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A Mediation Model to Explain HIV Antiretroviral Adherence Among Gay and Bisexual Men

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Abstract

Based on quantitative data describing a sample of 300 HIV seropositive gay and bisexual men living in New York City who were on antiretroviral drug therapy, variables of interest were collapsed into 4 latent constructs—SES (including health care provision), psychological states, drug use impairment, and HIV treatment adherence—and structural equation modeling was used to test the relations among them. Our model indicated a complex interplay between socioeconomic factors, drug use impairment, psychological states, and adherence. It is imperative for counselors and clinicians working with this population to understand the complex relationships between cultural, social, and psychological realities and adherence to HIV antiviral medications and to develop effective socially relevant and culturally nested interventions.

Keywords

Adherence; treatment; HIV; gay; SEM; latent class analysis

Adherence can be defined as the extent to which a patient's behavior coincides with medical advice, including the dosing and instructions specific to medications (Eldred, Wu, Chaisson, & Moore, 1997; Haynes, 1979). Non-adherence or sub-optimal adherence occurs when such advice is not followed; it can transpire among patients who are asymptomatic as well as those who are seriously ill (Kennedy, 2000). With regard to medications, imperfect adherence can contribute greatly to the variability observed in a drug's therapeutic effect. Moreover, such behaviors have been associated with increases in physician visits, higher hospitalization rates, and longer hospital stays (Blackwell, 1973; Greenberg, McCorkle, Vlahov, & Selwyn, 2000; Sackett, Haynes, & Taylor, 1979), resulting in higher health care costs and public health burden, and suggesting a critical role for mental health professionals in addressing obstacles to adherence.

The advent of Highly Active Antiretroviral Therapy (HAART), currently known simply as antiretroviral therapy (ARV) as a treatment for HIV infection has resulted in reductions in

AIDS-related morbidity and mortality in the United States (Grossberg, Zhang, & Gross, 2004), yet adherence to ARV is of particular concern (Batki & Ferrando, 1996), in part, because the dosing demands of ARV and the physiological and psychological side effects of these treatments are extremely burdensome (Ammassari, et al., 2001). Research suggests that adherence rates of 95% or better are necessary for a ARV regimen to be most effective (Chesney, 2003; Low-Beer, Yip, O'Shaughnessy, Hogg, & Montaner, 2000; Montaner, Harris, Mo, & Harrigan, 1998; Patterson, et al., 2000), and that a decrease of as small as 10% may be associated with doubling of HIV-RNA levels (Bangsberg, et al., 2000). Patients who miss even a few doses of the regimen have been shown to demonstrate increases of 100,000 copies or more of the virus per milliliter of blood (Ho, et al., 1995; Kastrissios, et al., 1998). In a 1998 study conducted at San Francisco General Hospital, of the patients reporting between 90% and 100% adherence over the recent past, approximately 60% had undetectable viral loads. Alternatively, of the patients reporting less than 80% adherence, only about 35% had undetectable viral loads (Hecht, Kahn, Dillon, Chesney, & Grant, 1998). Furthermore, non-compliance to such regimens may quickly encourage the development of drug resistance, since a missed or inappropriately taken dose allows greater replication of the virus and increases the likelihood that a viable mutant strain will be produced (Wainberg & Friedland, 1998). The emergence of resistant strains is problematic both for the patient and the greater community as resilient strains transmitted to others limit treatment alternatives (Routy, et al., 2000).

Reasons for non-adherence differ from person to person, however the most common factors cited in the literature include sociodemographic characteristics such as socioeconomic status (SES) particularly, lack of stable housing (Carthew & Styres, 1993), deficient health insurance coverage (Demas, et al., 1998), psychosocial factors including level of social support (Halkitis & Kirton, 1999; Morse, et al., 1991), avoidant coping (Halkitis, Parsons, Wolitski, & Remien, 2003), self-efficacy (Halkitis, Kutnick, Parsons, & Slater, in press), depression (Singh, et al., 1996), specific aspects of the treatment regimen (e.g., type, complexity, side effects), features of the illness or potential illness (e.g., symptoms, duration, disability, medically defined seriousness) (Roland, 1998; Kalichman, Catz, & Ramachandran 1999; Halkitis & Kirton, 1999), as well historical effects and trauma (e.g., 9/11) (Halkitis, Kutnick, Rosof, Parsons, & Slater, 2003). Furthermore, adherence to HIV medication regimens is not limited to the drugs themselves, but also applies to daily living adjustments that provide prerequisite conditions for drug efficacy.

