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Examining adherence among challenging patients in public and private HIV care in Argentina

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Abstract

Treatment engagement, retention and adherence to care are required for optimal HIV outcomes. Yet, patients may fall below the treatment recommendations for achieving undetectable viral load or not be retained in care. This study examined the most challenging patients in Buenos Aires, Argentina, those non-adherent to HIV care. Men ($n = 61$) and women ($n = 59$) prescribed antiretrovirals (ARVs) and non-adherent to treatment in the prior 3 to 6 months were enrolled and assessed regarding adherence, knowledge, motivation and attitudes regarding treatment. Private clinic patients had lower viral load and higher self-reported adherence than public clinic patients. Motivations to be adherent and positive beliefs regarding ARVs were associated with increased adherence in public clinic participants. Increased self-efficacy was associated with increased adherence among participants from both clinics. Results support patient and provider interventions that strengthen the characteristics supporting adherence, engagement and retention in public and private clinic settings.

Resumen—El compromiso, la retención en el cuidado y adherencia al tratamiento son esenciales para el manejo óptimo del paciente con VIH. Sin embargo, muchos pacientes con VIH no siguen las el tratamiento para lograr tener una carga viral indetectable, o no permanecen bajo cuidado médico. Este estudio examina los pacientes más difíciles de retener en el cuidado médico en Buenos Aires, Argentina. Hombres ($n = 61$) y mujeres ($n = 59$) a los que se les habían recetado antiretrovirales pero seguían el tratamiento en los últimos 3 - 6 meses participaron en el estudio. Adherencia, conocimiento, motivación y actitudes frente al tratamiento fueron evaluados. Los pacientes en la clínica privada tenían menor carga viral y mejor adherencia que los de la clínica pública. Motivación y pensamientos positivos con respecto a antiretrovirales estaban asociados con mejor adherencia en los pacientes de la clínica pública. La autoeficacia estaba asociada con mejor adherencia en los pacientes en las dos clínicas. Los resultados indican que son necesarias

intervenciones en pacientes y médicos para mejorar adherencia, compromiso y retención en el cuidado tanto en clínicas públicas como privadas.

Keywords

Healthcare setting; adherence; engagement; retention; Argentina

Introduction

Argentina was one of the first Latin American Countries to start the public provision of antiretroviral drugs to HIV individuals. The National Aids Law passed on 1990 warrants prevention, diagnosis and comprehensive care to HIV. In 2013 it was estimated that 52000 individuals were receiving antiretroviral drugs free of charge in the country, which represent the 81% of people in need [1,2]. Yet despite universal access to care, of those identified as HIV seropositive, a significant proportion of patients fell below the treatment recommendations for achieving undetectable viral load and many others are not retained in care [3]. Patient, provider and structural challenges to adherence to HIV treatment and care face those in both public and private HIV care [3, 4]. For many patients, these challenges may undermine treatment and long term retention in care.

Structural characteristics, such as ease of obtaining appointments, length of appointments, location of ancillary services or access to public transportation may impact patient engagement and adherence [5,6]. For example, providers at publicly funded health institutions may have less time with patients, while private health providers may offer more individualized service; public health clients may be unemployed with fewer options for care; private health clients may have more difficulty finding time for appointments due to work [5]. In fact, some clinical settings may enable patients with fewer characteristics associated with adherence to thrive, for example, private clinics may offer streamlined provision of care and reminder services, allowing patients to take a less active role in treatment. Psychosocial characteristics, such as knowledge and beliefs about treatment [7], motivation to engage in treatment, self-efficacy to engage in treatment, social support [8], as well as individual characteristics [9–13] e.g., depression, confusion, forgetting, expectations, attitudes, previous experiences with medication and time since infection can profoundly influence patients' potential to achieve optimal results from medical treatment. The setting in which health care is delivered may interact with patient characteristics, which may interact with each other, and the combination may influence the patient's health outcomes [14]. These patient differences are especially important to understand among those non-adherent to care, which may need targeted support to achieve optimal health [15].

This study examined characteristics associated with adherence to ARVs and HIV-related health among challenging patients not adherent to treatment in public and private HIV health care settings in Buenos Aires, Argentina. It was anticipated that the public health setting would make greater demands on patients and require greater self-efficacy and motivation to achieve adherence than among those in private care. It was hypothesized that the characteristics associated with adherence in public and private care would differ with regard to self-efficacy, motivation and attitudes regarding treatment.

