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The Association Between Housing Status and CD4 Count Among People Living with HIV and Utilizing Homelessness and Homelessness Prevention Services in the State of Georgia

Raheem Smith

ABSTRACT

The Association Between Housing Status and CD4 Count Among People Living with HIV and Utilizing Homelessness and Homelessness Prevention Services in the State of Georgia

By

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April 27, 2020

INTRODUCTION: Previous studies have indicated an association between housing insecurity and the management of HIV. Specifically, several of these studies have documented an association between having temporary housing and low CD4 count, one marker for HIV viral load suppression. However, there is some variation in the literature that may suggest that housing status alone does not predict CD4 count. The objective of this study is to further examine this association between temporary housing status and low CD4 count.

METHODS: A cross-sectional study was conducted with clients (n=117) sampled from a Homeless Management Information System (HMIS). These clients were separated into two housing categories (temporary and permanent) and two CD4 count categories (below 200 cells/µL and above 200 cells/µL). Logistic regression was performed to obtain odds ratios from two models (crude and adjusted) to examine the association between housing status and CD4 count.

RESULTS: There was no statistically significant association between temporary housing status and CD4 count under 200 cells/µL in the crude model (OR=2.275, 95% CI: 0.628, 8.241). However, there was a statistically significant association between temporary housing status and CD4 count under 200 cells/µL in the adjusted model (OR=5.708, 95% CI: 1.087, 29.979).

DISCUSSION: The findings of the adjusted model were statistically significant. However, the confidence interval was very wide, and the lower bound was very close to the null. This was likely a result of limited statistical power from low sample size (n=117). Future research is needed to further explore this association and to assess the impact of possible mediating factors such as injection drug use, sexual activity, and incarceration history.

KEYWORDS: HMIS, housing, homelessness, HIV/AIDS, CD4 count

The Association Between Housing Status and CD4+ T Cell Count Among People Living with HIV and Utilizing Homelessness Services and Homelessness Prevention Services in the State of Georgia

by

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Author's Statement Page

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Introduction

Background

Housing Opportunities for Persons with AIDS (HOPWA) is a program of the US Department of Housing and Urban Development (HUD) that offers housing and support for low-income people living with HIV (Georgia Department of Community Affairs, n.d.). The Georgia Department of Community Affairs (DCA) distributes federal funds from this program to grantees who then provide direct assistance within the Balance of State, a 126-county largely rural jurisdiction that covers the majority of the geographical area of the state excluding Metro Atlanta, which is covered by its own jurisdiction (Georgia Department of Community Affairs, n.d.).

Programs that receive HOPWA funding through DCA record two HIV-related biomarkers from clients. The first, viral load, refers to the number of copies of HIV per milliliter of blood. When viral load drops below 200 copies of HIV per milliliter of blood it is called viral suppression, and when viral load is so low that it does not appear on HIV tests it becomes known as undetectable (Centers for Disease Control and Prevention, 2020). The second, CD4+ T cell count, refers to the number of CD4+ T-lymphocytes--the cells that are attacked by HIV--per microliter of blood (Selik Richard et al., 2014). HIV reaches stage 3 (AIDS) when CD4+ T cell count drops below 200 cells per microliter of blood (Selik Richard et al., 2014).

The link between housing status and CD4+ T cell count has been established in the literature though not unanimously. It is possible that obtaining permanent housing makes way for better engagement and retention in care, for more consistent medication adherence, or for some other less examined pathways to successful management of HIV.

Objective

To examine the association between temporary housing status and low CD4+ T cell count.

Research Question

Is temporary housing status associated with lower CD4+ T cell count at program entry among people receiving HOPWA assistance in the State of Georgia?

Hypothesis

HOPWA recipients living in temporary housing situations are more likely to have CD4+ T cell counts under 200 cells/μL at program entry when compared to HOPWA recipients living in permanent housing situations.

Review of the Literature

Housing and HIV Biomarkers

Housing has been associated with both CD4 count, the outcome of interest in this study, and viral load. Most of the literature reports a significant positive association between stable housing and both biomarkers. However, there are studies that do not report this.

