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The Association of Individual and Systemic Barriers to Optimal Medical Care in People Living with HIV/AIDS (PLWHA) in Miami-Dade County

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Abstract

Barriers to retention in HIV care are detrimental to patients' progress along the HIV continuum of care. Previous literature has focused on individual, client-level barriers and interventions to address them. In contrast, less work has examined the role of system-level barriers on HIV care outcomes. The present study seeks to understand how individual and systemic barriers individually are associated with clinic appointment attendance and virologic suppression in HIV-infected patients attending the largest HIV clinic in Miami-Dade, Florida. In addition, we examined the synergistic effects of these barriers as potential syndemic factors on these health outcomes. Barriers to clinic attendance were determined in a face-to-face study interview with 444 HIV-infected outpatients (187 regular attenders, 191 irregular attenders, 66 non-attenders) identified from electronic medical records. Compared to the other attendance groups, non-attenders had higher viral loads, were less likely to be virologically suppressed, had lower CD4

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counts, had higher depressive symptoms, life chaos, lower quality of life, and higher rates of food insecurity and recent drug use. Additionally, non-attenders compared to regular attenders had lower physician relationship ratings, had lower medical information clarity, and more often reported transportation as a barrier to clinic attendance. When viewed as a syndemic, compared to patients not reporting any barriers, patients with three or more individual-level barriers were more likely to have a detectable viral load (OR = 3.60, 95% CI [1.71, 7.61]). Our findings suggest that patients presenting to the clinic with multiple barriers should be prioritized for assistance and future interventions to improve retention in care. Interventions should address multiple individual and system level barriers simultaneously with particular attention to addressing depressive symptoms, organizational skills, relationship with the physician, and HIV-related health education.

Keywords

Retention in care; Syndemics; Barriers to care; Psychosocial factors; Individual-level barriers; Systemic-level barriers

Introduction

Nonengagement in HIV medical care has been associated with deleterious clinical outcomes including delayed ART initiation, virologic failure, and mortality.^{1–3} Barriers to the receipt of regular HIV medical care at both the individual and the systemic level have been shown to impede progress along the Continuum of HIV Care⁴ including the achievement of viral suppression.^{1,5–9} According to the latest U.S. Antiretroviral Guidelines for Adults and Adolescents, HIV-infected patients should be monitored quarterly, approximately every 3 to 4 months during the first two years of antiretroviral therapy and, in some instances, after 2 years, monitoring can be extended to every 6 months with sustained suppression.¹⁰ The HIV/AIDS AIDS Bureau (HAB) Core Measures developed by HRSA define a regular attender as those with at least one medical visit in each 6-month period of a 24-month measurement period with a minimum of 60 days between visits.¹¹ The National HIV/AIDS Strategy (NHAS) and the Institute of Medicine define retention in care as documentation of ≥ 2 care visits ≥ 3 months apart during the most recent year.^{12,13} One of the major goals in the U.S. National HIV/AIDS Strategy is to increase access and retention in primary HIV care to improve HIV outcomes.¹²

Previous research on barriers to retention to care have predominantly focused on barriers at the individual level that stems from both socioeconomic and psychosocial factors¹⁴. Socioeconomic factors that also reflect individuals' life circumstances¹⁵ including food insecurity and poor dietary factors^{16–19}, low health literacy^{20,21}, low education^{22–24}, homelessness^{15,25,26}, and social stigma^{27,28} have been identified as important barriers to receipt of adequate HIV care. Additionally, at the individual level, the negative impact of psychosocial barriers on HIV-related health outcomes have been evident in previous research, including factors as substance use^{25,29–32}, mental illness³¹, anxiety^{17,33}, perceived stress^{22,33}, depression^{17,22,25,33}, hopelessness²², avoidant coping^{22,27}, personality traits³⁴,

low self-efficacy^{35,36}, low self-worth³⁷, lack of social support^{27,35,38–40}, lack of acceptance of seropositivity³⁷, and low patient satisfaction.⁴¹

On the systemic level, health care costs^{37,42}, lack of transportation^{43–46}, lack of child care⁴⁵, unstable housing^{47,48}, and fragmented HIV care services^{43,44,49,50} have been found to be associated with lower retention in HIV care. Additionally, within the realm of systemic barriers, provider and agency barriers to care can adversely impact health outcomes in HIV patients, such as physicians' communication skills, scheduling systems, clinic access issues⁵¹, and patient trust in their physicians.^{52,53}

A syndemic is defined as the synergistic interaction of two or more diseases and the subsequent burden on diseases states⁵⁴. In the HIV literature, having multiple negative psychosocial and socioeconomic status issues has been associated with an increased odds of being HIV-infected.⁵⁵ Syndemics have been more recently applied to the additive nature of psychosocial and socioeconomic health problems and their impact on health outcomes; psychosocial factors treated as a syndemic has served as predictors for detrimental outcomes along the HIV care continuum.⁵⁶ The existing literature has examined the prospective effects of individual barriers on clinic attendance and viral suppression. Using the syndemic framework is an innovative way of analyzing the association of individual and systemic barriers in HIV-related health outcomes.

Intervention strategies that are effective in promoting retention in care and improving HIV outcomes have recently been identified.^{57,58} However, which interventions are the most effective, sustainable, and applicable to real world setting is still an evolving field.¹⁴ Obtaining a better understanding of the multiple barriers to retention in HIV care can inform which intervention strategies should be directed at individual patients, or the system of care in order to improve retention and re-engagement in care resulting in improved outcomes.

Within this context, our study sought to examine how individual and systemic barriers are associated with retention in care based on previous attendance records and virologic suppression among HIV-infected patients from the largest HIV clinic in Miami-Dade County.

Methods

Participants and Design

Participants were recruited from the University of Miami/Jackson Memorial Medical Center (UM/JMMC) Adult HIV Outpatient Clinic, in Miami, Florida; human subjects approval was obtained from the University of Miami Institutional Review Board and the Jackson Health System Office of Research.

As guidelines for retention in care are based primarily on attendance, attendance history was used to classify patients into different groups. To identify patients' attendance to their regularly scheduled HIV care appointments, a database of all patients (n = 3093) who attended the UMH/JMMC Adult HIV Outpatient Clinic was compiled from existing electronic medical records from September 2012 to September 2013. Based on the latest

U.S. Antiretroviral Guidelines for Adults and Adolescents monitoring recommendations¹⁰, the National HIV/AIDS Strategy (NHAS)¹², and the Institute of Medicine¹³ definition of retention in care, patients were categorized as regular (n=1145), irregular (n = 1208), or non-attenders (n= 487). Based on historical attendance over the previous 12-month span before the day the interview took place, patients were classified as being regular attenders (patients who attended at least one appointment in at least 3 of 4 quarters in the previous year which reflects patients who came to their regularly scheduled primary HIV care appointment every 3 to 6 months, for a total of 3 or 4 appointments per year), irregular attenders (patients who attended at least one appointment in 1 or 2 quarters, reflecting those who had, at the most, at least a 6-month span between two consecutive primary HIV care appointments), or non-attenders (patients who did not attend a primary HIV care appointment in the previous year).

