## POPULATIONS AT RISK

# Does Racial Concordance Between HIV-positive Patients and Their Physicians Affect the Time to Receipt of Protease Inhibitors?

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**BACKGROUND:** Compared to whites, African Americans have been found to have greater morbidity and mortality from HIV, partly due to their lower use of effective antiretroviral therapy. Why racial disparities in antiretroviral use exist is not completely understood. We examined whether racial concordance (patients and providers having the same race) affects the time of receipt of protease inhibitors.

**METHODS:** We analyzed data from a prospective, cohort study of a national probability sample of 1,241 adults receiving HIV care with linked data from 287 providers. We examined the association between patient-provider racial concordance and time from when the Food and Drug Administration approved the first protease inhibitor to the time when patients first received a protease inhibitor.

**RESULTS:** In our unadjusted model, white patients received protease inhibitors much earlier than African-American patients (median 277 days compared to 439 days; $P < .0001$). Adjusting for patient characteristics only, African-American patients with white providers received protease inhibitors significantly later than African-American patients with African-American providers (median 461 days vs. 342 days respectively; $P < .001$) and white patients with white providers (median 461 vs. 353 days respectively; $P = .002$). In this model, no difference was found between African-American patients with African-American providers and white patients with white providers (342 vs. 353 days respectively; $P > .20$). Adjusting for patients' trust in providers, as well as other patient and provider characteristics in subsequent models, did not account for these differences.

**CONCLUSION:** Patient-provider racial concordance was associated with time to receipt of protease inhibitor therapy for persons with HIV. Racial concordance should be addressed in programs, policies, and future racial and ethnic health disparity research.

**KEY WORDS:** HIV; African Americans; quality of health care; physician-patient relations.
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**M**ortality rates from acquired immunodeficiency syndrome (AIDS) is much higher among African Americans than among whites.[1,2] This disparity is partly due to the fact that African Americans are less likely than whites to receive HIV medications.[3–9] Understanding why disparities in the use of antiretroviral medications exist may lead to improved treatment and outcomes of HIV in African Americans.

Previous studies have shown that income, health insurance, and severity of HIV disease only partly explain racial disparities in antiretroviral use.[8,10–13] One unexplored explanation is that aspects of the patient-provider relationship may influence racial disparities in HIV care. Specifically, African-American patients cared for by providers of the same race (race concordant) report greater participation and satisfaction with their provider than those with white providers (race discordant).[14–17] This may explain why African Americans in racially concordant relationships are also more likely to use preventive care,[17] and less likely to delay seeking care.[18] Thus, we hypothesize that race concordance may also explain why African Americans are less likely than whites to receive antiretroviral treatment.

We set out to examine whether African Americans who have providers of the same race are more likely to receive protease inhibitor therapy than those in racially discordant provider relationships. This is an important issue to study in HIV because the timely receipt of antiretroviral medications can have a profound impact on clinical outcomes. We examined data from the HIV Cost and Services Utilization Study (HCSUS), a cohort study of a nationally representative sample of HIV-infected adults receiving medical care and their providers.

## METHODS

### Study Population

Full details of the HCSUS sampling design are presented elsewhere.[19,20] In brief, the reference population was persons at least 18 years old with known HIV infection who made at least one visit, in the context of regular or ongoing care, to a nonmilitary, nonprison medical provider (other than an emergency department) in the contiguous United States, during the period January 5 to February 29, 1996. The HCSUS used a 3-stage sampling design, in which geographical areas, medical providers, and patients were sampled. In the first stage, we sampled 28 metropolitan areas and 25 clusters of rural counties within the United States. In the second stage, we sampled a total of 148 urban and 51 rural providers. In the third stage, we sampled patients from de-identified lists of all eligible patients who visited participating providers during January and February of 1996.

Of the 4,034 subjects who were sampled, 2,864 (71%) individuals completed the baseline survey. All participants gave informed consent and interviews were usually conducted in person. Respondents (2,466; 86.1% of the baseline cohort) completed the first follow-up survey and 2,267 persons (84.5% of baseline) completed the second follow-up survey. The median time from baseline to the second follow-up interview was 15 months, during which time 238 (8%) patients died and 359 (12%) were not located or did not cooperate with follow-up interviews.

To select providers for participation in the provider survey, patients in the first follow-up survey were asked to identify the provider that was most important to their HIV care. Of the 2,466 patients, 222 (9%) were unable to identify a provider. Of the 692 providers identified through this method, 551 had a confirmed identity, location, and mailing address. Each of these providers was mailed a self-administered written questionnaire, which was completed in 1998, approximately the same time as completion of the second follow-up patient interview. A total of 412 providers completed the questionnaire with a response rate of 75%. For this study, we excluded patients who did not have an identified provider or whose provider did not complete the survey. We also excluded 5 providers because they were nurses, 5 providers because their patients were dropped from the baseline survey, and 6 providers with missing key data. Finally, we excluded any patients or providers whose racial or ethnic group was not African American or white. Thus, for our analysis, there was a final "patient-provider sample" that included 1,241 (43%) of the baseline HCSUS cohort with linked data from 287 providers.

