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Running head: DISCRIMINATION AND SUBSTANCE USE

Racial Discrimination and Substance Use:  
Longitudinal Associations and Identity Moderators

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## Abstract

Current research indicates that racial discrimination is pervasive in the lives of African Americans. Although there are a variety of ways in which discrimination may contribute to health, one potentially important pathway is through its impact on substance use. Addressing the paucity of longitudinal research on this topic, the present study examined the influence of teacher discrimination on changes in substance use over time among African American adolescents and considered three dimensions of racial identity as moderators of this association (centrality, private regard, and public regard). Latent variable SEM analyses indicated that levels of discrimination were associated with increases in substance use across the high school years. Furthermore, public regard was found to moderate this association such that discrimination was less strongly associated with increases in substance use for individual who reported lower levels of public regard. The implications of these findings are discussed.

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## Racial Discrimination and Substance Use:

## Longitudinal Associations and Identity Moderators

Substantial disparities in health between African Americans and Whites exist in the United States today (Mays et al. 2007; Orsi et al. 2010). While there are a wide range of factors in the physical and social environment that may influence differences in health across groups, discrimination is one important social environment factor that disproportionately affects racial/ethnic minorities and is likely to be impacting physical health (Clark et al. 1999, Williams et al. 2003). However, the mechanisms linking discrimination to health are not yet clear (Williams and Mohammed 2009).

The immediate and prolonged stress resulting from exposure to discrimination is likely to be having a direct impact on physical health. However, discrimination is also thought to influence health status through its impact on behaviors such as substance use (Buka 2002; Jackson et al. 2010). In particular, substance use may serve as a coping response to discrimination, having short-term benefits—attenuating experiences of stress—while also having long-term deleterious consequences—impairing physical health (Jackson et al. 2010). Although the link between discrimination and substance use has been central to recent theoretical perspectives on health disparities (Jackson and Knight 2006), there is a surprising dearth of research examining whether experiences of discrimination impact changes in substance use over time or factors that may modify this relationship. Addressing these gaps in the literature, the current investigation (1) uses a longitudinal latent variable model to test the association between perceived discrimination and substance use, and (2) considers three dimensions of racial identity as moderators of this association.

## Racial Discrimination and Substance Use

Several studies have demonstrated that racial discrimination is associated with substance use (Borrell et al. 2007; Clark et al. 1999; Williams and Neighbors 2001), including tobacco (Bennett et al. 2005; Krieger et al. 2005; Landrine et al. 2006) alcohol (Borrell et al. 2007; Terrell et al. 2006), and marijuana use (Choi et al. 2006). Most of these studies, however, have used a cross-sectional design, precluding the possibility of drawing causal conclusions or understanding the effects of discrimination across time. We were only able to identify one study using a longitudinal design to assess associations between discrimination and substance use. This study examined the relationship between racial discrimination and substance use in a sample of African American parents and their children across three waves of data, collected when children were approximately 10, 12, and 15 years of age (Gibbons et al. 2004; Gibbons et al. 2010).

Among adult parents, results suggested that perceived discrimination was associated with increases in substance use across the first two waves (Gibbons et al. 2004). However, cross-lagged models were not assessed for this relationship, and measurement error was not accounted for, limiting conclusions relating to the directionality of this effect. Among the adolescents in the study, although discrimination at the first wave of the study was correlated with substance use five years later ( $r = .11$ ), no evidence suggested that discrimination predicted changes in substance use across any of the three waves (Gibbons et al. 2004; Gibbons et al. 2010). Furthermore, bidirectional associations between discrimination and substance use were not presented. Thus, additional longitudinal research on the association between racial discrimination and substance use during adolescence is needed and is of particular importance

given the known risk for substance use problems across this developmental period (Gibbons et al. 2007; Johnston et al. 2009; Petraitis et al. 1995).

### **The Role of Racial Identity**

Although racial discrimination is a common experience for many African American youth, there is considerable variation in how individuals perceive, respond to, and are impacted by these experiences (Eccles et al. 2006). Various elements of racial identity, such as an individual's beliefs about being a part of their racial/ethnic group, may mitigate the effects of discrimination among racial/ethnic minorities. In this study we consider the protective qualities of three dimensions of racial identity associated with the Multidimensional Model of Racial Identity (Sellers et al. 1998): public regard, private regard, and centrality. Public regard is defined as the extent to which individuals feel that others view their racial group positively or negatively. Private regard, on the other hand, is the extent to which a person feels positively or negatively about being part of their racial group. Lastly, centrality refers to the extent to which a person normatively defines him/herself with regard to race.