Moreover, currently in the United States, people living with HIV and consequently, adherence to HIV medication regimens, are disproportionately affected by poverty and its consequences, including lack of access to adequate health care, homelessness, unstable housing, poor social support, and mistrust of the medical establishment (Cunningham, et al., 1999; Lucas, Gebo, Chaisson & Moore, 2002; Stein & Nyamathi, 1999). This condition is further confounded by the impact of illicit drug use present in many of these impoverished communities that we believe interacts with psychological states to ultimately drive adherence behavior.

Thus, we sought to examine relationships between SES, drug use impairment, psychological states, and adherence to HIV antiviral medications among a community-based, ethnically

diverse sample of men-who-have-sex-with-men (MSM) on ARV. These analyses, based on a mediation approach, allowed us to posit a model to better explain the complex reality of adherence in the lives of HIV-positive men.

METHODS

Design

The data presented here are drawn from *Project PILLS (Protease Inhibitor Longitudinal Life Study)*, which sought to characterize the relationship between recreational substance use and HIV medication adherence to protease inhibitors in a cohort of 300 gay and bisexual men in the New York City metropolitan. Participants partook in eight assessments over one year. The protocol was approved by the IRB of the authors' academic institution. Here, we report on data obtained at the baseline interviews, which consisted of an initial meeting to obtain treatment and psychosocial data and a 2-week follow-up meeting to obtain adherence and drug use data.

Procedure

Participants were recruited using two different recruitment strategies: (1) active recruitment and (2) passive recruitment. Recruitment efforts were based on a targeted sampling strategy, designed to obtain systematic information because true random sampling was not feasible (Watters & Biernacki, 1989). Although targeted sampling cannot assure diversity of the sample, it can be used to enhance the degree to which the sample includes participants who come from a variety of backgrounds, reside within different social circles, and participate in gay, bisexual, and/or HIV/AIDS communities to varying degrees.

Men were screened by telephone to determine eligibility. Individuals who were interested and eligible were then scheduled for a two-part baseline interview. Eligibility at the time of screening consisted of the following criterion: biologically male, predominantly English speaking, self-identified as HIV-positive, self-identified as gay or bisexual, age of 18 or greater, and on an ARV regimen. In the end, we ascertained our desired sample of 300.

Baseline assessments consisted of two appointments. At the initial baseline interview, participants undertook informed consent. Further, they were provided with an explanation of the project and the use of the *MEMS* (Medication Event Management System) Track Cap, which was used as a measure of adherence; in addition, they completed a quantitative survey administered via the *Audio-CASI* system (Turner, et al., 1998) to assess demographic and psychosocial characteristics. At the end of the first session, a meeting was scheduled for two weeks later to ensure that the *MEMS* Track Cap was functioning properly and to obtain self-reported adherence data. The assessments each took approximately 90-120 minutes to complete.

Measures

The data reported here are based on baseline quantitative *Audio-CASI* surveys, and *MEMS* data obtained for the 300 eligible participants at the baseline and two week follow-up meetings.

Sociodemographic & Health Characteristics—Using *Audio-CASI* during the first baseline meeting, participants were asked to self-report their year of birth, race/ethnicity, sexual orientation, employment status, annual income, and health care coverage. In addition, participants indicated the year that they first tested positive for HIV antibodies, whether they had ever received an AIDS diagnosis, and when applicable the year that they received such diagnoses.

Viral Load—Participants provided plasma samples for use in PCR assessment of HIV viral load with a sensitivity level of 50 copies/ml of blood (Kappes, et al., 1995).