### Outcome Variables

At baseline and follow-up, subjects were asked which antiretrovirals medications they had used, and for protease inhibitors, when they began using the medication (see Appendix available online at http://www.jgim.org). From this information, we constructed a variable representing time of first protease inhibitor use. Time 0 was set as the earliest date that a protease inhibitor could have been prescribed, which was December 6, 1995 (the date when Saquinavir, the first protease inhibitor, was approved by the Food and Drug Administration [FDA]). Some individuals reported using protease inhibitors before this date, perhaps receiving the medication through a clinical trial. For these individuals, time to protease inhibitor use was set to a small positive number (i.e., 0.01). All patients in our cohort were HIV positive and enrolled in the study after the FDA's approval date and were therefore eligible for protease inhibitor therapy if they met prescribing guidelines for protease inhibitors during the course of the study.

### Independent Variables

All independent variables were measured at baseline. There were 3 groups of independent variables: patient-provider racial pairs, patient characteristics, and provider characteristics.

*Patient-Provider Racial Pairs.* To assess race/ethnicity, patients and providers were asked, "Which of these would you say is your main racial or ethnic group?" The response options were non-Hispanic white, non-Hispanic African American, Hispanic, American Indian or Alaskan Native, Asian or Pacific Islander, mixed race, or some other single race. We focused the racial and ethnic comparisons on African Americans and whites because there were too few cases for comparison among the other racial and ethnic groups. We then constructed 4 analytic categories: African-American patients with African-American providers, African-American patients with white providers, white patients with African-American providers, and white patients with white providers.

*Patient Characteristics.* From the baseline survey, information was collected regarding patient's age, gender, highest educational level completed, annual family income, insurance status (private fee-for-service, private managed care, Medicaid, Medicare, and uninsured), geographic region (Northeast, Midwest, South, and West), type of HIV exposure, and baseline CD4 count (500+, 200–499, 50–199, and less than 50). A previously derived symptom index was included to assess severity of illness, with a higher score reflecting more symptoms reported by the patient (range 0 to 86).[21] We assessed heavy alcohol use and drug dependency in the last year using previously validated questions.[8,22]

Self-reported access to care was measured using a previously developed 6-item scale.[23] Patients were asked to rate from strongly agree to strongly disagree statements regarding whether they could get admitted to the hospital without any trouble, could get emergency medical care, had to go without needed medical care because it was too expensive, had easy access to medical specialists, could get medical care whenever needed, and whether places to get medical care were conveniently located.

To assess patient attitudes toward their care, we asked patients to rate the quality of their medical care during their last visit to their physician or clinic, using an excellent, very good, good, fair, and poor response scale.[24] We dichotomized individuals between those who rated their care as fair or poor versus good to excellent. Based on a published measure of patient's trust in their provider, we used a scale created from 2 questions. One question asked patients how much they trust their doctor or clinic to provide them with high-quality medical care. The second question asked patients how much they trust their doctor or clinic to make their health care a top concern.[25] The 5 response options for the 2 items were completely, mostly, somewhat, a little, and not at all. We dichotomized the trust variable at the median, which because of the skewed distribution of the responses resulted in dichotomizing those who said "completely" to both questions (more trust) versus all others (less trust). Patients were also asked whether they believed that antiretrovirals were worth taking using a strongly agree to strongly disagree response scale. Similar to our method for the trust variable, we dichotomized these individuals into those who agree versus those who disagreed.

***Provider Characteristics.*** We asked providers about their gender, years of experience as a provider, clinical specialty (general medicine and family practice, infectious disease, and nurse practitioner/physician assistant), whether they defined themselves as an HIV specialist, number of HIV patients in their practice, and patient mix. HIV knowledge was assessed by a previously developed measure of 11 true-false questions about HIV treatment and was calculated based on the percent answered correctly.[26] Type of practice setting (private university, public university, public facility, or private setting) was derived from information on the specific location where the physician practiced and from information obtained through the sampling process. Patient mix was derived from a set of questions asking providers to estimate the proportion of their patients who had various HIV exposure risk factors. Providers had a practice primarily of injection drug users, for example, if they indicated that more than 50% of their patients were injection drug users. Patient-mix categories were injection drug users, men having sex with men, heterosexuals, none (less than 50% listed for all categories), and mixed (more than 50% listed for more than one category). We also asked providers whether they believed that many of their patients cannot adhere to protease inhibitor regimens, whether antiretrovirals should be delayed or withheld for nonadherent patients, and whether they preferred not to treat intravenous drug users, using a 5-point response scale from strongly agree to strongly disagree.

## Analysis

First, we performed bivariate comparisons of patient and provider characteristics among the 4 patient-physician racial pairs. We used $\chi^2$ statistics for comparing proportions, weighted to account for the complex sampling methods.