Procedure

Over the course of the study, from September 2013 to September 2014, patients classified in one of the three attendance groups who came to a clinic visit were approached by study staff and were asked to participate in the study; all potential participants who spoke and understood English were randomly invited to participate during their clinic visit when study staff was available. Patients were excluded if they were cognitively impaired or unable to understand the consent process; patients without a year of attendance history were also excluded from participating. Non-attenders who did not have an appointment or show up to a scheduled appointment were contacted via phone, and offered the following options: a clinic appointment, a phone interview, or a home visit to have study personnel administer the survey in person. Participants gave full informed consent to participate in the study and were offered a \$10 honorarium for their time.

Materials

Barriers Impacting HIV Medical Care—To determine factors associated with clinic attendance, a questionnaire was administered by an interviewer from the study staff. On an individual level, the questionnaire included items that measured depressive symptoms (Center for Epidemiologic Studies Depressive Scale; CES-D)⁵⁹, stability and predictability in life (Life Chaos Scale)⁶⁰, perceived health status (12-Item Short Form Health Survey; SF-12)⁶¹, quality of life (Medical Outcomes Study HIV Health Survey; MOS-HIV)⁶², social support (MOS Social Support Survey)⁶³, medication adherence (ACTG Adherence Questionnaire)⁶⁴, food insecurity (Household Food Insecurity Access Scale; HFIAS)⁶⁵, drug use (Addiction Severity Index Lite; ASI-Lite)⁶⁶, and caregiving responsibilities. On a systemic level, barriers that were most relevant to and may have had the largest impact on this patient population were identified by study staff. Specifically, participants were asked about their relationship with their physician, clarity of medical instructions, and the following barriers to care in the past 12 months^{43,44,50}: payment concerns, lack of a telephone, responsiveness of scheduling staff, convenient appointment times, transportation issues, and language spoken with their physician. These systemic level barriers were considered as environmental factors that were measured on an individual level; patients endorsing these barriers were reporting their symptoms of systemic forces. Demographics and socioeconomic factors including ethnicity, gender, race, sexual orientation, education, and income were measured.

Existence of a Barrier—For each of the measures, we categorized the individual patient as either having a particular barrier or not. Thus, for continuous measures, in addition to mean score, we dichotomized the measure and for categorical measures with more than one category, we collapsed into a dichotomy.

Specifically, for the individual-level barriers, any reported substance misuse (cocaine, crack, heroin, crystal methamphetamine, speed, painkillers in the past 3 months) was considered as having a substance misuse barrier. For the continuous individual-level measures, the mean score for each participant was calculated. For depressive symptoms, patients whose mean score was above 2, indicating depressive symptoms were occurring more than “Some or a little of the time” (CES-D)⁵⁹, were considered as having the depressive symptoms barrier. Patients whose mean score on the life chaos scale⁶⁰ was greater than 2, which indicated that the patient either somewhat or strongly agreed with statements such as “My life is unstable” and “My daily activities from week to week are unpredictable” were considered as having the chaos barrier. For quality of life, those endorsing 3 or greater, indicating that their quality of life was at least half bad (“Good and bad parts – about equal”) were classified as having a quality of life barrier.

Additionally, at the system level, endorsing the transportation barrier as yes was counted for each patient. For the continuous system-level barriers, for the relationship with their physician, patients with a mean score less than 3 (“Somewhat agree”) were considered to have a relationship with physician barrier. Patients whose mean scores on the medical information clarity were greater than 2 (“Sometimes” having problems understanding) were considered to have the clarity of medical instructions barrier.

HIV-1 Viral Load and CD4 Count—HIV-1 viral loads and CD4 counts were obtained for each patient who consented to participate in the study from existing medical records for up to two years prior to starting the study. The most recent HIV-1 viral loads and CD4 counts were extracted from the medical record; HIV-1 viral loads were log transformed prior to analysis in that viral loads were not normally distributed but actual viral load averages are reported below. Patients were classified as undetectable if their viral loads were below the lower limit of the assay (<20 copies/mL).

Analytic Plan

Retention in Care and Virologic Suppression—In examining how individual and systemic barriers are associated with retention in care and virologic suppression among HIV-infected outpatients, differences in barriers and health outcomes were compared between the three attendance groups using an ANOVA for continuous measures and the Chi-square test for categorical outcomes. Tests were considered statistically significant if the associated $P < .05$. The assumption of equality of variances was tested using the Brown-Forsythe test statistic and, when violated, the Welch’s F-test was used. Student’s t-tests were used to compare those who were virologically suppressed to those who were not suppressed for continuous outcome measures; Chi-square tests were used to compare proportions of patients in each group who endorsed a particular barrier.

Syndemic Analyses—Those barriers whose frequencies or means differed between attendance groups were used in the syndemic analysis. Barriers were examined by developing a count score of the number of individual-level and systemic barriers each client had.

Poisson regression one-way ANCOVAs were used to compare the total number of barriers between both attendance groups and viral suppression. These ANCOVA models controlled for age, race, gender, education, and income. Contrasts and associated chi-square statistics were calculated to compare the number of barriers between both attendance groups and viral suppression. Finally, logistic regression was used to determine the odds ratio of the number of barriers on viral suppression controlling for age, race, gender, education, and income.

Results

Sample Characteristics

A total of 444 patients completed the study interview between October 2013, to September 2014. The sample was comprised of 187 regular attenders, 191 irregular attenders, and 66 non-attenders. Demographic characteristics of the sample are shown in Table 1. The median age of the sample was 51 years; 80.0% were black and 16.6% were Hispanic or Latino. Just over 40% had not finished high school, 84.0% identified as heterosexual, 60% earned less than \$10,000 annually, and nearly 60% of patients had a history of incarceration.

Clinical Characteristics

Using the most recent lab results from electronic records, undetectable patients were identified. Labs from within the previous two years were available for 427 of the 444 patients (96.2% overall; 185 (98.9%) regular attenders, 183 (95.8%) irregular attenders, 59 (89.4%) non-attenders). The median number of days that had elapsed between the most recent lab results was 34 days and varied between groups (regular: 34 days; irregular: 73 days, non-attenders: 101 days).

The clinical characteristics of the sample are shown in Table 1. Overall, 65.1% reported that less than 3 months elapsed between their HIV diagnosis and the time to their first HIV care appointment; 41.4% were told that they were diagnosed with AIDS. Just over two-thirds (75.4%) reported that they were told they were undetectable at some point; for the most recent viral loads, only 38.3% were undetectable. A greater proportion of regular and irregular attenders were undetectable compared to non-attenders ($p < .001$); there was not a significant difference in the proportion of those who were undetectable between regular and irregular attenders. Additionally, non-attenders had significantly higher viral loads ($54,576 \pm 120,457.2$) compared to regular attenders ($11,450.08 \pm 46,176.5$) and irregular attenders ($21,541.55 \pm 107,183.1$; $p < .001$); irregular attenders had higher viral loads than did regular attenders ($p = .045$). Furthermore, non-attenders had significantly lower CD4 counts (375.50 ± 291.0) compared to regular (521.98 ± 337.1) and irregular attenders (489.07 ± 291.0 ; $p = .006$); regular and irregular attenders did not differ on CD4 counts.

