Original Contribution

Self-reported Racial Discrimination and Substance Use in the Coronary Artery Risk Development in Adults Study

Luisa N. Borrell[1], David R. Jacobs, Jr.[2,3], David R. Williams[4], Mark J. Pletcher[5], Thomas K. Houston[6,7], and Catarina I. Kiefe[6,8]

[1] Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY.
[2] Division of Epidemiology, School of Public Health, University of Minnesota, Minneapolis, MN.
[3] Department of Nutrition, University of Oslo, Oslo, Norway.
[4] Departments of African and African American Studies and of Sociology, School of Public Health, Harvard University, Boston, MA.
[5] Department of Epidemiology and Biostatistics, University of California, San Francisco, CA.
[6] Deep South Center on Effectiveness, Birmingham Veterans Affairs Medical Center, Birmingham, AL.
[7] Division of General Internal Medicine, University of Alabama, Birmingham, AL.
[8] Division of Preventive Medicine, University of Alabama, Birmingham, AL.

The authors investigated whether substance use and self-reported racial discrimination were associated in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Smoking status, alcohol consumption, and lifetime use of marijuana, amphetamines, and opiates were ascertained in 2000–2001, 15 years after baseline (1985–1986). Most of the 1,507 African Americans reported having experienced racial discrimination, 79.5% at year 7 and 74.6% at year 15, compared with 29.7% and 23.7% among the 1,813 Whites. Compared with African Americans experiencing no discrimination, African Americans reporting any discrimination had more education and income, while the opposite was true for Whites (all $p < 0.001$). African Americans experiencing racial discrimination in at least three of seven domains in both years had 1.87 (95% confidence interval (CI): 1.18, 2.96) and 2.12 (95% CI: 1.42, 3.17) higher odds of reporting current tobacco use and having any alcohol in the past year than did their counterparts experiencing no discrimination. With control for income and education, African Americans reporting discrimination in three or more domains in both years had 3.31 (95% CI: 1.90, 5.74) higher odds of using marijuana 100 or more times in their lifetime, relative to African Americans reporting no discrimination. These associations were similarly positive in Whites but not significant. Substance use may be an unhealthy coping response to perceived unfair treatment for some individuals, regardless of their race/ethnicity.

adaptation, psychological; African Americans; alcohol drinking; amphetamines; cannabis; cocaine; prejudice; smoking

Abbreviations: CARDIA, Coronary Artery Risk Development in Young Adults; CI, confidence interval.

Racial discrimination has recently emerged as an important health risk that is differentially distributed across racial/ethnic groups and may contribute to elevated health risks for African Americans (1–6). For example, a substantial proportion of African Americans experience discrimination adversely affecting multiple indicators of health status,

Correspondence to Dr. Luisa N. Borrell, Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY 10032 (e-mail: lnb2@columbia.edu).

including poorer self-rated physical and mental health (1, 4, 5, 7–12), blood pressure, and other cardiovascular outcomes (4–6, 13–17).

Although associations between racial discrimination and health outcomes have been reported consistently, the mechanism underlying these associations remains a challenge. It has been hypothesized that discrimination may lead to negative health outcomes through detrimental health behaviors, such as use of harmful substances. However, few studies have focused on the relation between racial discrimination and health risk behaviors, such as smoking, excessive alcohol consumption, or illicit substance use (18–30). Although these studies suggested that the stress associated with racial discrimination may lead to alcohol use and smoking among African Americans, they were based on small or specialized samples; for example, African-American adolescents and American-Indian children perceiving racism were more likely to report drug use than were those perceiving no racism (27, 28). However, to the best of our knowledge, no studies have investigated these associations in a population-based sample of African-American or White adults.

The Coronary Artery Risk Development in Young Adults (CARDIA) Study, a prospective cohort of Whites and African Americans with 15 years of follow-up, provides a unique opportunity to investigate the association of self-reported racial discrimination with cigarette smoking, alcohol consumption, and use of illicit substances, before and after adjustment for important covariates, including indicators of socioeconomic position and psychosocial measures, among younger adults. Specifically, we investigated whether self-reported discrimination in years 7 and 15 of the CARDIA Study is associated with smoking, alcohol consumption, and use of marijuana, crack, cocaine, speed, and heroin in African Americans at year 15; we further assessed whether parallel associations exist in Whites.

MATERIALS AND METHODS

Study design

A total of 5,115 persons aged 18–30 years at baseline (1985–1986) were recruited for the CARDIA Study, primarily by telephone at random in three cities (Birmingham, Alabama; Chicago, Illinois; and Minneapolis, Minnesota) and at random from the membership roster of a large health plan (Oakland, California) (31, 32). The overall response rate for recruitment was about 50 percent. The recruitment targeted obtaining at each center nearly equal numbers of African Americans and Whites, men and women, persons aged less than 25 and 25 or more years, and persons with a high school education or less and those with a post-high school education. Response rates at year 7 (1992–1993) and at year 15 (2000–2001), used in these analyses, were 80 percent and 74 percent, respectively, for a sample of 3,330. This report is limited to African-American ($n = 1,507$) and White ($n = 1,813$) participants with nonmissing racial discrimination data at years 7 and 15 and substance use data at year 15. The institutional review board at each center approved the study protocol.

Independent variable

At years 7 and 15, participants were asked about their experiences of discrimination due to race or color, gender, and socioeconomic position or social class (7, 14); we focus on discrimination due to race only. Because self-reported racial discrimination was far less frequent in Whites than in African Americans and may be a qualitatively different phenomenon with different health implications, we analyzed racial discrimination among African Americans and Whites separately.

