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## Differential Effects of Depression on Smoking Cessation in a Diverse Sample of Smokers in Treatment

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### Abstract

**Background**—Recent cross-sectional evidence suggests that the effect of depression on smoking prevalence and quit ratios differs by race/ethnicity.

**Purpose**—This study prospectively examined the main and interactive effects of race/ethnicity and depressive symptoms on smoking cessation during a specific quit attempt among smokers receiving cessation treatment.

**Methods**—Data from a longitudinal study of smokers in treatment were examined using continuation ratio logit modeling. Continuous abstinence across Weeks 1, 2, and 4 post-quit was the outcome variable. Data were collected between March 2005 and November 2007, and the current study analyses were conducted in April 2010.

**Results**—Depressive symptoms predicted significantly lower cessation rates for whites and African Americans. In contrast, among Latinos there was no relationship between depression and cessation.

**Conclusions**—This research is the first to prospectively demonstrate a racially/ethnically differentiated effect of depressive symptoms on smoking cessation, and it has implications for targeted smoking-cessation treatments as it indicates that depression may not be a key treatment target for Latinos.

### Introduction

Depression is strongly linked to the initiation, maintenance, and cessation of cigarette smoking,<sup>1–11</sup> but previous cessation research has largely examined white smokers, and little is known about how depression influences smoking cessation among minority smokers. The paucity of data addressing the determinants of smoking cessation among minorities has been noted in prominent publications<sup>12–14</sup> and severely hinders the development of effective treatments among these populations by limiting knowledge of promising treatment targets.

Recent cross-sectional evidence suggests that depression may be differentially related to smoking across racial/ethnic groups. Berg and colleagues (CJ Berg, Emory University, unpublished observations, 2010) examined the relationship between depression and smoking

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in a diverse sample of Minnesota residents. Using a dichotomous depression screener, they found that among whites, African Americans, and American Indians, status as a current smoker (vs former or never smoker) was significantly more prevalent among individuals who screened positive for depression compared to those who screened negative for depression. Additionally, a presence of depression was associated with lower quit ratios (proportion of people who have ever smoked who quit) among whites, African Americans, and American Indians. Among Asian/Asian Americans and Latinos, depression was not significantly related to either smoking prevalence or quit ratios. The current study extends this cross-sectional research by prospectively examining the impact of depressive symptoms on smoking cessation across three racial/ethnic groups.

## Methods

Data were collected as part of a longitudinal study examining racial/ethnic differences in smoking cessation. All participants received treatment that consisted of self-help materials, counseling, and nicotine patch therapy. Participants were recruited from the community via a free weekly advertising circular. The study was conducted in Houston TX between March 2005 and November 2007. This study was approved by the University of Texas MD Anderson Cancer Center IRB.

The current study analyses were conducted in April 2010. All participants gave signed informed consent in person before beginning the study. Full study procedures are described elsewhere.<sup>15–18</sup> Analyses included 389 participants with complete data on demographics, race/ethnicity, and depressive symptoms at baseline. Demographics included age, gender, partner status, education, and employment status. Nicotine dependence indicators included minutes lapsed after waking before smoking the first cigarette of the day and average number of cigarettes per day.

Race/ethnicity was self-reported by study participants. In the U.S., race/ethnicity categories are typically defined as follows:<sup>19</sup> *white*, people having origins in any of the original peoples of Europe, the Middle East, or North Africa; *black* or *African American*, people having origins in any of the black racial groups of Africa; and *Hispanic/Latino*, people of Cuban, Mexican, Puerto Rican, South or Central American origin, or other Spanish culture or origin, regardless of race.

Depressive symptoms were assessed with the Center for Epidemiologic Studies–Depression (CES-D) scale.<sup>20</sup> The CES-D is a 20-item scale designed to assess symptoms of depression in the general population. Participants rate how often they experienced depressive symptoms during the past week from *rarely or none of the time* to *most or all of the time*. The full scale is available in the original validation study.<sup>20</sup>

Continuous abstinence across Weeks 1, 2, and 4 post-quit was the outcome variable and was assessed by a self-report of not smoking since quit day and confirmed via a carbon monoxide reading of <10 parts per million. Follow-up rates were 81.3% for Week 1 post-quit date 1, 83.9% for Week 2, and 85.7% for Week 4. An intent-to-treat procedure was followed, whereby those lost to follow-up were considered not abstinent.