Individual and Systemic Barriers

Variations in barriers to remaining in care were compared between attendance categories; a summary of differences between attendance categories in barrier ratings and endorsement is presented in Table 2.

For the individual-level barriers, non-attenders, compared to regular attenders, had significantly higher scores for depressive symptoms (11.36 ± 4.7 vs. 13.7 ± 6.9 ; $p = .022$) and chaos (12.02 ± 3.6 vs. 13.59 ± 4.3 ; $p = .010$), but did not significantly differ from irregular attenders; regular attenders did not differ from irregular attenders. There were no significant differences in perceived health scores between the three attendance groups. Non-attenders had significantly lower quality of life ratings (3.41 ± 1.2) compared to regular (3.87 ± 0.9) and irregular attenders (3.82 ± 1.0 ; $p = .022$). Social support did not differ between attendance groups.

The proportion of patients who self-reported being adherent to their medication regimen did not differ among groups. Compared to both regular (16.0%) and irregular (20.4%) attenders, non-attenders (36.4%) had a significantly higher proportion of reporting that they did not have enough money to eat ($p = .002$); regular and irregular attenders did not differ. None of the groups differed in the proportion of those who ate less because of a lack of funds. In addition, of those reporting drug use, compared to both regular (13.7%) and irregular (11.6%) attenders, a significantly higher proportion of non-attenders (32.4%) had used cocaine in the past 3 months ($p = .015$); regular and irregular attenders did not differ in the proportion using cocaine. Additionally, crack use was higher in the non-attenders (29.0%) compared to the regular attenders (7.1%) in the past 3 months ($p = .012$); crack use did not differ between non-attenders and irregular attenders nor between regular and irregular attenders. No other recent drug use differed between patient attendance categories.

At the systemic level, non-attenders had lower ratings of communication with their physician (11.23 ± 1.9) compared to regular (11.76 ± 0.7) and irregular attenders (11.70 ± 0.7 ; $p = .047$); regular attenders did not differ from irregular attenders. Additionally, non-attenders had lower ratings of clarity of medical instructions (10.88 ± 3.0) compared to irregular attenders (12.04 ± 2.9 ; $p < .001$); regular attenders did not differ from irregular nor non-attenders. A greater proportion of non-attenders (40.9%) endorsed having a transportation barrier compared to regular (17.6%) and irregular (22.0%) attenders ($p = .001$).

Barriers were then compared between patients who were virologically suppressed and those who were not virologically suppressed. On an individual level, compared to patients who were undetectable, patients who were detectable had higher depressive symptoms (13.31 ± 6.1 vs. 11.03 ± 4.5 , $p < .001$), more chaos (13.47 ± 3.9 vs. 11.86 ± 3.6 , $p < .001$), perceived their health between fair and poor (2.96 ± 1.2 vs. 3.63 ± 1.1 , $p < .001$), and lower quality of life (3.57 ± 1.1 vs. 3.99 ± 0.9 , $p < .001$); social support did not differ in patients based on virologic suppression group. Additionally, those who were detectable had a higher proportion of having a food insecurity barrier (did not eat: 86.0% vs 72.0%, $p < .001$; ate less: 75.7% vs. 65.4%, $p = .020$). Self-reported medication adherence was significantly lower in those who were detectable (85.5% vs. 91.9%, $p = .042$); a greater proportion of

those who were detectable had been incarcerated at least once in their life (149 (69.6%) vs. 105 (49.1%), $p < .001$). Finally, a greater proportion of those who were detectable had reported recent use of cocaine (20.5% vs. 9.6%, $p = .030$) and crack (18 (18.0%) vs. 5 (6.8%), $p = .030$).

With regard to systemic level barriers, patients who were not virologically suppressed had lower ratings of their interactions with their physicians (11.14 ± 3.2 vs. 11.96 ± 2.9 , $p = .046$) and lower clarity of medical instructions (11.14 ± 3.2 vs. 11.96 ± 2.9 , $p = .006$). None of the other barriers significantly differed between suppression status; see Table 3.

Syndemic Barriers

Viral Suppression and Number of Barriers—Those who were undetectable had significantly fewer individual-level barriers than those who were detectable (1.01, 95% CI [0.81, 1.26] vs. 1.39, 95% CI [1.11, 1.75]; $p < .001$). The number of systemic barriers was not significantly different between those who were undetectable compared to those who were detectable ($p = .311$); see Table 4.

Attendance Groups and Number of Barriers—There was a significant difference in the number of individual-level barriers between attendance groups ($p = .02$); non-attenders had significantly more barriers (1.40, 95% CI [1.06, 1.86]) compared to regular attenders (1.06, 95% CI [0.84–1.33], $p = .002$) but did not differ from irregular attenders and regular and irregular attenders did not differ from each other. There was a significant difference in the number of systemic-level barriers between attendance groups ($p = .009$) whereby non-attenders had significantly more barriers than regular attenders (0.45, 95% CI [0.26, 0.77] vs. 0.25, 95% CI [0.15, 0.39], $p = .009$) and irregular attenders (0.27, 95% CI [0.17, 0.44], $p = .03$); irregular attenders did not differ from regular attenders. See Table 5.

Odds of Viral Suppression—To facilitate the interpretability of the results and that there were only a few patients at the higher counts of each type of barrier (4 individual barriers: $n = 6$, 1.3%; 3 systemic/structural barriers: $n = 1$, 0.2%; 4–6 of any barrier type: $n = 31$, 6.8%), the higher number of barriers was combined into one category. These categories were used in a logistic regression to determine if the number of barriers was predictive of undetectable status after adjusting for age, gender, race, income, and education. For the individual-level barriers, having one barrier did not significantly increase the odds of being detectable. However, compared to patients not reporting any individual-level barriers, patients were more likely to be detectable if they reported two individual-level barriers (OR = 1.82, 95% CI [1.04, 3.18]) or three or more individual-level barriers (OR = 3.60, 95% CI [1.71, 7.61]). In terms of systemic barriers, there were no increased odds of being detectable between those having one or two or more barriers compared to those who had no barriers. Examining the combined effects of individual and systemic level barriers in the same logistic regression model, there was no significant interaction effect of between the types of barriers and the likelihood of being detectable; see Table 5.

Discussion

The present study demonstrated the association of barriers on HIV infected individuals to attendance patterns. These attendance patterns have a direct association with HIV-viral loads; non-attending patients had higher viral loads and were less likely to be virologically suppressed than both regular and irregular attenders. Aside from the detrimental effect of missing appointments⁶⁷, patients not regularly attending their HIV care appointments may increase HIV transmission secondary to poorer viral load suppression.⁶⁸ Furthermore, the present study demonstrates that both individual and systemic level barriers impact clinic attendance as distinct, singular entities.

