ever falling below 200 cells/ml blood. Viral suppression was defined as a viral load below 200 copies of HIV/ml blood, and undetectable viral load was defined as viral load below 50 copies of HIV/ml blood.

Data were accessed in 2021 to describe client characteristics and service use over the period of 2017-2020. Lab data and service history records were only measured for this analysis beginning in 2017 to avoid any missing data because JASMYN record-keeping practices changed in 2017.

Analytic methods

A Fisher’s Exact test was used to assess if access and use of the different types of services were associated with ever having a CD4 count below 200 cells per milliliters of

blood, ever achieving viral suppression, or ever achieving an undetectable viral load. The relationships between race/ethnicity and gender with CD4 count and viral load levels were also assessed using these tests. Stratification and modeling were not possible due to small sample size and low power. Two-sided p-values were obtained and statistical significance was determined at $p < 0.05$.

Results

Demographic and service history of 92 HIV+ youth enrolled in JASMYN's HIV care coordination program between the years 2017-2020 are presented in Table 1. Of the clients studied, 74 (80%) were cisgender men, 11 (12%) were transgender women, and 7 (8%) were non-binary or gender non-conforming individuals. By race/ethnicity, 75 (82%) of clients were Black and non-Hispanic, 6 (7%) were white and Hispanic, 4 (4%) were Black and Hispanic, 4 (4%) were white and non-Hispanic, 2 (2%) were Black and Asian, and 1 (1%) were Native American. Overall, 30 (33%) of clients accessed financial support, 78 (85%) accessed logistical support, 73 (79%) accessed HIV-diagnosis specific support, 72 (78%) accessed general social support services, and 76 (83%) accessed risk factor mitigation services. Out of the 92 individuals studied, 4 (4%) ever had a CD4 cell count below 200 cells/ml of blood, 60 (65%) achieved viral suppression at least once during the time period studied, and 43 (47%) achieved an undetectable viral load.

Among cisgender males, 3 (4%) ever had a low CD4 cell count, 47 (64%) ever had viral suppression, and 33 (45%) ever had an undetectable viral load. Among transgender women, 1 (9%) ever had a low CD4 cell count, 9 (82%) had viral suppression, and 9 (73%) ever had an undetectable viral load. Among nonbinary/gender non-conforming patients, 4 (57%) had viral suppression, 2 (29%) ever had an undetectable viral load, and none ever had a low CD4 count.

Within Black/African American patients, 4 (5%) ever had a low CD4 cell count, 53 (65%) ever reached viral suppression, and 38 (47%) ever had an undetectable viral load. Within Hispanic/Latinx patients, 1 (10%) ever had a low CD4 cell count, 6 (60%) ever reached viral suppression, and 5 (50%) ever had an undetectable viral load. Within

white patients, 6 (60%) ever had viral suppression, 4 (40%) ever had an undetectable viral load, and none ever had a low CD4 cell count. Among Asian and Native American patients, 2 (100%) and 2 (100%) respectively reached viral suppression and an undetectable viral load, and none ever had a low CD4 cell count.

Financial support services were used by 30 (33%) of clients studied. Of those who used the financial support services, 1 (3%) ever had a low CD4 cell count, 24 (80%) ever reached viral suppression, and 19 (63%) ever had an undetectable viral load. Of the total study population, 78 (85%) used logistical support services. Of those who used the logistical support services, 4 (5%) ever had a low CD4 cell count, 56 (72%) ever had viral suppression, and 40 (51%) ever had an undetectable viral load. HIV-specific support services were accessed by 73 (79%) of the study population. Of those who accessed HIV-specific social support services, 3 (4%) ever had a low CD4 cell count, 52 (71%) ever had viral suppression, and 36 (49%) ever had an undetectable viral load. General social support services were used by 72 (78%) of the study population. Of those who accessed general social support, 3 (4%) ever had a low CD4 count, 50 (69%) ever reached viral suppression, and 36 (50%) ever had an undetectable viral load. Out of the total study population, 76 (83%) used the risk factor support services. Of those who access the risk factor support services, 3 (4%) ever had a low CD4 count, 52 (68%) ever reached viral suppression, and 39 (51%) ever had an undetectable viral load.

