

CHAIN REPORT 2019-6



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**Tri-County  
Housing and Transportation  
Need, Services Received,  
and Engagement with HIV  
Medical Care**

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**C.H.A.I.N. REPORT**

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## Introduction

According to the New York State (NYS) Continuum of HIV Care in the Tri-County Region, 86% of the 4,420 persons living with HIV (PLWH) infection in 2018 received HIV care. However, this rate drops to 69% among PLWH who received continuous care over time and only 62% were virally suppressed. Understanding barriers and supporting individuals to maintain consistent HIV medical care is key to the health and well-being of HIV-positive individuals and to achieving Ending the Epidemic goals.

Community Health Advisory & Information Network (CHAIN) Reports, as well as other research, have documented the importance of housing/lack of housing as a barrier to sustained engagement in HIV care and sustained viral suppression. Housing need by PLWH in New York City is associated with not receiving appropriate care (minimum clinical standards specific to appointment frequency, testing, and procedures) and is a predictor of multiple missed appointments, dropping out of care entirely for six months or more, and non-adherent antiretroviral (ARV) use (Aidala & Yomogida, 2019).

Affordable housing options are limited in the Tri-County Region. Housing costs exceed 30% of household income for more than 40% of households in Westchester County and populations requiring specialized services with their housing are inadequately served (Hudson Valley Pattern for Progress, 2019). In Putnam, housing costs were unaffordable ( $\geq 30\%$  of income) for 88% of households in 2014, the most recent assessment available (Hudson Valley Pattern for Progress, 2014). Rental options are particularly limited; 82% of housing units in Putnam are privately owned (Hudson Valley Pattern for Progress, 2014). Comparable figures were not available for Rockland County, but a tri-county assessment covering Orange, Rockland, and Westchester projected the housing market supply to satisfy only “some” of the demand (U.S. Department of Housing and Urban Development (HUD), 2017).

Rental units are not available in all locations throughout the Tri-County Region, further exacerbating difficulties with transportation in an area with limited public transit options. Transportation barriers are particularly detrimental to those with chronic diseases. Current research links transportation difficulties to missed appointments, inconsistent care, reduced utilization of health services, and reduced ability to fulfill prescriptions (Syed et al., 2013). These barriers are more common among already disadvantaged populations such as those with lower socioeconomic status (SES), racial/ethnic minorities, persons with limited mobility, and the elderly (Syed et al., 2013; Wolfe et al., 2020).

The purpose of this report is to examine housing and transportation needs, services received, and HIV care continuum outcomes of PLWH in the Tri-County Region. Specific research questions are: 1.) What are the housing and/or transportation needs among PLWH in the Tri-County Region and have needs changed over time? 2.) What have been patterns of housing and transportation assistance received? 3.) Are housing and/or transportation needs associated with continuum of care outcomes, considering regular appointments for HIV medical care, adherent ARV use, and/or viral suppression? 4.) Does receipt of housing assistance or transportation services have an effect on

engagement in care, adherence, and viral load?

## **Key Findings**

- The need for housing and/or transportation assistance was high, reported by more than 40% of respondents within each subgroup. Current substance users and persons with a low mental health functioning score had the highest rates of need for one or both services.
- Housing needs exceeded that of transportation. The percentage of respondents requesting rental assistance, permanent housing, or permanent supportive housing increased from 2008 to 2017, whereas the need for transportation assistance declined until the most recent study period.
- Safe and affordable housing enabled PLWH to start and stay on HIV treatment.
- Transportation barriers associated with missed appointments, delayed care, missed or delayed medication use, and poorer management of HIV.
- HIV medical care outcomes were consistently worse for participants with both housing and transportation needs relative to those with one or no need. Those in need of both services were significantly more likely to miss a scheduled appointment or go without HIV care for more than six months, not follow a recommended ARV regimen, and had a lower odds of being virally suppressed relative to those with no needs.
- The receipt of housing, transportation, or both services significantly improved the odds that participants were engaged with medical care that meets minimum clinical practical guidelines.

## **Methods**

### Sample and Recruitment

Study data were obtained from in-person interviews conducted during the period of 2008-2017 with participants in the Community Health Advisory & Information Network (CHAIN) Project. During this period the Tri-County CHAIN Project conducted a total of 912 interviews with 614 unique individuals living with HIV in Westchester, Putnam, or Rockland counties and engaged in the care system. Individuals were recruited from 22 randomly selected service sites among medical or social service agencies in the three counties. A repeated cross-sectional sampling strategy was used in which Tri-County study participants are recruited and interviewed over two-year cycles. At each interview period, some participants (approximately 20%) had also been interviewed during an earlier recruitment cycle. Analyses for this report will focus on the most recent interview or use statistical procedures to adjust for the dependency among multiple observations contributed by the same individuals.

### Measures

The CHAIN Project collects information on multiple aspects of an individual's life, including detailed housing status, use of social and medical services, as well as sociodemographic,

behavioral, and well-being measures relevant to the need for these services. Study variables for this analysis were chosen based on the theoretical and empirical evidence suggesting the variable has an effect on access to and retention in HIV medical care as well as HIV health outcomes.

