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Original article

Ethnic Differences in Cigarette Use Trajectories and Health, Psychosocial, and Academic Outcomes

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A B S T R A C T

Purpose: Cigarette smoking among youth is associated with poorer health and psychosocial outcomes. However, few studies address how smoking may differentially relate to the emergence of disparities in functioning across races/ethnicities over adolescence.
Methods: Youth (n = 2,509) were surveyed eight times from ages 11 to 18. We measured cigarette use, academic and social functioning, mental and physical health, and delinquency. Sequelae of change models controlled for sociodemographic factors, and tested whether intercept and slope for smoking trajectories were associated with outcomes at the end of high school, and examined racial/ethnic differences in outcomes assuming similar smoking trajectories across groups.
Results: Youth were 45% Hispanic, 20% Asian, 20% white, 10% multiethnic, 2% black, and 1% other ethnicities. Higher average probability of smoking and steeper slopes of smoking trajectories were associated with poorer outcomes in multiple domains. Controlling for smoking trajectories, we observed the following disparities (vs. white youth; all p's < .05): black, Hispanic, and multiethnic youth reported lower academic performance; Asian, black, and multiethnic youth reported higher academic unpreparedness; Asian and multiethnic youth reported poorer mental health; Asian, Hispanic, and multiethnic youth reported poorer physical health; and Asian youth reported higher delinquency and poorer social functioning.
Conclusions: Statistically adjusting for similar smoking trajectories, racial/ethnic minority youth demonstrated poorer outcomes in multiple domains compared with white peers. Smoking may be a particularly robust marker for risk of negative outcomes in racial/ethnic minority youth. Screening for cigarette use and intervening on smoking and associated risk behaviors among minority youth may help reduce disparities in functioning.
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IMPLICATIONS AND CONTRIBUTION

Racial/ethnic minority youth on similar trajectories of cigarette smoking demonstrated poorer academic functioning, poorer mental and physical health, and higher delinquency compared with white peers. Assessing for adolescent smoking among minority youth may help reduce disparities in functioning across multiple domains.

Smoking is associated with negative outcomes across multiple functional domains, and disparities may emerge early in a smoker's career. Adolescence is a critical period for initiation of risk behaviors such as smoking [1,2], and can set the stage for health trajectories over the life span. Youth who initiate smoking and continue to smoke demonstrate poorer academic and occupational outcomes, social difficulties, behavioral problems, and more physical and mental health problems in young adulthood relative to individuals who abstain entirely or desist after a period of experimentation [1–5]. These relationships likely arise through multiple pathways. For example, in addition to the direct deleterious effects of smoking (e.g., on cardiovascular functioning) [6], smoking during adolescence is associated with other risk

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behaviors (e.g., other drug use, delinquent behavior) [1–5] that are, in turn, associated with poorer health, psychosocial, and academic outcomes [3,7].

Certain groups experience worse smoking-related outcomes, and tobacco-related health and other disparities across racial/ethnic groups are well-documented among adults [8,9]. These disparities cannot be explained solely by disparate rates of cigarette exposure or consumption over time, and may arise through complex interactions between smoking and other risk factors (e.g., genetic risk factors, dietary and other health behaviors, environmental stressors) [10]. This suggests that similar patterns of smoking may have disproportionately negative effects for some racial/ethnic groups. Yet, little is known about when during one's lifetime such tobacco-related disparities manifest, and what types of racial/ethnic disparities may exist among youth who smoke. Investigating whether/how smoking during adolescence may disproportionately affect youth of different racial/ethnic groups has critical implications for understanding the role of cigarette smoking in the emergence of health, academic, psychosocial, and other disparities.