Barriers to Attendance

Examined separately, both individual and systemic-level barriers were found to be associated with suboptimal attendance. When barriers were examined synergistically as potential syndemic factors, non-attenders had significantly more individual level and systemic level barriers than did regular attenders. This study demonstrates that co-occurring barriers to HIV medical care are additively associated with poorer retention in HIV care and increased viral loads in our patient population. Our findings also suggest that these barriers can cluster and combine synergistically as a syndemic that is associated with poorer outcomes along the HIV continuum of care.

Impact of Barriers on Viral Suppression

When examining viral suppression, the rates of individual-level barriers differed between groups, with detectable patients having higher depressive symptoms, more chaos, lower perceived health status, lower quality of life, more food insecurity, worse medication adherence, more recent substance abuse, and were more likely to have been incarcerated. Systemically, patients not virologically suppressed had lower ratings of their interactions with their physicians and lower clarity of medical instructions. Since systemic level barriers were considered symptoms of the environment and reflected how individual patients perceived their environment, patients may not have perceived the systemic barriers as true barriers which may have accounted for few differences between attendance groups or virological suppression status. Examining barriers as potential syndemic factors, however, revealed that detectable patients had a significantly higher number of individual level barriers, but did not differ in the average number of systemic/structural barriers; having two or three concurrent individual-level barriers increased the odds of being detectable. Taken together, these findings suggest that individual level barriers operate both on their own and as syndemic barriers whereas systemic barriers may negatively impact viral suppression as distinct units rather than as syndemic factors. Potentially, systemic level barriers do not need the additive, co-occurring effects of multiple barriers to negatively impact viral suppression; systemic barriers, as distinct, single entities, may be potent enough to adversely affect attendance and viral suppression on their own. Furthermore, in that the systemic barriers were considered as patients' perception of environmental factors, although these factors may have been present, they may have been underreported if patients did not deem existing systemic barriers as a true barrier.

The results of this study highlight individual level barriers having both an independent, singular effect and a syndemic effect compared to systemic barriers. Although a syndemic effect was not demonstrated with systemic level barriers, the fact that only a single systemic barrier may negatively impact health outcomes indicates that features of the health care system itself function as a barrier and calls for systemic-level changes or interventions if real progress along the care continuum is to be realized.

Differential Impact of Syndemic Barriers

The characteristics of this sample of patients strongly underscores a great need to improve care in inner-city, lower socioeconomic status patients who experience both distinct and syndemic barriers to HIV care. While these variables themselves were not found to differ between patient attendance categories, they potentially serve as the root cause of why a patient may have experienced a particular barrier or group of barriers. Potentially, fundamental causes theory⁶⁹ may provide an explanation for how barriers due to socioeconomic factors may serve as the fundamental cause of maintaining poor health outcomes in that the barriers prevent access to health resources and operate through multiple mechanisms. Lower income, less education, and history of incarceration have been demonstrated to be associated with lower health knowledge⁷⁰, along with worse coping skills and poorer organizational ability, potentially due to increased allostatic load from chronic stress.^{71,72} In addition, these socioeconomic status factors fundamentally serve as their own barriers, such as not having enough money to access public transportation. Considering barriers as a syndemic, a fundamental causes framework can help dictate guidelines for effective interventions.

This study adds to the existing research on syndemics by applying syndemic theory to retention in care in HIV-infected outpatients. The literature has only recently reported on syndemics with health outcomes along the HIV continuum of care. For example, in a multi-site study of 1052 HIV-infected injection drug users, having multiple psychosocial problems was associated with an increased odds of not taking HIV medication; participants reporting three to six psychosocial problems were more than twice as likely to be non-adherent to HIV medicine in the previous day.⁵⁶ The same study also reported a 2.24 increased odds of being detectable in participants reporting four to six psychosocial problems. Another study found that psychosocial factors, when considered as syndemic, were associated with non-adherence to ART; compared to those with no negative psychosocial factors, those with one to five factors had an increased odds for being non-adherent.⁷² Our study suggest that barriers to medical care should be considered as a syndemic, with influence on how well HIV infected patients advance in the HIV continuum of care.

Research has demonstrated that most of the effective interventions to promote retention in care focus on strengths-based case management and individual skill-building which encourages patients to identify and use their own internal abilities to access ancillary resources and problem solve.^{14,74,75} More recently, clinic-wide interventions and enhanced personal contact has also been shown to improve retention in care.^{57,58} On an individual level, patients are being equipped to handle the multiple individual-level barriers to care. On a system-level, patients are being assisted in navigating an increasingly complex healthcare

system. It has been suggested that using multiple intervention strategies within a single study may be effective in retaining patients in care.¹⁴ Using multiple retention strategies appears to be necessary to effectively address the multiple syndemic barriers to accessing and consistently using HIV primary care. Potentially, the effect of syndemic factors can be diminished; syndemic psychosocial health conditions and sexual risk behaviors have been buffered by optimism and education in a sample of African American men who have sex with men.⁷⁶

The effectiveness of multiple interventions is likely due to the underlying syndemic of co-occurring barriers that collectively are more detrimental than a single barrier.¹⁴ Until recently, most intervention strategies have been targeted at the individual. Future interventions should ideally be multi-level and focus not only on the individual but also address systemic-level factors associated with barriers to retention in care.

Study Limitations

The study was conducted in English which limited the participation of monolingual Spanish or Creole-speaking subjects and Miami has a relatively high prevalence of monolingual Spanish and Creole-speaking individuals. This under representation of non-English speaking patients may have minimized the prevalence of the language structural barrier; potentially, there is a differential effect of the barriers in this study based on the ability to speak English despite Spanish and Creole on public signage in Miami. Furthermore, we did not collect participation refusal rates; this may introduce a potential bias for those who participated compared to those who did not participate, especially with the regular and irregular attenders. Additionally, the study was conducted in one clinic attended by outpatients of a lower socioeconomic status group that may inherently face more barriers than those in a higher socioeconomic status group; this may have hampered our ability to contrast between groups. In addition, there were other potential barriers that could have been measured that were not assessed through the questionnaire, such as health literacy, nutritional deficits, anxiety, coping skills, personality traits, and neurocognitive function, amongst others. Also, our measurement of barriers was retrospective; however, many, if not most of these barriers are enduring and measures today are likely very similar to measures over the previous year. The fact that viral loads were not obtained in real time is another potential limitation of the study along with the fact that a longer time had elapsed between most recent lab results and the date of the interview. Finally, the number of non-attenders were less than the other two attendance groups. This population of patients is particularly difficult to reach and include in this type of study.