The main effects of race/ethnicity and CES-D scores and their interaction were examined on abstinence across time. Analyses used continuation ratio logit modeling, which models the conditional probability of being abstinent at the current assessment point, given one has been abstinent through the most recent assessment.<sup>21–24</sup> CES-D score was entered as a continuous variable. Covariates included each of the demographic and dependence indicators shown in Table 1.

## Results

Table 1 summarizes participant characteristics by race/ethnicity. There were significant differences among the groups on all characteristics. There were no significant main effects of race/ethnicity ( $\chi^2[2]=2.95$ ,  $p=0.23$ ) or depressive symptoms ( $\chi^2[1]=0.00$ ,  $p=0.97$ ) on odds of abstinence across the Week-1, -2, and -4 follow-up periods. However, the interaction of race/ethnicity and CES-D was significant ( $\chi^2[2]=6.03$ ,  $p=0.049$ ). Specifically, the CES-D differentially predicted abstinence for Latinos versus whites (AOR=1.05, 95% CI=1.0007, 1.09) and Latinos versus African Americans (AOR=1.05, 95% CI=1.006, 1.10), but not for whites versus African Americans (AOR=0.99, 95% CI=0.95, 1.04). Analyses were repeated where individuals lost to follow-up were dropped (completers-only analysis; results not shown). Results differed only in that the main effect of CES-D was significant in the completers-only analysis. The interaction of race/ethnicity and CES-D remained significant above and beyond the main effect of CES-D.

To visually depict these effects, the sample was divided into four roughly equal quartiles of CES-D scores, and abstinence was plotted for each follow-up time point for each group (Figure 1). At each follow-up time point, higher levels of abstinence were associated with lower CES-D scores among whites and African Americans. CES-D did not have an impact on abstinence among Latinos. At each follow-up time point, levels of abstinence were similar at each level of CES-D scores among Latinos.

## Discussion

Consistent with a large body of evidence, greater depressive symptomatology decreased the odds of abstinence among white and African-American smokers. In contrast, depressive symptoms did not predict abstinence among Latinos. These findings are consistent with cross-sectional research (CJ Berg, Emory University, unpublished observations, 2010) that found a similar pattern of racial/ethnic differences in smoking prevalence and quit ratios (i.e., depressive symptoms were associated with smoking behaviors among whites and African Americans but were not related to smoking behaviors among Latinos). Thus, the current study extends the previous findings to prospectively predict cessation during a specific quit attempt.

The current study has implications for the development of smoking-cessation interventions targeted at minority smokers because it suggests depressive symptomatology may not be a key determinant of cessation among Latino smokers. Thus, smoking-cessation treatments that target depressive symptoms may not be useful for Latino smokers. Continued examination of whether or not other known key determinants of smoking cessation generalize to minority and underserved populations of smokers is warranted, as this will influence treatment targeting and cultural tailoring of smoking-cessation interventions.

The current study identifies a need to understand why depression is differentially associated with cessation by race/ethnicity. One possibility is that a variable not accounted for in the current study obscured the relationship between depression and cessation for Latinos. For example, although the current study controlled for physical nicotine dependence, it did not account for nonphysical (e.g., cognitive or contextual<sup>25</sup>) aspects of dependence, and depression appears to be more strongly related to nonphysical aspects of dependence.<sup>26</sup> Other unmeasured factors that may be relevant to both depression and cessation, and may have a differential impact across racial/ethnic groups, include social support or social network availability.

The current study has several limitations. Only three racial/ethnic groups and short-term abstinence were examined. Also, the present sample consisted of self-selected, treatment-

seeking smokers; thus generalizability is unknown. Additionally, use of only the CES-D for measuring depression is a limitation among Latino populations because of evidence that the factor structure of the CES-D appears to generalize to Latinas, but not Latino men<sup>27,28</sup> (but see Miller et al.<sup>29</sup> for an exception). However, there is evidence that the total CES-D score (as used here) is similarly predictive of depression among Latinos and non-Latino whites,<sup>30</sup> and the current study controlled for gender in analyses. Finally, these are new findings regarding the prospective impact of depression on smoking cessation across racial/ethnic groups and, replication is needed, especially with other measures of depression among Latino men. Nevertheless, the current results build on recent research suggesting that depression may have a differential impact on smoking behavior among Latinos relative to other racial/ethnic groups.