This ambiguity in the literature is evenly distributed; that is, there are not as many studies that report no positive association as studies that do. A systematic review of studies assessing the impact of housing on the health of people living with HIV found that 74.1% of those studies reported a statistically significant association between inadequate housing status and negative HIV clinical health outcomes (Aidala et al., 2016).

The clinical health outcomes observed in these studies refer to two biomarkers: CD4 count and viral load. In one study that assessed both biomarkers, Bowen et al. performed secondary analysis on data from a sample of clients in a Cincinnati shelter plus care program. During their time in the program, the percentage of participants with a healthy CD4 count (defined as greater than or equal to 500 cells/mm3) increased from 28% at baseline to 45% (Bowen et al., 2017). A similar change was observed in viral suppression, which increased from 66% to 79% (Bowen et al., 2017).

As obtaining stable housing can improve biomarkers, so too can unstable housing yield the opposite effect. As Galárraga et al. show, unstable housing--defined by a participant affirming that they currently reside on the street/beach, shelter/welfare hotel, jail/correctional facility, or halfway house--reduces the likelihood of viral suppression by 51 percentage points and also decreases likelihood of having adequate CD4 cell count by 53 percentage points

(Galárraga et al., 2018). It is worth noting here that, “adequate CD4 cell count” is defined as above 350 cells/µl blood as opposed to the ≥ 200 cells/µl or ≥ 500 cells/µl range found in other studies (Galárraga et al., 2018).

Viral load suppression is more consistently defined. Throughout the literature, it refers to <200 copies/mL. In a study of 1491 New York City HOPWA clients, 253 (17.0%) were unsuppressed at their last viral load test, and 523 (35.1%) were not durably suppressed, which was defined as having any HIV viral load test reported to the Registry during the observation period greater than 200 copies/mL. Emergency housing--defined as living in the street, in a homeless shelter, or in a single room occupancy hotel at any point during the observation period--was found to be predictive (OR=2.01, CI 1.53–2.64) of lack of durable viral suppression when compared to continuous stable housing (Beattie et al., 2019).

Similarly, undetectable viral load consistently refers to a viral load so low it does not register on HIV tests. In one of the few randomized trials on this topic, unstably housed people living with HIV were randomly assigned either to HOPWA rental assistance or customary care (Wolitski et al., 2010). Across both groups, 79% of those who experienced homelessness had a detectable viral load compared to 61% of those who had not (Wolitski et al., 2010).

There are findings of positive association across every means of assessing CD4 count and viral load. However, the findings on the link between housing and HIV biomarkers are not unanimous. Maulsby et al. performed a mixed-methods study with people living with HIV enrolled in a national access to care program. In the study, participants prioritized housing or shelter as their most urgent need, but the researchers found no significant difference in viral suppression between people with and without their basic needs met (Maulsby et al., 2018).

These findings were reiterated in 2019 by Hawk, Maulsby, Enobun, & Kinsky who found no significant differences in viral suppression at follow-up among participants who were unstably housed at enrollment (49%) as compared to those who were stably housed at enrollment (54%).

Not only were there studies that failed to find a significant improvement in HIV biomarkers among people with stable housing, one study even found a greater chance of viral rebound (11 vs. 7 %; mOR = 1.45;95 % CI 1.10–1.91) among low-income people living with HIV who were receiving HOPWA assistance as compared to matched participants who were not receiving HOPWA assistance (Terzian et al., 2015). Viral rebound here is defined as having an unsuppressed viral load following two consecutive suppressed viral loads at least 2 weeks apart (Terzian et al., 2015).

It is possible that there is no positive association between stable housing and high CD4 count. If such an association does exist, however, there is literature that supports a mediating pathway between the two.

Engagement and Retention in Care

There are multiple potential explanations for the connection between housing and HIV. Of these, much of the literature seems inclined towards two. The first is engagement and retention in care. This refers simply to attending regular primary care visits for HIV.