Several studies have examined private regard and centrality (or similar measures) as moderators of the relationship between discrimination and a variety of outcome variables, including psychological distress, academic achievement, and problem behaviors (Brondolo et al. 2009). Findings from these studies have been somewhat mixed, but with some evidence that high levels of private regard and centrality may be protective against the pernicious consequences of discrimination (e.g., Bynum et al. 2008; Sellers et al. 2003; Wong et al. 2003). While fewer studies have considered the moderating role of public regard, findings from these studies have more consistently found an effect. In particular, research on African American adolescents and adults has shown that discrimination has less of an adverse effect on mental

health for individuals who report that others view their racial group negatively (i.e., low public regard; Sellers and Shelton 2003; Sellers et al. 2006).

To our knowledge, there is only one study that focuses specifically on the role of racial identity in the relationship between racial discrimination and substance use (Chae et al. 2008). In a sample of Asian American adults, this study found that higher levels of ethnic identity (a measure similar to centrality), were associated with a lower probability of smoking among those who reported higher levels of discrimination. These findings provide some support of the idea that centrality may mitigate the effects of discrimination on substance use. The protective qualities of other aspects of racial identity, such as beliefs about how one's group is perceived by others (public regard), on risk for substance use have not yet been examined. It is particularly important to examine associations between racial discrimination and risk of substance use among African American youth, given evidence of their relatively high risk for experiencing racial discrimination in comparison to other racial/ethnic minority youth (Greene et al. 2006).

### **Current Study**

In the present study we use structural equation modeling to examine longitudinal associations between racial discrimination and substance use as well as the moderating effects of racial identity beliefs. Specifically, using the Multidimensional Model of Racial Identity (Sellers et al. 1998) we examine the moderating effects of centrality, private regard and public regard. The following hypotheses were examined:

**Hypothesis 1:** Perceived racial discrimination is associated with increases in substance use, but substance use is not associated with increases in perceptions of racial discrimination.

**Hypothesis 2:** The relationship between perceived racial discrimination and substance use is moderated by each of the racial identity beliefs assessed (centrality, private regard, public



regard), such that higher levels of centrality, higher levels of private regard, and lower levels of public regard will all be protective.

## Methods

### Sample and Missing Data

The current study utilized data from African American participants in the Maryland Adolescent Development in Context Study (MADICS). MADICS is an ongoing longitudinal study of individuals who were recruited at age 13, from middle schools in Prince George's County, Maryland (adjacent to Washington, DC) in 1991. In order for our sample to be consistent across all of the models presented, the analyses herein focus on African American adolescents who participated in both wave 3 (w3) and wave 4 (w4) of the study ( $N=417$ ; 49% male). Data for these waves were collected in participant's homes in 9<sup>th</sup> and 11<sup>th</sup> grade, respectively, using a combination of structured interviews and self-report questionnaires. Missing data analyses were conducted to compare individuals who were included in our analyses to those who were excluded due to missing data. Results of these analyses indicate that excluded individuals were more likely to be from less educated families ( $M_{diff} = .716$ ,  $t [614] = 3.412$ ,  $p < .001$ ). However, no differences were found on levels of discrimination or substance use at baseline.

### Measures

**Substance use.** At each wave of the study three items were used to assess participant's use of alcohol, cigarettes, and marijuana. Items asked participants to report how often they used each substance in the past month. Response options for all three variables were coded on a four point scale with higher scores indicating greater use. For alcohol and marijuana use, response categories ranged from never (coded as 0) to at least once a week (coded as 3). For cigarette use, responses ranged from none (coded as 0) to half pack or more per day (coded as 3). The

three items were used as indicators of a latent substance use variable at each wave. For moderation analyses, the three items were also averaged at each wave such that higher scores indicated greater use ( $\alpha_{w3}=.68$ ;  $\alpha_{w4}=.77$ ).