We used parametric time-to-event models to analyze the effect of racial concordance on time to first protease inhibitor use. We controlled for potential confounders using 4 staged models in which sets of covariates were progressively added at each stage. The first stage was unadjusted and included only the 4 patient-provider race groups as independent variables. In the second stage, we added to the model patient characteristics, which were age, gender, income, highest educational level completed, type of insurance, self-reported access to care, geographic region, HIV exposure, CD4 count, symptom index, and drug dependence or heavy alcohol use in the past year. The third stage model additionally controlled for provider characteristics: gender, years in practice, medical specialty, HIV expertise, HIV knowledge, patient caseload, practice setting, patient mix, belief that patients cannot adhere to antiretrovirals, preference not to treat injection drug users, and belief that antiretroviral should be withheld or delayed for nonadherent patients. The fourth stage additionally controlled for factors related to patients' attitudes toward their physician and their care. These attitudes were patients' rating of their medical care, trust in the provider, and the belief that antiretrovirals are worth taking.

For all comparisons, standard errors and statistical tests were adjusted for the complex sampling design and weighting scheme using linearization methods available in Stata (Stata Corporation, College Station, Tex). We used bootstrapping to estimate confidence intervals for predicted median times to first protease inhibitor use.[27]

## RESULTS

### Patient Characteristics

Of the 1,241 patients, 61% (803) were white with white providers, 32% (341) were African-American with white providers, 6% (86) were African-American with African-American providers, and less than 1% (11) were white with African-American providers (Table 1). Compared to other patients, African-American patients with African-American providers were most likely to be female (41.0%, $P < .0001$), have less than a high school education (37%, $P < .0001$), have annual incomes less than \$10,000 (75%, $P < .0001$), have Medicaid insurance (43%), and live in the southern United States (64%, $P < .02$). In contrast, white patients with white providers were most likely to have graduated from college (30%), have an annual income of more than \$25,000 (45%), have any health insurance (87%), have homosexual intercourse as their primary HIV exposure risk (66%), and live in the western United States. (46%). Self-reported access to care was lowest among African-American patients with white providers ($P = .0001$). Patients in the 4 different patient-provider race groups were similar with regard to their age distribution, recent drug or heavy alcohol use, lowest reported CD4 count, symptom burden, overall ratings of their medical care, trust in their provider, and the proportion believing that antiretrovirals are worth taking.

#### Table 1. Weighted Comparison of Patient Characteristics Stratified According to Patient-Provider Race Groups

| | White Providers | | African-American Providers | | |
| --- | --- | --- | --- | --- | --- |
| Patient Characteristic | White Patients | African-American Patients | White Patients | African-American Patients | *P* value* |
| *N* (weighted %) | 803 (61.0) | 341 (31.7) | 11 (0.7) | 86 (6.5) | |
| Age, y | | | | | .32 |
|   <35 | 29.2 | 35.0 | 31.3 | 36.9 | |
|   35 to 45 | 43.9 | 45.0 | 41.0 | 36.4 | |
|   >45 | 26.9 | 20.0 | 27.7 | 26.7 | |
| Female | 9.9 | 36.5 | 14.2 | 41.0 | <.0001 |
| Highest level of education | | | | | <.0001 |
|   Some high school | 12.2 | 24.6 | 20.4 | 37.2 | |
|   High school diploma | 25.3 | 30.0 | 26.5 | 32.0 | |
|   Some college | 32.3 | 35.2 | 20.6 | 26.7 | |
|   College graduate | 30.2 | 10.2 | 32.5 | 4.2 | |
| Annual family income | | | | | <.0001 |
|   <$5,000 | 10.2 | 31.3 | 14.9 | 21.4 | |
|   $5,000 to $10,000 | 21.8 | 26.7 | 8.3 | 53.5 | |
|   $10,000 to $25,000 | 22.9 | 29.1 | 63.8 | 17.7 | |
|   >$25,000 | 45.1 | 12.8 | 13.1 | 7.5 | |
| Insurance | | | | | <.0001 |
|   Uninsured | 13.4 | 22.2 | 43.3 | 33.2 | |
|   Medicaid | 16.1 | 40.8 | 25.1 | 43.0 | |
|   Managed care | 26.6 | 13.6 | 22.6 | 3.6 | |
|   Fee-for-service | 22.9 | 5.1 | 0.0 | 3.5 | |
|   Medicare | 21.0 | 18.3 | 8.9 | 16.8 | |
| Self-reported access to care | | | | | .37 |
|   Low | 37.7 | 46.9 | 34.6 | 42.6 | |
|   Medium | 28.2 | 24.8 | 28.6 | 22.6 | |
|   High | 34.1 | 28.3 | 36.9 | 34.8 | |
| HIV exposure | | | | | <.0001 |
|   Injection drug use | 20.7 | 32.5 | 45.0 | 26.4 | |
|   Men who have sex with men | 66.3 | 29.9 | 41.6 | 17.9 | |
|   Heterosexual intercourse | 7.3 | 25.7 | 9.5 | 33.3 | |
|   Other | 5.8 | 11.9 | 3.9 | 22.4 | |
| Drug or heavy alcohol use in last 12 months | 16.8 | 20.0 | 0.0 | 13.4 | .40 |
| Lowest reported CD4 count (cells/ml) | | | | | .13 |
|   >500 | 8.1 | 10.5 | 4.8 | 12.9 | |
|   200 to 499 | 34.4 | 41.3 | 30.5 | 48.4 | |
|   50 to 199 | 31.7 | 28.6 | 42.2 | 23.3 | |
|   0 to 49 | 25.8 | 19.6 | 22.6 | 15.4 | |
| Symptom burden index | | | | | .03 |
|   Low | 33.8 | 42.1 | 14.1 | 39.5 | |
|   Medium | 31.8 | 30.3 | 46.2 | 38.7 | |
|   High | 34.4 | 27.6 | 39.8 | 21.8 | |
| Region | | | | | .0008 |
|   Northeast | 20.6 | 39.3 | 29.6 | 32.9 | |
|   Midwest | 13.1 | 18.2 | 9.5 | 2.9 | |
|   South | 20.0 | 27.9 | 42.7 | 63.7 | |
|   West | 46.3 | 14.7 | 18.3 | 0.5 | |
| Overall rating of medical care | | | | | .39 |
|   Poor | 1.7 | 1.7 | 0.0 | 2.3 | |
|   Fair | 4.0 | 9.8 | 0.0 | 13.9 | |
|   Good | 11.7 | 17.0 | 30.7 | 29.7 | |
|   Very good | 27.9 | 23.7 | 3.9 | 22.7 | |
|   Excellent | 54.8 | 47.9 | 65.4 | 31.6 | |
| More trust in provider | 51.5 | 51.8 | 25.7 | 57.0 | .39 |
| Agree that antiretrovirals are worth taking | 79.7 | 80.5 | 70.8 | 82.9 | .88 |