Future Implications and Recommendations

Despite these limitations, the findings from this study have implications for understanding barriers to care that can guide future interventions. Importantly, this study highlights the association of individual and systemic barriers on HIV clinic engagement. We were able to identify the most salient individual and systemic barriers impacting this inner city HIV population. In addition, we demonstrated that barriers act in a syndemic pattern whereby those with more barriers experienced worse HIV-related health outcomes. Highlighting the most significant individual level and systemic level barriers impacting our HIV-infected

patients should help tailor future interventions to retain patients in care. Though multiple interventions, such as enhanced personal contact and basic HIV education, can be done at low costs⁷⁷, clinics may need to establish interventions to target those patients experiencing multiple barriers and prioritize those barrier-reduction mechanisms that make the most impact. Notably, some barriers could be alleviated if additional funding was available, such as funds for transportation⁷⁸ or meal subsidies; potentially interventions incorporating conditional cash transfers for clinic attendance may be successful in lower socioeconomic status patient populations.⁷⁹ In effect, interventions aimed at barrier reduction should be triaged and considered holistically.⁸⁰ With these findings in mind, ancillary elements to care, such as directing patients to address mental health, coping skills training, organizational skill training, transportation assistance, physician and staff training in communication and information delivery should be delivered as a bundle. Furthermore, delivery of these ancillary services should be triaged for those who are in the greatest need and are found to experience multiple barriers in that these patients are the most vulnerable to negative health outcomes.

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References

1. Cohen SM, Hu X, Sweeney P, et al. HIV viral suppression among persons with varying levels of engagement in HIV medical care, 19 US jurisdictions. *J Acquir Immune Defic Syndr*. 2014; 67(5): 519–527. [PubMed: 25230292]
2. Tobias CR, Cunningham W, Cabral HD, et al. Living with HIV but without medical care: barriers to engagement. *AIDS Patient Care and STDs*. 2007; 21(6):426–434. [PubMed: 17594252]
3. Mugavero MJ. Improving engagement in HIV care: what can we do? *Topics in HIV Medicine*. 2008; 16(5):156–161. [PubMed: 19106431]
4. U.S. Department of Health and Human Services, Health Resources and Services Administration. [Accessed on 1 October, 2014] Continuum of HIV care among Ryan White HIV/AIDS Program clients, US. 2010. from: <http://hab.hrsa.gov/data/reports/continuumofcare/index.html>
5. Berg MB, Safren SA, Mimiaga MJ, et al. Nonadherence to medical appointments is associated with increased plasma HIV RNA and decreased CD4 cell counts in a community-based HIV primary care clinic. *AIDS Care*. 2005; 17(7):902–907. [PubMed: 16120506]
6. Giordano TP, Gifford AL, White AC Jr, et al. Retention in care: a challenge to survival with HIV infection. *Clin Infect Dis*. 2007; 44(11):1493–1499. [PubMed: 17479948]
7. Mugavero MJ, Amico KR, Westfall AO, et al. Early retention in HIV care and viral load suppression: Implications for a test and treat approach to HIV prevention. *J Acquir Immune Defic Syndr*. 2012; 59(1):86–93. [PubMed: 21937921]
8. Mugavero MJ, Westfall AO, Zinski A, et al. Measuring retention in HIV care: the elusive gold standard. *J Acquir Immune Defic Syndr*. 2012; 61(5):574–580. [PubMed: 23011397]

9. Hall HI, Tang T, Westfall AO, et al. HIV care visits and time to viral suppression, 19 U.S. jurisdictions, and implications for treatment, prevention and the national HIV/AIDS strategy. *PLoS ONE*. 2013; 8(12):e84318. [PubMed: 24391937]
10. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents. Department of Health and Human Services; p. 26-29. Available at <http://aidsinfo.nih.gov/contentfiles/lvguidelines/AdultandAdolescentGL.pdf>. Section [accessed 30 October 2014]
11. HAB Performance Measures. Rockville, MD: U.S. Department of Health and Human Services (HRSA) HIV/AIDS Program; [Accessed September 15, 2014]
12. The White House Office of National AIDS Policy. National HIV/AIDS strategy for the United States. Washington DC: The White House; Jul. 2010 <http://www.whitehouse.gov/administration/eop/nap/nhas> [Accessed 30 October 2014]
13. Volberding, PA.; Aida, A.; Celentano, D., et al. Committee to Review Data Systems for Monitoring HIV Care. Monitoring HIV Care in the United States: Indicators and Data Systems. Washington, DC: Institute of Medicine National Academy of Sciences; 2012.
14. Higa DH, Marks G, Crepaz N, et al. Interventions to improve retention in HIV primary care: a systematic review of U.S. studies. *Curr HIV/AIDS Rep*. 2012; 9(4):313–325. [PubMed: 22996171]
15. Van Servellen G, Chang B, Garcia L, et al. Individual and system level factors associated with treatment nonadherence in human immunodeficiency virus-infected men and women. *AIDS Patient Care STDs*. 2002; 16(6):269–281. [PubMed: 12133262]
16. Vogenthaler NS, Hadley C, Lewis SJ, et al. Food insufficiency among HIV-infected crack-cocaine users in Atlanta and Miami. *Public Health Nutr*. 2010; 13(9):1478–1484. [PubMed: 20074395]
17. Fumaz CR, Gonzalez-Garcia M, Borrás X, et al. Psychological stress is associated with high levels of IL-6 in HIV-1 infected individuals on effective combined antiretroviral treatment. *Brain Behav Immun*. 2012; 26(4):568–572. [PubMed: 22306454]
18. Anema A, Chan K, Chen Y, et al. Relationship between food insecurity and mortality among HIV-positive injection drug users receiving antiretroviral therapy in British Columbia, Canada. *PLoS One*. 2013; 8(5):e61277. [PubMed: 23723968]
19. Musumari PM, Wouters E, Kayembe PK, et al. Food insecurity is associated with increased risk of non-adherence to antiretroviral therapy among HIV-infected adults in the Democratic Republic of Congo: a cross-sectional study. *PLoS One*. 2014; 9(1):e85327. [PubMed: 24454841]
20. Wawrzyniak AJ, Ownby RL, McCoy K, et al. Health literacy: impact on the health of HIV-infected individuals. *Curr HIV/AIDS Rep*. 2013; 10(4):295–304. [PubMed: 24222474]
21. Morgan EE, Iudicello JE, Cattie JE, et al. Neurocognitive impairment is associated with lower health literacy among persons living with HIV infection. *AIDS Behav*. 2014; 19(1):166–177. [PubMed: 25008384]
22. Ironson G, O'Leirigh C, Fletcher MA, et al. Psychosocial factors predict CD4 and viral load change in men and women with human immunodeficiency virus in the era of highly active antiretroviral treatment. *Psychosom Med*. 2005; 67(6):1013–1021. [PubMed: 16314608]
23. Marc LG, Testa MA, Walker AM, et al. Educational attainment and response to HAART during initial therapy for HIV-1 infection. *J Psychosom Res*. 2007; 63(2):207–216. [PubMed: 17662759]
24. Arnsten JH, Li X, Mizuno Y, et al. Factors associated with antiretroviral therapy adherence and medication errors in HIV-infected injection drug user. *J Acquir Immune Defic Syndr*. 2007; 46(Suppl 2):S64–71. [PubMed: 18089986]
25. Moss AR, Hahn JA, Perry S, et al. Adherence to highly active antiretroviral therapy in the homeless population in San Francisco: a prospective study. *Clin Infect Dis*. 2004; 39(8):1190–1198. [PubMed: 15486844]
26. Milloy MJ, Marshall BD, Montaner J, Wood E. Housing status and the health of people living with HIV/AIDS. *Curr HIV/AIDS Rep*. 2012; 9(4):364–374. [PubMed: 22968432]
27. Katz IT, Ryu AE, Onuegbu AG, et al. Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. *J Intl AIDS Soc*. 2013; 16(3 Suppl 2):18640.
28. Kleinman NJ, Manhart LE, Mohanraj R, et al. Antiretroviral therapy adherence measurement in non-clinical settings in South India. *AIDS Care*. 2014; 27(2):248–254. [PubMed: 25119585]