**Perceived racial discrimination.** A five-item measure of perceived racial discrimination focused on discrimination from teachers (Wong et al., 2003). Discrimination from teachers is particularly important for adolescents given the prominence of the classroom setting in their daily lives (Eccles and Roeser 2011), and the position of power that teachers hold over them. The relevance of findings to policy and intervention work is also strengthened by measures that are oriented towards a specific relational context (Muller 2001). Confirmatory factor analyses suggested a single factor solution fit the data well at both waves, and that all items loaded strongly on the factor (results for the measurement model are described below). Cronbach's alpha coefficients at each wave were also high ( $\alpha_{w3}=.88$ ;  $\alpha_{w4}=.88$ ). The scale items and response options are shown in an appendix.

**Racial identity.** A shortened version of the Multidimensional Inventory of Black Identity (MIBI; Sellers et al. 1997) was used in wave 4 of the MADICS study. Six items were used to measure centrality ( $\alpha=.78$ ), six items were used to measure private regard ( $\alpha=.79$ ), and four items were used to measure public regard ( $\alpha=.63$ ). Items for centrality include "Being Black is an important part of my self-image", and "Being Black is an important reflection of who I am". Items for private regard include "I am happy that I am Black", and "I often regret that I am Black". Items for public regard include "Overall, Blacks are considered good by others" and "In general, others respect Black people." Response options are on a five point scale ranging from "strongly disagree" (coded as 1) to "strongly agree" (coded as 5) with "neither agree nor disagree" as the neutral point (coded as 3).

## Results

### Analysis Strategy and Preliminary Analyses

In order to test our hypotheses, structural equation models were estimated using Mplus Version 6 (Muthén and Muthén 1998–2010). Indicators/items in our latent variable models were ordered categorical (ordinal) variables with five or fewer categories/response options. Models were therefore estimated using the WLSMV estimator (Muthén et al. 1997; Muthén and Kaplan 1985). WLSMV is a mean-and variance adjusted weighted least square estimator, which does not assume normality of indicator variables or linearity of associations between an indicator and a latent construct. WLSMV uses the diagonal of the weight matrix to obtain parameter estimates and the full weight matrix to obtain standard errors and measures of model fit.

The following indices were used to assess goodness of fit: the Tucker-Lewis Index (TLI; values of .90 or greater indicate good fit), the Comparative Fit Index (CFI; values of .90 or greater indicate good fit), the Root Mean Square Error of Approximation (RMSEA; values of .08 or less indicate good fit), the Weighted Root-Mean-Square Residual (WRMR, values of 1.0 or less indicate good fit), and the Standardized Root-Mean-Square Residual (SRMR, values of .08 or less indicate good fit). CFI and TLI compare the improvement in fit of the tested model as compared with the null model assuming zero covariance among variables. RMSEA is a parsimony-adjusted index, and SRMR and WRMR are measures of mean residual correlation (Kline 2005; Muthén and Muthén 1998–2010).

Zero-order correlations between each of our measured constructs are presented in Table 1. As hypothesized, w3 perceived discrimination was associated with substance use at w3 and w4 ( $ps < .001$ ). Levels of perceived discrimination were also slightly higher for males at both waves ( $ps < .05$ ).

## Measurement Model

Before running structural models to test our specific hypotheses, a measurement model was first established using confirmatory factor analysis (Kline 2005). This step is done to ensure that manifest variables relate to each other in expected ways and load on the hypothesized latent constructs. An initial measurement model was estimated that did not include error covariances between any of the indicators. Fit for this model was adequate:  $\chi^2 (98, N=417) = 129.324, p = .019, TLI=.995, CFI=.996, RMSEA=.028, WRMR=.678$ . However, modification indices suggested that allowing residuals of some indicators to correlate within measures may improve model fit. Allowing some error variances to be correlated within measures when assessed by the same reporter is standard practice and is expected due to similarities in item wording (Cole and Maxwell, 2003). Three error covariances were therefore added and the final revised measurement model was found to fit the data well:  $\chi^2 (95, N=417) = 103.793, p = .252, TLI=.999, CFI=.999, RMSEA=.015, WRMR=.567$ .