Methods

This manuscript presents baseline data from COPA, a longitudinal adherence intervention study. Prior to the initiation of study procedures, ethical approval was obtained from the Institutional Review Board and Ethical Review Committees affiliated with the US and Argentina sites.

Clinics and Participants

Participants (n = 120) were recruited from two clinics providing outpatient HIV health care services to patients in Greater Buenos Aires; a HIV clinic in a large referral public hospital serving over 3,000 patients and a private non-governmental organization serving 3,500 patients. Data collection was conducted from October 2012 to October 2014. The private clinic was the first private HIV ambulatory care center in Argentina, providing care for patients who have Health Maintenance Organization-like coverage, offering counseling, testing, diagnosis, comprehensive care, treatment and prevention in one venue. Strategies to achieve comprehensive care include medical follow-up by infectious diseases (ID) specialists (25 staff physicians); regular patients receive at least 2–3 ambulatory visits with ID specialists per year, usually the same physician, and a computer system prompts follow up and rescheduling for missed appointments and pharmacy refills. If required, psychological support, social work-assistance and support by an adherence team and peer support groups are provided. The public clinic was the first public clinic established in Argentina, and is located in a large public hospital with some laboratory services offered in a different venue. The hospital clinic provides similar services to the private clinic, has a comparable number of ID specialists (12 ID doctors and other 10 trainees), and regular patients receive 2–3 visits per year. Public patients may not see the same physician at each visit, and missed appointments may be difficult to reschedule, which would delay prescriptions for pharmacy refills. Appointments are shorter at the public clinic, and patients are expected to personally initiate follow up on missed appointments.

Potential study candidates were identified by clinic records or medical personnel according to differing criteria depending on whether the patient was new to ARVs or on an existing regimen. Participants were identified as non-adherent patients new to ARVs if they were non-adherent to their first ARV regimen, i.e., on medication between 6–12 months after being diagnosed as HIV positive, and met one of the following criteria: a) self-reported taking < 85% of medication at most recent medical consultation (self-report of missed one dose in the last week or missed 5 doses in the last month), or b) missed 1 refill of their ARV medication in any month of the previous 6 months, or c) had a detectable viral load over 6 months of treatment (as defined by less than log₂ reduction in viral load, or d) within a 12 month period, had detectable viral load following undetectable viral load (> 200 copies). Additional patients were identified as non-adherent to previously prescribed ARVs if they were non-adherent to an existing ARV regimen, i.e., prescribed medication > 12 months and met one of the following criteria: a) missed 3 pharmacy refills within previous 6 months or b) had no pharmacy refills for 3 consecutive months. Eligible candidates were invited by study staff to participate.

In the private clinic, most patients were recruited by phone following a review of clinic records. In the public clinic, patients were primarily referred by medical staff following a regular consultation. Of those public clinic patients identified by study staff ($n = 116$), those who declined to participate ($n = 56$) were due to not meeting the study criteria or being unreachable by phone (30%), changed treatment prior to enrollment and were re-engaged (10%), scheduling conflict (25%), personal reasons (10%), transferring to a new insurance system (20%) or other (5%). Of those private clinic patients identified ($n = 300$), those who declined to participate ($n = 240$) did so due to lack of interest (30%), conflict with employment (50%) or skepticism regarding the intervention program (20%).

Assessments and Measures

Following provision of informed consent, study staff administered a paper and pencil assessment battery consisting of demographic, psychosocial and adherence measures. Administration of the questionnaires by staff required approximately 1.5 hours and questionnaire items totaled 237; staff provided clarification to participants on individual items as queries arose. All measures were either available in Spanish translation and reviewed by the study team for accuracy of meaning in the local dialect, or translated and back-translated by the study team and tested with local focus groups of stakeholders, patients and providers.