### *Housing measures*

In order to encompass the multiple aspects of housing that may affect connection to HIV medical care and outcomes, we use an indicator that reflects both ‘objective’ housing status regarding adequacy and stability of living arrangements, and ‘subjective’ experience of housing problems and respondent reported need for housing assistance. At each interview, participants are asked a series of questions about their current and recent (past 6 months) housing and living arrangements. A separate set of questions asks about housing problems or the need for assistance in the area of housing, the nature of the problem, and whether or not any services or assistance was received to resolve housing need. Self-reported housing problem is a broader category than current housing status since individuals can be currently housed but facing housing loss due to inability to pay rent; facing eviction for any number of tenant or landlord reasons; being discharged from a residential program with no resources to secure housing; being in an intolerable or unhealthy situation due to domestic violence or other dangers; or lacking basic services such as heat and hot water.

Housing Need for the current analysis is indicated by: Housing status currently or in the past 6 months as *homeless* (individuals describe their living arrangements as sleeping in a drop-in center or shelter for homeless persons, single room occupancy (SRO) or welfare hotel with no services, on the street or other place not meant for sleeping) or *unstably housed* (not currently in permanent housing but not literally homeless, including those in a transitional housing program, in alcohol or drug (AOD) treatment housing with no other address, or temporarily doubled up with friends or family); OR *seriously rent burdened* (report difficulty paying rent in the past six months or insufficient income to secure housing indicated by a Fair Market Rate (FMR) >50% of income); OR *needing help or assistance* in the area of housing in the past 6 months to obtain stable, secure, appropriate housing, address habitability issues (e.g., no heat or hot water), leave domestic violence or unsafe housing, or avoid eviction or other housing loss.

Housing Assistance or Services is indicated by receipt of permanent tenant-based (e.g., HOPWA or Section 8 voucher) or facility-based (e.g., congregate permanent supportive housing, public housing) assistance with housing costs, or participant report that within the past six months he or she received ‘practical help’ for a housing problem from an agency or paid provider in the form of direct assistance with obtaining housing (e.g., provision of housing, housing placement assistance), application for housing assistance, or a service referral, that resolved a need or problem or made “some” or “a great deal” of progress with resolving their housing problem or need. Note that some participants currently may be receiving rental assistance from HOPWA or another program that may no longer be providing such assistance to new clients.

### *Transportation Measures*

Transportation needs are indicated by self-reported need for transportation assistance, or report that a lack of transportation resulted in delayed or missed medical or social services in the past six months. Transportation services are any assistance with transportation needs by an agency provider

or government program including receipt of transportation vouchers for bus, train, or taxi service, reimbursement for use of a private vehicle, transportation assistance such as Ride-Connect or ambulette or paratransit services for persons with limited mobility such as Access-a-Ride.

### *HIV medical care outcome measures*

The outcome measures for this study are selected to indicate care continuum markers of positive engagement in HIV medical care and viral load outcomes.

Continuous Care is an indicator of retention in care indicated by the absence of multiple missed scheduled appointments or intentional gaps in care for six months or more (see e.g. Mugavero et al., 2012). This variable is based on visits for medical care, regardless of the level or type of clinical services reported.

Appropriate Care. The next analyses examine receipt of HIV medical care that meets minimum clinical practice standards at the time of interview. Prior to 2013, minimum standards for appropriate care required at least one visit with blood work and a complete physical in the past six months if CD4 count is 350 or above and viral load is 400 or less; or at least two visits with at least one blood work and one complete physical if the CD4 count is less than 350 or viral load is over 400. After June 2013, minimum standards for appropriate care for anyone diagnosed with HIV must include taking ARV, regardless of CD4 or viral load. Our measure of ‘appropriate care’ is meant to indicate a level of individual engagement and follow-through with care recommendations, based on the Department of Health and Human Services (HHS) HIV/AIDS Bureau (HAB) criteria for minimum clinical standards of care (HAB.HRSA.gov) and NIH AIDSInfo guidelines (AIDSinfo.nih.gov)

Adherent ARV Use. Adherent antiretroviral medication use is indicated by taking any recommended ARV regimen prescribed by a physician and adherence to medication regimen indicated by reports of taking medications “exactly as prescribed, almost never missing a dose” and not missing any medications in the two days preceding the interview. Not adherent to recommended ARV regimen includes those who are not taking any antiretroviral medication and those who report taking medications not consistent with HHS guidelines in effect at the time of the interview (AIDSinfo.nih.gov).

Suppressed Viral Load. Viral load suppression is based on self-reported most recent HIV viral load as a numerical value below a reliably detectable cut point at the time (<400 copies 2002-2008; <200 2009 or after), or when the medical provider reported viral load test results as “undetectable,” or, in a few cases, simply as “good.” Viral load test results above the cut point or provider reported results as either ‘detectable’ or ‘bad’ were classified as unsuppressed viral load. Note that fewer than 1% of cases were classified based only on the good/bad designation.

Definitions of housing and transportation variables and all outcome indicators are summarized in **Table 1**.

### *Co-occurring needs and services received*

Problem substance use is indicated by any use of heroin, cocaine, crack, methamphetamine or problem drinking as indicated by the CAGE instrument (Ewing, 1984) or drinking five or more drinks weekly or more often. Timing of problem substance use is defined as currently or within six months of interview, prior to six months ago, or never. Alcohol or drug (AOD) treatment or services include any type of professional treatment in the past six months excluding self-help groups such as Alcoholics Anonymous (AA) or Narcotics Anonymous (NA).