## Structural Model

Having established a measurement model, a structural model was then tested to address our specific hypotheses. In particular, a cross-lagged longitudinal model was estimated to test the effects of perceived discrimination on changes in substance use, and the effects of substance use on changes in perceived discrimination. The model was found to fit the data well,  $\chi^2 (95, N=417) = 103.793, p = .252, TLI=.999, CFI=.999, RMSEA=.015, WRMR=.567$ . Path coefficients suggested that higher levels of perceived discrimination at w3 were associated with increases in substance use between w3 and w4 ( $\beta = .233, p = .022$ ). Substance use at w3 was not, however, associated with increases in perceived discrimination ( $\beta = -.179, p = .104$ ). In fact, while the association was not significant, substance use at w3 was associated with decreases—rather than

increases—in perceived discrimination. Unstandardized path coefficients for the final structural model are shown in Figure 1. Standardized coefficients are reported in the text.

An additional model was estimated to explicitly test the hypothesis that the path from w3 perceived discrimination to w4 substance use was significantly different from the path from w3 substance use to w4 discrimination. This was done by constraining the two paths to be equal and comparing the constrained and unconstrained models using a chi-squared difference test. These analyses showed that the unconstrained model provided a significant improvement in model fit,  $\chi^2(1) = 18.5, p < .001$ , suggesting that the effects of discrimination on changes in substance use are significantly different than the effects of substance use on discrimination. These findings provide support for the hypothesis that perceived teacher discrimination leads to increases in substance use.

### **Moderation Analysis**

Our next focus was to consider three identity variables as moderators of the longitudinal association between discrimination and substance use. Longitudinal regression models were estimated in Mplus to test these hypotheses. Before running specific models, data screening procedures were performed to test for normality and check for outliers. Normality was tested by considering the distribution of study variables and examining estimates of skewness and kurtosis. These analyses showed that discrimination and substance use were both positively skewed, with the majority of responses at the lower end of the scale and an elongated right tail. Accordingly, the discrimination and substance use variables were log transformed. The resulting distributions were less skewed and all observations were within three standard deviations of the mean. In order to account for remaining deviations from normality, the maximum likelihood robust (MLR) estimator option was used in Mplus (Muthén and Muthén 1998–2010). This method

calculates standard errors that are robust to deviations from normality using the Huber/White sandwich estimator (Huber 1967; White 1980). Multivariate outliers were also examined using the Cooks distance statistic (Cook 1977). No outliers were found using a cutoff value of 1 (Stevens 1984).

Initial models were estimated to replicate the main effect of discrimination on substance use, and to examine the main effects of each identity construct. In order to account for measurement error, analyses were conducted with single indicator latent variables for each construct with error variances specified using internal reliability scores (see Figure 2).

Replicating findings from the latent variable model shown above, w3 discrimination predicted changes in substance use ( $b = .163$ ,  $SE = .066$ ,  $p = .013$ ). However, none of the identity constructs predicted changes in substance use ( $ps > .05$ ).

In separate models, each identity construct was then considered as a moderator the association between discrimination and substance use. Reliability of the interaction term was based on the product of the Cronbach's alphas of the two predictors (Busemeyer and Jones 1983). While neither centrality nor private regard were found to moderate the effects of discrimination ( $p$ 's  $> .20$ ), the association between w3 discrimination and w4 substance use did significantly vary with levels of public regard ( $\beta = .168$ ,  $p = .040$ ). Unstandardized path estimates for this model are shown in Figure 2. A positive association between discrimination and substance use was found among individuals with higher levels of public regard (who believe that African Americans are viewed more positively by others), while no association was found between discrimination and substance use among individuals with lower levels of public regard (who believe that African Americans are viewed more negatively by others). The effects of discrimination at high and low levels of public regard are shown in Figure 3.

## Discussion

There are a variety of ways in which discrimination may contribute to health, and one potentially important pathway is through its impact on substance use. Addressing the paucity of longitudinal research on this topic, the present study examined the influence of discrimination on changes in substance use over time among African American youth. Latent variable SEM analyses indicated that higher levels of discrimination were associated with increases in substance use across the high school years, whereas substance use was not related to changes in reports of racial discrimination.

