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Original article

Explaining racial disparities in HIV incidence in black and white men who have sex with men in Atlanta, GA: a prospective observational cohort study

Patrick S. Sullivan DVM, PhD [a,*], Eli S. Rosenberg PhD [a], Travis H. Sanchez DVM, MPH [a], Colleen F. Kelley MD [b], Nicole Luisi MPH [a], Hannah L. Cooper ScD [c], Ralph J. Diclemente PhD [c], Gina M. Wingood PhD [c], Paula M. Frew PhD [b], Laura F. Salazar PhD [d], Carlos del Rio MD [b], Mark J. Mulligan MD [b], John L. Peterson PhD [e]

[a] Department of Epidemiology, Emory University Rollins School of Public Health, Atlanta, GA
[b] Division of Infectious Diseases, School of Medicine, Emory University, Atlanta, GA
[c] Department of Behavioral Sciences and Health Education, Emory University Rollins School of Public Health, Atlanta, GA
[d] Hubert Department of Global Health, Emory University Rollins School of Public Health, Atlanta, GA
[e] Department of Psychology, Georgia State University, Atlanta

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ABSTRACT

Purpose: To describe factors associated with racial disparities in HIV (human immunodeficiency virus) incidence among men who have sex with men (MSM) in the United States.
Methods: In a longitudinal cohort of black and white HIV-negative MSM in Atlanta, HIV incidence rates were compared by race. Incidence hazard ratios (HRs) between black and white MSM were estimated with an age-scaled Cox proportional hazards model. A change-in-estimate approach was used to understand mediating time-independent and -dependent factors that accounted for the elevated HR.
Results: Thirty-two incident HIV infections occurred among 260 black and 302 white MSM during 843 person-years (PY) of follow-up. HIV incidence was higher among black MSM (6.5/100 PY; 95% confidence interval [CI]: 4.2–9.7) than white MSM (1.7/100 PY; CI: 0.7–3.3) and highest among young (18–24 years) black MSM (10.9/100 PY; CI: 6.2–17.6). The unadjusted hazard of HIV infection for black MSM was 2.9 (CI: 1.3–6.4) times that of white MSM; adjustment for health insurance status and partner race explained effectively all of the racial disparity.
Conclusions: Relative to white MSM in Atlanta, black MSM, particularly young black MSM, experienced higher HIV incidence that was not attributable to individual risk behaviors. In a setting where partner pool risk is a driver of disparities, it is also important to maximize care and treatment for HIV-positive MSM.

Introduction

Human immunodeficiency virus (HIV) epidemiology in the United States is driven by an unrelenting epidemic among men who have sex with men (MSM) [1,2] and is remarkable for black versus white disparities in HIV among MSM [3] and for expanding subepidemics among young black MSM. There is an emerging consensus that factors beyond individual risk behaviors (e.g., structural factors [4], access to health care [4], and features of sexual networks [5]) are key to understanding black versus white disparities. HPTN (HIV prevention trials network) 061 described HIV incidence among black MSM in six U.S. cities and identified younger age and unprotected anal intercourse (UAI) as associated with incidence, but did not have a nonblack comparison group, and therefore could not explore reasons for disparities [6].

How we think about reasons for black versus white disparities among U.S. MSM was elegantly framed by Millet et al. in 2006 [7]; this conceptual framework has guided the scientific agenda in the field for nearly a decade. We conducted a prospective, cohort study of black and white MSM in Atlanta that systematically measured the domains suggested by Millett et al. [7] to assess their potential

* Corresponding author. Department of Epidemiology, Rollins School of Public Health, Emory University, 1518 Clifton Road NE, 4th Floor, Atlanta, GA 30329. Tel.: +1-404-727-2038; fax: 404-727-8737.
E-mail address: patrick.sullivan@emory.edu (P.S. Sullivan).

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to explain racial differences in HIV incidence. We recently reported on the baseline findings from this cohort study [3]. Here, we present HIV incidence among HIV-negative men followed prospectively and explore which factors might account for observed black and white disparities in HIV incidence. In addition, we consider the implications of how nonbehavioral factors associated with risk relate to eligibility criteria for pre-exposure prophylaxis (PrEP) and risk for new HIV infections.

Materials and methods

Recruitment

Involvement was a prospective cohort study designed to assess the multilevel factors associated with disparities in HIV incidence between black and white MSM in Atlanta. The study recruitment, baseline procedures, and baseline results are described elsewhere [3]. MSM were recruited from 2010 to 2012 via venue-time-space sampling and Facebook [3,8]. Eligible MSM self-reported black or white race, non-Hispanic ethnicity, were male at birth, lived in the Atlanta Metropolitan Statistical Area, had 1 male sex partner or more in the previous 3 months and were not in a mutually monogamous relationship. Participants who had a nonreactive HIV test result at baseline were offered participation in prospective follow-up (Fig. 1). This study was approved by the Emory University Institutional Review Board (protocol 42405).