Poor retention in care makes it difficult to maintain viral suppression, possibly as a result of lower rates of antiretroviral prescribing (Colasanti, Stahl, Farber, Del Rio, & Armstrong, 2017). This is exacerbated by systemic structural barriers such as housing insecurity (Colasanti, Stahl, Farber, Del Rio, & Armstrong, 2017). In a study assessing these barriers, it was found that

only 11% of unretained patients--defined by not having at least two primary care HIV visits at least 90 days apart within the last year--were virologically suppressed upon return to care (as compared to 84% of continuously retained patients) (Colasanti, Stahl, Farber, Del Rio, & Armstrong, 2017). Additionally, only 48% of unretained patients considered their housing to be stable versus 88% of continuously retained patients (Colasanti, Stahl, Farber, Del Rio, & Armstrong, 2017).

These numbers are very close to the findings of other studies. Rajabiun et al. conducted a study across multiple sites that assessed the influence of housing status on retention in HIV care, which was defined as having at least two HIV primary medical appointments at least 90 days apart during a yearlong observation period (Rajabiun et al., 2018). Housing status was separated into three categories: unstable housing (i.e. emergency shelters, places not meant for habitation, jails/prisons, and hotels/motels paid for by emergency shelter funds), temporary housing (i.e. staying with friends or family, residential treatment facilities, and hotel stays without subsidy), and stable housing (i.e. rented or owned rooms/apartments, permanent supported housing, and subsidized housing through HOPWA) (Rajabiun et al., 2018). When adjusting for covariates, those who stabilized their housing were over twice as likely to be retained in care (Rajabiun et al., 2018).

Not only does stable housing play a role in engagement and retention in care, but the speed at which a person obtains stable housing is also a factor. Wiewel et al. sampled 958 applicants to a supportive housing program for low-income persons living with HIV (PLWH) and mental illness or a substance use disorder. In their study, stable housing was defined as rental assistance or supportive housing, and unstable housing was defined as emergency shelters.

Stable housing was attained “quickly” if attained within six months. Of the applicants who were placed in the supportive housing program, 67% had a quick housing pattern versus only 28% of applicants not placed, which is important because people achieving stable housing quickly were found to be more likely to engage in care whether they were placed in the program (ARR: 1.14;95% CI 1.09–1.20) or not (1.19;1.13–1.25) and more likely to be virally suppressed whether placed (1.22;1.03–1.44)) or not (1.26;1.03–1.56) (Wiewel et al., 2020).

Engagement in care can be represented longitudinally rather than just assessing a single point in time. Enns, Reilly, Horvath, Baker-James, & Henry analyzed 2110 medical records of adults living with HIV who received care at a public hospital between 2008 and 2015. They identified five distinct trajectories of HIV care: (1) consistent care, (2) less frequent care, (3) return to care after initial attrition, (4) moderate attrition, and (5) rapid attrition (Enns, Reilly, Horvath, Baker-James, & Henry, 2019). Of these categories, the majority (73.9%) of those receiving consistent care achieved sustained viral suppression (Enns, Reilly, Horvath, Baker-James, & Henry, 2019). This stands in stark contrast to those experiencing rapid attrition, only 3.4% of whom achieved sustained viral suppression (Enns, Reilly, Horvath, Baker-James, & Henry, 2019).

One of the proposed strategies for improving retention in care is to prevent initial attrition, which can take the form of missed visits (Enns, Reilly, Horvath, Baker-James, & Henry, 2019). Research by Kay, Lacombe-Duncan, & Pinto has found that the impact of missed visits is cumulative, and that several factors can predict missed visits. These factors include poverty, lack of Ryan White HIV/AIDS Program support services, being uninsured, not having a high school degree, and being younger (Kay, Lacombe-Duncan, & Pinto, 2019). While all of these

factors were significantly associated with missing any visits (versus zero missed visits), only poverty, which is associated with housing instability, predicted missing three or more visits versus only missing one or two visits (Kay, Lacombe-Duncan, & Pinto, 2019).

Despite the evidence in favor of this pathway between housing and HIV, this pathway is not without contrary findings. The 2018 mixed-methods study by Maulsby et al. found no significant difference in linkage to care or retention in care among people with basic needs as compared to people without basic needs (Maulsby et al., 2018).