Low mental health functioning is indicated by the Mental Component Summary (MCS) score of the MOS-SF36 (McHorney et al., 1993); following established clinical cut points, individuals with scores below 37.0, the mean score seen in psychiatric inpatient populations, were categorized as having very low mental health functioning. Mental health services in the past six months include counseling or treatment from a licensed mental health care professional or clinical social worker.

Food insecurity is indicated by any of the following: reporting not enough money for food that the individual or family needs ‘sometimes’ to ‘very often’ in the past six months; or ‘sometimes/often’ there is not enough to eat; or the participant has gone a whole day without eating in the last 30 days; or they report need for services or help with food, groceries, or meals in the past six months. Food/nutrition services includes one or more of the following services in the last six months: meals provided in a group setting, prepared meals delivered to home, receipt of food voucher, or food from a food pantry.

Receipt of medical case management is indicated by reporting receiving assistance from a case manager in the past six months with access or referrals to specific medical services or with receiving or being referred for help with taking ARV medication. Social services case management indicates receiving one or more of the following services from a case manager in the last six months: care plan development or revision for dealing with needs, or help with access or referrals to specific social services or filling out forms for benefits or entitlements. Note that the measure is based on participant reported types of services received, not on classifying *types of case managers* or case management programs. The same case manager may be providing both medical case management and assistance with social service needs.

### *Covariates*

A number of covariates were included in the multivariate analyses, to control for individual characteristics and contextual factors that other research has shown to affect use of HIV services. Models control for socio-demographics (age, gender identity, race/ethnicity); risk exposure group (injection drug use (IDU), men who have sex with men (MSM), heterosexual transmission/other); SES (education, income); insurance status (public vs. private); and length of time since HIV diagnosis.

**Table 1. Measures – Variable Definitions**

Variable	Definition
<b>Housing Variables</b>	
Housing Need	Homeless (individuals who describe themselves as homeless or report sleeping on the street, in a shelter, or in an SRO or welfare hotel with no services) or unstably housed (not currently in permanent housing but not literally homeless, including those in a transitional housing program, in AOD treatment housing with no other address, or temporarily doubled up with friends or family) during the past six months; OR rent burdened (report difficulty paying rent past six months or insufficient income to secure housing indicated by FMR>50% of income; OR report needing help or assistance in area of housing in the past six months to obtain stable, secure, appropriate housing, address habitability issues (e.g., no heat, damaged wiring) or avoid eviction or other housing loss.
Housing Assistance	Received tenant-based or facility-based permanent rental assistance OR “practical” housing assistance in the past six months that resolved need or problem or made “some” or “a great deal” of progress with resolving housing needs.
<b>Transportation Variables</b>	
Transportation Need	Self-reported need for transportation assistance for any reason or report that a lack of transportation resulted in delayed or missed medical or social services in the past six months.
Transportation Services	Transportation services are any assistance with transportation needs by an agency provider including ambulette, ride services (e.g., RideConnect), transportation vouchers (e.g., bus pass), or reimbursement for use of a private vehicle.
<b>HIV Care Outcomes</b>	
Continuous Care	Absence of two or more missed scheduled appointments for HIV medical care during the past six months AND did not have a period of ‘drop out’ since last interview when intentionally stopped going to the doctor and had no HIV medical appointments for six months or more.
Appropriate Care <sup>1</sup>	Appropriate care meets minimal clinical practice standards at the time of interview. Prior to 2013, at least one visit with blood work and complete physical in the past six months if CD4 count is 350 or above and viral load is 400 or less; or at least two visits with at least one blood work and one complete physical if CD4 count is less than 350 or viral load is over 400. After June 2013, not appropriate care if not taking ARV, regardless of CD4 or viral load.
Adherent ARV Use	Adherent ARV indicated by taking any recommended ARV regimen and report taking medications “exactly as prescribed, almost never missing a dose” and report not missing any medications in the two days preceding the interview. Not adherent includes those who are not taking any antiretroviral medication and those taking medications listed under “not recommended” or “should be changed” regimens in the DHHS’s guidelines in effect at the time of the interview.

**Table 1. Measures – Variable Definitions**

Variable	Definition
Viral Suppression	Self-reported most recent HIV viral load as an actual numerical value or report medical provider designation as “undetectable,” or “good.” Viral load of <400 copies (or <200 copies from November 2009 and after), or provider report as “undetectable,” or “good” were coded as “suppressed viral load” and >400 copies (or >200 copies from November 2009 and after) or reported as “bad” as “unsuppressed viral load.”

### Analysis

Descriptive analyses were run to examine multiple indicators of housing status and housing and transportation service needs for each interview period from 2008-09 to 2015-17. To examine the relationship between housing and transportation needs, housing assistance, transportation assistance, and HIV medical care outcomes, the data from all interview period were pooled. Since both housing situation, transportation needs, as well as other services needed and used, can vary over time, each interview with each CHAIN study participant constituted an opportunity to examine the relationship between housing and transportation needs and receipt of housing and transportation assistance for medical care outcomes, controlling for other service needs, receipt of supportive services to address co-occurring needs, demographic and other covariates. Random effects logistic regression models were run to estimate the predictors of the four outcomes, adjusting for correlation among repeated observations on individuals.

## **Results**

### Sample description

**Table 2** presents background characteristics of the study sample at the most recent interview and housing and transportation needs by participant characteristics. Forty-eight percent (48%) of the sample are male; 57% of the sample are Black, and 27% are Latinx/Hispanic. The majority are over 50 years old (mean age 48) with relatively few younger than 35 years old. Sixteen percent of participants receive \$7500 or less in income per year from all sources; 36% have not completed high school. Over half (57%) have a history of problem alcohol or drug use with 17% reporting recent (past six months) use. Almost one-third (30%) score very low on a standardized measure of mental health functioning.