Among those whose ever had a low CD4 cell count, 3 (75%) were cisgender men, 1 (25%) were transgender women, 4 (100%) were Black, and 1 (25%) were Hispanic. Among those with a low CD4 count, 1 (25%) received financial support, 4 (100%)

received logistical support, and 3 (75%) received HIV-diagnosis specific support, general social support, and risk factor mitigation services.

Of those who ever achieved viral suppression, 47 (78%) were cisgender men, 9 (15%) were transgender women, and 4 (7%) were non-binary/ gender non-conforming individuals. Of those who ever had viral suppression, 51 (85%) were Black, 6 (10%) were Hispanic, 6 (10%) were white, 2 (3%) were Black and Asian, and 1 (2%) were Native American. Of those with viral suppression, 24 (40%) received financial support, 56 (93%) received logistical support, 52 (87%) received HIV-diagnosis specific support, 50 (83%) received general social support, and 52 (87%) received risk factor mitigation services.

From those who ever achieved an undetectable viral load, 33 (77%) were cisgender men, 8 (19%) were transgender women, and 2 (5%) were non-binary or gender non-conforming individuals. From those who had an undetectable viral load, 38 (88%) were Black, 5 (12%) were Hispanic, 4 (9%) were white, 2 (5%) were Asian, and 1 (2%) were Native American. Among these clients, 19 (44%) accessed financial support, 40 (93%) accessed logistical support, 36 (84%) accessed HIV-diagnosis specific and general social support services, and 39 (91%) accessed risk factor mitigation services.

Results of the Fisher's Exact test by service history type can be seen in Table 2a, and the results of the Fisher's Exact test by race/ethnicity and gender are presented in Table 2b.

Ever having a low CD4 count did not differ by receiving financial support services (χ^2 (1, N=91) = 0.12, $p > 0.99$), receiving logistical support services (χ^2 (1, N=91) = 0.75, $p > 0.99$), receiving HIV-specific social support services (χ^2 (1, N=91) =

0.14, $p > 0.99$), general social support services ($\chi^2 (1, N=91) = 0.02, p > 0.99$), risk factor support services ($\chi^2 (1, N=91) = 0.16, p = 0.55$), race/ethnicity ($\chi^2 (1, N=91) = 0.17, p = 0.42$), and gender ($\chi^2 (1, N=91) = 0.30, p = 0.59$).

Achieving viral suppression did not differ by receiving financial support services ($\chi^2 (1, N=86) = 3.46, p = 0.08$), receiving general social support services ($\chi^2 (1, N=86) = 3.36, p = 0.09$), receiving risk factor support services ($\chi^2 (1, N=86) = 1.25, p = 0.34$), race/ethnicity ($\chi^2 (1, N=86) = 0.043, p = 0.90$), and gender ($\chi^2 (1, N=86) = 1.83, p = 0.43$).

A significant relationship was found between achieving viral suppression and the client accessing logistical support services ($\chi^2 (1, N=86) = 13.3, p < 0.001$). The relationship between achieving viral suppression and the client accessing HIV-specific social support services was also significant ($\chi^2 (1, N=86) = 5.12, p = 0.04$).

Having an undetectable viral load did not differ by HIV-specific social support ($\chi^2 (1, N=87) = 0.57, p > 0.59$), general social support ($\chi^2 (1, N=87) = 1.52, p = 0.30$), risk factor support ($\chi^2 (1, N=87) = 2.83, p = 0.14$), race/ethnicity ($\chi^2 (1, N=87) = 0.81, p = 0.66$), and gender ($\chi^2 (1, N=87) = 2.74, p = 0.09$).

A significant relationship was found between ever having an undetectable viral load and the individual accessing financial support services ($\chi^2 (1, N=87) = 4.46, p = 0.04$). The relationship between ever having an undetectable viral load and the individual accessing logistical support services was also found to be significant ($\chi^2 (1, N=87) = 5.17, p = 0.030$).

Discussion

In this cross-sectional analysis, we used HIV lab results and social service history data entries to assess the relationship between access of wraparound care coordination and CD4/viral load levels among youth living with HIV enrolled in care coordination services at an LGBTQ+ youth resource center in Northeast Florida, leading to several important findings. First, access of logistical support services was associated with both suppressed and undetectable viral load levels. Second, access of social groups specific to youth living with HIV was associated with viral suppression. Third, accessing financial support services was associated with an undetectable viral load. These findings are consistent with previous literature on patient navigation and HIV health outcomes, particularly with respect to how patient navigation can improve viral suppression in PLWH (18, 22). While the positive impacts of patient navigation and care coordination programs are well-understood, existing literature acknowledges that more research must be done to understand exactly which elements of these services are essential to viral suppression in individuals enrolled in HIV care (17, 19, 20). Existing literature also lacks information on how these strategies influence outcomes in LGBTQ+ youth LWH. This analysis sought to explore which types of wraparound services were associated with CD4 levels, viral suppression, and undetectable viral load levels in our study population.