Assessments were selected for fit with the IMB Model (Information, Motivation and Behavioral Skills; [16,17]) which theorizes that adherence behavior and engagement in care is predicted by patient knowledge and motivation to engage in treatment. A demographic interview was used to assess age, ethnicity, education, employment, income, residence, marital/current partner status, access to care and substance use. Adherence was assessed using a visual analogue scale of adherence over the last 4 weeks; participants indicated on a scale of 0–100 their level of adherence to their medication [18]. Self-efficacy, the participant's belief that they are able to follow their treatment plan as prescribed, was measured using a 12 item questionnaire on which participants rated their ability to engage in a behavior on a scale of 0 (I am unable) to 10 (absolutely certain I am able) [19] (Raykov's reliability coefficient $\rho = .91$) [20]. Motivation, attitudes and beliefs about positive and negative consequences of HIV care was measured using the LifeWindows Information Motivation Behavioral Skills ART Adherence Questionnaire, which consisted of 10 questions that were rated by the participant using a Likert scale of agree strongly to disagree strongly ($\alpha = .70$) [21]. Participants also completed the Beliefs about Medication questionnaire [22], which consisted of 2 subscales of 10 items each, assessing attitudes regarding medication in general and HIV medication (antiretrovirals [ARVs]) in particular (subscale α range from 0.72–0.80 for the Spanish version). [23] Items were rated using a Likert scale of strongly agree to strongly disagree. In addition, participants completed an assessment of their relationship with their health care provider(s) [24] which consisted of 10 questions regarding the frequency and satisfaction with provider communication and action related to treatment, rated on a Likert scale of 'never' to 'all the time' (subscale α ranged from .71–.86 in this sample). HIV-specific health literacy was assessed using a measure previously developed [25] adapted by the team for local accuracy, and assessed participant

knowledge of their current CD4 and VL count and understanding of the meaning of both tests.

To assess the impact of potential covariates on adherence, participants also completed the Beck Depression Inventory – II (BDI) [26], a scale of 21 items rating their current experience of symptoms of depression (α range for the total score = 0.83 to 0.96 in 118 studies. [27] [N.B. both the Cognitive and Somatic subscales are included; however, findings related to the Somatic subscale should be interpreted with caution as somatic symptoms of depression may reflect other symptoms of HIV]). Cognitive functioning was measured using the Hopkins Verbal Learning Test – Revised – Spanish Version (HVLTR; [28]) and Color Trails (CTT; [29]). In the HVLTR, participants are read a set of twelve words and asked to repeat the words immediately afterwards. The first measure, total recall, is the sum of items correctly recalled after three trials (maximum score = 36). Delayed recall of the set of words is assessed 20 minutes following the third trial; the delayed recall score is the total number of correct responses (maximum score = 12). A retention percentage is computed as the delayed recall score divided by the highest score from trial number two or three. Finally participants are read a list of twenty-four words, containing the original twelve as well as twelve new words, and asked if each word appeared in the original list. The number of incorrectly identified words is subtracted from the number of correctly identified words (i.e., true positives minus false positives; maximum score = 12). The CTT consists of two exercises: Test 1 measures processing speed by timing test-takers to connect numbered circles in order and test 2 consists of alternately colored circled numbers used to measure speed of attention, sequencing, mental flexibility, and visual search and motor functions. The CTT is scored as time-to-completion. In this study, z-scores were generated using data from a normative age- and gender-matched Argentinian sample [29].

Statistical Analyses

Descriptive statistics (e.g., means, frequencies) were used to describe sample characteristics. Bivariate analyses including t-tests, Pearson correlations and Chi-square tests (as well as nonparametric alternatives where appropriate) were used to compare public and private patients on demographic and psychosocial characteristics as well as adherence and treatment outcomes. Finally, a series of regression models were fit in order to examine the relationship between psychosocial and cognitive measures, ART adherence and viral load, allowing for a different intercept and slope for the public and private clinics. Predictors were grand-mean centered, thus the intercepts describe adherence and viral load levels at the mean level of each predictor for each clinic. The clinic-specific slopes describe the relationship between the predictor and outcome within each clinic. Because adherence was significantly non-normal, it was dichotomized at 100% or <100% and logistic regression was utilized. For logistic models, a pseudo- R^2 was calculated according to Tjur et al., 2009 [30]. Viral load was log-transformed and ordinary least-squares regression was used. All analyses were completed using SAS v.9.3 at a two-tailed level of significance of $p < .05$.

Results

Demographic and psychosocial characteristics

On average, participants ($N = 120$; $n = 60$ from the private clinic and $n = 60$ from the public clinic) were 40 ± 9 years of age, 51% were male ($n = 61$) and 49% were female ($n = 59$). Just over half had a high school degree or more education ($n = 61$, 52%), 63% were employed ($n = 76$), and the mean monthly income was 4472 Argentine Pesos (approximately \$550). Most were not married ($n = 72$, 60%) but had a partner ($n = 74$, 62%). Of those who had a partner, the majority ($n = 48$, 65%) reported that their partner was HIV-negative or that they did not know their partner's HIV status. Participants were prescribed many different ARV regimens; however, the most common ARV drugs prescribed were lamivudine ($n = 102$, 85%), tenofovir ($n = 34$, 28%), zidovudine ($n = 28$, 23%), and efaviriz ($n = 25$, 21%).