29. Lucas GM, Cheever LW, Chaisson RE, et al. Detrimental effects of continued illicit drug use on the treatment of HIV-1 infection. *J Acquir Immune Defic Syndr*. 2001; 27(3):251–259. [PubMed: 11464144]
30. Feaster DJ, Mitrani VB, Burns MJ, et al. A randomized controlled trial of Structural Ecosystems Therapy for HIV medication adherence and substance abuse relapse prevention. *Drug Alcohol Depend*. 2010; 111(3):227–234. [PubMed: 20538417]
31. Merlin JS, Westfall AO, Raper JL, et al. Pain, mood, and substance abuse in HIV: implications for clinic visit utilization, antiretroviral therapy adherence, and virologic failure. *J Acquir Immune Defic Syndr*. 2012; 61(2):164–170. [PubMed: 22766967]
32. Rosen MI, Black AC, Arnsten JH, et al. Association between use of specific drugs and antiretroviral adherence: findings from MACH 14. *AIDS Behav*. 2013; 17(1):142–147. [PubMed: 22246513]
33. Greeson JM, Hurwitz BE, Llabre MM, et al. Psychological distress, killer lymphocytes and disease severity in HIV/AIDS. *Brain Behav Immun*. 2008; 22(6):901–911. [PubMed: 18321678]
34. Ironson GH, O’Cleirigh C, Weiss A, et al. Personality and HIV disease progression: role of NEO-PI-R openness, extraversion, and profiles of engagement. *Psychosom Med*. 2008; 70(2):245–253. [PubMed: 18256349]
35. Ammassari A, Trotta MP, Murri R, et al. Correlates and predictors of adherence to highly active antiretroviral therapy: overview of published literature. *J Acquir Immune Defic Syndr*. 2002; 31(Suppl 3):S123–127. [PubMed: 12562034]
36. Ironson G, Weiss S, Lydston D, et al. The impact of improved self-efficacy on HIV viral load and distress in culturally diverse women living with AIDS: the SMART/EST women’s project. *AIDS Care*. 2005; 17:222–236. [PubMed: 15763716]
37. Mills EJ, Nachega JB, Bangsberg DR, et al. Adherence to HAART: a systematic review of developed and developing nation patient-reported barriers and facilitators. *PLoS Med*. 2006; 3(11):e438. [PubMed: 17121449]
38. Bofill L, Waldrop-Valverde D, Metsch L, et al. Demographic and psychosocial factors associated with appointment attendance among HIV-positive outpatients. *AIDS Care*. 2011; 23(10):1219–1225. [PubMed: 21562998]
39. Underwood C, Hendrickson Z, Van Lith LM, et al. Role of community-level factors across the treatment cascade: a critical review. *J Acquir Immune Defic Syndr*. 2014; 66 (Suppl 3):S311–318. [PubMed: 25007202]
40. Qiao S, Li X, Stanton B. Social support and HIV-related risk behaviors: a systematic review of the global literature. *AIDS Behav*. 2014; 18(2):419–441. [PubMed: 23921582]
41. Dang BN, Westbrook RA, Black WC, et al. Examining the link between patient satisfaction and adherence to HIV care: a structural equation model. *PloS One*. 2013; 8(1):e54729. [PubMed: 23382948]
42. Langebeek N, Gisolf EH, Reiss P, et al. Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis. *BMC Med*. 2014; 12:142. [PubMed: 25145556]
43. Katz MH, Cunningham WE, Fleishman JA, et al. Effect of case management on unmet needs and utilization of medical care and medications among HIV-infected persons. *Ann Intern Med*. 2001; 135:557–565. [PubMed: 11601927]
44. Evaluating the contribution of ancillary services in improving access to primary care in the United States under the Ryan White CARE Act. *AIDS Care*. 2002; 14(Suppl 1):3–136. [PubMed: 11798401]
45. Andersen M, Hockman E, Smereck G, et al. Retaining women in HIV medical care. *J Assoc Nurses AIDS Care*. 2007; 18(3):33–41. [PubMed: 17570298]
46. Lankowski AJ, Siedner MJ, Bangsberg DR, et al. Impact of geographic and transportation-related barriers on HIV outcomes in sub-Saharan Africa: a systematic review. *AIDS Behav*. 2014; 18(7):1199–1223. [PubMed: 24563115]
47. Smith MY, Rapkin BD, Winkel G, et al. Housing status and health care service utilization among low-income persons with HIV/AIDS. *J Gen Intern Med*. 2000; 15(10):731–738. [PubMed: 11089717]