Our findings that a client having achieved viral suppression or an undetectable viral load were associated with accessing logistical support services is consistent with previous findings that non-monetary incentives such as bus passes, medication delivery services, and other systems coordination, such as support with employment or legal documents, can improve HIV care outcomes (20, 22). These types of services can reduce

barriers such as transportation and other navigation issues that may inhibit an individual's ability to adhere to their medication regimen and attend clinical appointments.

Our finding that a client achieving viral suppression was associated with accessing social support groups specific to other youth living with HIV is consistent with several previous studies and interventions that found that interaction within social networks, support groups, and peer connection with other people LWH are associated with improved care outcomes (15, 23, 24, 25). Qualitative research has found that HIV-related stigma as a barrier to timely treatment presents as a common theme among Black gay men (16). Social support in the form of social groups for youth LWH may be able to improve retention in care through individuals LWH sharing common lived experiences, knowledge, and beliefs with one another that can lead to reduced stigma surrounding living with HIV.

Our finding that achieving an undetectable viral load was associated with the client having accessed financial support is consistent with existing literature that cash incentives can improve viral load levels and retention in care (26). However, although it is known that poverty inhibits optimal HIV care and programs supporting housing stability in PLWH can improve viral suppression, not much literature exists about the impacts of financial support such as rent and utilities assistance and situational assistance for unexpected expenses such as medical bills, legal fees, and educational costs on treatment outcomes (15, 22). The relationship between an undetectable viral load and these types of financial support could be because assistance with the aforementioned costs could keep the individual stably housed, employed, and comfortable which creates an environment with fewer barriers to successful retention in care.

Strengths and Limitations

This analysis is subject to several limitations. The small sample size of this study population resulted in low statistical power to explore associations between client demographics, uptake of services, and treatment outcomes. We examined a large group of exposures, which could create multiple comparisons bias in the results. Care coordinators at JASMYN are trained to record service histories in the online system as soon as interaction with the client is concluded, but it is possible that a care coordinator might forget to input a service or input an incorrect service. Due to these limitations, statistical significance should be interpreted cautiously. Although this study population is not generalizable to the general population, it can be representative of LGBTQ+ youth living with HIV in settings with low healthcare resources, especially in the US South, and the findings in this analysis could be useful information for other LGBTQ+ youth resource organizations or other organizations that focus on social services or HIV care in HIV-positive youth. The cross-sectional nature of this analysis did not allow for consideration of temporality, and future analyses of these data should attempt to establish if service uptake precedes treatment outcomes based on timing of services provision within clients' service history and dates of clinical outcomes.

In spite of these limitations, our findings provide evidence that wraparound support services influence viral suppression and undetectable viral load levels in LGBTQ+ youth. Despite the lack of statistical significance for most relationships, we were still able to describe some important trends. For example, 100% of the participants with low CD4 counts were Black/African American despite this group making up 85% of the study population. Though more robust research is necessary, we could recommend

that vulnerable populations in HIV care have improved access to and uptake of logistical support services such as medication delivery; free bus passes; and legal/employment/other resource coordination; social support group involvement with other youth living with HIV; and financial support services such as rent assistance, utility assistance, or other financial assistance. Locations/organizations that provide HIV care to vulnerable populations should work to provide or refer clients to these services and encourage their use. Hiring care coordinators that facilitate an individual's access to this kind of support and applying for funding for rent/utility/other expenses support, legal/employment support, bus passes, and medication delivery can fortify an organization's ability to provide these services. Emphasis on and connection to social programs or support groups that connect youth living with HIV to one another could be a free-of-cost strategy in improving viral suppression in youth LWH.