During the year 7 examination, participants were asked whether they had ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior because of their race or color in seven domains (yes/no): at school, getting a job, at work, getting housing, getting medical care, on the street or in a public setting, and from the police or in the courts. At year 15, the phrase "been prevented from doing something" was dropped from the discrimination question, and the domain "from the police or in the courts" was replaced with "at home." We found little difference in African Americans between the prevalence of racial discrimination in one or more domains at year 7 versus at year 15 (79.5 percent and mean 2.8 domains vs. 74.6 percent and mean 2.3 domains). The same was true for Whites. Examination of time changes and repeatability yielded little difference in discrimination experience between years 7 and 15. We therefore studied a four-category variable that captured the extent of discrimination and its persistence: reporting discrimination in three or more domains at both years; reporting any discrimination in three or more domains at 1 year only; reporting any discrimination in at least 1 year but less than three domains at both years; and reporting no discrimination exposure. Findings were similar in both the continuous (sum of the seven domains across both years) and categorical variables, and we reported results only for the categorical variable.

Dependent variables

Smoking status (never, former, and current smoker), alcohol consumption, and lifetime use of illicit substances were ascertained at year 15. Participants were asked, "Did you drink any alcoholic beverages in the past year? Yes/no" and three follow-up questions regarding how many drinks of wine, beer, and liquor were usually consumed per week. Total consumption was categorized as those drinking more than 15.0 ml per week and those who did not. Alcohol consumption was also dichotomized as binge drinking, defined as five or more drinks in any 24 hours for men and four or more drinks in any 24 hours for women. Lifetime use of substances (marijuana, cocaine, crack, speed, and heroin) was recorded as one of the following: never, 1–10 times in lifetime, 11–99 times in lifetime, and 100 or more times in lifetime. The frequency of each substance use in the past 30 days was also queried as yes/no.

Other covariates

Two questions were asked at year 15 regarding coping mechanisms for unfair treatment: "If you feel you have been

treated unfairly, 1) do you usually accept it as a fact of life or try to do something about it; and 2) do you usually talk to others about it or keep it to yourself?'' These variables were categorized in three levels: those who both talk to others about it and do something; those who either try to do something about it or talk to others about it, but not both; and those who both do nothing about it and keep it to themselves (33).

Psychosocial measures of control/mastery (34), social network (35), anger (36, 37), and social support (38, 39) were calculated at year 15. The measure of control of one's life was calculated by adding responses to seven questions regarding one's control over things that happen in life, ability to solve problems and change important things in one's life, and feelings of helplessness with answers ranging from 1 (strongly agree) to 5 (strongly disagree), for a maximum score 35. Social network was assessed through six questions: ''Do you belong to any of these kinds of groups? Social or recreational group; labor union, commercial group, or professional organization; church group; a group concerned with children; a group concerned with community betterment, charity, or service; or any other group?'' Answers were added, each ''yes'' answer receiving a score of 2, with a maximum score of 12.

Anger was assessed in eight domains related to expression and feeling of anger, with answers ranging from 1 (almost never) to 4 (almost always), with a summary score calculated by adding the answers to the eight questions and a maximum score of 32. Social support was classified as emotional and negative support by adding responses to four questions for each domain, ranging from 1 (not at all) to 4 (a lot) for a maximum score of 16 for each domain of social support. Questions considered for emotional support were the following: How much 1) do members of your family or friends really care about you?; 2) do they understand the way you feel about things?; 3) can you rely on them if you need to talk about your worries?; and 4) can you open up to them if you have a serious problem? For negative support, these questions were as follows: How often 1) do members of your family or friends make too many demands on you?; 2) do they criticize you?; 3) do they let you down when you are counting on them?; and 4) do they get on your nerves? High score values indicate high control, high social network, higher anger, and high social emotional or negative support.

Age and sex were ascertained at baseline and updated at year 2. Income and education obtained from the year 15 interviews were used as socioeconomic position indicators, with combined family annual income selected from nine categories (<$5,000; $5,000–$11,999; $12,000–$15,999; $16,000–$24,999; $25,000–$34,999; $35,000–$49,999; $50,000–$74,999; ≥$75,000; and nonresponse). Income was missing for 1.1 percent (28 African Americans, eight Whites). Educational attainment was collected in years from 1 to 20 and as categorical variable as high school diploma or general equivalence diploma (GED); associate degree; bachelor's degree; master's degree; doctorate; and professional (doctor of medicine (MD), doctor of jurisprudence (JD), doctor of dental science (DDS), and so on) and recoded as less than high school, high school, some college, college graduate, and graduate school.

Statistical analysis

Descriptive statistics for selected characteristics were calculated by level of racial discrimination in Blacks and Whites separately, with the statistical significance of differences assessed via chi-squared and analysis-of-variance tests, as appropriate.

Logistic regression estimated the strength of the association between self-reported racial discrimination at years 7 and 15 and any alcohol consumption at year 15, while multinomial logistic regression estimated the association of discrimination with smoking and lifetime use of marijuana, crack, cocaine, speed, and heroin in separate models for each outcome, before and after adjustment for covariates including education and income. To assess whether one substance predominated in a cluster of behaviors, we further adjusted the models for smoking status and alcohol consumption by marijuana use, and vice versa. To determine whether the effect of racial discrimination differs by coping mechanisms to unfair treatment, sex, income, and education, we tested appropriate interaction terms in the final models.

Additional analyses that further exploited the longitudinal nature of the CARDIA Study but yielded no qualitatively different conclusions are included in a supplemental document referred to as the ''Web Appendix'' and posted to the *Journal*'s website (http://aje.oxfordjournals.org/). Two-sided p values of less than 0.05 were considered statistically significant. Analyses were performed using SAS, version 9.1.3, software (40).

