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Longitudinal Relationships Between Antiretroviral Treatment Adherence and Discrimination Due to HIV-Serostatus, Race, and Sexual Orientation Among African–American Men with HIV

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Abstract

African–Americans show worse HIV disease outcomes compared to Whites. Health disparities may be aggravated by discrimination, which is associated with worse health and maladaptive health behaviors. We examined longitudinal effects of discrimination on antiretroviral treatment adherence among 152 HIV-positive Black men who have sex with men. We measured adherence and discrimination due to HIV-serostatus, race/ethnicity, and sexual orientation at baseline and monthly for 6 months. Hierarchical repeated-measures models tested longitudinal effects of each discrimination type on adherence. Over 6 months, participants took 60% of prescribed medications on average; substantial percentages experienced discrimination (HIV-serostatus, 38%; race/ethnicity, 40%; and sexual orientation, 33%). Greater discrimination due to all three characteristics was significantly bivariately associated with lower adherence (all p 's < 0.05). In the multivariate model, only racial discrimination was significant ($p < 0.05$). Efforts to improve HIV treatment adherence should consider the context of multiple stigmas, especially racism.

Keywords

Adherence; Black/African–American race/ethnicity; Discrimination; HIV/AIDS

Introduction

High levels of treatment adherence are critical for people with HIV to benefit from antiretroviral medications, and to remain free from opportunistic infections resulting from a compromised immune system [1,2]. Nevertheless, a substantial number of people with HIV do not achieve optimal adherence levels. For example, research has found mean adherence rates of 67% of prescribed doses over 6 months [3]. Moreover, large racial/ethnic disparities exist: African–Americans with HIV have lower rates of antiretroviral adherence than do Whites with HIV

[4-7]; African-Americans who are nonadherent experience worse disease outcomes (i.e., virological failure) compared to Whites with similar levels of nonadherence [8]; and African-Americans on antiretroviral treatment are less likely to achieve viral suppression than are Whites on antiretroviral treatment [9]. Thus, identifying reasons for treatment nonadherence among African-Americans in particular is critical for determining ways to improve their long-term health outcomes and ultimately to narrow disparities.

Perceived discrimination may be one potential explanation for low levels of treatment adherence and worse disease outcomes among African-Americans with HIV. As hypothesized by biopsychosocial models treating discrimination as a stressor [10-13], chronic discrimination may increase detrimental stress responses related to poor self-control, such as maladaptive coping and poor health behaviors. In addition, perceptions of unfair treatment against one's group may foster mistrust of public health entities and other societal institutions, including suspicion of public health messages and medical treatments [14,15]. Accordingly, a recent meta-analysis documented significant effects of perceived discrimination on poor physical health and health behaviors [16]. In particular, HIV-related discrimination and internalized HIV stigma (i.e., feelings of judgment and blame associated with cultural stereotypes about HIV) have been associated with a lower likelihood of medication adherence [17,18]. Furthermore, analysis of a nationally representative sample of people in care for HIV found that perceptions of mistreatment in health care are substantial (reported by 26%) [19] and are related to lower perceptions of medication efficacy, which in turn are associated with lower treatment adherence [20]. People with HIV may not adhere because they fear inadvertent serostatus disclosure, and consequent discrimination, from others observing their medication taking or seeing their medication bottles [21-23].

In addition to HIV-serostatus, people with HIV are likely to have several stigmatized characteristics that elicit discrimination, including African-American or Latino race/ethnicity and gay sexual orientation; they also may experience prejudice from others' assumptions that they have engaged in stigmatized sexual and substance use behaviors associated with contracting HIV (e.g., sex work, injection drug use) [24-27]. HIV-positive Black men who have sex with men in particular are at the nexus of three stigmatized co-occurring categories related to HIV-serostatus, race/ethnicity, and sexual orientation. However, only a few small studies have examined the effects of the layering of stigma from multiple devalued social categories. In a study of 57 people with HIV (47% Black), perceived racism was the only significant correlate of self-reported antiretroviral treatment nonadherence in multivariate analyses controlling for discrimination due to HIV-serostatus and sexual orientation [28]. A study of 101 people with HIV (45% Black) found that perceived discrimination in health care due to social class was significantly associated with self-reported antiretroviral treatment nonadherence and missed medical appointments, whereas perceived discrimination due to race/ethnicity was not significantly related to either HIV care measure [29].