### Transportation and Housing Service Needs by Client Characteristics

**Table 2** also shows need for transportation and/or housing services. Rates of service need are high; 40% or more of each of the different subgroups of study participants need transportation assistance, housing assistance, or both. For example, cisgender men are more likely than cisgender women to report one or both service needs but differences by gender are not large (Rates of service need are high among transgender individuals but there are too few cases for comparisons.). There are racial/ethnic differences with highest need among Latinx and ‘other/mixed’ ethnic groups. There are differences by educational level and income but rates of housing and/or transportation need

even among the more advantaged are 40-50%. Rates of need for one or both services are highest among current drug users and persons who score very low on a measure of mental health functioning. For all study participants, the percentage who need housing assistance is much higher than those who report need for transportation services alone.

### Housing and Transportation Needs and Services Received at Different Time Periods

**Table 3** examines indicators of housing and transportation need, and services to address needs, at each cross-sectional cohort recruitment period. For each time period, the majority of Tri-County CHAIN study participants were stably housed; however, over 10% were homeless or unstably housed (Table 3). Separate from classifying housing status, participants were asked to describe any housing problems or need for housing assistance. Problems described in response to open-ended questions included not having a regular place to live; not being able to pay rent; being asked to leave a ‘doubled up’ situation; being discharged from a housing program, living in a treatment facility, or other institution; habitability (e.g., no heat, damaged wiring) or access (need elevator building) issues; need to leave domestic violence or unsafe situation; and facing eviction or other housing loss with no resources to secure housing. Rates of self-reported housing problems were 20% in 2008-2010 then were lower for several years until most recent interview period, 2015-2017, when 23% of respondents reported serious housing problems.

Both objective and subjective sources of data were used to classify type of need for housing assistance including classification of housing status based on description of living situation at cohort enrollment, participant report of housing problems, and additional information about their tenancy rights, economic resources, and behavioral health challenges. Participants were classified as *seriously rent burdened*, *needing permanent housing*, or *needing permanent supportive housing* regardless of whether they defined any housing need in these terms. This information provides a portrait of different types of housing-related service needs that may inform service planning (note that subsequent analyses do not distinguish among types of housing need).

At all interview periods, the need has been greatest for rental assistance and the need has only increased (Table 3). At the most recent interview period (2015-17), 84% of study participants were in their own housing but seriously rent burdened indicated by reported difficulty paying rent fairly often or very often in the past six months and their current income insufficient to secure housing (FMR>50% of income). Fewer Tri-County CHAIN participants needed permanent housing, that is, they were currently homeless, temporarily doubling up, or living in temporary or transitional housing during the last six months or currently in their own housing but facing eviction for any reason. Fewer still needed permanent supportive housing – housing that included supportive services to address mental illness or substance use disorder and/or challenges indicated by a long duration or multiple episodes of homelessness.

Table 3 also shows need for transportation assistance at different time periods. At the most recent interview, 16% of respondents reported problems with transportation services or transportation barriers to accessing medical or social services within the past six months. More recently, individuals who need transportation assistance are more likely to need both housing and transportation services than just transportation assistance alone.

**Table 2. Sample Characteristics at Most Recent Interview and Rates of Housing and Transportation Needs**

	Total Sample % ( n )		Need for Housing and Transportation Services <sup>1</sup>			
			No Need for Housing or Transportation Assistance	Need Transportation Assistance Only	Need Housing Assistance Only	Need Both Housing and Transportation Assistance
<b>Gender</b>						
Female	51%	(314)	54%	5%	32%	9%
Male	48%	(296)	49%	3%	41%	7%
Transgender	<1%	(4)	0%	33%	67%	0%
<b>Race/Ethnicity</b>						
White, Non-Hispanic	13%	(80)	58%	3%	33%	8%
Black, Non-Hispanic	57%	(355)	53%	3%	37%	8%
Latinx /Hispanic	27%	(161)	47%	7%	37%	9%
Other <sup>2</sup>	3%	(20)	30%	10%	50%	10%
<b>Age Group</b>						
<35 years old	11%	(66)	39%	3%	44%	14%
35-49 years old	40%	(218)	47%	6%	39%	6%
50 + years old	49%	(332)	56%	3%	33%	8%
Mean (SD)	50 (11.2)	(616)	51 (11.2)	48 (11.2)	48 (10.9)	47 (11.4)
<b>Education</b>						
Less than High School	36%	(222)	47%	6%	37%	7%
High School/GED	45%	(276)	53%	3%	37%	7%
Post-secondary	19%	(118)	54%	3%	34%	8%
<b>Risk Exposure</b>						
MSM <sup>3</sup>	21%	(128)	50%	3%	40%	7%
IDU	17%	(102)	55%	2%	36%	7%
Heterosexual/ Other	62%	(382)	51%	5%	35%	9%
<b>HIV Diagnosis Year</b>						
<1996	40%	(241)	55%	5%	32%	8%
1996-2001	24%	(143)	59%	4%	34%	4%
2002 or later	36%	(215)	42%	5%	41%	12%
<b>Annual Income</b>						
< \$7500	16%	(512)	53%	7%	41%	10%
\$7500 +	84%	(86)	42%	4%	36%	8%
<b>Problem Substance Use<sup>4</sup></b>						
Current (past 6 months)	17%	(78)	33%	4%	46%	17%
Past ( > 6 months ago)	40%	(272)	61%	6%	28%	6%
Never	43%	(263)	47%	3%	42%	8%
<b>Mental Health Functioning<sup>5</sup></b>						
Very low (MCS<37)	30%	(182)	37%	3%	47%	13%
Higher score (MCS 37+)	70%	(434)	57%	5%	32%	6%
Mean (SD)	42 (9.4)	(616)	44 (8.8)	43 (9.5)	40 (10.0)	38 (8.7)

<sup>1</sup> Need for services at most recent interview, 2008-2017. Row percentages shown.