Adherence—At the second portion of the baseline assessment, adherence to the protease inhibitor in the participants' regimen was assessed in the following manner. First, we assessed adherence using an electronic monitoring of pill retrieval with the *MEMS* cap. The *MEMS Track Cap* system consists of a computer chip embedded in a cap that fits all standard size medicine bottles. The chip records the date and time that the bottle is opened, which is defined as an event (Kruse, Rampmaier, Ullrich, & Weber, 1994; Matsuyama, Mason, & Jue, 1995; Waterhouse, Calzone, Mele, & Brenner, 1993). The chip was then downloaded as a data file, and based on the dosing data and the missed doses indicated, we calculated a percentage of adherences for the protease inhibitor that we were monitoring. In addition, participants examined the *MEMS* data output with a research assistant and indicated which doses were correctly accounted for by the *MEMS*, and this was the basis for our adjusted *MEMS* value. In addition, participants indicated the number of missed doses of their medications via self-report (via *Audio-CASI*) at the follow-up meeting.

Psychosocial/Psychological States—Four major psychosocial and psychological factors were assessed during the *Audio-CASI* portion of the first baseline interview. Depression was measured using the 21-item *Beck Depression Inventory* (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), which assesses how individuals describe their own emotional states over the past two weeks. In our sample $\alpha = 0.89$.

HIV-related coping was assessed based on Folkman, Chesney, Pollack, and Coates (1993) and drawn from previous work on adherence conducted by Halkitis, Parsons, and colleagues (2003). The extent to which participants engaged in active and avoidant coping strategies to deal with HIV-related stress in their lives was assessed using a 5-point Likert scale (0 = "I never do it" to 4 = "I always do it"), consisting of two sub-scales, accounting for 42% of the variance. Active coping was assessed using 10 items with $\alpha = 0.77$. Items in this scale included "Talk to my friends or family about it" and "Work on my feelings in therapy or counseling." Avoidant coping was assessed using 5 items with $\alpha = 0.60$. Items on the avoidant subscale included "Keep to myself; do not go out" and "Avoid social situations."

In addition, feelings of guilt towards non-adherence, was assessed using a measure based on the *Diabetes-Specific Guilt Survey* created by Bybee and Zigler (1991). The scale included nine 5-point Likert items (0 = "Not at all like me" to 4 = "Extremely like me") to indicate the level with which feelings of non-adherence guilt were endorsed, and constituted one factor accounting for 57% of the variance, with $\alpha = 0.90$. Items included "When I change

the dose of my protease inhibitor, I feel badly about it” and “When I stop taking my protease inhibitor for several days in a row, I feel badly about it”.

Finally, we assessed personal level concerns about HIV using a 5-point Likert scale (0 = “Never worry” to 4 = “Always Worry”) developed by the research team. The final scale consisted of two factors accounting for 41% of the variance. The first subscale consisted of 33 items and assessed quality of life related concerns about HIV such as disclosing serostatus, ability to work, becoming unattractive to the disease, and experiencing side effects of treatments. This subscale had $\alpha = 0.95$. The second subscale assessed disease/infection related concerns of HIV such as re-infection and infection with other pathogens such as Hepatitis and consisted of four items with an $\alpha = 0.93$.

Drug Use Impairment—Level of drug use impairment was assessed using the *Drug Abuse Screening Test (DAST-10)* (Addiction Research Foundation, ADR, 1982). For the purposes of path analyses, a continuous, composite scale score was used. However, for the purposes of bivariate analyses, participants were classified into one of three typologies of drug use: Non-Drug User, Drug-User, and Drug Abuser. Participants were classified into one of the three-drug use typologies based on the number of items endorsed. The items were based on DSM-IV criterion for substance abuse (Coco & Carey, 1998) and were also based on drug use behavior in the previous six months. Sample items included, “Have you always been able to stop using drugs when you have wanted to?” “Have you had blackouts or flashbacks as a result of your drug use?” and “Have people you are close to ever complained about your involvement with drugs?” Participants who scored 0-2 on the DAST-10 were classified as Non-Drug Users, those with scores of 3-5 were classified as Drug Users and those with scores of 6-10 were classified as Drug Abusers.

