



## Perceived racial/ethnic discrimination, smoking and alcohol consumption in the Multi-Ethnic Study of Atherosclerosis (MESA)

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### ABSTRACT

**Objective.** To examine the association of perceived racial/ethnic discrimination with smoking and alcohol consumption in adults participating in the Multi-Ethnic Study of Atherosclerosis.

**Methods.** Data on 6680 black, Chinese, Hispanic and white adults aged 45 to 84 years of age recruited from Illinois, New York, Maryland, North Carolina, Minnesota and California during 2000 and 2002 were used for this analysis. Logistic regression was used to estimate the association of perceived racial/ethnic discrimination with smoking status and alcohol consumption for each racial/ethnic group separately.

**Results.** Blacks were more likely to experience racial/ethnic discrimination (43%) than Hispanics (19%), Chinese participants (10%) or whites (4%,  $P < 0.0001$ ). In the fully-adjusted model, blacks reporting racial/ethnic discrimination had 34% and 51% greater odds of reporting smoking and drinking, respectively, than blacks who did not report racial/ethnic discrimination. Hispanics reporting racial/ethnic discrimination had 62% greater odds of heavy drinking. Whites reporting racial/ethnic discrimination had 88% greater odds of reporting being current smokers than whites who did not report racial/ethnic discrimination.

**Conclusions.** Our findings suggest that the experience of discrimination is associated with greater prevalence of unhealthy behaviors. Specifically, the use of smoking and alcohol may be patterned by experience of discrimination.

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Racial discrimination, a potentially important risk factor for adverse health outcomes, is differentially distributed across race/ethnicity (Williams, 1999, Williams and Collins, 1995, Williams et al., 2003, 1997, Krieger, 1999). Recent research reveals that at least 75% of blacks experience discrimination (Borrell et al., 2006, 2007). Moreover studies suggest that perceived racial discrimination is associated with poorer self-rated physical and mental health (Williams et al., 2003, Schulz et al., 2000a,b, Karlsen and Nazroo, 2002, Gee, 2002, Williams, 1999, Krieger, 1999, Paradies, 2006, Borrell et al., 2006) and with adverse cardiovascular outcomes (Klonoff and Landrine, 2000, Williams et al., 2003, Krieger and Sidney, 1996, Krieger, 1999, Wyatt et al., 2003, Troxel et al., 2003, Lewis et al., 2006). Although most of the evidence on the association between racial discrimination and health status pertains to blacks, there is evidence

for other racial/ethnic groups such as Hispanics and Asians (Williams et al., 2003, Paradies, 2006, Araujo and Borrell, 2006, Gee, 2002, Gee et al., 2007b,c, Williams and Mohammed, 2009).

The mechanisms through which racial discrimination (hereafter discrimination) may affect health are poorly understood. One plausible mechanism involves the physiologic consequences of stress resulting from chronic experiences of discrimination (Cohen et al., 1995, Williams and Mohammed, 2009, Pascoe and Smart Richman, 2009). A second possible mechanism involves known behavioral risk factors for adverse health outcomes (Cohen et al., 1995, Williams and Mohammed, 2009, Pascoe and Smart Richman, 2009). Persons may cope with the chronic stress of discrimination through the adoption of coping strategies that involve engaging in unhealthy behaviors such as smoking and drinking (Jackson and Knight, 2006). Specifically, these behaviors may buffer the stress induced by discrimination by relieving anxiety and generating a sense of well-being. Discrimination may also operate by reducing self-control and thus promoting adoption of unhealthy behaviors (Pascoe and

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Smart Richman, 2009). Although a few studies have reported that perceived discrimination is associated with greater alcohol and tobacco use in adults (Yen et al., 1999a,b, Landrine and Klonoff, 2000, 1996, Martin et al., 2003, Guthrie et al., 2002, Bennett et al., 2005, Kwate et al., 2003, Resnicow et al., 1999, Whitbeck et al., 2001, 2004, Terrell et al., 2006, Borrell et al., 2007, Gee et al., 2007a, Landrine et al., 2006, Krieger et al., 2005, Taylor and Jackson, 1990, Chae et al., 2008a,b), few studies have focused on more than two racial/ethnic groups (Krieger et al., 2005, Landrine et al., 2006). Thus, there is a need to investigate the use of smoking and alcohol in racial/ethnic diverse population-based samples.