<sup>2</sup> Includes Asian, Pacific Islander, Native American, Alaskan, Hawaiian, Other, and Mixed.

<sup>3</sup> Includes 14 MSM+IDU.

<sup>4</sup> Use of heroin, cocaine, crack or methamphetamine, or problem drinking (CAGE). Ewing JA. Detecting Alcoholism: The CAGE questionnaire. *JAMA*. 1984; 252: 1905-1907.

<sup>5</sup> MOS-SF36 Mental Component Summary Score <37.0, mean score among psychiatric inpatient populations. McHorney CA et al. (1993). The MOS 36- item short-form health survey (SF-36). *Medical Care*, 31, 247–263.

**Table 3. Indicators of Need for Housing and Transportation Assistance and Services to Address Needs**

	2008-2010	2010-2012	2012-2013	2015-2017
(n=)	(302)	(251)	(177)	(182)
<b>Housing Status at Current Interview</b>				
• Stable, in own place	83%	83%	90%	89%
• Temporarily doubled up with others	7%	10%	7%	9%
• Temporary/ transitional housing program	7%	4%	2%	1%
• Homeless: in shelter, SRO, street, place not meant for sleeping	3%	3%	2%	1%
<b>Housing Transience</b>				
• Moved at least once in past 6 months	15%	13%	10%	7%
<b>Self-reported Housing Problems<sup>1</sup></b>				
<i>Regardless of housing status respondent reported:</i> Not having a permanent place to live, unable to pay rent, unable to pay utilities, facing eviction, being discharged from program with no resources to secure housing, lacking heat or working plumbing, experiencing domestic violence or other dangerous situation, in need of an accessible unit	20%	13%	11%	23%
<b>Type of Need for Housing Assistance</b>				
• No housing need	15%	10%	12%	5%
• Need rental assistance <sup>2</sup>	64%	73%	78%	84%
• Need permanent housing <sup>3</sup>	11%	11%	7%	9%
• Need permanent supportive housing <sup>4</sup>	11%	6%	3%	2%
<b>Need for Transportation Assistance<sup>5</sup></b>				
Self-reported problems with transportation or need for transportation services, or respondent answered that they delayed or did not get needed services during the past six months because of transportation difficulties	18%	11%	8%	16%
<b>Housing and Transportation Service Needs</b>				
• No need for either service	47%	55%	61%	50%
• Need Transportation Assistance Only	7%	4%	5%	6%
• Need Housing Assistance Only	35%	33%	31%	33%
• Need both Transportation and Housing Assistance	11%	7%	3%	11%
<b>Housing and Transportation Service Receipt</b>				
• No Transportation or Housing services received	32%	24%	30%	29%
• Received Transportation Assistance Only	6%	6%	6%	3%
• Received Housing Assistance Only	40%	45%	40%	51%
• Received both Transportation and Housing Assistance	22%	25%	24%	17%

- Answers to questions: "Please tell me if, in the last 6 months, that is since \_\_\_\_ (reference date), you had a problem or needed assistance in in the area of housing? (if YES) Please tell me a little bit more about your need for assistance with housing or the problem you had
- Need Rental Assistance: Currently in own housing but seriously rent burdened indicated by reported difficulty paying rent fairly often or very often in the past 6 months; current income insufficient income to secure housing (FMR>50% of income)
- Need Permanent Housing: Currently homeless, temporarily doubling up, or living in temporary or transitional housing for any time during the last 6 month; or currently in own housing but facing eviction (for any reason) or needing to move; and not needing supportive housing
- Need Permanent Supportive Housing: Currently homeless, temporarily doubling up, or living in a temporary/transitional housing program anytime during the last 6 months; or currently in own housing but facing eviction or housing loss for any reason, AND experiencing persistent mental illness or substance use disorder, or chronically homeless, indicated by long duration or multiple episodes of homelessness
- Percent answering "YES" in response to the question: "In the last six months, have you had a problem or needed assistance in the area of transportation" or reported that they delayed or did not get medical or social services they needed "because it was difficult to get transportation there."

## Housing and Transportation Needs and Services and Engagement in HIV Medical Care

We examined bivariate associations between housing and transportation needs and HIV medical care and health outcomes. **Figure 1** shows cross sectional associations at the most recent interview. Both transportation need and housing need, and especially co-occurring need for both services, is associated with worse engagement with HIV care and viral load outcomes. The overall pattern is clear – study participants who need both transportation and housing assistance have worse outcomes compared to those who experience either service need but not the other and both of these are worse off than individuals with no needs in either service area.