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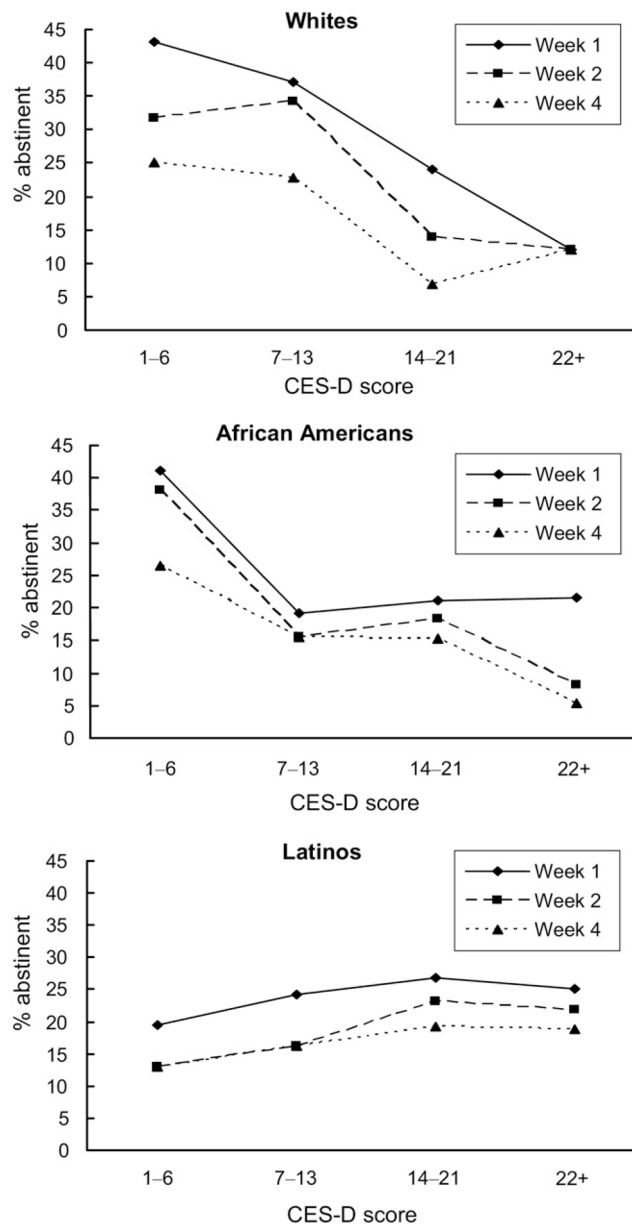
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**Figure 1.** Abstinence as a function of CES-D scores among white, African-American, and Latino smokers  
 CES-D, Center for Epidemiologic Studies-depression scale

**Table 1**

Participant characteristics, M (SD) unless otherwise indicated

	Whites (n=133)	African Americans (n=130)	Latinos (n=126)
Age (years)	42.87 (11.55)	44.86 (9.87)	36.75 (10.09) <sup>ab</sup>
CES-D score	13.04 (11.51)	16.28 (11.47) <sup>a</sup>	14.98 (10.68)
Cigarettes per day	23.42 (9.16)	20.55 (11.46) <sup>a</sup>	19.18 (9.06) <sup>a</sup>
Years of education	13.39 (2.19)	12.81 (1.51) <sup>a</sup>	12.55 (1.96) <sup>a</sup>
Employed (n [%])	69 (52.7)	59 (46.1)	93 (74.4) <sup>ab</sup>
Male (n [%])	60 (45.1)	54 (41.5)	69 (54.8) <sup>b</sup>
With partner (n [%])	42 (31.8)	29 (22.5)	63 (50.4) <sup>ab</sup>
Smoking within 5 minutes of waking (n [%])	75 (56.4)	74 (56.9)	43 (34.1) <sup>ab</sup>

Note: Three individuals did not report education or partner status.

<sup>a</sup>Significantly different from whites ( $p < 0.05$ )

<sup>b</sup>Significantly different from African Americans ( $p < 0.05$ )

CES-D, Center for Epidemiologic Studies-depression scale