Some demographic differences emerged between participants from the private and public clinics. More males were enrolled from the private clinic compared to the public clinic (60% vs. 42% male, Chi-square = 4.03, $p = .045$). As private insurance was typically subsidized through employment, more private clinic participants were employed (83% vs. 43% employment, Chi-square = 20.7, $p < .001$) and reported higher monthly income [mean (private clinic) = 5299 Argentine Pesos vs. 3010 Pesos (public clinic), $t = 4.13$, $p < .001$]. Participants from the private clinic also demonstrated a trend towards older age (mean = 41.4 years vs. 38.6 years, $t = 1.74$, $p = .079$). Table I presents overall and clinic-specific demographic, adherence, and HIV-related characteristics.

In addition, there were differences between sites in some psychosocial measures. Self-efficacy was higher among participants from the private clinic (mean = 103.6 vs. 72.0, $t = 5.66$, $p < .001$) but was not related to education ($r = .05$, $p = .565$). Similarly, perceptions of the patient-provider relationship were more positive among clients of the private clinic (mean = 13.6 vs. 10.7, $t = 4.41$, $p < .001$). Conversely, depression was higher among participants attending the public clinic [mean (private clinic) = 10.3 vs. 16.1 (public clinic), $t = 2.82$, $p = .006$], though the difference lay in the somatic subscale, which may also reflect increased HIV symptoms (see table 2), although the two depression subscales were highly correlated ($r = .78$, $p < .001$). Illegal drug use did not differ between public and private patients (Chi square = 0.11, $p = .741$). Public clinic patients were more likely to know their CD4 cell count than private patients (Chi square = 4.1, $p = .043$), but public and private patients did not differ with regard to their understanding of the meaning of their CD4 and VL results (VL, Wilcoxon's test $p = .587$; CD4, Wilcoxon $p = .826$). Cognitive functioning was also compared between participants from the private and public clinics, and no differences were found (see table II).

ART adherence and HIV disease status

In addition to demographic and psychosocial characteristics, ART adherence and HIV disease status indicators were compared between the two clinics (see table 1). Participants from the private clinic reported better adherence overall (mean = 82.5% of doses taken in the past week vs. 51.8%, Wilcoxon $p < .001$) and were more likely to have taken every dose

in the past week (48% were 100% adherent vs. 22%, Chi-square = 9.01, $p = .003$). Private patients were more likely to have less medication persistence, i.e., missed three pharmacy refills during the previous 6 months ($n = 44$, 73%). In contrast, public patients were more likely to have been lost from care, i.e., to have missed three consecutive refills ($n = 36$, 60%). In fact, public patients more often discontinued their medication (Chi-square = 21.26, $p < .001$) and showed a trend to be more likely to miss medical appointments and not reschedule (Chi-square = 9.075, $p = .059$). Both public and private patients were unsure of the impact of discontinuing medication, and most felt that ARV medication was toxic, fraught with side effects, and the prospect of taking medication for a lifetime was difficult. There was no association between adherence and understanding the meaning of VL (Spearman's $\rho = -.04$, $p = .687$) or the meaning of CD4 ($\rho = .06$, $p = .528$); similarly, adherence was not associated with participant knowledge of their CD4 count (Wilcoxon $p = .462$) or VL (Wilcoxon $p = .618$). Adherence was not related to alcohol bingeing (Wilcoxon $p = .119$ or Illegal drug use (Wilcoxon, $p = .550$). Similarly, viral load was not related to bingeing ($t = .56$, $p = .579$) or drug use ($t = .10$, $p = .925$).