In the present study, we investigated the simultaneous effects of discrimination from HIV-serostatus, race/ethnicity, and sexual orientation among HIV-positive Black men who have sex with men. We hypothesized that racism would have more powerful effects on nonadherence than would discrimination based on HIV-serostatus and sexual orientation. In general, visible stigmas such as race/ethnicity elicit more discrimination than stigmas that can be concealed, such as HIV-serostatus and sexual orientation [30]. Thus, others are more likely to be aware of (and therefore discriminate based on) a person's race/ethnicity. No prior research has examined whether discrimination and adherence covary over multiple time-points, or investigated such longitudinal effects for multiple types of discrimination simultaneously. Such information is useful for the design of stigma reduction interventions, which tend to focus on only one type of stigma at a time, as well as for interventions to reduce racial/ethnic disparities in treatment behaviors and health among people with HIV.

Methods

Participants and Procedure

As described in a prior publication [15], participants were recruited via flyer dissemination at three HIV social service agencies and an HIV medical clinic in Los Angeles, CA, over 2 years, from January, 2007 to February, 2009. The flyers advertised a study of “HIV treatment attitudes and behaviors” for African–American/Black men with HIV aged 18 and older on antiretroviral treatment. Interested individuals completed telephone eligibility screenings. Informed consent was obtained from all study participants prior to study inclusion. The institutional review boards of Children’s Hospital Boston, RAND Corporation, and Charles Drew University of Medicine and Science approved all study procedures. A federal Certificate of Confidentiality was obtained. All study procedures were in accordance with the ethical standards of the responsible committee on human experimentation and the Helsinki Declaration of 1975, as revised in 2000.

At baseline, participants completed an audio computer-assisted self-interview measuring discrimination events due to HIV-serostatus, race/ethnicity, and sexual orientation in the past year, as well as socio-demographics that have been associated with medication adherence in prior research [31-34]. To enable examination of the relationship between discrimination and adherence over time, participants returned monthly for 6 months following the baseline assessment to report any new discrimination events and for study staff to download electronic medication adherence data (described below). Participants received \$30 for the baseline assessment and \$20 for each follow-up assessment; participants who completed all seven assessments were given an additional \$30 bonus.

Measures

Socio-Demographic Characteristics—Participants reported date of birth, education (i.e., highest degree earned), income, employment, sexual orientation, and housing status. Education was dichotomized into low (less than high school diploma) versus high school diploma or greater than high school; annual income into low (<\$5000) versus \$5000 or more annually; employment into employed full/part-time versus unemployed, on disability, retired, or in school; sexual orientation into heterosexual versus other categories (i.e., gay/same-gender loving, bisexual, not sure or in transition, something else, or don’t know); and housing status into stable (rent or own home or apartment; subsidized housing) versus unstable (homeless, living rent-free with friend/relative, residential treatment facility, temporary/transitional housing).

Discrimination—Perceived discrimination was measured with the Multiple Discrimination Scale (MDS), which has strong construct validity and reliability (Bogart et al., Discrimination and health among HIV-positive black men who have sex with men, under review). Participants were asked whether they experienced 10 different discrimination events in the past year, with response options “yes” and “no.” Items cover violence (verbal, physical, property; e.g., “In the past year, were you physically assaulted or beaten up because someone thought that you were gay?”); institutional discrimination (employment, housing, health care; e.g., “In the past year, were you denied a job or did you lose a job because you are Black/African–American?”), and interpersonal discrimination (from close others, partners, strangers, in general; e.g., “In the past year, were you ignored, excluded, or avoided by people close to you because someone knew or suspected that you are HIV-positive?”). The Multiple Discrimination Scale uses parallel items (10 items each) to capture discrimination due to African–American/Black race/ethnicity (MDS-Black; $\alpha=0.83$), HIV-serostatus (MDS-HIV; $\alpha=0.85$), and sexual orientation (MDS-Gay; $\alpha=0.86$). All three Multiple Discrimination Scale subscales have shown strong concurrent validity (Bogart et al., Discrimination and health among HIV-positive black men