* Statistical comparison adjusted for complex sampling methods.

**Table 2. Weighted Comparison of Provider Characteristics Stratified According to Patient-Provider Race Groups**

| | White Providers | | African-American Providers | | |
|---|---|---|---|---|---|
| Provider Characteristic | White Patients | African-American Patients | White Patients | African-American Patients | P value* |
| Female | 12.9 | 34.5 | 50.1 | 31.4 | .02 |
| More than 10 years in practice | 89.8 | 85.9 | 64.2 | 78.4 | .4 |
| Specialty/HIV expert | | | | | .001 |
|   Infectious disease | 42.3 | 47.9 | 18.3 | 6.0 | |
|   GIM expert | 43.8 | 33.0 | 52.2 | 78.2 | |
|   GIM nonexpert | 12.0 | 7.1 | 29.6 | 14.2 | |
|   NP or PAs | 1.8 | 12.0 | 0.0 | 1.6 | |
| HIV knowledge (>80% correct) | 56.6 | 67.5 | 26.5 | 48.1 | .21 |
| Predominant patient population | | | | | <.0001 |
|   Injection drug users | 14.5 | 23.4 | 5.5 | 16.6 | |
|   Homosexual men | 77.7 | 48.0 | 75.3 | 14.8 | |
|   Heterosexual persons | 1.3 | 20.1 | 19.2 | 55.3 | |
|   Mix | 3.3 | 2.3 | 0.0 | 4.2 | |
|   None | 3.2 | 6.2 | 0.0 | 9.1 | |
| Site type | | | | | .002 |
|   Private, university-based | 33.0 | 42.7 | 33.5 | 18.6 | |
|   Public, university-based | 10.5 | 24.5 | 45.0 | 25.9 | |
|   Public | 1.4 | 3.7 | 21.5 | 38.6 | |
|   Private office | 38.3 | 12.0 | 0.0 | 1.3 | |
|   Other | 16.8 | 17.1 | 0.0 | 15.6 | |

\* *Statistical comparison adjusted for complex sampling methods.*
*GIM, general internist; NP, nurse practitioner; PA, physician assistant.*

## Provider Characteristics

We compared the provider characteristics of those caring for the different patient-provider racial groups (Table 2). Among African-American patients with African-American providers, only 6% were cared for by infectious disease specialists compared to 42% of whites with white providers, 48% of African-American patients with white providers, and 18% of white patients with African-American providers. African-American patients with African-American providers were most likely to be cared for by providers who are HIV experts but not infectious disease specialists (general medicine specialists; 78%). African-American patients with white providers were least likely to be cared for by providers who are general medicine nonspecialists (neither general medicine HIV experts nor infectious disease specialists). Compared to other patients, white patients with white providers were most likely to have a provider whose predominant patient population are homosexual men ($P < .0001$), and have sought care in a private office ($P = .002$). Approximately 38% of African-American patients with African-American providers received care in a public health care facility as compared to 22% of white patients with African-American providers, 4% of African-American patients with white providers, and 1% of white patients with white providers.