Prospective follow-up

Participants were followed for up to 24 months, with study visits at 3, 6, 12, 18, and 24 months after enrollment, until HIV seroconversion or censoring. At study visits, participants completed HIV and sexually transmitted infection (STI) testing and counseling and behavioral assessment. Participant follow-up ended in March 2014. Some participants were administratively censored at 12 and 18 months of follow-up because of funding reductions.

HIV and STI testing

At study visits, participants were screened for antibodies to HIV with a rapid HIV rapid test [3]. For men who had a preliminary positive result, additional specimens were collected for confirmatory testing using western immunoblot, CD4+ lymphocyte count, and HIV-1 viral load testing. For one incident case, HIV infection was confirmed with two additional HIV rapid tests [9,10]. All HIV-infected participants were linked to HIV care. For men who tested HIV positive at their first (3 months) follow-up visit, HIV-1 RNA testing was performed on stored blood specimens from the baseline visit to document acute infection at enrollment. Participants were tested at each visit for syphilis, urethral gonorrhea (GC) and chlamydia (CT), and rectal GC and CT as previously published [3].

Longitudinal behavioral assessments

At baseline, participants completed a computer-assisted self-interview questionnaire. Domains included demographics, residential address, individual-level HIV-related behaviors, health insurance coverage, and a dyadic inventory of the most recent five sex partners in the previous 6 months [3]. Prospective questionnaires reassessed socioeconomic status, residence, and aggregate sexual and substance use behaviors.

Measures

Explanatory variables

We considered the following several domains of possible explanatory factors: sociodemographic factors, biological factors increasing susceptibility, sexual network features, and neighborhood factors.

Demographic and social factors included age, sexual identity, educational attainment, poverty, employment, health insurance status, homelessness, and recent arrest. Circumcision status was assessed by self-report, as was use of illicit noninjection and injection drugs [11]. Sexual behaviors included reported partner number, reporting any main partners, any AI partners, and any UAI partners [12]. UAI was defined by reporting one UAI partners or more (including reporting failure or incomplete use of condoms) or by diagnosis of a new rectal STI. Biological factors included circumcision and STI diagnoses. Sexual network features hypothesized as causes of the disparity were having older partners, black race partners, and partners of serodiscordant or unknown HIV status [7]. Neighborhood factors were operationalized as several census tract factors (see Table 1). Methods for residence geocoding and census tract data sources were previously described [3]. Data were primarily from the 2008 to 2012 American Community Survey.

In HIV incidence analyses, most factors were time independent (sexual identity, education, health insurance, circumcision, and census tract factors were assessed only at baseline). Each reported value was assumed to apply since the last visit, including intervals containing missed visits. For missing values for time-dependent factors, we conservatively assumed nonoccurrence of the factor, rather than carrying forward earlier values, which might impute risk where none actually occurred.

To understand how men in our cohort would have been evaluated for PrEP based on current eligibility guidelines [13], we analyzed self-reported behaviors in the 6 months before baseline visit. Based on these responses, we determined whether each of our seroconverting men would have met current Centers for Disease Control and Prevention eligibility criteria for PrEP, overall and stratified by race.

Person-time for HIV incidence

For participants who remained HIV negative throughout follow-up, person-time was the difference between the date of the final study visit and enrollment. For HIV seroconverters, the date of seroconversion was halfway between the date of new HIV diagnosis and the previous visit. Those with acute HIV infection (i.e., HIV antibody negative participants at baseline for whom HIV-RNA testing was conducted and results were RNA positive) were considered as seroconverters and assigned an infection date of 12 days before enrollment.

Analysis

Statistical methods

For prospective participants, we descriptively summarized the previously mentioned explanatory factors at baseline and compared black and white MSM using χ^2, Fisher's exact, and Wilcoxon tests. We found minimal clustering of men in census tracts, and therefore treated census tract factors as individual-level exposures [3]. Cumulative study retention was estimated by the Kaplan-Meier method.

Cumulative HIV incidence was estimated by the Kaplan-Meier method, stratified by race, and by race and age at study enrollment, with differences in failure curves evaluated by the log-rank test. For each racial group and explanatory variable, we computed bivariate incidence density rates, rate ratios, and exact 95%