Future Directions

This work is part of an important expansion of research into engagement and retention in care for people living with HIV. Improved treatment outcomes are necessary for meeting domestic and international HIV treatment goals through increasing levels of viral suppression and undetectable viral loads, thereby reducing the spread of HIV and improving lives (HIV National Strategic Plan (2021-2025), 2021, UNAIDS, 2017). Better retention in care and medication adherence can both improve individual lives and contribute to slowing community spread of HIV to reach both domestic and international HIV strategic treatment and prevention goals for the future. Organizations or clinics that serve similarly vulnerable populations and experience low retention in care or medication

adherence among patients LWH that result in poor viral load or CD4 levels can use the conclusions found in this analysis to continue to investigate the impact of different support services. Implementing effective care coordination services will improve HIV viral load levels in the youth living with HIV that are most vulnerable to falling out of care and can serve to inform interventions and program implementations that will contribute to reaching these goals both within the United States and worldwide.

References

1. UNAIDS. 90-90-90: An ambitious treatment target to help end the AIDS epidemic. 2017. <https://www.unaids.org/en/resources/documents/2017/90-90-90>
2. Centers for Disease Control and Prevention. Behavioral and Clinical Characteristics of Persons with Diagnosed HIV Infection—Medical Monitoring Project, United States, 2018 Cycle (June 2018–May 2019). HIV Surveillance Special Report 25. <https://www.cdc.gov/hiv/library/reports/hiv-surveillance.html>. 2020. <https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-special-report-number-25.pdf>
3. US Department of Health & Human Services. National HIV/AIDS strategy for the United States: updated to 2020. 2021. <http://www.hiv.gov/federal-response/national-hiv-aids-strategy/nhas-update>.
4. Centers for Disease Control and Prevention. HIV in the United States by Region. 2018. <https://www.cdc.gov/hiv/statistics/overview/geographicdistribution.html>
5. Becasen JS, Denard CL, Mullins MM, Higa DH, & Sipe TA. Estimating the Prevalence of HIV and Sexual Behaviors Among the US Transgender Population: A

Systematic Review and Meta-Analysis, 2006–2017. *American Journal of Public Health* 2019; 109(1), e1–e8. <https://doi.org/10.2105/ajph.2018.304727>.

6. Baral SD, Poteat T, Strömdahl S, Wirtz AL, Guadamuz TE, & Beyrer C. Worldwide burden of HIV in transgender women: A systematic review and meta-analysis. *The Lancet Infectious Diseases* 2013; 13(3), 214–222.

7. Brennan J, Kuhns LM, Johnson AK, et al. Syndemic theory and HIV-related risk among young transgender women: The role of multiple, co-occurring health problems and social marginalization. *American Journal of Public Health* 2012; 102(9), 1751–1757.

8. Chapin-Bardales J, Rosenberg ES, & Sullivan PS. Trends in racial/ethnic disparities of new AIDS diagnoses in the United States, 1984–2013. *Annals of Epidemiology* 2017; 27(5), 329–334.

9. Clark H, Babu AS, Wiewel EW, Opoku J, & Crepaz N. Diagnosed HIV infection in transgender adults and adolescents: Results from the National HIV Surveillance System, 2009–2014. *AIDS and Behavior* 2017; 21(9), 2774–2783.

10. Centers for Disease Control and Prevention. HIV and Youth. 2018.
<https://www.cdc.gov/hiv/group/age/youth/index.html>

11. Coker TR, Austin SB, & Schuster MA. The Health and Health Care of Lesbian, Gay, and Bisexual Adolescents. *Annual Review of Public Health* 2010; 31(1), 457–477.
<https://doi.org/10.1146/annurev.publhealth.012809.103636>

12. Herrick AL, Marshal MP, Smith HA, Sucato G, & Stall RD. Sex While Intoxicated: A Meta-Analysis Comparing Heterosexual and Sexual Minority Youth. *Journal of Adolescent Health*, 2011; 48(3), 306–309.
<https://doi.org/10.1016/j.jadohealth.2010.07.008>

13. Ryscavage P, Anderson EJ, Sutton SH, Reddy S, Taiwo B. Clinical outcomes of adolescents and young adults in adult HIV care. *J Acquir Immune Defic Syndr* 2011; 1:58(2):193-7. doi: 10.1097/QAI.0b013e31822d7564. PMID: 21826014.