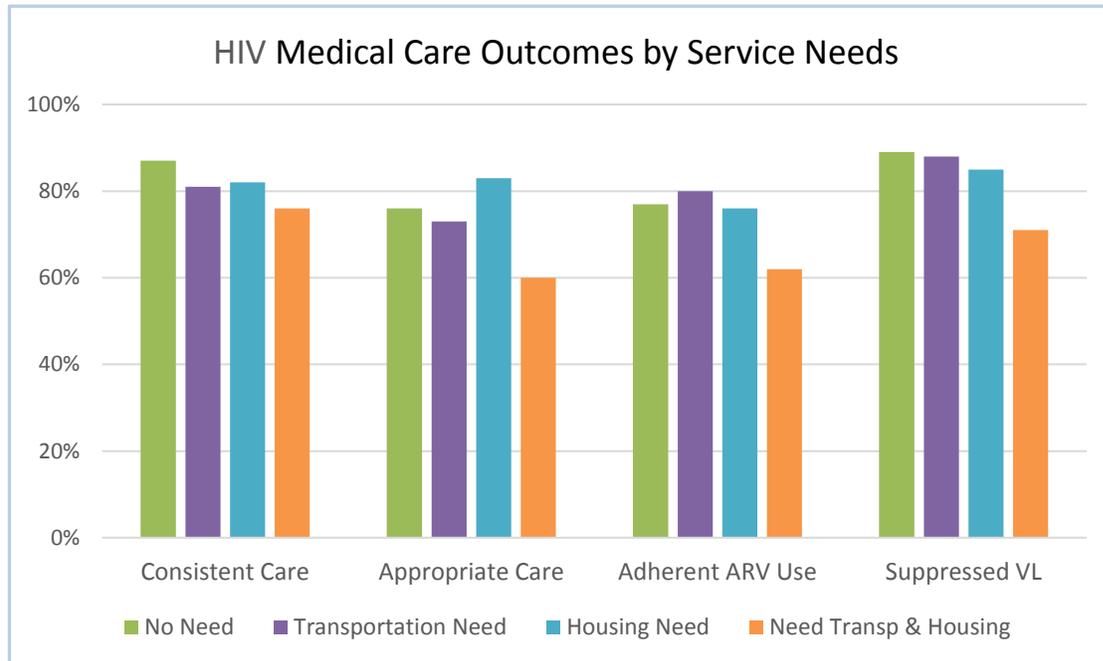


Figure 1. HIV Medical Care Outcomes by Need for Housing Services, Transportation Assistance, and Need Both Housing and Transportation Services

**Table 4** presents the results of the multivariable analyses of housing and transportation needs and receipt of housing and transportation assistance as predictors of continuity of care, receiving appropriate HIV care, adherent ARV use, and viral suppression, controlling for other service needs, receipt of services to address additional service needs, and client sociodemographic. We use the odds ratio statistic to show the relationship between housing and transportation needs, receiving housing, transportation, and other supportive services, and engagement with medical care and viral load outcomes. The odds ratio statistic describes how much a variable reduces or increases the odds of a specific outcome controlling for the other variables in the analysis. Odds ratios less than one indicate that the variable is associated with a lower likelihood of the engagement in care or viral load outcome, while odds ratios greater than one indicate that the variable is associated with increased odds of the positive outcome. A value of two or more represents a substantial impact. Table 4 presents four models showing the odds ratios associated with each of the different engagement in care outcomes. The first column within each model shows

the relationship between each variable and the medical care outcome, without considering any other factor. The second column shows the adjusted odds ratios, adjusted for all other variables in the model.

### *Continuous HIV Medical Care*

Continuity of care is indicated by the absence of missed scheduled appointments for HIV medical care or any intentional gap in appointments for six months or more. The analysis tests the relationship between housing and transportation needs and receipt of housing and transportation assistance at each interview period as these factors increase or decrease the likelihood that the individual has maintained continuous HIV care. The model also considers low mental health functioning, current and past problem substance use, food insecurity, and services to address these needs (Table 4, first model).

Transportation and housing needs, especially experiencing both service needs simultaneously, are associated with lower odds of continuous care. The odds of experiencing continuous HIV medical care, not missing scheduled appointments or deliberately dropping out of care are less than 30% as high among individuals who need both housing and transportation assistance as for those who have neither need in the full adjusted models, controlling for other service needs, service utilization, and client characteristics (AOR 0.280).

Receipt of housing assistance, transportation assistance, or both during the six months prior to interview are not associated with continuous care indicators.

### *Care that Meets Practice Guidelines*

The same analytical approach was used to examine housing and transportation needs and receipt of housing and transportation assistance as predictors of receiving appropriate HIV medical care that meets minimum clinical practice guidelines (Table 4, second model). A participant is considered to be “engaged in appropriate medical care” at each interview in which all indicators – recommended visits, tests, treatments, and procedures are consistent with standards for appropriate medical care for HIV. Like the model assessing continuity of care, the appropriate medical care model controls for substance use, mental health and other service needs, other services received, and demographic and other client characteristics.

PLWH in the Tri-County Region who have transportation needs are less likely to be engaged in medical care that meets minimum clinical practice standards (AOR 0.441). On the other hand, the odds of receiving medical care that meets clinical practice guidelines are three to four times higher for persons who receive transportation and/or housing assistance compared to persons with similar characteristics not receiving such assistance (AOR for receipt of transportation services 3.144 and AOR 2.315 for receiving both transportation and housing services).