## Receipt of Protease Inhibitors

First, we examined time to first protease inhibitor use by patient race. In bivariate analysis, white patients received protease inhibitors a median of 277 days (95% confidence interval [CI], 256 to 301) after the FDA approved the first protease inhibitor, compared to 439 days for African Americans (95% CI, 393 to 494; $P < .0001$). After controlling for patient demographics, CD4 count, symptom burden, insurance status, self-reported access to care, type of HIV exposure risk, and heavy alcohol or illicit drug use, African Americans still had later use of protease inhibitors than whites (440 vs. 348 days; $P = .005$).

We then examined time to first protease inhibitor use for each of the patient-provider race groups. Without adjustment for patient or provider characteristics (Table 3, Stage 1 model), white patients with white providers received protease inhibitors 278 days (95% CI, 258 to 304) after the first protease inhibitor was approved by the FDA. Compared to this patient-provider group, African-American patients with white and African-American providers received protease inhibitors later (443 days, $P < .001$ and 419 days, $P = .003$, respectively).

Adjusting for all patient covariates, we found no difference in time to first protease inhibitor use between African-American patients with African-American providers and white patients with white providers (342 vs. 353 days; $P > .20$; Table 3 Stage 2 model). However, African-American patients with white providers received protease inhibitors later than white patients with white providers (461 vs. 353 days; $P = .002$). African-American patients with white providers still had significantly later use of protease inhibitors compared to other patients after additionally adjusting for provider characteristics, which were specialty training, HIV

**Table 3. Unadjusted and Adjusted Days Until First Protease Inhibitor Use by Patient-Provider Race Groups**
**(95% Confidence Intervals)**

|  | White Providers | | African-American Providers | |
|---|---|---|---|---|
|  | White Patients | African-American Patients | White Patients | African-American Patients |
| Stage 1: unadjusted | 278 (258 to 304) | 443 (392 to 503)[‡] | 206 (99 to 458) | 419 (337 to 551)[†] |
| Stage 2: adjusted for patient characteristics | 353 (317 to 386) | 461 (404 to 520)[†] | 251 (160 to 422) | 342 (269 to 429) |
| Stage 3: adjusted for patient and provider characteristics | 377 (335 to 413) | 460 (393 to 516)* | 227 (125 to 375) | 285 (219 to 369)* |
| Stage 4: adjusted for patient, provider and attitude characteristics | 383 (340 to 419) | 467 (397 to 522)* | 223 (122 to 351)* | 288 (222 to 368)* |

* $P < .05$ for comparison to white patients with white providers.
† $P < .01$ for comparison to white patients with white providers.
‡ $P < .001$ for comparison to white patients with white providers.
*Patient covariates are age, gender, education, annual family income, type of health insurance, self-reported access to care, primary HIV risk factor, recent heavy alcohol or drug use, CD4 count, symptom burden index, and geographic region. Provider covariates are gender, sexual orientation, years in practice, specialty/expertise, HIV knowledge, practice setting, belief that patients cannot adhere to antiretrovirals, preference not to treat injection drug users, and belief that antiretroviral therapy should be withheld or delayed for nonadherent patients. Attitude covariates are trust in provider, rating of medical care, and belief that antiretrovirals are worth taking.*

expertise, HIV knowledge, years in practice, gender, sexual preference, patient care mix, type of practice, preference not to treat injection drug users, and the belief that most of their patients can adequately adhere to their medication regimen (Table 3, Stage 3 model), as well as after adjusting for patient's ratings of their medical care, trust in their provider, and belief that antiretrovirals are worth taking (Table 3, Stage 4 model). These results were similar in a sensitivity analysis excluding nurse practitioners/physician assistants and their patients.

## DISCUSSION

Racial disparities in a variety of HIV treatments and services have been widely documented.[11,28] Disparities in the delivery of potent antiretrovirals is particularly important, because these treatments have a profound impact on AIDS mortality, which is disproportionately greater among African Americans.[29] Previous studies have not been able to fully explain why racial disparities in antiretroviral medication use exists.[8,10–13] However, these studies have primarily focused on patient characteristics, such as income and insurance status, as explanatory factors and have not examined the impact of racial concordance. Others studies have found that racial concordance between patient and physician influences satisfaction and use,[14,15,17,30] but have not found differences in treatment for health conditions.[31] In the present study, we found that African-American patients with white providers received protease inhibitors later than white patients with white providers and African-American patients with African-American providers. Although white patients with African-American providers appeared to have the shortest time to protease inhibitor use, this group represents such a small fraction of the patients (<0.1%)

that we recommend great caution should be exercised in reaching any conclusions about them.

A number of possible explanations for our findings should be considered. Differences in trust and satisfaction may influence a patient's willingness to accept new therapies. We controlled for trust in their medical provider using a 2-item measure and patient ratings of their medical care. These factors did not appear to explain our findings, however. Still, there may be other characteristics of the patient-provider relationship, including aspects of trust not accounted for in our 2-item scale, that might explain the study results. For example, communication may be better in racially concordant doctor-patient relationships, which may improve patients' acceptance of and readiness to take antiretroviral treatment. Recent studies found that African-American patients in racially concordant relationships reported more participation in decision making, as well as longer doctor visits and greater satisfaction, than those in racially discordant relationships.[32]

Our findings might also result from differences in physician prescribing behavior, which may be unintentional or possibly represent overt racial discrimination. Prior research has demonstrated that physicians are susceptible to having prior biases and stereotypes in assessing African-American intelligence, likelihood of substance abuse, and ability to adhere to regimens, which ultimately may affect their clinical decisions about African Americans.[33,34] For example, most physicians delay treatment for patients whom they believe will be nonadherent.[35] African-American patients in a white physician's panel may be more likely to be perceived as nonadherent. Ultimately, physicians might then be more likely to delay treatment for African Americans than for whites. We asked providers whether they considered patient adherence in their decision to prescribe protease inhibitors. This factor, however, did not explain our findings.