Mean log viral load was lower among participants from the private clinic (mean = 2.7 vs. 3.8, $t = 3.62$, $p < .001$) and participants from the private clinic were more likely to be virally suppressed (40% undetectable vs. 17%, Chi-square = 6.3, $p = .012$). Similarly, mean CD4 cell count was higher among those from the private clinic [mean (private) = 424.9 vs. mean (public) = 171.1, $t = 6.49$, $p < .001$ (see table 1)]. There was no association between health status (VL/CD4 count) and understanding the meaning of VL ($\rho = -.07$, $p = .455$) or CD4 ($\rho = -.08$, $p = .429$). Because there were gender differences between clinics, gender was tested for association with adherence and viral load; no relationship was found for either outcome (adherence Chi-square = 0.90, $p = .343$; viral load $t = 0.99$, $p = .326$). Finally, adherence and viral load were modestly correlated (Spearman's $\rho = -.26$, $p = .01$).

Association between psychosocial measures and ART adherence and HIV status

A series of regression models were fit in order to examine the relationship between psychosocial and cognitive measures, ART adherence and viral load, allowing for a different intercept and slope for each clinic. Logistic regression was used to examine adherence, and ordinary least-squares regression was used to examine log viral load. All analyses controlled for demographic differences between clinics. The results of these analyses are presented in tables III and IV.

In summary, increased self-efficacy was associated with increased adherence among participants from both clinics, with a stronger relationship among those from the private clinic [private $b = .138$, OR (per one-unit increase) = 1.15, $p < .01$; public $b = .058$, OR = 1.06, $p = .02$; pseudo- $R^2 = .40$]. Motivation to be adherent was associated with increased adherence, but only among participants from the public clinic ($b = .282$, OR = 1.33, $p = .01$; pseudo- $R^2 = .20$). Figure I displays these relationships graphically. Beliefs about medication, perceptions and experiences of the patient-provider relationship, and depression were not related to adherence. Log viral load was also analyzed using the above strategy, and there was an association between self-efficacy and viral load among participants from

the private clinic, such that higher self-efficacy was associated with lower viral load ($b = -.020, p = .04; R^2 = .25$; see figure 1).

Discussion

This study examined characteristics associated with adherence and health among challenging patients in public and private HIV health care settings in Buenos Aires and found associations to differ between patient populations. Increased self-efficacy was associated with increased adherence among participants from both clinics, but to a greater extent among private clinic participants. In addition, self-efficacy was associated with decreased viral load among private clinic participants. In contrast, motivations to be adherent was associated with increased adherence only among public clinic participants. Outcomes in both settings represent opportunities for intervention.

Despite differences in healthcare provision, unlike previous studies (e.g., [12,31,32]), neither attitudes regarding the patient-provider relationship nor depression were related to adherence. Provider utilization of a “patient-centered” approach to healthcare provision, i.e., understanding each patient as a unique person, has previously been associated with fewer missed appointments, retention in care, medication adherence, positive ARV beliefs and undetectable viral load [31,33]. Results may reflect a lack of variability in patients’ perceived relationships with their providers, many of whom worked in both private and public settings simultaneously and may have been offering similar care of varying length. Future research should examine the variability among provider care in more depth to explore this question. In the current study, although patients in private care rated their relationship with their providers more positively, it was patients’ adherence self-efficacy, their level of confidence in being able to be adherent, which was associated with adherence, and to a greater extent among private clinic patients. This impact of self-efficacy among private patients may be attributable in part to the achievement of employment and financial security, as well as the ease with which private patients obtain care. Self-efficacy may also impact positive attitudes towards medication use, which have been previously associated with adherence [8]. The lack of association between depression and adherence may be due to the relationship between lower self-efficacy and depression; the current sample was too small to examine the impact of this association.

Greater motivation was most highly associated with increased adherence among public clinic participants, despite the fact that many patients reported higher levels of depression and more uncontrolled viral load. This increased motivation may also have contributed to positive attitudes towards treatment [8]. Previous models e.g., Pina and Gonzalez [34], have also identified making the decision to engage in treatment and having the ability to tolerate the ambiguity and frustrations associated with living with HIV as elements underlying the motivation to achieve treatment adherence. Providers may, in some part, also contribute to patients’ motivation regarding treatment; however, additional examination of this provider effect was precluded by the small sample size. Future studies should examine the role of the provider in patient “activation,” as challenging patients may have specialized psychological resources and attitudes that can be activated to support adherence. It may be useful to

develop methods for providers or health care staff to enhance self-efficacy and motivation in both clinic populations.