**Table 4. Housing Need, Housing Assistance, and Viral Suppression**

	Continuous Care		Appropriate Medical Care		Adherent ARV Use		Suppressed Viral Load	
	OR	AOR	OR	AOR	OR	AOR	OR	AOR
<b>Housing and Transportation Need</b>								
Transportation Only <sup>1</sup>	0.411	0.477	0.527#	0.441*	0.384*	0.472	0.864	1.136
Housing Only <sup>2</sup>	0.601#	0.611#	1.156	1.32	0.826	1.115	0.616*	0.700
Both Transportation and Housing	0.195***	0.280*	0.593#	0.702	0.275***	0.372*	0.289***	0.420*
<b>Housing and Transportation Services</b>								
Transportation Only <sup>3</sup>	0.823	1.372	1.673	3.144*	0.516	0.548	0.809	0.878
Housing Only <sup>4</sup>	0.591#	0.835	1.399#	1.642*	0.929	1.064	0.872	1.136
Both Transportation and Housing	0.556	1.103	1.813*	2.315**	0.560#	0.778	0.750	1.247
<b>Other Service Needs</b>								
Past Problem Substance Use	0.501*	0.318**	1.502*	0.911	1.110	0.836	0.691	0.572*
Current Problem Substance Use	0.109***	0.061***	1.104	0.590	0.346***	0.325**	0.485*	0.544#
Low Mental Health Functioning	0.531*	0.621	0.900	1.122	0.435***	0.421**	0.528**	0.626#
Food Insecurity	0.648#	0.989	0.685*	0.754	0.689#	0.790	0.605*	0.766
<b>Supportive Services</b>								
Medical Case Management <sup>5</sup>	1.137	1.373	1.239	1.515#	0.875	0.751	0.583**	0.610*
Social Service Case Management <sup>6</sup>	0.864	0.755	0.787	0.631#	0.941	1.443	0.631*	0.874
AOD Treatment or Services	0.899	2.413#	1.387	1.499	0.378**	0.614	0.462*	0.792
MH Treatment or Services	0.896	1.286	0.950	0.954	0.977	1.393	0.570**	0.716
Food and Nutrition Services	0.373***	0.629	1.034	1.123	0.659#	0.805	0.745	0.873

Note: OR =odds-ratio; AOR =adjusted odds ratio # p < .10 \* p < .05; \*\* p < .01; \*\*\* p < .001

Logistic regression equations using random effects procedure to adjust for the dependency among multiple observations contributed by the same individual. Model 1 examines predictors of continuous care (n= 557 respondents, 812 observation points.) Model 2 examines predictors of appropriate medical care (n= 557 respondents, 813 observation points). Model 3 examines predictors of adherent ARV use (n= 556 respondents, 811 observation points.) Model 4 examines predictors of suppressed viral load (n= 534 respondents, 780 observation points.) All models control for age, gender, race/ethnicity, education, income, risk exposure group, and year of HIV diagnosis.

1. Self-reported need for transportation assistance for any reason or report that a lack of transportation resulted in delayed or missed medical or social services in the past six months.
2. Homeless/unstably housed past 6 months, or severely rent burdened, or need housing assistance to obtain housing, address safety or habitability issues, or avoid housing loss.
3. Received any assistance for transportation needs by an agency provider including ambulette, ride services (e.g., RideConnect), transportation vouchers (e.g., bus pass), or reimbursement for use of private vehicle.
4. Received rental assistance or 'practical' help or assistance with housing problems in the past 6 months that resolved needs or achieved some/a great deal of progress resolving housing needs.
5. Received assistance from a case manager with access or referrals to specific medical services during the last six months and currently has an HIV primary care provider considered to be in charge of overall HIV care.
6. One or more of the following services from a case manager in the last six months: developed or revised care plan for dealing with needs, helped with accessing or referrals to specific social services, or help with filling out forms for benefits or entitlement.

### *Adherent ARV Use*

There is an increased risk of non-adherence among PLWH who need housing and transportation assistance (Table 4, third model). The odds of adherent ARV use are only about a third as high among study participants who need both services (AOR 0.372) compared to their counterparts who need neither, controlling for behavioral health and other supportive service needs, and a wide range of client characteristics. The odds of adherent ARV use are not significantly higher for persons who receive transportation or housing services than their peers not receiving these services.

### *Viral Suppression*

Needing both housing and transportation assistance significantly reduces the odds of viral suppression by more than half (AOR 0.420). Receipt of both housing and transportation services is associated with higher odds of suppressed viral load, but the relationship is not statistically significant (Table 4, last model). No other services are associated with positive viral load outcomes; medical case management is in fact negatively associated with viral suppression. However, this likely results from the fact that complex needs and poor viral suppression is a trigger for enrollment in medical case management or a care coordination program.

## **Summary and Discussion**

Despite recognition that unstable housing and transportation barriers are disruptive to engagement in care along the HIV care continuum, the need for these services persists among PLWH in the Tri-County Region.

Housing costs represent a significant burden for PLWH in the Tri-County Region. The median monthly income of Tri-County CHAIN participants varied between \$729 and \$1041 per interview period,<sup>1</sup> insufficient to afford a studio apartment in either Westchester (\$1196/month) or Putnam and Rockland (\$1352/month) counties at the 2017 fair market rate. Across the study period, the percentage of severely rent burdened households rose from 80% to 93%. Unsurprisingly, the need for rental assistance paralleled this trend, rising twenty percentage points to 84% in 2017.