This is the first study to consider bidirectional longitudinal associations between discrimination and substance use and to show that discrimination predicts changes in substance use across the high school years. Our findings therefore extend previous research considering similar associations among younger adolescents and adults (Gibbons et al. 2004; Gibbons et al. 2010), and are consistent with research suggesting that discrimination is prospectively predictive of delinquency/problem behaviors (Brody et al. 2006). Bidirectional findings also provide additional evidence in support of the hypothesis that discrimination leads to increases in substance use, and that the causal pathway does not run in the opposite direction (i.e. substance use does not predict increases in perceived discrimination).

Racial identity beliefs (centrality, private regard, and public regard) were also examined as potential buffers of the effects of perceived discrimination on increases in substance use. While we did not find buffering effects for centrality or private regard, public regard significantly moderated the effects of discrimination on substance use. In particular, perceived discrimination at baseline was predictive of increases in substance use among those reporting high levels of public regard, but did not predict changes in substance use among those reporting low levels of

public regard (see Figure 3). Although this study is novel in showing that racial identity moderates the effects of discrimination on substance use, the findings are consistent with research showing that lower levels of public regard buffer against the harmful effects of perceived discrimination on mental health among African American adolescents and adults (Sellers and Shelton 2003; Sellers et al. 2003). In addition, these findings are consistent with work suggesting that less optimistic worldviews may be beneficial when they turn out to be consistent with reality (Major et al. 2007; Sellers et al. 2003). That is, in this study, African Americans fared better, in terms of substance use, when their reports of discrimination matched their belief that others feel negatively about their group (i.e., low public regard) than when it mismatched (i.e., high public regard). The null findings for centrality and private regard, however, are inconsistent with research showing that ethnic identity moderates the association between discrimination and substance use among Asian American adults (Chae et al. 2008). This may be due to differences in the age of the samples, the meaning of racial/ethnic identity across different groups, or the measurement of racial/ethnic identity. More research is necessary to understand the role of racial/ethnic identity in determining the influence of discrimination across different racial/ethnic groups and ages.

### **Limitations and Future Directions**

Because the sample for the current study was drawn from a particular area (Prince Georges County, Maryland), caution should be exercised in generalizing the findings until they are replicated in other contexts. Furthermore, although assessing racial identity as a moderator of the association between discrimination and substance use is a novel contribution of the current investigation, the self-report scales used to measure racial identity inevitably only capture a portion of the variance in people's beliefs and feelings towards group membership. An



important direction for future research will be to consider the role of implicit evaluations of one's group, assessed via measures such as the evaluative Implicit Association Task (Greenwald et al. 1998). Implicit measures may provide access to another component of racial identity that impacts how individuals are affected by discrimination.

The relatively long timeframe between waves of data collection (approximately two years) precludes the possibility of considering the more immediate effects of discrimination on substance use. It will therefore be important for future studies to consider how specific experiences of discrimination influence substance use over shorter periods of time. Daily diary designs, for example, offer another important layer of analysis—allowing for consideration of the influence of discrimination within and across days, as well as an exploration of the short-term mechanisms behind the effects of discrimination on substance use (Ong et al. 2010).

## Conclusion

This study has shown that discrimination from teachers is prospectively associated with substance use among African American adolescents, and that this association varies with racial identity. Since discrimination is a regular experience in the lives of African Americans, further understanding—and finding ways to mitigate—the influence of discrimination on substance use may be an important step in addressing enduring racial disparities in health.

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Table 1.

## Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8
1. Gender	—							
2. SUse3	.079	—						
3. SUse4	.101 <sup>*</sup>	.236 <sup>***</sup>	—					
4. Disc3	.126 <sup>**</sup>	.296 <sup>***</sup>	.215 <sup>***</sup>	—				
5. Disc4	.261 <sup>***</sup>	.067	.223 <sup>***</sup>	.367 <sup>***</sup>	—			
6. Centrality	.099 <sup>*</sup>	-.056	-.032	-.013	.056	—		
7. Public Reg	.021	-.070	-.085	-.120 <sup>*</sup>	-.153 <sup>**</sup>	-.016	—	
8. Private Reg	-.040	-.136 <sup>**</sup>	-.123 <sup>*</sup>	-.268 <sup>***</sup>	-.246 <sup>***</sup>	.437 <sup>***</sup>	.084	—
<i>M</i>	.494	.201	.388	1.693	1.404	3.598	3.024	4.130
<i>SD</i>	.500	.448	.613	.897	.681	.659	.645	.580

Correlations are based on log transformed versions of the substance use and discrimination variables. Means and standard deviations are based on the raw/untransformed scale scores. Gender: 0=female; 1=male. <sup>\*</sup> $p < .05$ , <sup>\*\*</sup> $p < .01$ , <sup>\*\*\*</sup> $p < .001$ .