It is important to note that while this study actively recruited challenging patients, many self-reported spontaneously reinitiating their use of ARVs after being contacted by a recruiter; higher levels of adherence may, thus, have reflected the medical reminder inherent in recruitment or inaccurate self-report. This may explain, in part, the variability between private and public patients' reports of adherence behavior. However, pharmacy records and viral loads provide confirmation of pre-existing non-adherence and non-persistence among these participants. Pharmacy records also suggest that patients sometimes re-initiated medication use shortly before regular medical visits, supporting the need for more frequent visits among challenging patients and the potential benefits of "engaging, validating and partnering" provider relationships, rather than "paternalistic," to maintain engagement in treatment [35].

Demographic differences between clinic populations were primarily related to income, employment, age and gender, variables associated with adherence in previous studies [7, 8,10,14]. Public patients had lower levels of self-reported adherence and higher viral load, supporting self-report among these patients. Many of both public and private patients did not understand the impact of discontinuing medication, and most were concerned about the toxicity of medication and the implications of taking it for a lifetime [11]. This finding supports previous research (e.g., [9,10] addressing the underlying components of adherence. In contrast with previous work [25], understanding the meaning of HIV tests did not differ between sites, and neither adherence nor health status were associated with VL or CD4 comprehension. Public clinic patients were more likely to know their CD4 cell count; however, less variability in CD4 cell count was observed among public clinic patients, which may explain this finding. In addition public clinic patients were more likely to have discontinued their medication, and to have been completely lost from care, having a greater trend to miss appointments and not reschedule. Overall, public patients may be experiencing more challenges, both personal and at the clinic level, that may require more reliance on personal motivation and positive attitudes towards treatment. Overall, study results obtained may reflect the socioeconomic setting (e.g., poverty, food insecurity, instability) of those accessing public, as opposed to private, health care, rather than the characteristics of the institutions themselves. As evidenced by the levels of depression in the public health clinic, those who must, of necessity, attend a public hospital due to unemployment, appear to differ from private clinic patients. Interestingly, awareness of lab values and their meaning to patients appeared to be lacking among patients from both sites, though in contrast with previous studies (e.g., [25]), this personal HIV information did not appear to influence or motivate adherence behavior.

Limitations of this study include the small sample size and reliance on self-reported adherence behavior. In addition, participants were recruited based on disengagement and non-adherence to HIV treatment and care. Thus, adherence to medication may also be less variable in this population, which may have reduced the likelihood of discovering characteristics associated with adherence (e.g., aspects of the patient-provider relationship). Also, the rate of study candidates declining to participate was high in both clinics, although

this may be expected given that potential participants were selected based on failure to engage in HIV treatment. Regardless, non-participation may limit the generalizability of study findings. Additionally, exploration of the impact of alcohol and drug use on adherence was limited by the relatively small numbers reporting this behavior. Finally, participants reflected a broad cross section of persons living with HIV in Buenos Aires, and future research should examine adherence predictors within subgroups.

Conclusion

This study examined the most challenging patients in Buenos Aires, Argentina, those non-adherent to care in public and private HIV health care settings. It was hypothesized that public health setting would make greater demands on patients and require greater self-efficacy and motivation to achieve adherence than among those in private care. Results support targeted patient and provider interventions that strengthen the characteristics supporting adherence, engagement and retention in public and private clinic settings.

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Figure I. Clinic-specific relationships between psychosocial and cognitive measures and ART adherence and log viral load.

Table I

Demographic, adherence, and HIV-related characteristics of N = 120 COPA participants

Characteristic	All Mean(sd) N(%)	Private Clinic	Public Clinic	t, <i>p</i> Chi-square, <i>p</i>
Gender				4.03, .045
Male	61(51%)	36(60%)	25(42%)	
Female	59(49%)	24(40%)	35(58%)	
Age	40.0(8.6)	41.4(8.8)	38.6(8.3)	1.74, .085
Education level				1.66, .197
High school or greater	61(52%)	34(58%)	27(46%)	
Did not finish high school	57(48%)	25(42%)	32(54%)	
Employment status				20.7, <.001
Employed	76(63%)	50(83%)	26(43%)	
Unemployed	44(37%)	10(17%)	34(57%)	
Monthly income (Argentine Pesos)	4472.2(3238.0)	5299.5(3704.4)	3010.7(1893.9)	4.13, <.001
Marital status				2.6, .279
Married	24(20%)	13(22%)	11(18%)	
Not married	72(60%)	32(53%)	40(67%)	
Other (e.g., divorced, widowed)	24(20%)	15(25%)	9(15%)	
Adherence (% of medication taken in past week)	67.2(37.3)	82.5(24.9)	51.8(41.4)	Wilcoxon's test, <i>p</i><.001
Adherence				9.01, .003
100%	42(35%)	29(48%)	13(22%)	
<100%	77(65%)	31(52%)	46(78%)	
Years since HIV diagnosis	11.3(6.1)	10.9(6.1)	11.8(6.1)	0.80, .425
Years since ART initiation	9.8(5.8)	9.2(5.7)	10.3(5.9)	0.95, .345
Log viral load	3.2(1.6)	2.7(1.5)	3.8(1.5)	3.62, <.001
Undetectable viral load				6.3, .012
Yes	32(30%)	24(40%)	8(17%)	
No	74(70%)	36(60%)	38(83%)	
CD4 cell count	304.9(242.9)	424.9(245.6)	171.1(155.8)	6.49, <.001
Partner HIV status (n = 74 with a current partner)				1.3, .263
Positive	26(35%)	16(41%)	10(29%)	
Negative/Unknown	48(65%)	23(59%)	25(71%)	