Using data from the Multi-Ethnic Study of Atherosclerosis (MESA), we investigated the association of self-reported perceived discrimination with smoking and alcohol consumption in a large population-based sample of black, Hispanic, Chinese and white adults aged 45 to 84 years adjusting for potential confounders. Because the experience of discrimination is more common among blacks (Borrell et al., 2006, 2007) and may be a qualitatively different phenomenon for other racial/ethnic groups, we conducted racial/ethnic-specific analyses. We hypothesized that self-reported perceived discrimination would be associated with smoking and alcohol consumption in MESA participants regardless of their race/ethnicity. We also hypothesized that associations of discrimination with poorer health behaviors would be stronger in persons of low income and/or lower education because persons of low socioeconomic position (SEP) may lack other resources helpful in buffering the effects of chronic stress or may live in environments that facilitate the adoption of unhealthy behaviors as a coping mechanism (Alaniz, 1998, Alaniz and Wilkes, 1998, Chuang et al., 2005, Primack et al., 2007).

## Methods

Data used in these analyses were derived from the baseline examination of MESA, a longitudinal study of atherosclerosis (Bild et al., 2002). MESA enrolled 6814 men and women aged 45–84 years from July 17, 2000, to August 29, 2002 at six field centers in the U.S.: New York City, NY; Baltimore City and County, MD; Forsyth County, NC; Chicago, IL; St. Paul, MN; and Los Angeles, CA. Persons free of clinical cardiovascular disease were recruited using a variety of population-based approaches such as lists of residents, telephones and dwellings. The participation rate among those screened and deemed eligible was 59.8%. Of the 6814 participants at baseline, 134 records were excluded because of missing data on discrimination, leaving a total of 6680 participants (2575 whites, 1839 blacks, 803 Chinese and 1463 Hispanics).

The outcomes investigated were cigarette smoking and alcohol consumption. Smoking status was derived from two questions, “Have you smoked cigarettes within the past 30 days?” and “Have you smoked at least 100 cigarettes in your entire life?” Consistent with standardized approach used in national studies (Anon., 2009b,a), smoking status was defined as current, former and never smokers.

Alcohol consumption was assessed using three questions, ever consumed alcohol (Yes/No)?; currently drinking (Yes/No)?; and what was the largest # of drinks in one day in the past month? Alcohol consumption was categorized in three groups based on ever consumption and largest number of drinks per day: no consumption or moderate consumption (0–1 drinks/day for women and 0–2 drinks/day for men), high consumption (2–3 drinks/day for women and 3–4 drinks/day for men) and heavy drinking (defined as 4+ drinks/day for women and 5+ drinks/day for men). We used the categorization based on the maximum number of drinks per day because it is likely to capture the use of alcohol as a coping or stress relieving mechanism more accurately than the categorization based on current, former or never users which do not distinguish light social users from heavier users.

Questions about self-reported major or lifetime discrimination attributed to race/ethnicity were adapted from the Detroit Area Study (Williams et al., 1997, 1999). Specifically, participants were asked whether they had ever been unfairly treated in the following six domains (Yes/No): fired or denied a promotion, not hired for a job, treated unfairly by the police, discouraged by a teacher from continuing education, prevented from moving into a neighborhood or neighbors have made their life difficult. Those answering “Yes”, were asked a follow-up question on the perceived reason for the unfair treatment

with the following choices: race or ethnicity, gender, age, religion, physical appearance, sexual orientation, income/social class or other reason. Participants who answered “Yes” to one or more of the six domains assessed and attributed the cause to race/ethnicity were classified as perceiving and reporting racial/ethnic lifetime discrimination (hereafter, discrimination). Limited variability in responses did not allow meaningful use of the discrimination scale as a continuous predictor.

Other covariates included in the analysis were age, gender, race/ethnicity, marital status, education, income and employment status. Age was included in the analysis as continuous and categorical (45 to 54; 55 to 64; and 65 to 84 years old). Race/ethnicity was self-reported and classified as non-Hispanic white, non-Hispanic black, Chinese and Hispanic (hereafter, non-Hispanic white and non-Hispanic black would be referred as white and black). Marital status was classified as married, widowed, divorced/separated, and never married.

Educational attainment was classified as less than high school; complete high school/GED; some college or technical school; and college graduate or higher. Family annual income was specified as less than \$25,000, \$25,000 to \$49,999, \$50,000 to \$74,999 and \$75,000+. Employment status was categorized as employed, unemployed or retired and homemaker. Indicator variables for the 6 field centers were also included in the analyses to control for any possible confounding effect of site.