Figure 1. Results for cross-lagged longitudinal latent variable model showing the effect of discrimination on substance use. Note. Path coefficients are unstandardized. Standard errors are shown in parentheses.  $*p < .05$ ,  $***p < .001$ .

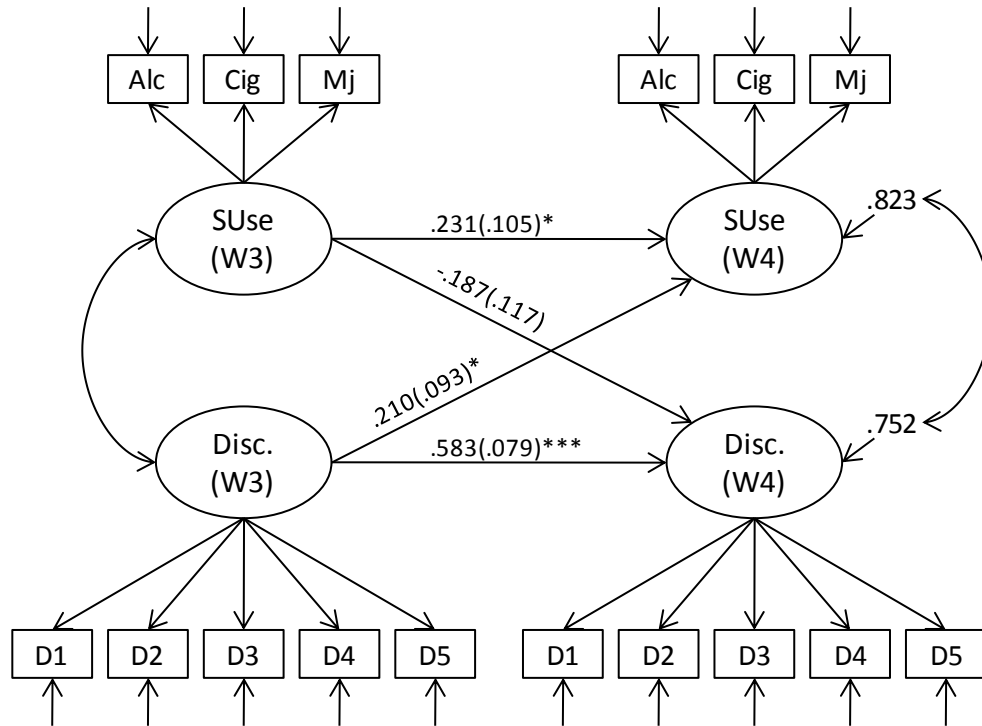


Figure 2. Model specification and results for moderating effects of public regard. *Note.* Error variances of manifest variables were fixed using the formula  $(1 - \text{reliability}) \times \text{sample variance}$ . Path coefficients are unstandardized. Standard errors are shown in parentheses.