Over 60% of Tri-County CHAIN participants received some type of rent or other housing assistance during every interview period from 2008-10 to 2015-17. However, study results also indicate a persistent gap in service delivery. The percentage of unstably-housed respondents in the Tri-County Region has remained at or above 10% for nearly a decade, suggesting that current assistance may not be reaching this population. In addition, much of the housing assistance is temporary; permanent housing assistance through Housing Opportunities for People with AIDS (HOPWA) or other governmental programs such as Section 8 has been scarce. Although CHAIN research has documented the study participants have multiple behavioral health and service needs in addition to housing, there are currently no programs providing permanent supportive housing for PLWH. Permanent supportive housing has not consistently been available in the Tri-County

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<sup>1</sup> Median monthly income for Tri-County participants was \$1041 for all interview periods except 2012-2013, when reported income among those interviewed dipped to \$729.

Region (New York State Office of Temporary and Disability Assistance (NYS OTDA), n.d.-a; NYS OTDA, n.d.-b) over the study period.

Given that those in need of housing or both housing and transportation assistance are more likely to have poorer HIV medical care outcomes, the unstably housed remain a priority population for targeted assistance in the Tri-County Region.

While there is a clear relationship between housing need and engagement with HIV medical care along the care continuum, the combination of housing and transportation needs is more strongly associated with poor engagement than housing needs alone. Homelessness/unstable housing or having other housing needs AND having transportation needs are associated with multiple missed appointments or episodes of dropping out of care entirely, lower adherence to ARV, and lower odds of achieving viral suppression, when controlling for sociodemographic characteristics, risk exposure groups, and year of HIV diagnosis.

Engagement in appropriate care, care meeting minimum practice standards based on recommended number of visits, monitoring tests and procedures, is significantly associated with the receipt of all services, housing, transportation, and both combined, when controlling for other factors. No other care outcome is associated with the receipt of housing or transportation services net of other factors.

While the need for housing and transportation assistance affect engagement with HIV care, problem substance use and low mental health functioning are also strong predictors of reduced odds of positive HIV medical care outcomes. However, receipt of housing and/or transportation services is more strongly associated with receipt of appropriate medical care, than either mental health or substance use services, controlling for mental health and substance use needs. The inconsistent association of medical case management with medical care outcomes, and significantly reduced odds of viral suppression likely results from the prioritization of individuals with worse viral load outcomes for assistance with access to or referrals for medical care and adherence support services.

Widespread financial insecurity among PLWH is likely to exacerbate the disruptions to HIV care associated with housing and transportation needs. Estimated monthly costs of basic needs for a single adult living in the Tri-County Region range from \$890 to \$1072 before transportation, out-of-pocket medical expenses, or child care are factored in (\$295 for food and \$595 for other necessities, such as clothing, personal hygiene products, and phone service in Westchester; \$347 for food and \$725 for other necessities in Putnam; \$279 for food and \$745 for other necessities in Rockland) (Economic Policy Institute, 2018). These expenses nearly consume or exceed CHAIN participants' median monthly income.

Housing and transportation assistance are not an exhaustive solution to removing barriers to sustained engagement in HIV care and positive health outcomes. Initiatives addressing food and nutrition needs are also crucial as, on average, 40% or more of study participants who received housing assistance were food insecure. Food insecurity and poor nutrition are themselves major

impediments to engagement in HIV care, adherent ARV use, and sustained viral suppression (Aidala et al., 2019). Additionally, almost two in five PLWH receiving housing assistance need services or treatment for mental health needs.

These needs are unlikely to subside in the near future and are projected to grow due to the consequences of the COVID-19 pandemic. Declining housing availability in the Tri-County Region, exacerbated by the migration of those who can work from home out of New York City, created a “seller’s market,” reducing available inventory and increasing rental demand (Hudson Valley Pattern for Progress, 2020). Low turnover in existing rental properties, due to COVID-19-related eviction moratoriums, further constrict available rental options and, in the case of unpaid rent, may also reduce landlords’ abilities to maintain their property, raising the possibility of increasingly limited housing options, higher rent, and poorer housing conditions in the short-term (Hudson Valley Pattern for Progress, 2020). Public transportation options have narrowed to offset reduced ridership and allow for additional cleaning (MTA, 2021). The cost of private transportation, such as ride-sharing services like Uber or Lyft, has, on average, more than doubled, with wait times of up to an hour (Lisa Best, Tri-County Steering Committee, personal communication, April 13, 2021). Without affordable or available transportation, households may forgo any trips deemed unnecessary, such as medical checkups, to preserve already scarce financial resources. Finally, household food insecurity is on the rise across the state, attributed to COVID-19-related employment losses (New York State Assembly Standing Committee on Social Services, 2020).

Results of cross-sectional and overtime analyses support the development of patient-centered, care-coordination models featuring integrated services. Successful engagement and retention in the HIV care continuum necessitate addressing the medical, behavioral health, and social needs of PLWH concurrently. To engage harder-to-reach PLWH, programs should explore the possibility of using alternative forms of outreach or care delivery for homeless/unstably housed clients such as including community health workers or delivering care through mobile care teams. When necessary, immediate assistance should be extended to prevent the use of negative coping strategies offsetting financial losses and other burdens generated by the COVID-19 pandemic that other research has shown may include forgoing medical appointments.

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