RESULTS

Most African Americans reported experiencing racial discrimination, with 89 percent reporting any discrimination at year 7 or year 15 and 34 percent reporting discrimination in at least three of seven domains in both years. African Americans reporting racial discrimination also reported more education, higher income, less control of their life, more anger, less emotional support, more negative interactions, and having a stronger social network than those reporting no racial discrimination (table 1). Racial discrimination was far less common among Whites, with 1 percent reporting racial discrimination in three or more domains in both years and 38 percent reporting any discrimination in either year (table 2). In contrast to African Americans, Whites reporting racial discrimination reported less education and lower income than did those who reported none. Similar to African Americans, Whites reporting any discrimination were more likely to report less control of their life, more anger, less emotional support, and more negative interactions than did their counterparts reporting none (all p values < 0.001).

African Americans reporting any discrimination were more likely to report drinking any alcohol in the past year and using marijuana and cocaine 11 or more times in their lifetime (table 3). Distinct monotonic increase patterns with increasing reported racial discrimination were seen for any alcohol consumption in the past year and for marijuana and cocaine lifetime uses of 11–99 and 100 or more times. There was no association between self-reported racial discrimination and moderate to heavy drinking or binge

TABLE 1.   Selected sociodemographic characteristics at year 15, by self-reported racial discrimination in years 7 and 15 among African Americans, the CARDIA* Study, 1992–2001

Characteristics at year 15	Racial discrimination experience in years 7 and 15†				
	None ($n = 173$)	Any but <3 at both years ($n = 406$)	Any with ≥3 at 1 year only ($n = 420$)	≥3 at both years ($n = 508$)	p value‡
Racial discrimination experience (%)	11.5	26.9	27.9	33.7	
Age in years (mean (SD*))	39.4 (3.8)	39.7 (3.8)	39.4 (3.8)	39.9 (3.8)	0.15
Sex (%)					
Male	30.6	37.4	43.8	43.5	
Female	69.4	62.6	56.2	56.5	0.01
Married (%)					
Yes	42.8	50.5	49.5	52.8	
No	57.2	49.5	50.5	47.2	0.15
Education (%)					
Incomplete high school	12.7	7.1	8.6	4.7	
Complete high school or GED*	36.4	28.1	23.1	19.3	
1–3 years of college	37.6	41.1	39.3	40.5	
4 years of college	9.8	15.5	22.4	22.0	
Some graduate or professional school	3.5	8.1	6.7	13.4	<0.0001
Income (%)					
<$12,000	20.1	11.8	8.5	7.4	
$12,000–$15,999	9.5	4.8	4.6	3.2	
$16,000–$24,999	10.1	9.3	10.9	7.8	
$25,000–$34,999	10.1	14.4	14.3	11.2	
$35,000–$49,999	17.2	18.1	18.2	21.0	
$50,000–$74,999	18.9	22.2	23.0	19.6	
≥$75,000	14.2	19.4	20.6	29.8	<0.0001
Unfair treatment coping mechanisms at year 15 (%)					
Talk to others and do something	18.6	20.7	18.4	20.1	
Either talk to others or do something (not both)	4.1	3.9	3.1	3.0	
Do nothing	77.3	75.4	78.5	76.9	0.92
Control/mastery score (mean (SD))§	24.2 (3.9)	25.0 (3.8)	25.0 (3.6)	24.4 (3.7)	0.01
Anger score	13.0 (3.1)	13.4 (3.4)	13.5 (3.3)	14.3 (3.7)	<0.0001
Social support					
Emotional support	13.8 (2.4)	13.9 (2.4)	13.8 (2.4)	13.7 (2.6)	0.79
Negative interactions	11.7 (2.8)	11.6 (2.7)	11.6 (2.7)	11.0 (2.6)	0.001
Social network	5.7 (1.0)	6.0 (1.2)	6.1 (1.2)	6.4 (1.4)	<0.0001

  * CARDIA, Coronary Artery Risk Development in Young Adults; SD, standard deviation; GED, general equivalence diploma.

  † Categories for racial discrimination experience represent discrimination in seven domains in both year 7 and year 15. Control, anger, and social network were calculated by adding responses to seven, eight, and six questions, respectively.

  ‡ p values for chi-squared and analysis-of-variance tests.

  § For social support, emotional support was calculated by adding responses to four questions representing emotional support, and negative interactions were calculated by adding responses to four questions representing negative interactions. Higher values indicated higher control of one's life: higher emotional support or negative interaction, higher social networking or greater anger.

drinking in the past month, nor with current (last 30 days) marijuana use.

After full adjustment, as shown in model 2 of table 4, African Americans experiencing racial discrimination in at least three domains in both years had 1.87 (95 percent confidence interval (CI): 1.18, 2.96) and 2.28 (95 percent CI: 1.19, 4.36) higher odds of reporting current and former tobacco use than did those experiencing no discrimination. Those reporting discrimination were also more likely to report having any alcohol in the past year as compared with those reporting none, before and after full adjustment.

African Americans reporting discrimination were more likely to report lifetime marijuana use compared with those reporting no discrimination, before and after full adjustment

TABLE 2. Selected sociodemographic characteristics at year 15, by self-reported racial discrimination in years 7 and 15 among Whites, the CARDIA* Study, 1992–2001