\* $p < .05$ , \*\* $p < .01$

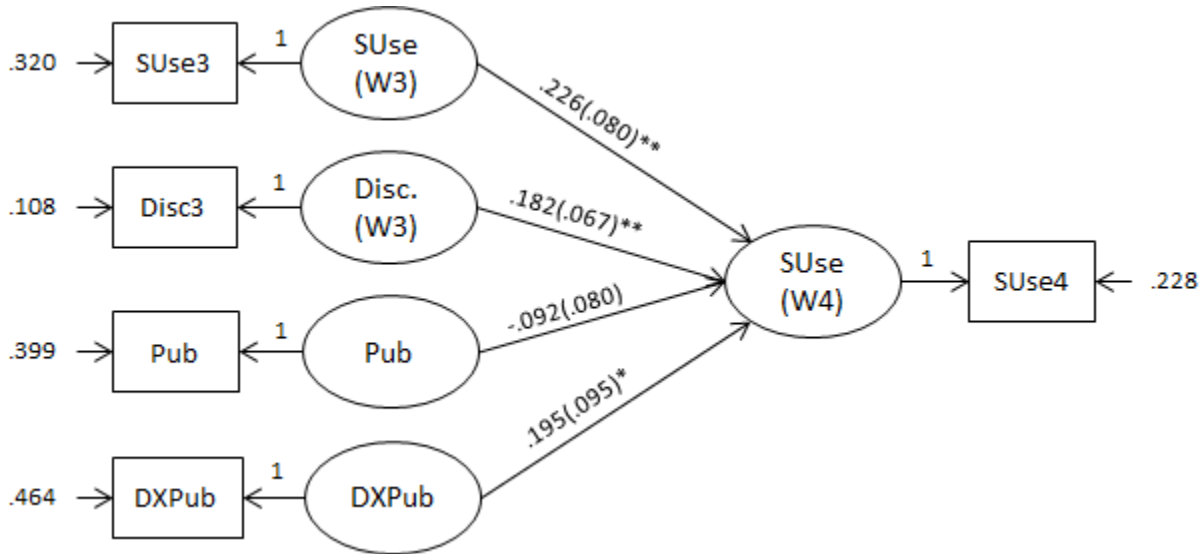
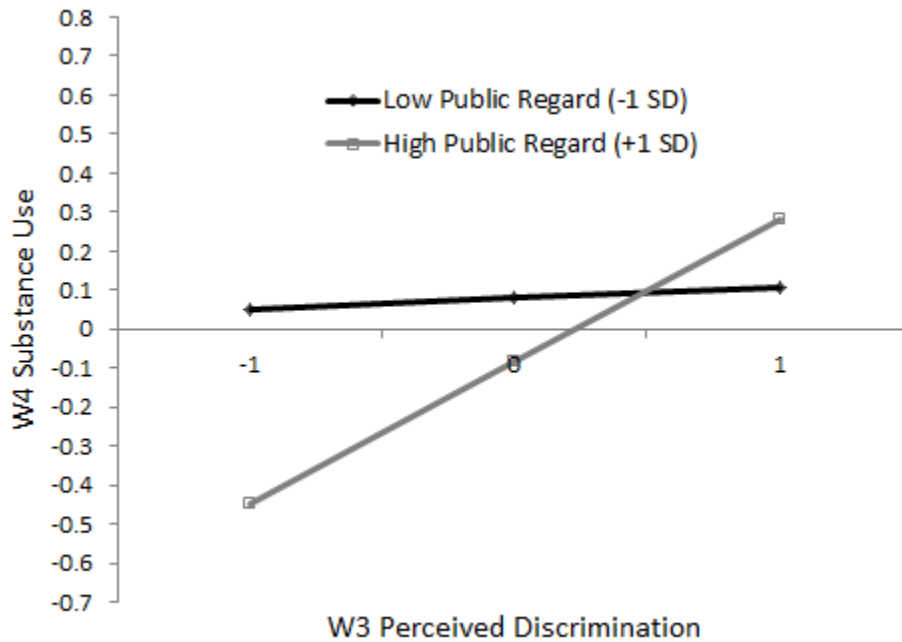


Figure 3. Fitted interaction plot showing public regard as a moderator of the relationship between perceived discrimination and substance use. Values shown on the plot are based on parameter estimates from the model shown in Figure 2. Standard deviation units are shown on both axes, with zero representing the sample mean.



## Appendix

### Items for Measure of Perceived Teacher Discrimination

1. At school, how often do you feel that teachers call on you less often than they call on other kids because of your race?
  2. At school, how often do you feel that teachers grade you harder than they grade other kids because of your race?
  3. At school, how often do you feel that you get disciplined more harshly by teachers than other kids do because of your race?
  4. At school, how often do you feel that teachers think you are less smart than you really are because of your race?
  5. How often have you felt that teachers/counselors discourage you from taking certain classes because of your race?
- Response options for items 1-4: never (1); a couple of times a year (2); a couple of times each month (3); once or twice a week (4); every day (5).
  - Response options for item 5: never (1); once or twice (2); three or four times (3); five or six times (4); more than six times (5).