Medication Adherence

The second major pathway between housing and HIV that was observed in the literature is related to the first but operationalized differently. Medication adherence refers to regularly taking antiretroviral therapy for the management of HIV. This can be measured using unannounced pill counts if the study is longitudinal. It is possible for a person to be retained in care but not adherent to their medication, so this warrants a separation of the two concepts.

Multiple qualitative studies have uncovered patterns of housing playing a role in medication adherence for people living with HIV. Paudyal et al. conducted a study in 2017 on the topic. This study consisted of face-to-face interviews with patients experiencing homelessness. Across the interviews, the researchers found a recurring theme: the patients were aware of the importance of taking their medications, but they faced difficulties that often prevented them from doing so (Paudyal et al., 2017). Some were sharing medications with other patients experiencing homelessness, and some had their medications stolen from them. Even among those who did not suffer a loss of medication as a result of sharing or theft, the

most central theme among the patients seemed to be that they found it difficult to prioritize their medication when they had to focus on obtaining food and shelter (Paudyal et al., 2017).

Similar findings were reported in another qualitative study that focused specifically on women living with HIV being released from incarceration (Toorjo et al., 2019). In this study, the authors described housing as improving medication adherence along two pathways. The first is the subjective pathway, by which changes in medication adherence are intangible and more related to changes in perception and feelings of self-empowerment as an indirect result of stable housing (Toorjo et al., 2019). The second is the material pathway, by which changes in medication adherence are tangible and more directly related to the security provided by stable housing itself (Toorjo et al., 2019).

In addition to these qualitative findings, Cornelius et al. developed quantitative models using data from Audio-Computer-Assisted Self Interviews. In the interviews, they assessed housing instability, food insecurity, transportation access, ability to access services, social support, and self-efficacy (Cornelius et al., 2017). The researchers found that a lack of basic resources, namely housing, food, and transportation, had consistent negative effects on adherence (Cornelius et al., 2017). They also found, however, that these effects were indirect and mediated by social support and access to services (as assessed by questionnaire responses) (Cornelius et al., 2017). Their findings indicate a mixed result, that housing has an effect on medication adherence but also that such an effect can be eliminated through intervention in other areas (Cornelius et al., 2017).

This result aligns with that of a meta-analysis (n=10556) of observation studies on housing stability and medication adherence (in general, not ART specifically). This meta-analysis

found a positive and significant summary effect for the association between housing and medication adherence (Harris, Xue, & Selwyn, 2017). However, the magnitude of this effect is small (standardized mean difference = 0.15), and the authors question the practical impact of such a difference (Harris, Xue, & Selwyn, 2017).

Most of the literature supports a positive association between housing status and CD4 count. Most of the literature also supports a positive association between housing status and retention in care and medication adherence, two potential pathways between housing status and CD4 count. However, the degree of uncertainty in the literature justifies more research.

Methods and Procedures

Sample

Participants were sampled from ClientTrack, the Homeless Management Information System (HMIS) used by the Georgia Department of Community Affairs (DCA). Participants consisted of clients who received housing, funds, services, or other assistance from any organization granted HOPWA funds through DCA between July 1, 2016 and March 25, 2020. A custom query was created in ClientTrack to set the timeframe, eligible organizations, and a list of variables. These variables included CD4+ T Cell Count, Age, Race, Gender, Income, Health Insurance, and Prior Living Situation. The selection of these covariates was informed by the literature (Galárraga et al., 2018; Henwood, Lahey, Rhoades, Winetrobe, & Wenzel, 2018; Rajabiun et al., 2018). These sample characteristics are all included in Table 1.

A second export from the query included information on whether clients experienced any of the following in addition to HIV: Alcohol Abuse, Chronic Health Condition, Developmental Disability, Drug Abuse, Mental Health, and Physical Disability. These data were

merged with the original export to create a single dataset. The sample includes HOPWA recipients from multiple program types, which is consistent with other samples in the literature (Terzian et al., 2015). The client counts and percentages for each of these barriers are included in Table 4.

The full export using these parameters yielded 1075 entries. However, only 117 clients remained in the dataset after removing duplicates and clients who were missing CD4 count values or information on prior living situation. Most of these clients, 815 to be exact, were excluded because they had no CD4 count value recorded at all.