Structural Equation Model and Rationale

The proposed model sought to examine the mediational relationship between factors affecting adherence to HIV antiretroviral medication regimens. To test this model, we used the following exogenous variables: (1) SES, which was a measure of income on an ordinal scale and Health Care, a self-reported assessment of the type of health insurance coverage participants possessed, which was coded as 0 for public insurance and 1 for private insurance; (2) Drug Use Impairment, which was a measure of the composite scale score of the DAST screening instrument; and (3) Psychological States, as measured by the six psychosocial scales of Depression, Avoidant Coping, Active Coping, Adherence Guilt, HIV-Infection Related Concerns, and HIV Quality of Life Concerns. Finally, using this model we sought to explain the following endogenous variable: (4) Adherence, which consisted of four measures, the MEMS cap, Adjusted MEMS cap, self-reported adherence, and a measure of viral load.

Moreover, this model sought to explain three mediational relationships, that between SES, Drug Use Impairment and Adherence; that between SES, and the endogenous variable/latent construct of Psychological States. Finally, we sought to examine the mediational relationships between Psychosocial States, Drug Use Impairment and Adherence.

RESULTS

Sample Characteristics

All 300 participants were HIV-positive biological males. The average age of the participants was 42 ($SD = 7.72$) and ranged from 20 to 70 years of age. The sample was racially and ethnically diverse, with 66.3% ($n = 200$) identifying as men of color. Specifically, 36.0% ($n = 108$) identified as African American, 20.7% ($n = 62$) as Latino/Hispanic, 33.7% ($n = 101$) as White, and 9.7% ($n = 29$) as another or mixed race. In terms of sexual orientation, 78.0% ($n = 234$) identified as homosexual or gay, 16.7% ($n = 50$) as bisexual, 4.0% ($n = 12$) as other, 1% ($n = 3$) as heterosexual, and 0.3% ($n = 1$) refused to answer. Data regarding employment and relationship status, as well as annual income and health care coverage is shown in Table 1.

The data indicated that the participants in this sample have been diagnosed with an HIV-positive serostatus for 9.51 years on average ($SD = 4.34$), ranging between the years 1984-2001. Of these men, 65.0% ($n = 195$) reported having been diagnosed with AIDS. Those 195 participants who reported having been diagnosed with AIDS were found to have been living with the syndrome for 6.26 years on average ($SD = 3.69$). The earliest diagnosis reported was 1984 and the latest being 2001. Based on PCR analyses the mean HIV viral load was detected at an average of 41,027.58 copies/ml ($SD = 134,246.39$) with an associated median value of 1,006.00 copies/ml. Categorically, 25.0% of the sample ($n = 75$) were found to have a viral load of 50 copies/ml or less, 13% ($n = 39$) were found to have a viral load between 51-500 copies/ml, 32.0% ($n = 96$) had a viral load between 501-5000 copies/ml, and 27.7% ($n = 83$) had a viral load of 5001 copies/ml or greater. Viral load data was missing or faulty for seven of the individuals in this sample. Viral load was found to be unrelated to years one has been living with a HIV-positive serostatus, relationship status, AIDS diagnosis, race, sexual orientation, income, and healthcare coverage.

Socioeconomic Characteristics

Table 2 provides detailed information about the health care coverage of the 300 participants. As is noted the majority of the participants were covered with public assistance programs including Medicaid, Medicare, and ADAP-Plus. Only 17.3% ($n = 52$) were insured through private coverage. For purposes of our descriptive and bivariate analyses, we trichotomized the health care coverage as follows: private coverage, coverage administered by federal government (Medicaid, Medicare, VA), and state administered coverage (ADAP-PLUS). This grouping was based on a review of the literature indicating qualitative difference in program maintenance and administration (Fisher, et al., 2004).