Characteristics at year 15	Racial discrimination experience in years 7 and 15†				
	None (n = 1,125)	Any but <3 at both years (n = 579)	Any with ≥3 at 1 year only (n = 88)	≥3 at both years (n = 21)	p value‡
Racial discrimination experience (%)	62.1	31.9	4.8	1.2	
Age in years (mean (SD*))	40.9 (3.2)	40.5 (3.5)	39.7 (3.5)	40.2 (3.5)	0.03
Sex (%)					
Male	47.8	47.1	48.9	38.1	
Female	52.2	52.9	51.1	61.9	0.82
Married (%)					
Yes	72.5	66.3	63.6	42.9	
No	27.5	33.7	36.4	57.1	
Education (%)					0.001
Incomplete high school	1.8	2.1	9.1	0	
Complete high school or GED*	12.7	10.7	14.8	19.1	
1–3 years of college	21.3	22.9	23.8	38.1	
4 years of college	32.4	33.5	19.3	19.1	
Some graduate or professional school	31.7	30.7	32.9	23.8	0.001
Income (%)					
<$12,000	1.2	2.8	3.4	4.8	
$12,000–$15,999	0.8	1.2	3.4	4.8	
$16,000–$24,999	2.9	5.7	9.1	9.5	
$25,000–$34,999	5.2	7.4	9.1	19.1	
$35,000–$49,999	13.8	12.8	11.4	23.8	
$50,000–$74,999	23.5	24.3	23.9	9.5	
≥$75,000	52.6	45.7	39.8	28.6	<0.0001
Unfair treatment coping mechanisms at year 15 (%)					
Talk to others and do something	14.2	14.2	27.3	4.8	
Either talk to others or do something (not both)	3.6	2.2	3.4	4.8	
Do nothing	82.1	83.6	69.3	90.4	0.02
Control/mastery score (mean (SD))§	25.0 (3.4)	24.3 (3.6)	23.0 (3.9)	23.1 (5.3)	<0.0001
Anger score	13.7 (3.0)	14.1 (3.1)	14.6 (3.3)	16.4 (4.8)	<0.0001
Social support					
Emotional support	14.5 (1.9)	14.0 (2.3)	13.4 (2.5)	13.6 (2.8)	<0.0001
Negative interactions	12.4 (2.2)	11.7 (2.3)	11.0 (2.4)	9.6 (2.7)	<0.0001
Social network	6.3 (1.2)	6.3 (1.2)	6.4 (1.3)	6.5 (1.2)	0.83

* CARDIA, Coronary Artery Risk Development in Young Adults; SD, standard deviation; GED, general equivalence diploma.

† Categories for racial discrimination experience represent discrimination in seven domains in both years 7 and 15. Control, anger, and social network were calculated by adding responses to seven, eight, and six questions, respectively.

‡ p values for chi-squared and analysis-of-variance tests.

§ For social support, emotional support was calculated by adding responses to four questions representing emotional support, and negative interactions were calculated by adding responses to four questions representing negative interactions. Higher values indicated higher control of one's life: higher emotional support or negative interaction, higher social networking or greater anger.

(table 5). This pattern was observed for those reporting having used marijuana 1–10 times, 11–99 times, and 100 or more times in their lifetime. For African Americans reporting being discriminated in three or more domains in both years, the odds of using cocaine 11–99 times over their lifetime were 7.04 (95 percent CI: 1.65, 29.96) versus no

discrimination. The adjusted associations between crack, speed, and heroin and racial discrimination were not significant (data not shown).

There was no evidence that discrimination interacted with sex, income, education, and coping for smoking status, alcohol consumption, or marijuana use. The odds ratios for

TABLE 3. Prevalence of smoking, alcohol consumption, marijuana use, cocaine, crack, speed, and heroin at year 15, according to self-reported racial discrimination in years 7 and 15 among African Americans, the CARDIA* Study, 1992–2001

Characteristics at year 15	Racial discrimination experience in years 7 and 15†				
	None (n = 173)	Any but <3 at both years (n = 406)	Any with ≥3 at 1 year only (n = 420)	≥3 at both years (n = 508)	p value‡
Smoking status (%)					
Current	27.7	26.3	28.6	28.3	
Former	8.1	11.6	11.2	14.3	
Never	64.2	62.1	60.2	57.4	0.38
Alcohol consumption					
Any alcohol in the past year (%)	59.0	65.3	75.2	78.1	<0.001
Alcohol in ml consumed per day (mean (SE*))	18.4 (4.0)	13.2 (2.2)	15.5 (1.9)	14.0 (1.9)	0.68
% drinking >15 ml per week	16.2	14.3	21.0	19.5	0.06
Binge drinking (%)§	20.8	19.7	24.5	23.2	0.35
Marijuana by times used in life (%)					
0	56.6	44.3	34.1	30.0	
1–10	19.1	21.9	23.8	22.9	
11–99	9.8	18.2	17.1	21.7	
≥100	14.5	15.5	25.0	25.4	<0.001
Cocaine by times used in life (%)					
0	87.3	82.5	76.4	73.8	
1–10	7.5	8.9	11.0	12.6	
11–99	1.2	4.9	8.3	8.7	
≥100	4.0	3.7	4.3	4.9	0.004
Crack by times used in life (%)					
0	86.1	86.7	80.5	84.6	
1–10	4.6	5.2	6.2	4.5	
11–99	4.1	4.2	5.7	5.1	
≥100	5.2	3.9	7.6	5.7	0.46
Speed by times used in life (%)					
0	93.6	90.4	86.2	86.0	
1–10	3.5	5.7	8.1	7.5	
11–99	1.7	2.7	5.0	4.9	
≥100	1.2	1.2	0.7	1.6	0.12
Heroin by times used in life (%)					
0	98.3	96.5	96.2	96.0	
1–10	0	2.0	1.4	1.6	
11–99	0.6	0.7	1.4	1.6	
≥100	1.2	1.0	0.9	1.2	0.78

* CARDIA, Coronary Artery Risk Development in Young Adults; SE, standard error.

† Categories for racial discrimination experience represent discrimination in seven domains in both years 7 and 15.

‡ p values for chi-squared and analysis-of-variance tests.