Statistical Analysis

All analyses were performed in SAS 9.4. Permanent and temporary housing categories were created in accordance with the literature (Wiewel et al., 2020) and with HUD regulations (US Department of Housing and Urban Development, 2012). If a client's prior living situation was an emergency shelter, a hotel/motel, or a place not meant for habitation, then he/she was included as living in temporary housing. All other clients were coded under permanent housing. The full list of included prior living situations is included in Table 3.

Clients coming from a hospital or other residential non-psychiatric medical facility or from a substance abuse treatment facility or detox center were excluded along with those missing prior living situation data. This was done for three reasons. First, those two locations do not communicate information about whether a client has temporary (unstable) or permanent (stable) housing, only where they were immediately prior to referral. Second, there are drastically lower CD4 counts among these clients, and including them may have introduced bias (e.g. hospitalization did not cause low CD4 count; it is more likely that low CD4 count caused

hospitalization). Third, there were very few clients from those locations: only two from a hospital or other residential non-psychiatric medical facility and three from a substance abuse treatment facility or detox center.

Only one client had a race listed other than “Black or African American” or “White,” so for the purpose of analysis, this client’s race was recoded to a missing value. Similarly, one client had a gender listed other than “Female” or “Male,” so this client’s gender was recoded to a missing value. This is in no way intended to trivialize the impact of races other than “Black or African American” or “White” or the impact of genders other than “Female” or “Male.” However, with only one client in each category, no robust analysis could be performed using these values within this dataset.

Additionally, the dataset contained a single outlier for income: one client was recorded as having an income of over $10,000 per month. Given that HOPWA funding is intended for people with low income, this was likely either a typo or the client’s annual income. Rather than assume which was the case, this value was instead coded as missing for the purposes of analysis.

Comorbid health conditions, of which there had been six in addition to HIV/AIDS (Alcohol Abuse, Chronic Health Condition, Developmental Disability, Drug Abuse, Mental Health, and Physical Disability) were combined into a single binary (yes/no) variable. If a client reported any of those six conditions, they would be coded as yes.

A binary categorical variable for CD4+ T cell count was created for the purpose of logistic regression. All CD4+ T cell count values were coded as either above or below 200 cells/µL, which is the threshold at which a person’s HIV reaches stage 3, commonly referred to as AIDS

(Selik Richard et al., 2014). Logistic regression was then performed using two models. The first model regressed the binary CD4+ T cell count variable on the binary housing status variable with no covariates. The second included age, race, gender, monthly income, whether the client had health insurance, and whether the client experienced a comorbid health condition in addition to HIV.

Results

Descriptive Statistics

The sample consisted of 117 clients after the exclusion of ineligible participants. Of these 117, the following characteristics were observed: 96 did not have a CD4+ T cell count under 200, and 21 did; 104 came from a permanent housing situation, and 13 came from a temporary housing situation; 40 were female, and 73 were male; 72 had health insurance, and 43 did not; 86 suffered from one of the six recorded comorbid barriers, and 31 did not. Age (mean: 45 years, SD: 11.5 years) and income (mean: $979.81, SD: $411.57) were both normally distributed.

Given the high number of clients with missing CD4 counts, it was important to ensure that there were no differences in the remaining variables between those missing CD4 values and those with CD4 values recorded. Chi-squared tests were performed for all categorical variables, and t-tests were performed for all interval variables. There were no significant differences between those with recorded CD4 counts and those missing CD4 counts with respect to any of the following variables: housing status (χ^2=0.29, p= 0.59), race (χ^2=0.41, p=0.52), gender (χ^2=2.66, p=0.10), health insurance (χ^2=1.40, p=0.24), comorbid barriers (χ^2 =2.55, p= 0.11), and income (t= 0.09, p=0.93) . A statistically significant difference in age was

observed (t=-2.13, p= 0.03). However, it is unlikely that this difference between those with recorded CD4 counts (mean=45.44, SD=11.10) and those missing CD4 counts (mean=43.55, SD=12.79) would have any meaningful clinical significance.

Crude Measures of Association

The crude odds ratio showed greater odds of having a low CD4+ T cell count among people with an unstable prior living situation as compared to people with a stable prior living situation (OR=2.275, 95% CI: 0.628, 8.241); however, this was not statistically significant.