Note: **Bold** indicates a statistically significant difference between clinics.

Note: N may vary due to instances of missing data on questionnaire items.

Table II

Psychosocial characteristics of N = 120 COPA participants

Measure	All Mean(std)/n(%)	Private	Public	t/Chi-square, <i>p</i>
Self-efficacy	87.9(33.8)	103.6(19.2)	72.0(37.9)	5.66, <.001
Motivation to be adherent	34.0(6.5)	34.6(6.7)	33.5(6.2)	0.87, .384
Beliefs about medications in general	19.7(5.8)	20.4(5.8)	19.0(5.9)	1.27, .208
Beliefs about ART medication	27.3(4.9)	27.2(4.7)	27.4(5.1)	0.25, .803
Perception of the patient-provider relationship	12.2(3.6)	13.6(2.5)	10.7(4.0)	4.41, <.001
Experiences of the patient-provider relationship	9.5(4.0)	10.0(3.6)	8.8(4.6)	1.49, .139
Depression (Total)	13.2(11.5)	10.2(11.9)	16.1(10.5)	2.84, .005
Somatic	8.7(7.4)	6.5(7.3)	11.0(6.9)	3.47, <.001
Affective	4.3(4.8)	3.6(5.1)	5.1(4.4)	1.70, .091
Trail making test A (Z score)	-0.6(1.5)	-0.6(1.4)	-0.6(1.6)	0.04, .972
Trail making test B (Z score)	-1.3(2.4)	-1.1(1.9)	-1.5(2.8)	0.70, .484
HVLT num correct ^a	11.2(1.0)	11.3(1.0)	11.2(1.0)	0.49, .625
HVLT delayed recall correct	7.1(2.0)	7.0(2.0)	7.3(2.1)	0.74, .462
HVLT true positive–false positive	10.2(1.6)	10.2(1.7)	10.1(1.6)	0.40, .692
HVLT retention percentage	82.6(15.5)	82.6(17.3)	82.6(13.7)	0.03, .975
Knew accurate CD4 count				4.1, .043
Yes	48(49%)	24(41%)	24(62%)	
No	50(51%)	35(59%)	15(38%)	
Knew accurate VL count				0.22, .623
Yes	40(38%)	24(40%)	16(36%)	
No	65(62%)	36(60%)	29(64%)	

Note: **Bold** indicates a statistically significant difference between clinics.

Note: N may vary due to instances of missing data on questionnaire items.

^a Scores on the HVLT are raw scores and percentages, not Z scores

Table III

Public and private clinic-specific relationships between psychosocial and cognitive measures and ART adherence