Type of health care coverage varied along several demographic lines. Race and ethnicity was related to the type of coverage ($\chi^2(6) = 31.57, p < .001$). Among White participants ($n = 101$), 33.7% ($n = 34$) had private insurance coverage, as compared to 12.9% ($n = 8$) of Latinos ($n = 62$) and 5.6% ($n = 6$) of African Americans ($n = 108$). Similarly, while 53.5% ($n = 54$) of Whites had a coverage administered by a federal program (Medicaid, Medicare, VA), 81.5% ($n = 88$) of African Americans and 72.6% ($n = 45$) of Latinos had this program. A higher annual income (regardless of source of income) was associated with a greater

likelihood to have private health insurance ($\chi^2(4) = 94.98, p < .001$). In addition, race and annual income were related to each other ($\chi^2(6) = 31.94, p < .001$). Among African Americans, 83.2% reported an annual income of less than 20K per year, and 78.7% of Latinos reported this income, as compared to Whites, among whom 53.5% reported annual income in this range.

Adherence to Medication

Data collected on adherence using the *MEMS*, *MEMS* after adjustment, and the self-report of adherence (all for a 2 week period) were examined. Specifically mean adherence rates using the *MEMS* was found to be 71.2% ($SD = 28.31$); adjusted *MEMS* was found to be 89.9% ($SD = 17.95$) and for the self-report mean was computed at 95.2% ($SD = 8.90$).

Results indicated that the three assessments were significantly related (all $p < .001$) and were converged to form a latent construct for the measurement model and subsequent mediational analyses. Our measures of adherence were further validated by the fact that each three of the assessment methods yielded a significant negative relationship with plasma viral load (i.e., PCR measures), which is a proxy indicator of adherence (Grossberg, et al., 2004).

Drug Use Impairment

Based on *DAST-10* scores, drug use was categorized into three typologies: non-user, user, and abuser. The majority of our sample were drug users ($n = 153, 51.0\%$). Abusers constituted 18.3% ($n = 55$), and 30.0% ($n = 90$) were categorized as non-users.

In terms of drug use, differential rates of adherence were noted among the three drug using typologies ($F(2, 274) = 3.51, p = .03$). Specifically, those classified as non-drug users reported higher levels of adherence than drug users (94.1% vs. 87.7%, $p < .01$), however drug users and drug abusers reported similar levels off adherence (87.7% vs. 89.0%), and comparable rates of adherence were noted between non-drug users and drug abusers.

Drug use classification was related to healthcare coverage with those classified as drug abusers more likely to have federal as compared to state of private coverage ($\chi^2(4) = 10.24, p = .04$). Similarly, drug abusers were more likely to have a lower annual income ($\chi^2(4) = 12.93, p = .01$). Race/ethnicity was unrelated to level of drug use.

Finally, we sought to assess the relation between the psychological/psychosocial states and drug abuse typology. These are shown in Table 3. As is noted in the table, level of drug use was related to active coping ($F(2, 297) = 4.50, p = .01$), avoidant coping ($F(2, 296) = 16.88, p < .001$), personal level HIV concerns ($F(2, 297) = 6.77, p < .001$), and tangentially to depression ($F(2, 297) = 2.55, p = .08$), and adherence guilt $F(2, 287) = 2.34, p = .09$). Drug abusers report more avoidant and less active coping, and have higher of HIV-related concerns. However, none of these factors were directly related to adherence or demographic characteristics.

The Measurement Model

After our initial explorations of bivariate relations, we undertook three measurement models to ensure that all measures in our constructs of SES, Adherence and Psychological States

adequately loaded together to form latent constructs. Because unit-weighted composites often perform better on cross-validation than empirically weighted composites (Moustaki, Jöreskog, & Mavridis, 2004), unit weighting was used to form composites of individual items or subscales. When the subscales or items making up the composites were on different measurement scales, the items or subscales were standardized prior to summation to equalize the variance and hence the weight of each in the total score. Our model was tested with SEM analyses. The test of the measurement model revealed good loadings for the indicators on the latent variables, and the overall model had a good fit $\chi^2 = 53.65$, $df = 14$, $Critical N = 163.42$; $IFI = 0.87$; $CFI = .87$, Root Mean Square Error of Approximation = 0.97, thus justifying testing the proposed relations among the latent variables.