Adjusted Measures of Association

When covariates were included in the regression model, the adjusted odds ratio was more pronounced (AOR=5.708, 95% CI: 1.087, 29.979) and statistically significant albeit with a wide confidence interval. This odds ratio and the odds ratios for all covariates can be found in Table 2.

Discussion and Conclusion

Summary and Interpretation

When adjusting for age, race, gender, income, health insurance, and comorbid barriers, the odds of a Georgia DCA-funded HOPWA client from a temporary housing situation having a CD4+ T cell count under 200 cells/µL are 5.708 times those of a client from a permanent housing situation.

These adjusted findings were consistent with most studies in the literature on the subject, which also report a positive association between temporary housing status and low CD4+ T cell count. Even the crude findings were consistent with the literature in that multiple

studies found stronger associations in their adjusted models (Giordano et al., 2018; Rajabiun et al., 2018).

Study Limitations

In the literature reviewed for this study, sample size ranged from n=81 to n=138757. There were articles with sample sizes comparable to this study (Bowen et al., 2017; Sarango, de Groot, Hirschi, Umeh, & Rajabiun, 2017). However, most articles fell between those extremes, with a median value of about 800, well above this study's sample size.

A lower sample means lower statistical power, limiting the precision of the analysis, as shown by the wide confidence intervals of both the crude and adjusted odds ratios. This also limits the capacity for analysis. At this size, important covariates could not be considered independently within the model. For example, each individual barrier type, of which there were six, had to be collapsed into a single dichotomous comorbid barrier variable.

It should be noted that the adjusted odds ratio would not be significant without the variable for comorbid barriers (without comorbid barriers AOR= 4.050, 95%CI: 0.905, 18.134). While the constructs encompassed within this variable are important, they are not universally defined, and their presentation to a client may vary depending on the case manager recording the information (e.g. "Do you have a chronic health condition?" versus "Do you have a chronic health condition such as asthma, lupus, diabetes, etc.?"). Additionally, the stigma attached to these barriers, especially alcohol abuse, drug abuse, and mental health, may cause an underestimate for this variable, as clients are often meeting case workers for the first time when completing entry assessments.

There were important covariates that were likely confounders but could not be included in the analysis. These include sexual practices and injection drug use, for example, two variables that have been shown in the literature to be associated with both housing status and HIV (Galárraga et al., 2018). Unfortunately, these variables are not recorded in ClientTrack.

Additionally, viral load is notably absent because undetectable viral load values are coded as missing, making them indistinguishable from actual missing values outside of individual client reports, which are not used to generate a query and were made inaccessible for the purposes of this study in order to protect sensitive client data.

Deeper patterns in HIV care and outcomes emerge when participants are followed over time. Length of stay in supportive housing is positively associated with viral suppression (Bowen et al., 2017). Experiencing viral suppression once does not mean that a client will not rebound (Terzian et al., 2015). Rather, clients experience a variety of different care trajectories, which, when considered, more thoroughly account for consistency and attrition in care (Enns, Reilly, Horvath, Baker-James, & Henry, 2019). Unfortunately, even clients who had multiple assessments recorded in ClientTrack over time often did not have multiple CD4+ T cell count and viral load values. This not only means that longitudinal variables could not be accounted for, but it also means that reverse causality could not be ruled out—it is entirely possible that low CD4 count by some mechanism (such as inability to work from illness) is causing people to live in temporary housing situations and not the other way around.

Implications of Findings

These findings add to the body of work asserting an association between housing and HIV. However, more research is certainly justified to help clarify the inconsistencies in the

literature and to better elucidate the precise mechanisms affecting the relationship between housing status and HIV. Future studies could look more granularly at variables that were dichotomized in this study, especially variables that comprised the temporary and permanent housing categories in this study.

Everyone included in this dataset will receive some sort of services, and the literature does suggest that social support can mediate the adverse adherence effects of unstable housing (Cornelius et al., 2017). Following participants over time could provide more information and could potentially be useful for assessing the impact of HOPWA programs on HIV (in addition to assessing their impact on housing).