We report both statistical and clinical limitations of our study. First, we relied on self-reported dates of antiretroviral medications use. The wrong starting date could lead to either an underestimation or overestimation of the time to first protease inhibitor. Self-report of antiretroviral use is reasonably accurate when compared with pharmacy records,[36] but the accuracy of dates of use is not known. There is also little reason to believe that errors in self-report would occur differentially by patient and provider race and result in a biased association. Second, we cannot exclude the possibility of selection bias resulting in some unmeasured differences between patients of the same race who are cared for by African-American versus white providers. African-American patients who have specifically chosen to see African-American providers may be more assertive in seeking medical treatments, may be more receptive to new treatments, or have other characteristics that could improve their access to protease inhibitors. Third, prior research analyzing the impact of patient trust in their provider on patient-provider relationships used more extensive scales to measure trust that the 2-item measure that we used. Thus, we may not have completely controlled for patient's trust in their provider. Finally, unmeasured differences between providers who mainly care for white and African-American patients may also exist. Although we controlled for HIV expertise, physician specialty, patient panel characteristics, and practice location, there may be unmeasured regional or philosophical differences in the standard of care that would affect prescribing patterns. In addition, we controlled for patients' belief that antiretrovirals are effective and found this variable had little effect on our results. Finally, there were not enough patients of both races cared for by the same physician to conduct within-physician analysis of differences in treatment.

Although the median delay in time translates to greater than 3 months, the clinical implications are not straightforward. Because of side effects[37] and the concern about the development of drug resistance, HIV treatment strategy has moved away from early antiretroviral use and toward a "wait and see" approach when initiating treatment.[38,39] Thus, the delay in treatment among African-American patients may have actually benefited them. Still, when respondents were enrolled in our study in 1996, the prevailing opinion among HIV experts was that protease inhibitors are crucial in reducing morbidity and mortality and must be included in the initial regimens of patients who could tolerate them.[40] During the time of data collection, treatment delay was documented to result in lower CD4 counts and higher mortality rates.[41,42] Thus, regardless of the clinical implications, our study indicates that race concordance influences the delivery of state-of-the-art care.

As for the policy implications of our study, one might conclude that segregating patients to providers based upon race may help eliminate health care disparities. We believe, however, that involuntary racial segregation of patients is inappropriate and unethical. Alternatively, we should strive to better understand and improve the relationship between patients and their physician, paying particular attention to the effects of race concordance. Future research should examine how and why race concordance influences satisfaction and care and whether discrimination in physician behavior plays a role. In addition, our study has important policy implications as we consider how to address the paucity of African-American providers available to African-American patients.[43] Patients often select providers based upon specific characteristics, including race and ethnicity. African-American patients should have access to a provider of their own race and ethnicity if they so choose. Unfortunately, African-Americans are less than 5% of the total number of physicians, and recent anti-affirmative action judicial and legislative decisions have negatively impacted African-American medical school admissions.[44–46]

Therefore, policy changes to increase the supply of African-American physicians and meet patient demand are imperative. These changes are not likely to occur very soon. In the meantime, medical educators should expand cultural competence training for physicians, as outlined by the Institute of Medicine Report and the American and National Medical Associations. Increasing the number of African-American physicians and improving the patient-provider relationship are potentially critical to eliminating disparities in care. Only when African Americans achieve equity in health care can racial health disparities be eliminated.

## REFERENCES

1. Centers for Disease Control and Prevention. HIV/AIDS Surveillance Report. Vol. 13. Atlanta, Ga; 2001:1–44.

2. Centers for Disease Control and Prevention. HIV/AIDS Surveillance Supplemental Report: Deaths Among Persons with AIDS Through December 2000. Atlanta, Ga; 2002:1–22.

3. Asch SM, Gifford AL, Bozzette SA, et al. Underuse of primary *Mycobacterium avium* complex and *Pneumocystis carinii* prophylaxis in the United States. J Acquir Immune Defic Syndr. 2001;28:340–4.

4. Bing EG, Kilbourne AM, Brooks RA, Lazarus EF, Senak M. Protease inhibitor use among a community sample of people with HIV disease. J Acquir Immune Defic Syndr Hum Retrovirol. 1999;20:474–80.

5. Crystal S, Sambamoorthi U, Moynihan PJ, McSpiritt E. Initiation and continuation of newer antiretroviral treatments among Medicaid recipients with AIDS. J Gen Intern Med. 2001;16:850–9.