who have sex with men, under review): they have been significantly associated with validated discrimination and internalized stigma measures from prior research [12,35-37], as well as physical health (i.e., AIDS symptoms). The number of endorsed events was summed for each subscale separately. The Multiple Discrimination Scale was administered at baseline to assess discrimination events in the past year and at all six monthly follow-up assessments to assess discrimination in the past month (approximately since the last assessment).

Procedures for Electronic Monitoring of Adherence

Participants were required to bring their medication bottles to the baseline assessment, which allowed the interviewer to select one medication for which to measure antiretroviral treatment adherence electronically for 6 months post-baseline. Adherence was electronically monitored using the Medication Event Monitoring System (AARDEX, Inc., Zurich, Switzerland), which consists of bottle caps that record the times when bottles are opened. Electronic monitoring software yields detailed reports of daily medication-taking patterns and calculates the percentage of total scheduled doses actually taken in a format suitable for conversion to a statistical analysis package. We monitored adherence to the medication with the most complex regimen only [38]. Participants were instructed to refill the bottle after they removed the last pill.

Participants' electronic adherence data were downloaded at each monthly follow-up session. Participants completed a short questionnaire assessing whether (and how often) they opened the bottle without removing a dose, took a dose from a source other than the bottle with the electronic cap, and removed multiple doses from the bottle at a time over the past month. We used responses to adjust electronic adherence scores to more accurately reflect actual pill taking behavior [39]. We examined continuous adherence (average percentage of prescribed doses taken for 6 months post-baseline).

Statistical Analysis

A hierarchical repeated-measures analysis of variance model was used to test the relationship between discrimination and adherence; a spatial-power covariance structure [40] accounted for uneven spacing of follow-up assessments (because participants did not tend to return exactly 1 month later for each follow-up visit, and the time in between follow-up assessments varied slightly between participants). We first used bivariate models to test the effects of each type of discrimination (HIV-serostatus, race/ethnicity, and sexual orientation) on adherence over time separately. A full multivariate model tested whether all three types of discrimination (including all main effects and two- and three-way interactions) were simultaneously associated with adherence over time, controlling for baseline self-reported discrimination, number of follow-up time-points completed, number of days since the baseline interview, and socio-demographic baseline characteristics (age, income, employment status, and housing status). To facilitate interpretation of the coefficients, discrimination scales were centered around the grand mean of discrimination scores across all participants' follow-up assessments [41].

Results

Participant Characteristics

A total of 214 participants were interviewed, of whom 85% ($n=181$) reported ever having sex with men. Of the 181 men who have sex with men at baseline, 152 (84%) had sufficient longitudinal data for analysis (i.e., self-reported adherence and discrimination at baseline as well as electronic adherence data and discrimination responses for at least one follow-up wave). Of these 152 individuals, 90% participated in follow-up 1, 77% in follow-up 2, 70% in follow-up 3, 68% in follow-up 4, 66% in follow-up 5, and 69% in follow-up 6. Participants who did

not return for at least one follow-up did not differ from other participants on discrimination reports or nonadherence (all p values >0.05). All analyses reported in this paper are based on the subsample of 152 men who have sex with men. The sample size was chosen to ensure adequate statistical power to detect medium effect sizes for the relationships of discrimination with nonadherence over time.

Participants averaged 44 years old ($SD=9$). Many (40%) had annual incomes of less than \$5,000, 85% were unemployed, and a fifth had a high school degree or less. Less than half (45%) were living in an owned or rented home, and 11% were in subsidized housing. Others were living in temporary or transitional housing, such as a rehabilitation facility (22%); with a friend or relative (14%); in another type of unspecified situation (1%); or were homeless (6%). Although all reported sex with men in their lifetime, 13% identified as heterosexual, 62% identified as gay, 22% as bisexual, and 3% as not sure, in transition, or “other.”