## Statistical analysis

Descriptive statistics for selected characteristics were calculated by self-reported discrimination in each racial/ethnic group. Chi-square statistics and *t*-tests were used to determine statistical significance of differences observed.

Multinomial logistic regression was used to estimate the strength of the association of self-reported discrimination with smoking status and alcohol consumption before and after controlling for selected covariates for each racial/ethnic group separately. For each outcome, models were adjusted for age, gender, marital status and field center (Model 1); and then additionally adjusted for education, income and employment status (Model 2). Heterogeneity in associations of discrimination measures with the outcomes by gender, race/ethnicity and SEP indicators were tested by adding appropriate interaction terms to the final models. Interactions between discrimination and each SEP indicator were examined separately by racial/ethnic group. Two-sided *P*-values of <0.05 were considered statistically significant. Analyses were performed using SAS V9.2 (Anon., 2009c).

## Results

Hispanics tended to be slightly younger and Chinese participants and whites tended to be slightly older than the other groups (Table 1). Chinese participants were the most likely to be married whereas blacks were the least likely to be married. Hispanics generally had lower education and less income whereas whites generally had higher education and more income than the other racial/ethnic groups. Whites were the most likely to report being employed while blacks were the most likely to be unemployed or retired. Blacks (18%) were most likely and Chinese (5.6%) participants least likely to report current smoking. Alcohol consumption was highest among whites (39.9%) and lowest among Chinese (4.7%) participants. Hispanics (12.9%) and whites (12.1%) were more likely to report heavy drinking than black (7.6%) and Chinese (1.5%) participants.

Blacks were more likely to report discrimination (42.7%) than Hispanics, Chinese or whites (Table 2). The percent reporting discrimination decreased with age in each racial/ethnic group, except for Chinese participants. Black and Hispanic men reported significantly more discrimination than black or Hispanic women. Possibly due to the confounding effects of age, widowed participants reported less discrimination than other marital status categories, although differences across categories were not always statistically significant. In blacks and Hispanics both education and income were positively associated with reports of discrimination ( $P<0.01$ ). The socioeconomic patterning of discrimination

**Table 1**

Distribution (%) of selected characteristics according to race/ethnicity: the MESA study, 2000–2002.

Characteristics	Black (n = 1839)	Chinese (n = 803)	Hispanic (n = 1463)	White (n = 2575)	P-value*
<b>Age</b>					
45–54	31.5	30.5	34.3	30.5	0.03
55–64	36.2	35.4	36.2	34.7	
65–84	32.3	34.1	29.5	34.8	
<b>Gender</b>					
Male	44.6	48.6	48.1	48.0	0.09
Female	55.4	51.4	51.9	52.0	
<b>Marital status</b>					
Married	45.9	81.5	59.8	66.4	<0.0001
Separated/divorced	25.5	5.7	20.1	13.7	
Widow	17.4	10.2	13.7	10.8	
Single	11.1	2.5	6.4	9.1	
<b>Education</b>					
≤11	12.0	23.4	42.8	4.8	<0.0001
High school or GED	18.9	16.5	21.1	16.7	
Some college	28.6	14.2	22.3	24.0	
College graduate or higher	40.5	45.9	13.7	54.4	
<b>Income**</b>					
<\$25,000	27.7	49.2	48.5	15.8	<0.0001
\$25,000–\$49,999	29.6	21.8	31.7	25.8	
\$50,000–\$74,999	18.3	11.5	10.2	20.1	
≥\$75,000	16.5	16.8	7.1	35.9	
<b>Employment status</b>					
Employed	45.4	46.6	46.1	52.0	<0.0001
Unemployed or retired	48.4	36.7	37.7	37.2	
Homemaker	6.4	16.7	16.1	10.7	
<b>Smoking status</b>					
Current	18.0	5.6	13.7	11.5	<0.0001
Former	36.9	19.1	32.5	44.4	
Never	45.1	75.3	53.8	44.1	
<b>Alcohol consumption</b>					
No or moderate	75.2	95.2	73.0	60.1	<0.0001
High	17.2	3.2	14.2	27.8	
Heavy drinking	7.6	1.5	12.9	12.1	

\* P-values for comparison across categories of race/ethnicity.