6. Cunningham WE, Markson LE, Andersen RM, et al. Prevalence and predictors of highly active antiretroviral therapy use in patients with HIV infection in the United States. HCSUS Consortium. HIV Cost and Services Utilization. J Acquir Immune Defic Syndr. 2000;25:115–23.

7. Jeffe DB, Meredith KL, Mundy LM, Fraser VJ. Factors associated with HIV-infected patients' recognition and use of HIV medications. J Acquir Immune Defic Syndr Hum Retrovirol. 1998;19:350–60.

8. Shapiro MF, Morton SC, McCaffrey DF, et al. Variations in the care of HIV-infected adults in the United States: results from the HIV Cost and Services Utilization Study. JAMA. 1999;281:2305–15.

9. Stone VE, Clarke J, Lovell J, et al. HIV/AIDS patients' perspectives on adhering to regimens containing protease inhibitors. J Gen Intern Med. 1998;13:586–93.

10. Moore RD, Stanton D, Gopalan R, Chaisson RE. Racial differences in the use of drug therapy for HIV disease in an urban community. N Engl J Med. 1994;330:763–8.

11. Palacio H, Kahn JG, Richards TA, Morin SF. Effect of race and/or ethnicity in use of antiretrovirals and prophylaxis for opportunistic infection: a review of the literature. Public Health Rep. 2002; 117:233–51; discussion 231–2.

12. Sambamoorthi U, Moynihan PJ, McSpiritt E, Crystal S. Use of protease inhibitors and non-nucleoside reverse transcriptase inhibitors among Medicaid beneficiaries with AIDS. Am J Public Health. 2001;91:1474–81.

13. Andersen R, Bozzette S, Shapiro M, et al. Access of vulnerable groups to antiretroviral therapy among persons in care for HIV disease in the United States. HCSUS Consortium. HIV Cost and Services Utilization Study. Health Serv Res. 2000;35:389–416.

14. Cooper-Patrick L, Gallo JJ, Gonzales JJ, et al. Race, gender, and partnership in the patient-physician relationship. JAMA. 1999;282:583–9.

15. Laveist TA, Nuru-Jeter A. Is doctor-patient race concordance associated with greater satisfaction with care? J Health Soc Behav. 2002;43:296–306.

16. Murray-Garcia JL, Selby JV, Schmittdiel J, Grumbach K, Quesenberry CP Jr. Racial and ethnic differences in a patient survey: patients' values, ratings, and reports regarding physician primary care performance in a large health maintenance organization. Med Care. 2000;38:300–10.

17. Saha S, Komaromy M, Koepsell TD, Bindman ABRD. Patient-physician racial concordance and the perceived quality and use of health care. Arch Intern Med. 1999;159:997–1004.

18. LaVeist TA, Nuru-Jeter A, Jones KE. The association of doctor-patient race concordance with health services utilization. J Public Health Policy. 2003;24:312–23.

19. Bozzette SA, Berry SH, Duan N, et al. The care of HIV-infected adults in the United States. HIV Cost and Services Utilization Study Consortium. N Engl J Med. 1998;339:1897–904.

20. Frankel MR, Shapiro MF, Duan N, et al. National probability samples in studies of low-prevalence diseases. Part II: Designing and implementing the HIV cost and services utilization study sample. Health Serv Res. 1999;34(5 pt 1):969–92.

21. Mathews WC, McCutchan JA, Asch S, et al. National estimates of HIV-related symptom prevalence from the HIV Cost and Services Utilization Study. Med Care. 2000;38:750–62.

22. Rost K, Burnam MA, Smith GR. Development of screeners for depressive disorders and substance disorder history. Med Care. 1993;31:189–200.

23. Cunningham WE, Andersen RM, Katz MH, et al. The impact of competing subsistence needs and barriers on access to medical care for persons with human immunodeficiency virus receiving care in the United States. Med Care. 1999;37:1270–81.

24. Wilson IB, Ding L, Hays RD, Shapiro MF, Bozzette SA, Cleary PD. HIV patients' experiences with inpatient and outpatient care: results of a national survey. Med Care. 2002;40:1149–60.

25. Kao AC, Green DC, Davis NA, Koplan JP, Cleary PD. Patients' trust in their physicians: effects of choice, continuity, and payment method. J Gen Intern Med. 1998;13:681–6.

26. Landon BE, Wilson IB, Wenger NS, et al. Specialty training and specialization among physicians who treat HIV/AIDS in the United States. J Gen Intern Med. 2002;17:12–22.

27. Davison AC, Hinkley DV. Bootstrap Methods and Their Application. Cambridge, UK: Cambridge University Press; 1997.

28. Easterbrook PJ, Keruly JC, Creagh-Kirk T, et al. Racial and ethnic differences in outcome in zidovudine-treated patients with advanced HIV disease. Zidovudine Epidemiology Study Group. Jama. 1991; 266:2713–18.