Over the 6-month time-period of the study, average electronically monitored adherence was low (60%; $SD=29\%$; range, 0-99%), and substantial percentages experienced any discrimination related to HIV-serostatus (38%), race/ethnicity (40%), and/or sexual orientation (33%). Over 6 months, participants averaged <1 discrimination event on each subscale [MDS-Black mean (SD)= 0.53 (1.39); MDS-HIV mean (SD)= 0.47 (1.43); and MDS-gay mean (SD)= 0.60 (1.58)]. The three Multiple Discrimination Scale subscales were highly correlated with each other: MDS-Black with MDS-HIV= 0.76 ; MDS-Black with MDS-Gay= 0.77 ; and MDS-HIV with MDS-Gay= 0.84 (all p values <0.0001). Sexual orientation was not significantly associated with any of the discrimination subscales at baseline or follow-up (all p values >0.05).

Bivariate and Multivariate Tests of the Effects of Discrimination on Adherence Over Time

We first conducted bivariate repeated-measures tests of the relationship between each discrimination type and adherence separately. In these models, participants who experienced more discrimination related to HIV-serostatus [b (SE)= -1.2 (0.6), $p<0.05$], race/ethnicity [b (SE)= -2.0 (0.7), $p<.01$], or sexual orientation [b (SE)= -1.7 (0.8), $p<.05$] during the follow-up period showed lower adherence to their medication regimens.

As shown in Table 1, in a multivariate hierarchical repeated-measures model testing main and interactive effects of each discrimination type, only racial discrimination was significantly associated with nonadherence over time. Participants who experienced a greater amount of racial discrimination during the 6-month follow-up period took a lower percentage of their prescribed medication doses over those 6 months. The significant covariate main effects indicated that participants' adherence significantly decreased over time; participants who completed more assessments exhibited greater adherence; and lower education was related to higher adherence.

Figure 1 shows the relationship between adherence and racial discrimination during each of the six follow-up periods. For each time interval, racial discrimination is shown as trichotomized into no discrimination, low levels of discrimination (one to two discrimination events), and high levels of discrimination (three or more discrimination events). The figure suggests that, during each time interval, those who experienced high levels of discrimination had worse adherence than did those who experienced low levels of discrimination, or who did not experience any discrimination. Furthermore, those who experienced low levels of discrimination generally showed lower adherence than did those who did not experience any discrimination. Across time intervals, average adherence was 64% for participants who did not report any racial discrimination, 58% for participants who reported low levels of racial discrimination, and 48% for participants who reported high levels of racial discrimination.

Discussion

The present study extends prior work by examining temporally proximate reports of both discrimination and adherence over multiple time-points, and investigating the effects of three types of co-occurring stigmas among Black men who have sex with men. Consistent with prior research supporting an association between discrimination and adherence [17,18,28,29], a greater number of discrimination experiences were associated with worse treatment adherence over 6 months.

Our findings indicate the value of considering discrimination in the context of other potential stigmas. In longitudinal bivariate models testing each type of discrimination separately, all three types of discrimination (due to HIV-serostatus, race/ethnicity, and sexual orientation) were significantly associated with nonadherence. In the full model containing main and interactive effects of all three discrimination types on nonadherence, only racial discrimination was significant. Thus, researchers who consider one type of discrimination in isolation may miss other key discrimination-related determinants of health and health behaviors. In particular, findings from the sizable HIV stigma literature may need to be re-examined to determine whether new insights would be gained from including other types of stigma in conceptual and analytic models.

The effects of racial discrimination were more robust than were the effects of HIV-serostatus and sexual orientation discrimination. Because race/ethnicity is typically more visible than is HIV-serostatus or sexual orientation, men may have been more vulnerable to racial stigma. Due to the highly stigmatized nature of HIV and gay sexual orientation, especially in African-American communities [42-44], some men may choose to hide their serostatus and sexual orientation from others, and consequently would experience less discrimination from these characteristics.