§ Binge drinking was defined as five or more drinks on any occasion for men and as four or more drinks on any occasion for women.

smoking and alcohol for model 2 in table 4 were further adjusted for marijuana and cocaine (analysis not shown). After this adjustment, the association was attenuated to non-significance for smoking, while for alcohol, the odds ratio decreased by 50 percent in the high level of discrimination (odds ratio = 2.12 vs. 1.59). However, when the models for smoking and alcohol consumption were additionally adjusted only for each other, the associations barely changed. When the model for marijuana use was additionally adjusted for smoking, alcohol consumption, and cocaine, the association remained significant, although its magnitude decreased somewhat (range: 17–24 percent).

TABLE 4.   Odds ratios and their 95% confidence intervals for smoking status and alcohol consumption at year 15 by self-reported perceived racial discrimination experience in years 7 and 15 among African Americans, the CARDIA* Study, 1992–2001†

Dependent variable by racial discrimination in years 7 and 15	Model 1‡		Model 2‡	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Smoking status (reference: never smoker)				
Former smoker				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	1.48	0.78, 2.82	1.60	0.83, 3.07
Any discrimination with ≥3 domains at 1 year only	1.53	0.80, 2.91	1.64	0.85, 3.17
Discrimination in ≥3 domains in both years	2.01	1.09, 3.74	2.28	1.19, 4.36
Current smoker				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	0.99	0.66, 1.50	1.27	0.81, 2.01
Any discrimination with ≥3 domains at 1 year only	1.09	0.72, 1.65	1.57	1.00, 2.47
Discrimination in ≥3 domains in both years	1.16	0.78, 1.73	1.87	1.18, 2.96
Alcohol consumption in the past year				
Any alcohol (reference: no use)				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	1.29	0.89, 1.86	1.19	0.81, 1.75
Any discrimination with ≥3 domains in 1 year only	2.00	1.37, 2.91	1.84	1.24, 2.72
Discrimination in ≥3 domains in both years	2.39	1.65, 3.47	2.12	1.42, 3.17

* CARDIA, Coronary Artery Risk Development in Young Adults.

† Odds ratios are from logistic regression models for alcohol consumption within the past year (yes vs. no) and from separate multinomial logistic regression models for smoking status with never smokers as the reference.

‡ Odds ratio adjusted for age, sex, and marital status (model 1) and additionally adjusted for income, education, unfair treatment coping mechanisms, anger, personal control, social support (emotional and negative), and social networks (model 2).

Whites reporting any discrimination both years were more likely to report using marijuana, cocaine, and speed in their lifetime than were Whites reporting none (all $p <$ 0.001) (table 6). In fact, there was a positive monotonic pattern for those using marijuana, cocaine, and speed 100 or more times in their lifetime. Although discrimination in three or more domains in both years was rare among Whites (1.2 percent), the pattern of association of racial discrimination with marijuana and cocaine was similar to the one for African Americans in the fully adjusted model (data not shown). For example, in Whites reporting being discriminated in three or more domains in both years, the fully adjusted odds of using marijuana and cocaine 100 or more times during their lifetime were 3.00 (95 percent CI: 0.77, 11.71) and 2.24 (95 percent CI: 0.42, 12.05) versus Whites reporting no discrimination.

DISCUSSION

We found that self-reported racial discrimination was common in African Americans, with 89 percent reporting any discrimination when queried 8 years apart and 34 percent reporting racial discrimination in at least three of seven domains in both years. Racial discrimination was much less common among Whites, with self-reported rates of 38 per-

cent and 1 percent, respectively. Self-reported racial discrimination in African Americans was associated with smoking, past year alcohol consumption, and lifetime use of marijuana and cocaine (as it was in Whites). However, experiencing racial discrimination was unrelated to marijuana use in the past 30 days, was stronger in former than in current smokers, and was unrelated to amount of alcohol consumed. Although less common in Whites, the pattern of association of drug use and discrimination was clear in both racial/ethnic groups, indicating that unfair treatment may lead to similar coping responses in African Americans and Whites.

Our findings are consistent with those of some studies reporting an association between self-reported discrimination and smoking among African Americans in the United States (20, 22, 23, 25, 27) and in other ethnic groups elsewhere (29). The odds ratios for current smoking in these studies range from 1.37 to 2.10. For example, in the United States, Landrine and Klonoff (20) found that African-American college students reporting high discrimination were 1.87 times more likely to smoke than were those reporting a lower level of discrimination. Guthrie et al. (22) found that African-American adolescents reporting racial discrimination were 1.37 times more likely to smoke than were those who did not, and Bennett et al. (23) found a stronger association (odds ratio = 2.10) among African-American young adults. Similarly, Harris et al. (29) found that those reporting

TABLE 5. Odds ratios and their 95% confidence intervals for marijuana use and cocaine use at year 15 by self-reported perceived racial discrimination experience in years 7 and 15 among African Americans, the CARDIA* Study, 1992–2001†