Although studies indicate that racial/ethnic minority youth are *less likely* to smoke cigarettes than their white peers [11–14], and white adolescents tend to initiate regular smoking at younger ages compared with black [15–17], Asian [16–18], and Hispanic youth [14,18], it is unclear whether and how smoking differentially relates to outcomes among youth of different racial/ethnic groups. Few longitudinal studies examine cigarette smoking trajectories among ethnically diverse samples of youth, and most studies examine racial/ethnic differences across only two or three groups [11,16–18]. Furthermore, few studies examine the association between smoking trajectories and functioning in multiple health, psychosocial, and academic domains [2,3]. Longitudinal research with diverse groups is necessary to understand how smoking during adolescence may differentially affect racial/ethnic groups and contribute to disparities later in life. Given the multiple pathways through which tobacco-related disparities may develop [10,19], examining different outcomes is critical to understanding how smoking may differentially relate to disparities in functioning. This is important because even though youth cigarette use is on the decline, 28% of youth in 2016 reported having used cigarettes by the time they were in 12th grade [20]. To our knowledge, no studies have examined the association between adolescent smoking trajectories and disparities across multiple outcomes at the end of high school for youth of different racial/ethnic groups. Recent work examining alcohol and marijuana (AM) use trajectories for adolescents suggests that after adjusting for similar trajectories of AM use, relative to white youth, Hispanic and multiethnic adolescents reported poorer academic performance; Asian, black, and Hispanic youth reported higher academic unpreparedness; and Asian youth and multiethnic youth reported poorer physical health [7]. This suggests that AM use during adolescence may disproportionately affect functioning in adolescence for some racial/ethnic groups. However, it is unknown whether *cigarette use* during adolescence has differential associations with functioning for youth of different races/ethnicities.

The current study addresses gaps by modeling the association between trajectories of adolescent cigarette use from middle school through high school (ages 11 through 18), and examining how trajectories affect academic, mental and physical health, and social outcomes at the end of high school across different racial/ethnic groups in a diverse sample of adolescents from Southern California. This study uses methods similar to those employed in a recent study [7], which examined racial/ethnic differences in trajectories of adolescent AM use in relation to these outcomes. We hypothesize that racial/ethnic minority youth will show disproportionately poorer outcomes at the end of high school compared with their white peers, after controlling for smoking trajectories during adolescence (i.e., assuming similar smoking trajectories over time across groups). Findings will advance the understanding of the role of cigarette smoking in the emergence of disparities across racial/ethnic groups, and may yield important insights into intervention targets for clinicians and tobacco control efforts.

Methods

Sample and procedures

Participants were from two cohorts of students in sixth and seventh grade in 2008, followed through 2016. Adolescents (n = 6,509) were initially recruited from 16 middle schools from three districts in the Los Angeles area as part of an alcohol and drug use prevention program, CHOICE [21]. The three districts were similar in terms of socioeconomic (e.g., the proportion of students receiving free or reduced lunch) and student demographics [21]. Procedures were approved by the institution's institutional review board. Procedures are reported in detail in the prevention trial [21]. Briefly, participants completed waves 1 through 5 (wave 1: fall 2008; wave 2: spring 2009; wave 3: fall 2009; wave 4: spring 2010; wave 5: spring 2011) during physical education classes at 16 middle schools. Follow-up rates ranged from 74 to 90%, excluding new youth who could have come in at a subsequent wave. Adolescents transitioned from middle schools to more than 200 high schools following wave 5, and were subsequently recontacted and reconsented to complete annual Web-based surveys. At wave 6 (spring 2013 to spring 2014), 61% of the sample participated in the follow-up survey. At wave 7 (1 year later), we retained 80% of the sample, and at wave 8 (1 year later; when most students had completed high school), we retained 90.5% of the sample. Dropout was not associated with demographics or risk behaviors, including alcohol and drug use [7].

Measures

Cigarette smoking at waves 1–8 was assessed using the *Monitoring the Future* [20] item: "During the past month, how many days did you smoke cigarettes?" Responses ranged from 0 to 20–30 days. Due to considerable skew, responses were dichotomized to indicate any (1) versus no (0) smoking.

Socio-demographics and race/ethnicity at wave 1 included self-reported age, gender, race/ethnicity, and mother's education (as a proxy for socioeconomic status). Participants were classified into one of six racial/ethnic groups: non-Hispanic white (reference group), non-Hispanic black, Hispanic, Non-Hispanic Asian, multiethnic (more than one race/ethnicity), and any other ethnicities.

Academic, health, and social outcomes at wave 8. *Academic orientation* assessed a combination of self-reported grades in the past year (1 = "mostly F's" to 8 = "mostly A's") [22], highest level of education students intended to complete (1 = "I may not finish high school" to 6 = "I plan to go to graduate school or professional school") [23], and how much students agreed with the statement

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