14. Cohen MS, Chen YQ, Mccauley M, Gamble T, Hosseinipour MC, Kumarasamy N, Hakim, JG, Kumwenda J, Grinsztejn B, Pilotto JHS, Godbole SV, Mehendale S, Chariyalertsak S, Santos BR, Mayer KH, Hoffman IF, Eshleman SH, Piwowar-Manning E, Wang L, Fleming TR. Prevention of HIV-1 Infection with Early Antiretroviral Therapy. *New England Journal of Medicine* 2011; 365(6), 493–505.
<https://doi.org/10.1056/nejmoa1105243>

15. Quinn KG, Reed SJ, Dickson-Gomez J, & Kelly JA. An Exploration of Syndemic Factors That Influence Engagement in HIV Care Among Black Men. *Qualitative Health Research* 2018; 28(7), 1077–1087. <https://doi.org/10.1177/1049732318759529>

16. Arnold EA, Rebchook GM, & Kegeles SM. ‘Triply cursed’: racism, homophobia and HIV-related stigma are barriers to regular HIV testing, treatment adherence and disclosure among young Black gay men. *Culture, Health & Sexuality* 2014; 16(6), 710–722. <https://doi.org/10.1080/13691058.2014.905706>

17. Koester KA, Morewitz M, Pearson C, Weeks J, Packard R, Estes M, Tulskey J, Kang-Dufour M, & Myers J. Patient Navigation Facilitates Medical and Social Services Engagement Among HIV-Infected Individuals Leaving Jail and Returning to the Community. *AIDS Patient Care and Stds* 2014; 28(2), 82–90. <https://doi.org/10.1089/apc.2013.0279>

18. Mizuno Y, Higa DH, Leighton CA, Roland KB, Deluca JB, & Koenig LJ. Is HIV patient navigation associated with HIV care continuum outcomes? *AIDS* 2018; 32(17), 2557–2571. <https://doi.org/10.1097/qad.0000000000001987>

19. Traynor SM, Metsch LR, Gooden L, Stitzer M, Matheson T, Tross S, Carrico AW, Jain MK, Del Rio C, & Feaster DJ. Self-efficacy as a mediator of patient navigation interventions to engage persons living with HIV and substance use. *Drug and Alcohol Dependence* 2021; 221, 108567. <https://doi.org/10.1016/j.drugalcdep.2021.108567>

20. Beima-Sofie K, Begnel ER, Golden MR, Moore A, Ramchandani M, & Dombrowski JC. “It’s Me as a Person, Not Me the Disease”: Patient Perceptions of an HIV Care Model

Designed to Engage Persons with Complex Needs. *AIDS Patient Care and Stds* 2020; 34(6), 267–274. <https://doi.org/10.1089/apc.2019.0310>

21. Fox MP, Pascoe S, Huber AN, Murphy J, Phokojoe M, Gorgens M, Rosen S, Wilson D, Pillay Y, & Fraser-Hurt N. Adherence clubs and decentralized medication delivery to support patient retention and sustained viral suppression in care: Results from a cluster-randomized evaluation of differentiated ART delivery models in South Africa. *PLOS Medicine* 2019; 16(7), e1002874. <https://doi.org/10.1371/journal.pmed.1002874>

22. Rajabiun S, Davis-Plourde K, Tinsley M, Quinn EK, Borne D, Maskay MH, Giordano TP, & Cabral HJ. Pathways to housing stability and viral suppression for people living with HIV/AIDS: Findings from the Building a Medical Home for Multiply Diagnosed HIV-positive Homeless Populations initiative. *PLOS ONE* 2020; 15(10), e0239190. <https://doi.org/10.1371/journal.pone.0239190>

23. Wouters E, Damme WV, Loon FV, Rensburg DV, Meulemans H. Public-sector ART in the Free State Province, South Africa: community support as an important determinant of outcome. *Social Science & Medicine* 2009;69(8):1177–85.