The present study has implications for stigma- and prejudice-reducing interventions, many of which have focused solely on one type of stigma [45-48]. Such interventions have included reducing stigma among people in the general public, and helping people with a stigmatized characteristic cope with distress from discrimination. Interventions that focus on reduction of one type of stigma may be ineffective if they do not take into account the context of discrimination in which that stigma is embedded. In particular, HIV stigma reduction interventions need to address stigma related to race/ethnicity as well in order to be most effective in African-American communities.

Our findings also have implications for interventions to improve adherence among Black men with HIV. Insufficient attention to cultural factors may be contributing to the lack of success in some adherence interventions. To our knowledge, no randomized controlled intervention trial has been published that addresses culturally relevant constructs such as discrimination to improve adherence among Black men who have sex with men. Randomized controlled trials of adherence interventions that address the full range of discrimination-related stressors in African-Americans' lives are critical for improving adherence levels. Interventions that fail to openly address the causes of stigma are unlikely to meet African-Americans' unique cultural needs and thus may be ineffective.

Interpretation of our results must be considered through the lens of potential limitations. We recruited a convenience sample, and results may not reflect the experiences of the population of HIV-positive African-American men in the USA. Discrimination was perceived rather than objectively observed, and thus reports of discrimination or attributions of unfair treatment to HIV-serostatus, race/ethnicity, or sexual orientation may not be accurate. However, our focus is primarily on perceptions of unfair treatment, which, regardless of validity, act as stressors with important consequences for health behavior and health outcomes. In addition, results

indicated worse adherence over time, which may be a reflection of a natural waning of adherence that has been observed in other studies [49], or alternately may be indicative of assessment reactivity. Nevertheless, the correlation between discrimination and nonadherence was maintained throughout the study period, suggesting that the measurement may have affected the absolute level of adherence, but not its relationship with discrimination.

Another limitation is related to potential measurement error. Correlations among the Multiple Discrimination Scale subscales were high, possibly due to response bias: the subscales used nearly identical item wording and shared the same response scales. Although measurement error may be a factor in similar responses across subscales, the overall pattern of results suggests that participants' responses reflected their actual experiences. For example, the results of the present analysis and prior research (Bogart et al., Discrimination and health among HIV-positive black men who have sex with men, under review) indicate that the different Multiple Discrimination Scale subscales have unique relationships with outcomes related to health behavior and health outcomes. These data suggest that each discrimination subscale measures a distinct discrimination construct that does not overlap with the other discrimination subscales.

In sum, previous literature shows reliable relationships between discrimination and health behavior. However, most prior work has focused on one stigma at a time rather than multiple co-occurring stigmas. Using nonadherence as an example, the present data demonstrate that, for African-American men with HIV, consideration of the context of race-related stigma is critical for understanding the effects of discrimination on health behavior.