Testing the Model

A structural equation model was then fit with commercial SEM software, LISREL (Joreskog & Sorbom, 1997) using maximum likelihood estimation. The model is shown in Figure 1. Results indicated statistically significant paths between SES and Drug Use Impairment (Beta or $\alpha = .30$, $p < .01$), SES and Adherence (Beta = .22, $p < .01$), Drug Use Impairment and Adherence (Beta = .24, $p < .01$) and Psychological States and Drug Use Impairment (Beta = .28, $p < .01$).

Further, our analyses indicated that our construct of SES was not significantly related to Psychological States, nor did it significantly mediate the relationship between Drug Use Impairment and Adherence. However, our analyses demonstrated that Drug Use did in fact, mediate the relationship between Psychological States and Adherence (Beta = 0.28, $p = 0.05$). Overall, the model fit the data well $\chi^2 = 17.53$, $df = 14$ with a ratio of 1.252, $IFI = 0.98$, $CFI = 0.98$, $RMSEA = 0.029$, $GFI = 0.99$ and $AGFI = 0.96$.

DISCUSSION

The mediation analyses we conducted sought to determine the antecedents of HIV medication adherence among gay and bisexual men. Specifically, creating latent constructs (SES, drug use impairment, psychological states, and adherence) from multiple measures, we sought to determine how adherence behavior is inflected.

The findings from our analyses demonstrate both the complex nature of HIV antiretroviral treatment adherence, as well as the multifaceted nature of factors associated with adherence to these treatments. As shown in Figure 1, adherence to treatments is directly linked to both drug use impairment and SES, and that drug use is predisposed by psychological states. Similar relationships between adherence and drug use, and adherence and health care (part of our SES latent construct) have been noted elsewhere (Halkitis, Parsons, et al, 2003; Martini et al., 2004; Mehta et al., 1997). Our mode also suggests a path between psychological states and adherence to HIV medications. While previous work has shown that such states may be linked to treatment adherence (Halkitis, Parsons, et al., 2003; Kleeberger, et al., 2001; Weiser, Wolfe, & Bangsberg, 2004), our model posits further that these psychological realities may predispose individuals to drug use and abuse and in turn make them vulnerable to poorer treatment adherence. Studies have shown that impaired judgment, short-term memory loss, and a decline in cognitive functioning are heightened

when substances are used (Bondi, Drake & Grand, 1998; Rosseli & Ardilla, 1996). These effects facilitate avoidant coping in relation to HIV/AIDS and HIV medication adherence. Dissociation, in particular, is detrimental to HIV medication adherence, as optimal adherence requires consciousness of the daily realities of this behavior.

As in our study, substance use has been shown to compromise adherence among many diverse populations (Batki & Ferrando, 1996; Freeman, Rodriguez, & French, 1996; Stone, Adelson-Mitty, Arnsten, Davenney & Schoenbaum, 2002; Turner et al., 1998; Haubrich, et al., 1998; Hirschhorn, Quinones, Goldin, & Metras, 1998). For gay men, in particular, it has been suggested that internalized homophobic states are often a great source of distress and may explain recreation drug use as a form of coping, a manifestation of depression and concern, as well as a form of escapism (Shidlo, 1994). Those who utilize avoidant coping strategies (e.g., isolation from others, sleep, food indulgence, have sex, become a workaholic) may be less inclined to take an active role in their medication management. Instead, these individuals may choose to escape the stressors and reminders related to being HIV-positive (Halkitis & Kirton, 1999).

Certainly there are both direct and indirect effects of drug use and abuse on adherence including exacerbated side effects, using drugs to escape anxiety surrounding AIDS and homophobia, and the burdens of poverty that are often related to substance use. Essentially, the health seeking behaviors that are central to optimal adherence are dramatically impacted by the dynamics of poverty, health care and substance use, where HIV-positive substance users and abusers are predisposed to vulnerabilities such as HIV-related concerns, depression and guilt as well as to less effective coping strategies. These social and economic realities better explain disparities in adherence rates than do race and ethnicity alone. Implicated by these findings is the pivotal role of substance use interventions as a component of adherence management.

Limitations

The results presented in this paper are based solely on the baseline assessments of a larger longitudinal study that included eight assessment points over the course of twelve months. The cross-sectional nature of these data fails to capture historical and developmental changes, which would better inform a more holistic understanding of treatment adherence.