\*\* Values may not add up to 100 due to missing values.

was not as consistent in Chinese or whites, but similar to blacks and Hispanics, positive trends were observed for income in Chinese and for education in whites. Significant differences in reports of discrimination were also observed by employment status in blacks and Hispanics: reports of discrimination were most common for the employed and least common for homemakers ( $P < 0.0001$ ). Reports of discrimination were highest for current smokers and lowest in never smokers in blacks and in Hispanics. This pattern was also observed for alcohol consumption where reports of discrimination were highest in heavy drinkers, intermediate in high alcohol users and lowest in non- or moderate users in blacks and in Hispanics.

In unadjusted models, discrimination was positively associated with smoking and alcohol consumption among blacks and Hispanics (Table 3). In whites, discrimination was positively associated with smoking but was not associated with alcohol consumption. After adjustment for age, gender, marital status and socioeconomic indicators, blacks who reported discrimination had 34% (95%CI: 1.00–1.81;  $P$ -value:0.052) and 51% (95%CI: 1.03–2.22) greater odds of reporting being current smokers and heavy drinking, respectively, than blacks who did not report discrimination (Model 2). Discrimination also remained significantly associated with the odds of heavy drinking in Hispanics and with the odds of smoking in

**Table 2**

Prevalence (%) of perceived racial/ethnic discrimination for selected characteristics according to race/ethnicity: the MESA study, 2000–2002.

Characteristics	Percent reporting perceived racial/ethnic discrimination			
	Black (n = 1839)	Chinese (n = 803)	Hispanic (n = 1463)	White (n = 2575)
Overall	42.7	10.3	19.3	4.0
P-value				<0.0001
<b>Age</b>				
45–54	48.7	12.2	24.7	5.5
55–64	41.3	11.3	17.6	3.9
65–84	38.4	7.7	15.3	2.7
P-value*	0.001	0.19	0.001	0.01
<b>Gender</b>				
Male	56.8	12.0	23.8	3.5
Female	31.3	8.7	15.3	4.4
P-value	<0.0001	0.12	<0.0001	0.23
<b>Marital status</b>				
Married	45.4	10.5	20.4	3.9
Separated/divorced	45.4	10.9	18.5	4.0
Widow	30.2	4.9	13.6	3.2
Single	45.3	25.0	19.3	4.7
P-value	<0.0001	0.06	0.18	0.86
<b>Education</b>				
≤11 years	23.2	0.5	14.1	0.8
High school or GED	30.5	10.8	18.1	2.1
Some college	44.5	6.2	25.7	3.6
College graduate or higher	53.0	16.9	30.6	5.0
P-value	<0.0001	<0.0001	<0.0001	0.01
<b>Income</b>				
<\$25,000	32.5	5.6	17.1	2.5
\$25,000–\$49,999	41.8	10.3	19.4	3.9
\$50,000–\$74,999	52.2	10.9	26.7	6.2
≥\$75,000	57.4	24.4	27.9	3.6
P-value	<0.0001	<0.0001	0.01	0.02
<b>Employment status</b>				
Employed	47.7	13.1	21.6	4.6
Unemployed or retired	40.7	8.2	20.8	3.4
Homemaker	23.1	7.5	9.3	3.2
P-value	<0.0001	0.06	0.0001	0.20
<b>Smoking status</b>				
Current	47.3	13.3	24.0	6.1
Former	44.8	12.4	23.1	4.0
Never	39.2	9.6	15.9	3.3
P-value	0.03	0.47	0.001	0.09
<b>Alcohol consumption</b>				
No or moderate	40.0	10.0	16.8	4.2
High	48.7	15.4	22.2	3.9
Heavy drinking	55.4	25.0	30.8	3.2
P-value	0.0001	0.17	<0.0001	0.74

\* P-values for chi-square for comparison of categories within racial/ethnic groups.

whites, after adjustment: OR: 1.62 (95%CI: 1.10–2.40) and 1.88 (95%CI: 1.02–3.44), respectively.

There was no evidence of multiplicative interaction between discrimination and age, gender, education, income, employment status or recruitment site in each racial/ethnic group for smoking status and alcohol consumption (all  $P$ -values > 0.05).

## Discussion

This study examined associations of perceived discrimination with smoking and alcohol consumption in a racial/ethnic diverse sample of middle-aged and older adults. We found that after adjustment for potential confounding factors, reports of discrimination were significantly associated with smoking and heavy drinking in blacks, with heavy drinking in Hispanics, and with smoking in whites.