Measure	Intercept	b(se)	Chi-square _p (slope)
Self-efficacy			
Private	-3.08	.138(.04)	9.61, .002
Public	-1.16	.058(.02)	5.60, .018
Motivation for adherence			
Private	-0.51	.055(.05)	1.43, .232
Public	-1.65	.282(.10)	7.92, .005
Beliefs about medication in general			
Private	-0.29	.066(.05)	1.55, .213
Public	-1.19	-.007(.06)	0.01, .906
Specific beliefs about ART			
Private	-0.44	.054(.07)	0.59, .443
Public	-1.31	.117(.07)	2.75, .097
Perception of the patient-provider relationship			
Private	-0.23	.001(.11)	0.01, .991
Public	-1.03	.030(.10)	0.10, .758
Experiences of the patient-provider relationship			
Private	-0.63	.069(.08)	0.73, .394
Public	-1.23	.032(.10)	0.11, .736
Depression (Total)			
Private	-0.22	.008(.03)	0.08, .784
Public	-1.14	-.005(.04)	0.02, .884
Depression (Affective)			
Private	-0.24	.034(.06)	0.28, .599
Public	-1.16	-.071(.09)	0.63, .429
Depression (Somatic)			
Private	-0.19	.015(.05)	0.09, .762
Public	-1.16	.017(.05)	0.10, .746
Trail making test A			
Private	-0.15	.524(.28)	3.52, .060
Public	-1.35	.107(.28)	0.14, .704
Trail making test B			
Private	-0.15	.078(.18)	0.20, .658
Public	-1.54	.205(.24)	0.75, .387
HVLT total correct			
Private	-0.29	-.339(.29)	1.37, .243
Public	-1.03	.303(.40)	0.56, .453

Measure	Intercept	b(se)	Chi-square, <i>p</i> (slope)
HVLT delayed recall correct			
Private	−0.23	−.195(.15)	1.62, .203
Public	−1.02	−.082(.17)	0.22, .640
HVLT true positives – false negatives			
Private	−0.29	−.110(.18)	0.38, .536
Public	−1.03	.118(.22)	0.28, .595
HVLT retention percentage			
Private	−0.24	−.025(.02)	1.90, .168
Public	−1.06	.006(.03)	0.06, .806

Note: ART adherence was analyzed using logistic regression. Intercepts describe the log odds of adherence at mean levels of the predictor variable, and slopes describe the change in log odds per 1 unit increase in the predictor variable. Statistically significant relationships are noted in **Bold**.

Note: All regression analyses controlled for differences between clinics in gender, income, and employment status. Income was grand-mean centered, and reference categories for gender and employment were male and employed.

Table IV

Public and private clinic-specific relationships between psychosocial and cognitive measures and log viral load

Measure	Intercept	b(se)	Chi-square _p (slope)
Self-efficacy			
Private	3.02	-.020(.01)	4.87, .038
Public	3.24	-.011(.01)	3.09, .096
Motivation for adherence			
Private	2.80	.019(.03)	0.43, .532
Public	3.43	-.029(.04)	0.49, .505
Beliefs about medication in general			
Private	2.74	-.030(.03)	0.86, .377
Public	3.48	.049(.04)	1.72, .212
Specific beliefs about ART			
Private	2.67	-.053(.05)	1.38, .264
Public	3.35	-.010(.05)	0.05, .839
Perception of the patient-provider relationship			
Private	2.82	-.055(.07)	0.55, .479
Public	3.27	-.062(.06)	1.06, .327
Experiences of the patient-provider relationship			
Private	2.77	-.064(.05)	1.56, .237
Public	3.53	.011(.06)	0.03, .867
Depression (Total)			
Private	2.75	.013(.02)	0.43, .529
Public	3.44	-.002(.02)	0.01, .924
Depression (Affective)			
Private	2.70	.016(.04)	0.15, .714
Public	3.41	-.026(.05)	0.27, .617
Depression (Somatic)			
Private	2.79	.026(.03)	0.70, .424
Public	3.45	.007(.03)	0.04, .848
Trail making test A			
Private	2.60	.025(.14)	0.03, .868
Public	3.19	.203(.16)	1.58, .235
Trail making test B			
Private	2.63	-.046(.12)	0.15, .712
Public	3.37	-.135(.14)	0.94, .358
HVLT total correct			
Private	2.58	.307(.18)	2.79, .113
Public	3.34	-.124(.21)	0.34, .578

Measure	Intercept	b(se)	Chi-square, <i>p</i> (slope)
HVLT delayed recall correct			
Private	2.62	.046(.09)	0.25, .633
Public	3.32	-.157(.11)	1.94, .185
HVLT true positives – false negatives			
Private	2.58	.037(.12)	0.10, .762
Public	3.32	-.144(.14)	1.04, .330
HVLT retention percentage			
Private	2.65	.002(.01)	0.03, .866
Public	3.36	-.006(.02)	0.16, .704

Note: Statistically significant relationships are noted in **Bold**

Note: All regression analyses controlled for differences between clinics in gender, income, and employment status. Income was grand-mean centered, and reference categories for gender and employment were male and employed.