48. Aidala AA, Lee G, Abramson DM, et al. Housing need, housing assistance, and connection to HIV medical care. *AIDS Behav.* 2007; 11(Suppl 6):101–115. [PubMed: 17768674]
49. Williams B, Amico KR, Konkle-Parker D. Qualitative assessment of barriers and facilitators to HIV treatment. *J Assoc Nurses AIDS Care.* 2011; 22(4):307–312. [PubMed: 21277804]
50. Mugavero MJ, Norton WE, Saag MS. Health care system and policy factors influencing engagement in HIV medical care: piecing together the fragments of a fractured health care delivery system. *Clin Infect Dis.* 2011; 52 (Suppl 2):S238–246. [PubMed: 21342913]
51. Giordano TP. Retention in HIV care: what the clinician needs to know. *Top Antivir Med.* 2011; 19(1):12–16. [PubMed: 21852711]
52. Altice FL, Mostashari F, Friedland GH. Trust and the acceptance of and adherence to antiretroviral therapy. *J Acquir Immune Defic Syndr.* 2001; 28(1):47–58. [PubMed: 11579277]
53. Beckerman A, Fontana L. Medical treatment for men who have sex with men and are living with HIV/AIDS. *Am J Mens Health.* 2008; 3(4):319–329. [PubMed: 19477739]
54. Singer M, Clair S. Syndemics and public health: reconceptualizing disease in bio-social context. *Med Anthropol Q.* 2003; 17(4):423–441. [PubMed: 14716917]
55. Santos GMM, Do T, Beck J, Makofane K, Arreola S, Pyun T, et al. Syndemic conditions associated with increased HIV risk in a global sample of men who have sex with men. *Sex Transm Infect.* 2014; 90(3):250–253. [PubMed: 24431183]
56. Mizuno Y, Purcell DW, Knowlton AR, et al. Syndemic vulnerability, sexual and injection risk behaviors, and HIV continuum of care outcomes in HIV-positive injection drug users. *AIDS Behav.* 2014 Sep. Epub ahead of print.
57. Gardner LI, Marks G, Craw JA, et al. A low-effort, clinic-wide intervention improves attendance for HIV primary care. *Clin Infect Dis.* 2012; 55(8):1124–1134. [PubMed: 22828593]
58. Gardner LI, Giordano TP, Marks G, et al. Enhanced personal contact with HIV patients improves retention in primary care: a randomized trial in 6 US HIV clinics. *Clin Infect Dis.* 2014; 59(5): 725–734. [PubMed: 24837481]
59. Andresen EM, Malmgren JA, Carter WB, et al. Screening for depression in well older adults: Evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prevent Med.* 1994; 10(2):77–84.
60. Wong MD, Sarkisian CA, Davis C, et al. The association between life chaos, health care use, and health status among HIV-infected persons. *J Gen Intern Med.* 2007; 22(9):1286–1291. [PubMed: 17597350]
61. Ware J, Kosinski M, Keller SD. A 12-item short-form health survey: Construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996; 34(3):220–233. [PubMed: 8628042]
62. Wu AW, Revicki DA, Jacobson D, et al. Evidence for reliability, validity and usefulness of the Medical Outcomes Study HIV Health Survey (MOS-HIV). *Qual Life Res.* 1997; 6(6):481–493. [PubMed: 9330549]
63. Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med.* 1991; 32(6):705–714. [PubMed: 2035047]
64. Reynolds NR, Sun J, Nagaraja HN, et al. Optimizing measurement of self-reported adherence with the ACTG adherence questionnaire: A cross-protocol analysis. *J Acquir Immune Defic Syndr.* 2007; 46(4):402–409. [PubMed: 18077832]
65. Coates, J.; Swindale, A.; Bilinsky, P. Household food insecurity access scale (HFIAS) for measurement of household food access: Indicator guide. Washington D.C: Food and Nutrition Technical Assistance Project, Academy for Educational Development; 2007.
66. Cacciola JS, Alterman AI, McLellan AT, et al. Initial evidence for the reliability and validity of a “lite” version of the Addiction Severity Index. *Drug Alcohol Depend.* 2007; 87(2–3):297–302. [PubMed: 17045423]
67. Mugavero MJ, Lin HY, Willig JH, et al. Missed visits and mortality among patients establishing initial outpatient HIV treatment. *Clin Infect Dis.* 2009; 48(2):248–256. [PubMed: 19072715]
68. Hoffmann CJ, Gallant JE. Rationale and evidence for human immunodeficiency virus treatment as prevention at the individual and population levels. *Infect Dis Clin of North Am.* 2014; 14:S0891–5520. [PubMed: 25287588]

69. Link BG, Phelan J. Social conditions as fundamental causes of disease. *J Health Soc Behav.* 1995; (Spec No):80–94. [PubMed: 7560851]
70. Baral S, Holland CE, Shannon K, et al. Enhancing benefits or increasing harms: community responses for HIV among men who have sex with men, transgender women, female sex workers, and people who inject drugs. *J Acquir Immune Defic Syndr.* 2014; 66 (Suppl 3):S319–328. [PubMed: 25007203]
71. McEwen BS, Seeman T. Protective and damaging effects of mediators of stress. Elaborating and testing the concepts of allostasis and allostatic load. *Ann N Y Acad Sci.* 1999; 896:30–47. [PubMed: 10681886]
72. Szanton SL, Gill JM, Allen JK. Allostatic load: a mechanism of socioeconomic health disparities? *Biol Res Nurs.* 2005; 7(1):7–15. [PubMed: 15919999]
73. Blashill AJ, Bedoya CA, Mayer KH, et al. Psychosocial syndemics are additively associated with worse ART adherence in HIV-Infected individuals. *AIDS Behav.* 2014 Oct. Epub ahead of print.
74. Willis S, Castel AD, Ahmed T, et al. Linkage, engagement, and viral suppression rates among HIV-infected persons receiving care at medical case management programs in Washington, DC. *J Acquir Immune Defic Syndr.* 2013; 64 (Suppl 1):S33–41. [PubMed: 23982662]
75. Gross R, Bellamy SL, Chapman J, et al. Managed problem solving for antiretroviral therapy adherence: a randomized trial. *JAMA Intern Med.* 2013; 173(4):300–306. [PubMed: 23358784]
76. O’Leary A, Jemmott JB 3rd, Stevens R, et al. Optimism and education buffer the effects of syndemic conditions on HIV status among African American men who have sex with men. *AIDS Behav.* 2014; 18(11):2080–2088. [PubMed: 24705710]
77. Shrestha RK, Gardner L, Marks G, et al. Estimating the cost of increasing retention in care for HIV-infected patients: results of the CDC/HRSA Retention in Care Trial. *J Acquir Immune Defic Syndr.* 2014 In press.
78. Sagrestano LM, Clay J, Finerman R, et al. Transportation vulnerability as a barrier to service utilization for HIV-positive individuals. *AIDS Care.* 2014; 26(3):314–319. [PubMed: 23876086]
79. Galárraga O, Sosa-Rubí SG, González A, et al. The disproportionate burden of HIV and STIs among male sex workers in Mexico City and the rationale for economic incentives to reduce risks. *J Int AIDS Soc.* 2014; 17:19218. [PubMed: 25399543]
80. Govindasamy D, Meghij J, Kebede Negussi E, et al. Interventions to improve or facilitate linkage to or retention in pre-ART (HIV) care and initiation of ART in low- and middle-income settings--a systematic review. *J Int AIDS Soc.* 2014; 17:19032. [PubMed: 25095831]

Table 1

Participant Characteristics (n = 444)

	Regular (n=187)	Irregular (n=191)	Non-Attender (n=66)
Sex			
Female	83 (44.4%)	83 (43.4%)	32 (48.5%)
Age (years)	50.60 ± 9.5	50.00 ± 10.0	47.97 ± 10.7
Race			
Black	151 (80.7%)	151 (79.1%)	53 (80.3%)
White	30 (16.0%)	34 (17.8%)	13 (19.7%)
Other	6 (3.2%)	6 (3.1%)	0 (0.0%)
Ethnicity			
Hispanic or Latino	29 (15.5%)	31 (16.2%)	12 (18.2%)
Education			
Some high school or less	85 (45.5%)	64 (33.5%)	31 (47.0%)
GED/High school graduate or more	102 (54.5%)	117 (64.6%)	25 (53.0%)
Sexual Orientation			
Bisexual	5 (2.7%)	6 (3.1%)	5 (7.6%)
Heterosexual/Straight	164 (87.7%)	159 (83.2%)	54 (81.8%)
Homosexual/Gay	17 (9.1%)	26 (13.6%)	7 (10.6%)
Homosexual/Lesbian	1 (0.5%)	0 (0.0%)	0 (0.0%)
Income			
Under \$5000	64 (34.2%)	49 (25.7%)	24 (36.4%)
\$5000 – \$9999	55 (29.4%)	58 (30.4%)	17 (25.8%)
Incarceration			
None	75 (40.1%)	85 (44.5%)	20 (30.3%)
Less than a week	30 (16.0%)	30 (15.7%)	8 (12.1%)
7 days - less than a month	14 (7.5%)	7 (3.7%)	6 (9.1%)
1 month – 1 year	32 (17.1%)	28 (14.7%)	14 (21.2%)
More than a year	36 (19.3%)	41 (21.5%)	18 (27.3%)
Told Undetectable	151 (80.7%)	142 (74.3%)	47 (71.2%)
Diagnosed with AIDS	79 (42.2%)	61 (31.9%)	33 (50.0%)
Time to first HIV care appointment			
< 3 months	135 (72.2%)	125 (65.4%)	38 (57.6%)
> 3 months	52 (27.8%)	66 (34.6%)	28 (42.4%)
Undetectable	110 (59.5%) ^a	90 (48.9%) ^b	14 (6.5%) ^c