Dependent variable by racial discrimination in years 7 and 15	Model 1‡		Model 2‡	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Marijuana lifetime use (reference: never use)				
1–10 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	1.48	0.93, 2.37	1.60	0.98, 2.61
Any discrimination with ≥3 domains in 1 year only	2.15	1.34, 3.45	2.22	1.36, 3.63
Discrimination in ≥3 domains in both years	2.28	1.43, 3.64	2.46	1.49, 4.05
11–99 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	2.31	1.28, 4.14	2.38	1.29, 4.35
Any discrimination with ≥3 domains in 1 year only	2.85	1.57, 5.15	3.00	1.63, 5.54
Discrimination in ≥3 domains in both years	4.03	2.27, 7.16	4.30	2.34, 7.90
≥100 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	1.27	0.74, 2.18	1.35	0.77, 2.38
Any discrimination with ≥3 domains in 1 year only	2.60	1.54, 4.39	2.74	1.58, 4.74
Discrimination in ≥3 domains in both years	2.97	1.78, 4.96	3.31	1.90, 5.74
Cocaine use (reference: never use)				
1–10 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	1.22	0.63, 2.37	1.12	0.57, 2.20
Any discrimination with ≥3 domains in 1 year only	1.60	0.84, 3.07	1.35	0.69, 2.62
Discrimination in ≥3 domains in both years	1.91	1.02, 3.59	1.53	0.80, 2.96
11–99 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	4.21	0.97, 18.29	3.96	0.90, 17.31
Any discrimination with ≥3 domains in 1 year only	7.73	1.83, 32.66	6.54	1.53, 27.95
Discrimination in ≥3 domains in both years	8.02	1.92, 33.63	7.04	1.65, 29.96
≥100 times				
No discrimination in any domain	1.00		1.00	
Any discrimination but <3 domains in both years	0.86	0.34, 2.19	0.89	0.34, 2.32
Any discrimination with ≥3 domains in 1 year only	0.94	0.63, 2.37	1.04	0.40, 2.70
Discrimination in ≥3 domains in both years	1.21	0.51, 3.07	1.36	0.54, 3.42

* CARDIA, Coronary Artery Risk Development in Young Adults.

† Odds ratios are from separate multinomial logistic regression models for lifetime use of marijuana and cocaine with never users as the reference.

‡ Odds ratio adjusted for age, sex, and marital status (model 1) and additionally adjusted for income, education, unfair treatment coping mechanisms, anger, personal control, social support (emotional and negative), and social networks (model 2).

lifetime discrimination in New Zealand (mostly non-European ethnic groups such as Maori, Pacific Islanders, and Asians) were 1.67 times more likely to smoke than were those reporting no discrimination. We found that those reporting discrimination in three or more domains on two occasions had 1.87 times higher odds of reporting current smoking than did those reporting no discrimination. Interestingly, the association for past smoking was stronger than for current smoking (odds ratio = 2.28).

Previous studies examining the association between racial discrimination and alcohol consumption have produced mixed results (18, 19, 21, 25, 27). For example, Yen et al. (18, 19) found no association between racial discrimination and heavy drinking among African Americans after adjusting for age, sex, education, income, marital status, and seniority among transit operators in San Francisco, California. Resnicow et al. (27) reported similar findings in African-American adolescents. However, Martin et al. (21), using

TABLE 6. Prevalence of smoking status, alcohol consumption, marijuana use, cocaine, crack, speed, and heroin at year 15, according to self-reported racial discrimination in years 7 and 15 among Whites, the CARDIA* Study, 1992–2001

Characteristics at year 15	Racial discrimination experience in years 7 and 15†				
	None (n = 1,125)	Any but <3 at both years (n = 579)	Any with ≥3 at 1 year only (n = 88)	≥3 at both years (n = 21)	p value‡
Smoking status (%)					
Current	15.6	15.9	19.3	42.9	
Former	20.9	26.2	32.9	23.8	
Never	63.5	57.9	47.7	33.3	0.002
Alcohol consumption					
Any alcohol in the past year (%)	87.0	85.6	80.7	76.2	0.19
Alcohol in ml consumed per day (mean (SE*))	12.9 (0.7)	14.7 (1.0)	9.9 (2.8)	14.3 (5.6)	0.22
% drinking >15 ml per week	25.0	24.9	18.2	19.1	0.49
Binge drinking (%)§	27.6	23.7	21.6	33.3	0.22
Marijuana by times used in life (%)					
0	25.5	19.3	11.4	14.3	
1–10	25.1	20.8	21.6	14.3	
11–99	23.9	25.7	35.2	23.8	
≥100	25.6	34.2	31.8	47.6	0.0001
Cocaine by times used in life (%)					
0	62.6	55.1	40.9	42.9	
1–10	20.9	21.0	30.7	23.8	
11–99	12.5	17.0	20.4	23.8	
≥100	4.0	6.9	7.9	9.5	0.0003
Crack by times used in life (%)					
0	95.6	94.1	89.8	85.7	
1–10	2.3	3.8	6.8	14.3	
11–99	0.9	1.3	2.3	0	
≥100	1.2	0.7	1.1	0	0.02
Speed by times used in life (%)					
0	69.1	58.9	57.9	42.9	
1–10	16.9	22.5	21.6	14.3	
11–99	10.8	13.7	12.5	33.3	
≥100	3.2	4.8	7.9	9.5	<0.0001
Heroin by times used in life (%)					
0	96.0	89.5	84.1	95.2	
1–10	2.1	6.4	11.4	0	
11–99	1.4	3.4	4.5	4.8	
≥100	0.4	0.7	0	0	<0.0001

* CARDIA, Coronary Artery Risk Development in Young Adults; SE, standard error.
† Categories for racial discrimination experience represent discrimination in seven domains in both year 7 and year 15.
‡ p values for chi-squared and analysis-of-variance tests.
§ Binge drinking was defined as five or more drinks on any occasion for men and as four or more drinks on any occasion for women.

data from the National Survey of Black Workers, found that African Americans reporting discrimination were 2.12 times more likely to report problem drinking than were those who did not. Our findings suggest an association between discrimination and alcohol consumption within the past year, although we found neither a dose-response effect nor an association with heavy or binge drinking.

Among the substances that we studied, the relation with marijuana use appeared strongest, with a dose-response effect. There was an association between racial discrimination and lifetime cocaine use among those reporting high discrimination in both years and using cocaine 11–99 times, but not for 0–10 or 100 or more times. Although we did not find any previous study examining the association of racial

discrimination with marijuana and cocaine use in adults, studies have found that African-American adolescents and American-Indian children perceiving racism were more likely to report drug use including marijuana than were those perceiving no racism (27, 28). If replicated by future research, our finding of an association of self-reported discrimination with marijuana and cocaine use may be generalizable across multiple health practices behaviors. We found no association between discrimination and crack, speed, and heroin. Possibly, this relates to the lower prevalence of the use of these substances, compared with marijuana and cocaine.