There is an abundant literature investigating the relation between stressful life circumstances and behaviors such as smoking (Aronson et al., 2008, Booker et al., 2007, 2008) and drinking (Castillo et al., 2008, Jennison, 1992, Windle and Windle, 1996). Several studies have reported an association between self-reported discrimination (which can be



**Table 3**

Odds ratios (95% confidence intervals)\* of smoking and alcohol consumption for those reporting versus not reporting racial/ethnic discrimination according to race/ethnicity: the MESA study, 2000–2002.

Dependent variable	Crude	Model 1**	Model 2
	Self-reported racial/ethnic discrimination		
Black			
Smoking status			
Never	1.00	1.00	1.00
Former	1.26 (1.03, 1.55)	1.09 (0.87, 1.35)	1.06 (0.84, 1.34)
Current	1.39 (1.07, 1.80)	1.11 (0.84, 1.46)	1.34 (1.00, 1.81)
Alcohol consumption			
No or moderate	1.00	1.00	1.00
High	1.42 (1.11, 1.82)	1.40 (1.07, 1.81)	1.27 (0.97, 1.66)
Heavy drinking	1.86 (1.31, 2.64)	1.45 (1.00, 2.10)	1.51 (1.03, 2.22)
Chinese			
Smoking status			
Never	1.00	1.00	1.00
Former	1.33 (0.77, 2.32)	1.08 (0.57, 2.06)	1.21 (0.62, 2.35)
Current	1.45 (0.59, 3.57)	1.58 (0.60, 4.15)	2.19 (0.79, 6.11)
Alcohol consumption			
No or moderate	1.00	1.00	1.00
High	1.64 (0.55, 4.89)	0.94 (0.30, 2.91)	0.84 (0.26, 2.70)
Heavy drinking	3.01 (0.80, 11.35)	1.82 (0.46, 7.25)	1.99 (0.47, 8.40)
Hispanic			
Smoking status			
Never	1.00	1.00	1.00
Former	1.59 (1.19, 2.12)	1.32 (0.97, 1.79)	1.27 (0.93, 1.74)
Current	1.67 (1.15, 2.44)	1.27 (0.85, 1.90)	1.40 (0.92, 2.11)
Alcohol consumption			
No or moderate	1.00	1.00	1.00
High	1.42 (0.98, 2.04)	1.15 (0.79, 1.68)	1.00 (0.68, 1.48)
Heavy drinking	2.21 (1.56, 3.14)	1.63 (1.11, 2.39)	1.62 (1.10, 2.40)
White			
Smoking status			
Never	1.00	1.00	1.00
Former	1.21 (0.78, 1.88)	1.23 (0.79, 1.91)	1.23 (0.79, 1.92)
Current	1.88 (1.05, 3.34)	1.74 (0.96, 3.17)	1.88 (1.02, 3.49)
Alcohol consumption			
No or moderate	1.00	1.00	1.00
High	0.94 (0.60, 1.48)	0.73 (0.46, 1.16)	0.72 (0.45, 1.15)
Heavy drinking	0.76 (0.39, 1.51)	0.56 (0.27, 1.15)	0.59 (0.28, 1.22)

\* Odds ratios are from multinomial logistic regression models.

\*\* Odds ratio adjusted for age, sex, marital status and recruitment site (Model 1); and additionally adjusted for education, income and employment status (Model 2).

conceptualized as a stressor) and smoking in blacks (Landrine and Klonoff, 2000, Guthrie et al., 2002, Bennett et al., 2005, Resnicow et al., 1999, Kwate et al., 2003, Borrell et al., 2007, Krieger et al., 2005, Landrine et al., 2006), whites (Borrell et al., 2007, Krieger et al., 2005, Landrine et al., 2006), Hispanics (Landrine et al., 2006, Krieger et al., 2005) and Asians (Landrine et al., 2006, Chae et al., 2008a) in the U.S. and in other ethnic groups elsewhere (Harris et al., 2006). Our study adds to prior work by replicating these associations in a large, multi-ethnic, population-based sample. We documented a strong association between discrimination and current smoking in black and white adults only. Although associations between perceived discrimination and smoking were not statistically significant in Hispanics or Chinese participants, point estimates showed associations of similar direction and magnitude to those observed in blacks and whites. These findings suggest that adoption of smoking as a coping mechanism may help individuals to alleviate or buffer the stress associated with discrimination regardless of their race/ethnicity.