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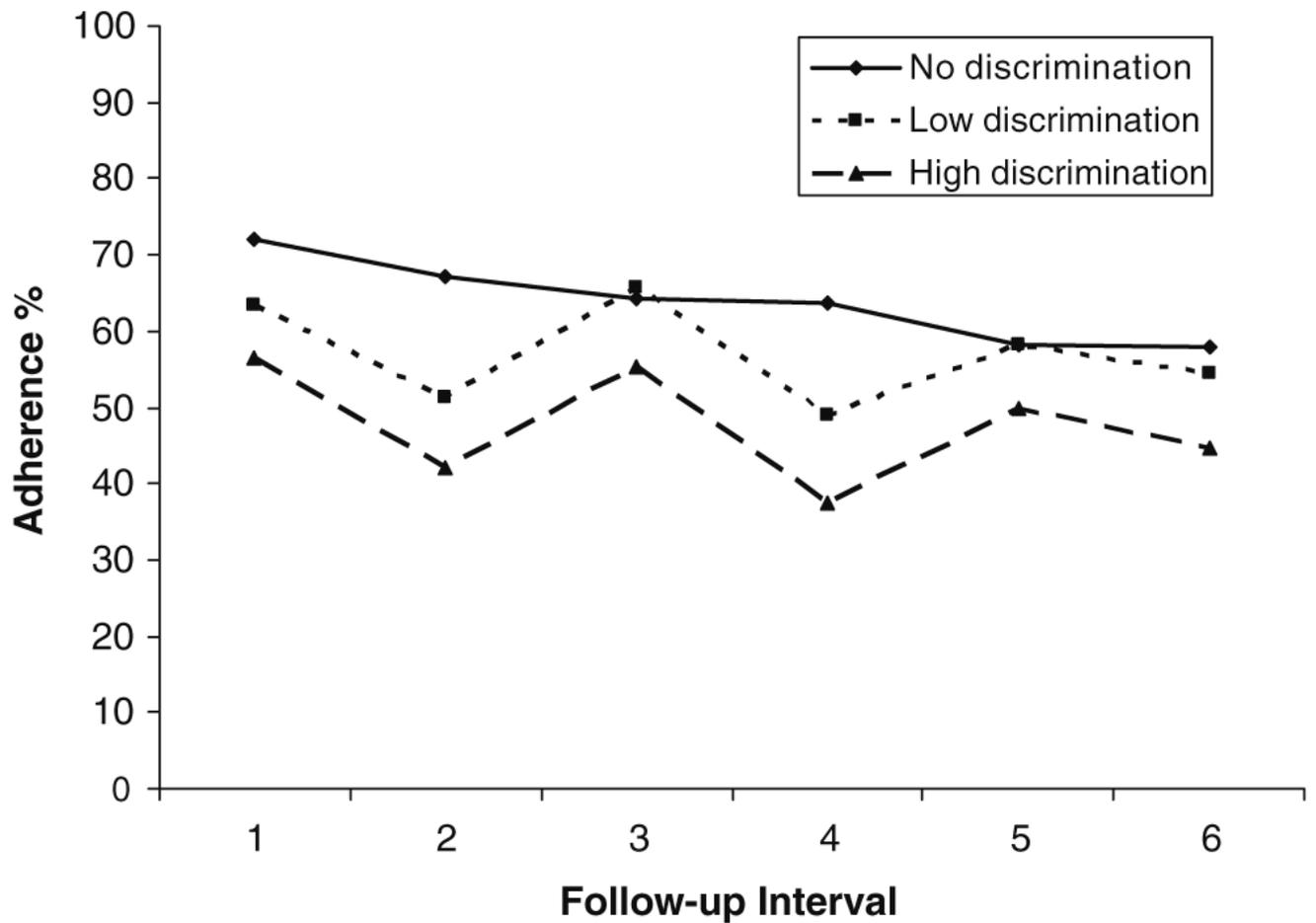


Fig. 1. Adherence percentage by racial discrimination during each time interval among 152 Black men who have sex with men. Low discrimination=1–2 instances within a time interval; high discrimination=3 or more instances within a time interval

Table 1

Multivariate repeated-measures model testing longitudinal main and interactive effects of each discrimination type on electronically monitored adherence among 152 black men who have sex with men

	Adjusted <i>b</i> (<i>SE</i>)
Discrimination main effects	
HIV	2.5 (1.7)
Race	-4.0 (1.3)**
Sexual orientation	-1.6 (2.1)
Discrimination interactions	
Race × HIV discrimination	0.4 (0.5)
Race × gay discrimination	1.1 (0.6) ⁺
HIV × gay discrimination	-0.6 (0.4) ⁺
Race × HIV × gay discrimination	-0.1 (0.1)
Time (in days)	-0.1 (0.0)***
Number of assessments completed	4.1 (1.3)**
Baseline values	
Discrimination	
HIV ^a	-1.3 (1.8)
Race ^a	0.6 (1.6)
Sexual orientation ^a	0.1 (1.7)
Socio-demographic characteristics	
Age	0.1 (0.3)
Education (low)	15.1 (4.3)***
Income (low)	-4.0 (4.2)
Housing status (stable)	-2.8 (4.2)

⁺ $p < 0.10$

** $p < 0.01$

*** $p < 0.001$

^a Self-reported discrimination in past year at baseline