Previous studies have found that racial discrimination is positively associated with socioeconomic position in African Americans (7, 12, 18, 19, 41–43). Specifically, African Americans with higher education were more likely to experience discrimination (7, 12, 18, 19, 42). We found that African Americans reporting discrimination in three or more domains in both years had higher levels of education and income than did those who reported experiencing less or no discrimination. In Whites, the associations were in the opposite direction, with the least educated and lowest income subjects more likely to report discrimination. Possibly, African Americans with a higher socioeconomic position report more discrimination because they are more exposed to situations in which they are discriminated, or they may be more aware of subtle forms of discrimination. In contrast, Whites with a low socioeconomic position may be more likely to be exposed to environments in which they are the minority and, therefore, be more likely to feel discriminated.

The findings of Armstead et al. (43) indicate, albeit without a formal mediation analysis, that anger may be a mediator of the association between racial discrimination and blood pressure. However, Clark (44) shows that seeking social support was associated with higher levels of blood pressure under high perceived racism. Moreover, Steffen et al. (45) found that anger did not explain the association between perceived racism and blood pressure. We found that CARDIA Study participants reporting any discrimination were more likely to report less control of their life, higher anger, lower emotional support, and more negative interactions than those reporting none, regardless of race/ethnicity. Furthermore, our study shows that anger, control, social support, and networks partially mediated the association of racial discrimination with smoking and marijuana in both African Americans and Whites. Assuming that smoking and marijuana help to relieve at least some of the negative feelings generated by racial discrimination, we find it possible that anger, emotional support, negative interactions, and social network may amplify or diminish the need for using smoking and marijuana as a buffer for the negative effect of discrimination.

Among the strengths of our study are its population-based nature, the focus on young to middle-aged adults, the wide ranges of educational attainment and income, the information on illicit substance use, and socioeconomic position indicators. An important limitation is the observational nature of the data. Remarkably, current marijuana use at years 0 and 2 of the CARDIA Study was greater among persons reporting (in years 7 and 15) discrimination ever, compared with never (data not shown). Given that discrimination was queried as "ever," conceivably persons who experienced early life discrimination also engaged in substance misuse in early adulthood and then gave it up; however, the temporal ordering of the questions precludes clear inference. Further, because both exposure and outcome measures were self-reported, same-source bias (i.e., a tendency for individuals who report more risky behaviors to also report more discrimination) could have biased the results away from the null.

We found that, after controlling for education and income, African Americans experiencing discrimination were more likely to have used marijuana relatively often during their lifetimes and to smoke and drink at least casually. Although discrimination was less frequent in Whites, their findings parallel those in African Americans. With due regard for issues of temporal ordering of the associations found here, it is possible that use of a recreational drug helps to cope with life stress resulting from perceived unfair treatment because of one's race/ethnicity. Our findings that current use of marijuana was not related to discrimination and that risk of being a former smoker was increased suggest that, by early middle age (average age, 40 years), people may have found other ways to cope. However, the persistence of excess current smoking, which is associated with adverse effects on long-term health in this sample (46), suggests that this particular addictive habit may be more lasting (47), even as alternative coping behaviors are adopted.

REFERENCES

1. Williams DR. Race, socioeconomic status, and health. The added effects of racism and discrimination. Ann N Y Acad Sci 1999;896:173–88.
2. Williams DR, Yu Y, Jackson J, et al. Racial differences in physical and mental health: socioeconomic status, stress, and discrimination. J Health Psychol 1997;2:335–51.
3. Williams DR, Collins C. US socioeconomic and racial differences in health—patterns and explanations. Annu Rev Sociol 1995;21:349–86.
4. Williams DR, Neighbors HW, Jackson JS. Racial/ethnic discrimination and health: findings from community studies. Am J Public Health 2003;93:200–8.

5. Krieger N. Embodying inequality: a review of concepts, measures, and methods for studying health consequences of discrimination. Int J Health Serv 1999;29:295–352.

6. Paradies Y. A systematic review of empirical research on self-reported racism and health. Int J Epidemiol 2006;35: 888–901.

7. Krieger N, Sidney S, Coakley E. Racial discrimination and skin color in the CARDIA Study: implications for public health research. Am J Public Health 1998;88:1308–13.

8. Schulz A, Williams D, Israel B, et al. Unfair treatment, neighborhood effects, and mental health in the Detroit metropolitan area. J Health Soc Behav 2000;41:314–32.

9. Karlsen S, Nazroo JY. Relation between racial discrimination, social class, and health among ethnic minority groups. Am J Public Health 2002;92:624–31.

10. Schulz A, Israel B, Williams D, et al. Social inequalities, stressors and self reported health status among African American and white women in the Detroit metropolitan area. Soc Sci Med 2000;51:1639–53.

11. Gee GC. A multilevel analysis of the relationship between institutional and individual racial discrimination and health status. Am J Public Health 2002;92:615–23.

12. Borrell LN, Kiefe CI, Williams DR, et al. Self-reported health, perceived racial discrimination, and skin color in African Americans in the CARDIA Study. Soc Sci Med 2006;63: 1415–27.

13. Klonoff EA, Landrine H. Is skin color a marker for racial discrimination? Explaining the skin color-hypertension relationship. J Behav Med 2000;23:329–38.

14. Krieger N, Sidney S. Racial discrimination and blood pressure: the CARDIA Study of young black and white adults. Am J Public Health 1996;86:1370–8.

15. Troxel WM, Matthews KA, Bromberger JT, et al. Chronic stress burden, discrimination, and subclinical carotid artery disease in African American and Caucasian women. Health Psychol 2003;22:300–9.