In addition to the variables recorded in ClientTrack that could not be assessed independently, there are several variables that are not recorded in ClientTrack but could reasonably have a strong connection to both housing and HIV. Further research is warranted to assess the mediating effects of injection drug use (ClientTrack only records “Drug Abuse”), sexual activity (particularly among transgender women, men who have sex with men, and sex workers), and incarceration history (which was previously recorded by ClientTrack but has since been removed by HUD).

These factors illuminate an opportunity to reassess HUD data standards. HMIS is useful for assessing a variety of housing issues, but as public health research moves forward, health is rapidly becoming recognized as a housing issue (and vice versa). HOPWA is a housing program, but its focus is a health issue, so health-related factors should be more consistently recorded in order to assess its impact.

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Appendices

Table 1. Characteristics of Sampled HOPWA Clients, Stratified by CD4 Count

Characteristic	**Total (n=117)**	**CD4 < 200 cells/µL (n=21)**	**CD4 > 200 cells/µL (n=96)**
Temporary Housing Status	13 (11%)	4 (19%)	9 (9%)
Permanent Housing Status	104 (89%)	17 (81%)	87 (91%)
Age, mean (SD)	45 (11.5)	46 (9.7)	45 (11.9)
Black or African American	81 (70%)	14 (67%)	67 (71%)
White	*34 (30%)*	7 (33%)	27 (29%)
Female	40 (35%)	8 (38%)	32 (35%)
Male	73 (65%)	13 (62%)	60 (65%)
Income, mean (SD)	980 (411.6)	919 (420.3)	992 (411.8)
Insured	72 (63%)	13 (65%)	59 (62%)
Uninsured	43 (37%)	7 (35%)	36 (38%)
Comorbid Barriers Present	86 (74%)	18 (86%)	68 (71%)
No Comorbid Barriers Recorded	31 (26%)	3 (14%)	28 (29%)

Table 2. Odds Ratios and 95% Confidence Intervals for Housing Status and All Covariates

Effect	Odds Ratio	95% CI Lower Bound	95% CI Upper Bound
Housing Status (Crude)	2.275	0.628	8.241
Housing Status (Adjusted)	5.708	1.087	29.979
Age	1.003	0.939	1.072
Race	1.874	0.383	9.180
Gender	0.828	0.181	3.793
Income	0.999	0.998	1.001
Health Insurance	0.818	0.107	6.272
Comorbid Barriers	7.500	0.723	77.845

Table 3. Prior Living Situation (Original Categories), Stratified by CD4 Count

Prior Living Situation	**Total (n=117)**	**CD4 < 200 cells/µL (n=21)**	**CD4 > 200 cells/µL (n=96)**
Emergency Shelter	6 (5%)	1 (5%)	5 (5%)
Hotel/Motel	6 (5%)	3 (14%)	3 (3%)
Owned by client, no subsidy	5 (4%)	-	5 (5%)
Owned by client, with subsidy	2 (2%)	-	2 (2%)
Permanent housing	16 (14%)	2 (10%)	14 (15%)
Place not meant for habitation	*7 (6%)*	1 (5%)	6 (6%)
Rental, no subsidy	40 (34%)	7 (33%)	33 (34%)
Rental, with subsidy	11 (9%)	2 (10%)	9 (9%)
Staying with family	15 (13%)	5 (24%)	10 (10%)
Staying with friend	9 (8%)	-	9 (9%)

Table 4. Comorbid Barriers (Original Categories), Stratified by CD4 Count

Barrier	Total (n=117)	CD4 < 200 cells/µL (n=21)	CD4 > 200 cells/µL (n=96)
Alcohol Abuse	16 (14%)	6 (29%)	10 (10%)
Chronic Health Condition	41 (35%)	9 (43%)	32 (33%)
Developmental Disability	7 (6%)	1 (5%)	6 (6%)
Drug Abuse	22 (19%)	6 (29%)	16 (17%)
Mental Health	50 (43%)	8 (38%)	42 (44%)
Physical Disability	25 (21%)	5 (24%)	20 (21%)

Note: Barriers are not mutually exclusive, so column totals and percentages do not necessarily add to total sample values.