Furthermore, as in most studies involving self-report, measures must be considered with caution. In addition, the measurement of adherence is complex, and there is no gold standard for assessing this behavior (Liu et al. 2001). However, the use of multiple measures to create a latent construct for adherence overcomes the short-coming of any single method of measurement. In our study, adherence was assessed by both self-report and the *MEMS* tracking system and are elements of the latent construct of adherence used in our analysis. The same rationale can be applied when considering our latent construct of psychological states, which is compromised of numerous standardized self-report measures. Only drug use impairment is measured by a single measure, the *DAST-10*.

Finally, a limitation of the study is that a convenience sample was utilized. In addition, data were collected from a major metropolitan area and it is unclear if similar results would emerge from samples obtained in other geographic areas.

CONCLUSIONS

As we have shown, adherence to HIV antiretroviral treatments is affected by an array of social realities in people's lives. Thus, it is imperative for practitioners working with the HIV-positive population to clearly understand these social factors that may both impede and facilitate adherence behavior. To this end, careful assessments of psychological and social states should complement biomedical data in decision-making about treatment prescription as well as success of treatments.

Counseling individuals who are on HIV treatments requires that the clinician consider the totality of the person's life, as this behavior cannot be separate from an individual's socioeconomic state, drug using behavior, or psychological state. Adherence to treatment needs to be considered from a contextualized perspective, paying attention to the numerous factors which may predispose people to be adherent (Wagner & Ryan, 2004). Finally, such interventions must be culturally and developmentally appropriate in order to be effective. As such, models such as those implemented through Motivational Interviewing techniques (Miller & Rollnick, 2002) may be effective in tailoring counseling interventions to facilitate individuals' abilities to develop internal motivations and cues for treatment adherence.

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FIGURE 1.
Mediation Model to Explain HIV Treatment Adherence

TABLE 1

Characteristics of Study Participants (N = 300)

	N	%
Employment Status		
Disability	125	41.7%
Disability & working off books	46	15.3%
Employed part-time	42	14.0%
Employed full-time	31	10.3%
Unemployed non-student	30	13.0%
Unemployed student	17	5.7%
Total	300	100.0%
Annual Income		
Less than \$10,000	115	38.3%
\$10,000 to \$19,999	97	32.3%
\$20,000 to \$29,999	31	10.3%
\$30,000 to \$39,999	23	7.7%
\$40,000 to \$49,999	15	5.0%
\$50,000 to \$74,999	11	3.7%
\$75,000 or more	6	2.0%
Refuse to Answer	1	.35%
Not Applicable	1	.35%
Total	300	100.0%
Relationship Status		
Single	198	66.0%
Currently in a relationship	102	34.0%
Total	300	100.0%
Health Care Coverage		
Medicaid/Medicare	204	68.0%
Private	52	17.3%
ADAP ⁺	41	13.7%
Other	3	1.0%
Total	300	100.0%

TABLE 2

Health Care Coverage of Participants

Program	n	%
Private—Indemnity/POS	25	8.3%
Private—HMO	27	9.0%
Medicaid	130	43.3%
Medicaid HMO	13	4.3%
Medicare	57	19.0%
Medicare HMO	4	1.3%
ADAP +	41	13.7%
VA Benefits	3	1.0%

TABLE 3

Drug Use in Relation to Mean Scores on Psychosocial/Psychological States

	Drug Use Typologies		
	Non-User (n = 90)	User (n = 153)	Abuser (n = 55)
Active Coping *	14.04 (6.18)	12.03 (5.46)	13.87 (4.98)
Avoidant Coping **	4.97 (2.75)	7.22 (3.16)	7.3 (3.52)
Adherence Guilt	9.12 (8.12)	10.49 (8.00)	12.11 (7.66)
Depression	10.50 (8.17)	10.26 (7.54)	13.05 (9.19)
HIV-Concerns			
Quality of Life **	58.08 (28.45)	59.67 (25.11)	73.56 (27.24)
Infection Related	7.61 (4.96)	7.73 (4.60)	9.07 (5.20)

*
p .01**
p .001