16. Wyatt SB, Williams DR, Calvin R, et al. Racism and cardiovascular disease in African Americans. Am J Med Sci 2003; 325:315–31.

17. Lewis TT, Everson-Rose SA, Powell LH, et al. Chronic exposure to everyday discrimination and coronary artery calcification in African-American women: the SWAN Heart Study. Psychosom Med 2006;68:362–8.

18. Yen IH, Ragland DR, Greiner BA, et al. Racial discrimination and alcohol-related behavior in urban transit operators: findings from the San Francisco Muni Health and Safety Study. Public Health Rep 1999;114:448–58.

19. Yen IH, Ragland DR, Greiner BA, et al. Workplace discrimination and alcohol consumption: findings from the San Francisco Muni Health and Safety Study. Ethn Dis 1999;9: 70–80.

20. Landrine H, Klonoff EA. Racial discrimination and cigarette smoking among Blacks: findings from two studies. Ethn Dis 2000;10:195–202.

21. Martin JK, Tuch SA, Roman PM. Problem drinking patterns among African Americans: the impacts of reports of discrimination, perceptions of prejudice, and ''risky'' coping strategies. J Health Soc Behav 2003;44:408–25.

22. Guthrie BJ, Young AM, Williams DR, et al. African American girls' smoking habits and day-to-day experiences with racial discrimination. Nurs Res 2002;51:183–90.

23. Bennett GG, Wolin KY, Robinson EL, et al. Perceived racial/ethnic harassment and tobacco use among African American young adults. Am J Public Health 2005;95: 238–40.

24. Landrine H, Klonoff EA. The schedule of racist events: a measure of discrimination and a study of its negative physical and mental health consequences. J Black Psychol 1996;22:144–68.

25. Kwate NO, Valdimarsdottir HB, Guevarra JS, et al. Experiences of racist events are associated with negative health consequences for African American women. J Natl Med Assoc 2003;95:450–60.

26. McCord J, Ensminger ME. Multiple risks and comorbidity in an African-American population. Crim Behav Ment Health 1997;7:339–52.

27. Resnicow K, Soler RE, Braithwaite RL, et al. Development of a racial and ethnic identity scale for African American adolescents: the survey of Black life. J Black Psychol 1999;25:171–88.

28. Whitbeck LB, Hoyt DR, McMorris BJ, et al. Perceived discrimination and early substance abuse among American Indian children. J Health Soc Behav 2001;42:405–24.

29. Harris R, Tobias M, Jeffreys M, et al. Racism and health: the relationship between experience of racial discrimination and health in New Zealand. Soc Sci Med 2006;63:1428–41.

30. Whitbeck LB, Chen X, Hoyt DR, et al. Discrimination, historical loss and enculturation: culturally specific risk and resiliency factors for alcohol abuse among American Indians. J Stud Alcohol 2004;65:409–18.

31. Cutter GR, Burke GL, Dyer AR, et al. Cardiovascular risk factors in young adults. The CARDIA baseline monograph. Control Clin Trials 1991;12(suppl):1S–77S.

32. Friedman GD, Cutter GR, Donahue RP, et al. CARDIA: study design, recruitment, and some characteristics of the examined subjects. J Clin Epidemiol 1988;41:1105–16.

33. Stancil TR, Hertz-Picciotto I, Schramm M, et al. Stress and pregnancy among African-American women. Paediatr Perinat Epidemiol 2000;14:127–35.

34. Pearlin LI, Schooler C. The structure of coping. J Health Soc Behav 1978;19:2–21.

35. Berkman LF, Syme SL. Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. Am J Epidemiol 1979;109:186–204.

36. Spielberger CD. State-trait anger expression inventory: professional manual. Odessa, FL: Psychological Assessment Resources, Inc, 1998.

37. Spielberger CD, Johnson EH, Russell SF, et al. The experience and expression of anger: construction and validation of an anger expression scale. In: Chesney MA, Roseman RH, eds. Anger and hostility in cardiovascular and behavioral disorders. New York, NY: Hemisphere, 1985:5–30.

38. Seeman TE, Berkman LF, Charpentier PA, et al. Behavioral and psychosocial predictors of physical performance: MacArthur studies of successful aging. J Gerontol A Biol Sci Med Sci 1995;50:M177–83.

39. Seeman TE, Bruce ML, McAvay GJ. Social network characteristics and onset of ADL disability: MacArthur studies of successful aging. J Gerontol B Psychol Sci Soc Sci 1996;51: S191–200.

40. SAS Institute, Inc. SAS/STAT 9.1 user's guide. Cary, NC: SAS Institute, Inc, 2004.

41. Kessler RC, Mickelson KD, Williams DR. The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. J Health Soc Behav 1999; 40:208–30.

42. Ren XS, Amick BC, Williams DR. Racial/ethnic disparities in health: the interplay between discrimination and socioeconomic status. Ethn Dis 1999;9:151–65.

43. Armstead CA, Lawler KA, Gorden G, et al. Relationship of racial stressors to blood pressure responses and anger expression in black college students. Health Psychol 1989;8:541–56.

44. Clark R. Self-reported racism and social support predict blood pressure reactivity in Blacks. Ann Behav Med 2003;25: 127–36.

45. Steffen PR, McNeilly M, Anderson N, et al. Effects of perceived racism and anger inhibition on ambulatory blood pressure in African Americans. Psychosom Med 2003;65: 746–50.

46. Kertesz SG, Pletcher MJ, Safford M, et al. Illicit drug use in young adults and subsequent decline in general health: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Drug Alcohol Depend 2007;88:224–33.

47. Chen K, Kandel DB. The natural history of drug use from adolescence to the mid-thirties in a general population sample. Am J Public Health 1995;85:41–7.