24. Decroo T, Telfer B, Biot M, Maïkéké J, Dezembro S, Cumba LI, Das Dores C, Chu K, & Ford N. Distribution of Antiretroviral Treatment Through Self-Forming Groups of Patients in Tete Province, Mozambique. *JAIDS Journal of Acquired Immune Deficiency Syndromes* 2011; 56(2), e39–e44. <https://doi.org/10.1097/qai.0b013e3182055138>

25. Cabral HJ, Davis-Plourde K, Sarango M, Fox J, Palmisano J, & Rajabiun S. Peer Support and the HIV Continuum of Care: Results from a Multi-Site Randomized Clinical Trial in Three Urban Clinics in the United States. *AIDS and Behavior* 2018; 22(8), 2627–2639. <https://doi.org/10.1007/s10461-017-1999-8>
26. Underwood J, Osterman M, Green R. How can financial incentive programs support HIV viral load suppression? Lessons learned from a pilot program at federally qualified healthcare centers in New York city. 2019. Institute for Family Health. <https://sync2020.org/wp-content/uploads/2020/10/Clinical-Health-Session-2-Innovative-Methods-for-Promoting-Viral-Suppression-Underwood.pdf>
27. Philbin MM, Tanner AE, Duval A, Ellen JM, Xu J, Kapogiannis B, Bethel J, & Fortenberry JD. Factors Affecting Linkage to Care and Engagement in Care for Newly Diagnosed HIV-Positive Adolescents Within Fifteen Adolescent Medicine Clinics in the United States. *AIDS and Behavior* 2014; 18(8), 1501–1510. <https://doi.org/10.1007/s10461-013-0650-6>
28. Kim SH, Gerver SM, Fidler S, & Ward H. Adherence to antiretroviral therapy in adolescents living with HIV. *AIDS* 2014; 28(13), 1945–1956. <https://doi.org/10.1097/qad.0000000000000316>

Tables

Table 1. Demographic and Service History Characteristics by CD4 and Viral Load Status

	Ever had a CD4 count below 200 (n = 4, %)	Ever achieved viral suppression (n = 60, %)	Ever achieved an undetectable viral load (n = 43, %)	All (N = 92, %)
Gender				
Cisgender Male	3(75)	47(78)	33(77)	74(80)
Transgender Woman	1(25)	9(15)	8(19)	11(12)
Nonbinary/Gender Non- conforming	0(0)	4(7)	2(5)	7(8)
Race/Ethnicity				
Black non-Hispanic	3(75)	48(80)	34(79)	75(82)
Black and Hispanic	1(25)	3(5)	2(5)	4(4)
White non-Hispanic	0(0)	3(5)	1(2)	4(4)
White and Hispanic	0(0)	3(5)	3(7)	6(7)
Black and Asian	0(0)	2(3)	2(5)	2(2)
Native American	0(0)	1(2)	1(2)	1(1)
Financial Support				
Yes	1(25)	24(40)	19(44)	30(33)
No	3(75)	36(60)	24(56)	62(67)
Logistical Support				
Yes	4(100)	56(93)	40(93)	78(85)
No	0(0)	4(7)	3(7)	14(15)
HIV-Specific Support				
Yes	3(75)	52(87)	36(84)	73(79)
No	1(25)	8(13)	7(16)	19(21)
General Social Support				
Yes	3(75)	50(83)	36(84)	72(78)
No	1(25)	10(17)	7(16)	20(22)
Risk Factor Support				
Yes	3(75)	52(87)	39(91)	76(83)
No	1(25)	8(13)	4(9)	16(17)

Table 2a. Fisher's Exact Test Comparing Service Types to CD4 and Viral Load Levels

Service Type	Ever had a CD4 count below 200cells/ml blood (N=4)		Ever achieved viral suppression (N=60)		Ever achieved an undetectable viral load (N=43)	
	Chi-Square, df=1	Two-sided p-value	Chi-Square, df=1	Two-sided p-value	Chi-Square, df=1	Two-sided p-value
Financial	0.12	>0.99	3.46	0.08	4.46	0.04
Logistical	0.75	>0.99	13.3	<0.001	5.17	0.04
HIV-Specific	0.04	>0.99	5.12	0.04	0.57	0.59
General	0.02	>0.99	3.36	0.09	1.52	0.30
Social						
Risk Factor	0.16	0.55	1.25	0.34	2.87	0.14

Table 2b. Fisher's Exact Test Comparing Client Characteristics to CD4 and Viral Load Levels

Characteristic	Ever had a CD4 count below 200cells/ml blood (N=4)		Ever achieved viral suppression (N=60)		Ever achieved an undetectable viral load (N=43)	
	Chi-Square, df=1	Two-sided p-value	Chi-Square, df=1	Two-sided p-value	Chi-Square, df=1	Two-sided p-value
Race/Ethnicity	0.17	0.42	0.04	0.90	0.81	0.66
Gender	0.30	0.59	1.83	0.43	2.74	0.09