Previous studies examining the association between discrimination and alcohol consumption have produced mixed results (Yen et al., 1999a,b, Martin et al., 2003, Resnicow et al., 1999, Kwate et al., 2003, Borrell et al., 2007, Chae et al., 2008b, Taylor and Jackson, 1990). For example, Borrell et al. (2007) found an association between perceived discrimination and alcohol consumption in the past year among young black adults. Martin et al. (2003) reported a similar association among black adults in the National Survey of Blacks Workers. However, Yen et al. (1999a,b) found no association between

discrimination and heavy drinking among black transit operators in San Francisco, California. Resnicow et al. (1999) also found no association between discrimination and alcohol consumption in black adolescents. Few studies have examined associations of discrimination with drinking in groups other than blacks (Gee et al., 2007a, Chae et al., 2008b). We found significant associations between perceived discrimination and alcohol consumption in blacks and Hispanics. Findings for Chinese participants were in a similar direction for heavy drinking but did not reach statistical significance. Our results for non-whites suggest that alcohol consumption may be one of the coping strategies used to buffer discrimination in these groups.

In general, discrimination was not associated with alcohol consumption among whites. This is consistent with a previous study that observed no associations between discrimination and drinking outcomes in young white adults (Borrell et al., 2007). Findings for whites may be limited by the very low prevalence of reports of discrimination in whites. It is worth noting that whites have higher prevalence of alcohol than any other group in the US, and thus, the factors driving drinking in whites may be different from those driving drinking patterns in other groups. Our data suggests that drinking is not associated with discrimination in whites, although it could be a coping mechanisms used for other more prevalent stressors in this group. Additional studies are needed to better understand the meaning and implications of reports of discrimination in whites in the US context, and to better understand why reports of discrimination were associated with smoking but not with drinking.

Reports of discrimination have been found to be associated with SEP indicators in blacks (Krieger et al., 1998, Kessler et al., 1999, Ren et al., 1999, Borrell et al., 2006, 2007, Yen et al., 1999a,b, Williams et al., 1997), with blacks with higher education and high incomes reporting more discrimination in most cases (Ren et al., 1999, Krieger et al., 1998, Borrell et al., 2006, 2007, Yen et al., 1999a,b). However, a recent study found that the opposite was true for whites (Borrell et al., 2007), with those reporting discrimination being more likely to be less educated and to have lower incomes than those reporting no discrimination. We found that, in general, those reporting discrimination had higher education and high income than those who reported experiencing no discrimination. The extent to which this socioeconomic patterning reflects reality or reporting differences across socioeconomic groups requires further research. Despite greater perceived discrimination for better education and income, however, we found no consistent evidence that the associations of discrimination with smoking status and alcohol consumption varied with education, income or employment status.

Important strengths of our study include the racial/ethnic diverse, population-based sample of participants and the large sample size. However, while the sample size was adequate for most groups, the low prevalence of discrimination in Chinese participants may have affected our ability to detect associations among this group. It may also have affected our ability to detect interactions between socioeconomic factors and discrimination. Another important limitation is the cross-sectional nature of the data that precludes inferences on temporal ordering between the exposure and the outcome. Further, it is possible that those who smoke and drink may experience adverse personal interactions generally and perceive them as discrimination. The age distribution of the MESA sample is generally more weighted towards older groups than other studies such as the Detroit Area Study (Williams et al., 1997). If older persons are less likely than younger persons to report discrimination (even if it has occurred) due to differential recall or other factors, this may have affected our estimates of the prevalence of discrimination as well as the association of discrimination with behaviors. For example, the percent of persons reporting discrimination in MESA was substantially lower than that observed in younger samples using the same discrimination scale (43% of blacks and 4% of whites reported discrimination in MESA compared to 62% and 37% of blacks and whites aged 18 and over in the Detroit Area Study). Non-participation

may also have affected our results regarding prevalence of discrimination (if those experiencing discrimination were less likely to participate) as well as associations of discrimination with the outcomes (if participants were simultaneously selected on both behaviors and discrimination).

Our results show that important risk behaviors such as smoking and alcohol may be patterned by reports of discrimination. Although additional work is needed to determine if the relation between discrimination and behaviors is causal, the patterns we observed suggest that these behaviors may sometimes be used as coping mechanisms by those experiencing discrimination. If confirmed, our results suggest that preventing smoking and alcohol abuse may need to address not only the addictive nature of these substances, but also the underlying circumstances that make these behaviors useful coping strategies to deal with stressful life experiences.

#### Conflict of interest statement

The authors declare that there are no conflicts of interest.

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