29. Lee LM, Karon JM, Selik R, Neal JJ, Fleming PL. Survival after AIDS diagnosis in adolescents and adults during the treatment era, United States, 1984–1997. JAMA. 2001;285:1308–15.

30. LaVeist TA, Carroll T. Race of physician and satisfaction with care among African-American patients. J Natl Med Assoc. 2002;94:937–43.

31. Chen J, Rathore SS, Radford MJ, Wang Y, Krumholz HM. Racial differences in the use of cardiac catheterization after acute myocardial infarction. N Engl J Med. 2001;344:1443–9.

32. Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR. Patient-centered communication, ratings of care, and concordance of patient and physician race. Ann Intern Med. 2003;139:907–15.

33. van Ryn M, Burke J. The effect of patient race and socio-economic status on physicians' perceptions of patients. Soc Sci Med. 2000;50: 813–28.

34. Bogart LM, Catz SL, Kelly JA, Benotsch EG. Factors influencing physicians' judgments of adherence and treatment decisions for patients with HIV disease. Med Decis Making. 2001;21:28–36.

35. Wong MD, Cunningham WE, Shapiro MF, et al. Disparities in HIV treatment and physician attitudes about delaying protease inhibitors for nonadherent patients. J Gen Intern Med. 2004;19:366–74.

36. Korthuis PT, Asch S, Mancewicz M, et al. Measuring medication: do interviews agree with medical record and pharmacy data? Med Care. 2002;40:1270–82.

37. Stein JH. Dyslipidemia in the era of HIV protease inhibitors. Prog Cardiovasc Dis. 2003;45:293–304.

38. Ho DD. Time to hit HIV, early and hard. N Engl J Med. 1995;333:450–1.

39. Report of the NIH Panel to Define Principles of Therapy of HIV Infection. Ann Intern Med. 1998;128:1057–8.

40. Carpenter CC, Fischl MA, Hammer SM, et al. Antiretroviral therapy for HIV infection in 1996. Recommendations of an international panel. International AIDS Society-USA. JAMA. 1996;276:146–54.

41. Concorde: MRC/ANRS randomised double-blind controlled trial of immediate and deferred zidovudine in symptom-free HIV infection. Concorde Coordinating Committee. Lancet. 1994;343:871–81.

42. Volberding PA, Lagakos SW, Grimes JM, et al. A comparison of immediate with deferred zidovudine therapy for asymptomatic HIV-infected adults with CD4 cell counts of 500 or more per cubic millimeter. AIDS Clinical Trials Group. N Engl J Med. 1995;333: 401–7.

43. Rabinowitz HK, Diamond JJ, Veloski JJ, Gayle JA. The impact of multiple predictors on generalist physicians' care of underserved populations. Am J Public Health 2000;90:1225–8.

44. Carlisle DM, Gardner JE, Liu H. The entry of underrepresented minority students into U.S. medical schools: an evaluation of recent trends. Am J Public Health. 1998;88:1314–8.

45. Cohen JJ. Statistics don't lie: anti-affirmative action is bad for our health. Acad Med. 1997;72:1084.

46. DeVille K. Defending diversity: affirmative action and medical education. Am J Public Health. 1999;89:1256–61.

# APPENDIX

**Time to protease inhibitor use (days). Model is sequentially adjusted for patient and provider characteristics**

| | white patients, white providers | black patients, white providers | black patients, black providers | white patients, black providers |
|---|---|---|---|---|
| **Unadjusted** | 278 | 443 | 419 | 206 |
| **Patient covariates** | | | | |
| age | 282 | 440 | 425 | 204 |
| female | 295 | 433 | 410 | 212 |
| education | 300 | 428 | 393 | 215 |
| income | 306 | 419 | 396 | 212 |
| insurance variables | 310 | 420 | 382 | 203 |
| access to care scale | 309 | 420 | 383 | 205 |
| risk factor | 309 | 421 | 384 | 208 |
| drug/alcohol use | 309 | 422 | 388 | 213 |
| baseline cd4 | 345 | 453 | 366 | 249 |
| symptom index | 347 | 451 | 363 | 255 |
| region | 353 | 461 | 342 | 251 |
| **Provider covariates** | | | | |
| MALE | 364 | 455 | 341 | 238 |
| YEARS IN PRACTICE | 363 | 456 | 343 | 241 |
| SPECIALTY/EXPERT | 364 | 456 | 332 | 228 |
| KNOWLEDGE | 364 | 456 | 330 | 224 |
| BELIEF THAT PTS CANT ADHERE | 364 | 455 | 330 | 224 |
| PREFER NOT TO TREAT IDUS | 364 | 460 | 320 | 223 |
| DELAY CARE FOR NONADHERENT PTS | 364 | 460 | 322 | 222 |
| PATIENT PRACTICE RISK PROFILE | 374 | 461 | 292 | 227 |
| PRACTICE SETTING | 377 | 460 | 285 | 227 |
| **Attitudes and beliefs** | | | | |
| rating of care | 378 | 460 | 283 | 223 |
| ARVs are worth taking | 382 | 467 | 289 | 222 |
| trust | 383 | 467 | 288 | 223 |