	Regular (n=187)	Irregular (n=191)	Non-Attender (n=66)
Viral Load	11450.08 ± 46176.5 ^a	21541.55 ± 107183.1 ^b	54567.46 ± 120457.2 ^c
CD4 Count	521.98 ± 337.1 ^a	489.07 ± 326.6 ^a	375.50 ± 291.0 ^b

^{a,b,c} Indicates differences between groups with different letters ($p < .05$)

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Table 2**Individual and Systemic/Structural Barriers by Attendance Group**

Individual	Regular (n=187)	Irregular (n=191)	Non-Attender (n=66)
Depressive Symptoms	11.36 ± 4.7 ^a	12.20 ± 5.4 ^a	13.70 ± 6.9 ^b
Chaos	12.02 ± 3.6 ^a	12.91 ± 3.7 ^{a,b}	13.59 ± 4.3 ^b
Perceived Health Status	3.35 ± 1.1 ^a	3.31 ± 1.2 ^a	3.21 ± 1.4 ^b
Quality of Life	3.87 ± 0.9 ^a	3.82 ± 1.0 ^a	3.41 ± 1.2 ^b
Social Support	14.02 ± 4.4	14.21 ± 4.2	14.70 ± 5.1
Adherence	164 (89.1%)	155 (87.6%)	44 (89.8%)
Food Insecurity			
Did not eat; not enough money	30 (16.0%) ^a	39 (20.4%) ^a	24 (36.4%) ^b
Eat less; not enough money	47 (25.1%)	60 (31.4%)	23 (34.8%)
Substance Abuse - Past 3 months			
Cocaine	13 (13.7%) ^a	10 (11.6%) ^a	11 (32.4%) ^b
Crack	5 (7.1%) ^a	10 (13.0%) ^a	9 (29.0%) ^b
Heroin	3 (8.8%)	3 (8.6%)	2 (11.1%)
Meth	2 (11.1%)	2 (9.5%)	2 (12.5%)
Speed	0 (0.0%)	0 (0.0%)	0 (0.0%)
Painkillers	2 (10.5%)	2 (9.1%)	2 (13.3%)
Injected any drugs	1 (0.5%)	2 (1.0%)	2 (3.1%)
Caregiving Responsibilities			
Child Care	45 (24.1%)	43 (22.5%)	15 (22.7%)
Adult Care	32 (17.1%)	26 (13.6%)	12 (18.2%)
Structural/Systemic			
Physician Communication	11.79 ± 0.7 ^a	11.70 ± 0.7 ^a	11.20 ± 1.0 ^b
Medical Information Clarity	11.40 ± 3.2 ^{a,b}	12.04 ± 2.9 ^a	10.88 ± 3.0 ^b
Worried about payments	48 (25.7%)	51 (26.7%)	16 (24.2%)
Appointment difficulty - no phone	10 (5.3%)	17 (8.9%)	7 (10.6%)
Appointment difficulty - answer your calls	26 (13.9%)	34 (17.8%)	13 (19.7%)
Appointment difficulty - appointment time	29 (15.5%)	39 (20.4%)	14 (21.2%)
Transportation barrier	33 (17.6%) ^a	42 (22.0%) ^a	27 (40.9%) ^b
Language barrier	16 (8.6%)	13 (6.8%)	0 (0.0%)

^{a,b,c} Indicates differences between groups with different letters ($p < .05$)

Table 3**Individual and Systemic/Structural Barriers by Virological Suppression**

Individual	Undetectable (n=214)	Detectable (n=214)
Depressive Symptoms	11.03 ± 4.5	13.31 ± 6.1 ***
Chaos	11.86 ± 3.6	13.47 ± 3.9 ***
Perceived Health Status	3.63 ± 1.1	2.96 ± 1.2 ***
Quality of Life	3.99 ± 0.9	3.57 ± 1.1 ***
Food Insecurity (not enough money)		
Did not eat	154 (72.0%)	184 (86.0%) ***
Eat less	140 (65.4%)	162 (75.7%) *
Adherence	193 (91.9%)	159 (85.5%) *
Substance Abuse - Past 3 months		
Cocaine	9 (9.6%)	24 (20.5%) *
Crack	5 (6.8%)	18 (18.0%) *
Heroin	1 (2.7%)	7 (14.6%)
Meth	2 (8.3%)	4 (13.8%)
Speed	0 (0.0%)	0 (0.0%)
Painkillers	2 (8.3%)	4 (13.8%)
Injected any drugs	3 (12.5%)	3 (10.0%)
Caregiving Responsibilities		
Child Care	47 (22.0%)	50 (23.4%)
Adult Care	33 (15.4%)	32 (15.0%)
Previous Incarcerations	105 (49.1%)	149 (69.6%) ***
Social Support	14.34 ± 4.1	13.86 ± 4.7
Structural/Systemic		
Worried about payments	57 (26.6%)	52 (24.3%)
Appointment difficulty - no phone	13 (6.1%)	18 (8.4%)
Appointment difficulty - answer your calls	28 (13.1%)	42 (19.6%)
Appointment difficulty - appointment time	36 (16.8%)	41 (19.2%)
Transportation barrier	46 (21.5%)	53 (24.8%)
Language barrier	14 (6.5%)	13 (6.1%)
Physician Communication	11.76 ± 0.7	11.58 ± 1.1 *
Medical Competence	11.96 ± 2.9	11.14 ± 3.2 **

Means compared using Student's t-test; proportions compared using a chi-squared test

* $p < .05$;

** $p < .01$;

*** $p < .001$

Table 4

Average number of barriers by type (with 95% CI)

	Undetectable	Detectable	Regular	Irregular	Non- Attender
Individual Barriers	1.01 [0.81, 1.26]	1.39 [1.11, 1.75] [*]	1.06 [0.84, 1.33] ^a	1.22 [0.97, 1.52] ^{a,b}	1.40 [1.06, 1.86] ^b
Systemic/Structural Barriers	0.27 [0.17, 0.41]	0.31 [0.20, 0.50]	0.25 [0.15, 0.39] ^a	0.27 [0.17, 0.44] ^a	0.45 [0.26, 0.77] ^b

^{*} $p < .05$

^{a,b,c} Indicates differences between groups with different letters ($p < .05$)

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