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## Identifying demographic and psychosocial factors related to the escalation of smoking behavior among Mexican American Adolescents

Sahil S. Shete<sup>1</sup> and Anna V. Wilkinson<sup>2</sup>

<sup>1</sup>Trinity University, San Antonio, TX, USA

<sup>2</sup>The University of Texas School of Public Health, Michael and Susan Dell Center for Healthy Living, Austin, TX

### Abstract

Cigarette smoking is the leading preventable cause of death in the United States; smoking in Mexican American adolescents, a rapidly growing population, remains a major concern. Factors associated with escalation or progression along the smoking trajectory have not been studied in adolescent Mexican Americans. A better understanding of escalation is needed for cancer prevention and overall health.

N=1,328 Mexican American adolescents joined a cohort in 2005–06. At baseline participants provided demographic, acculturation and psychosocial data, and reported their smoking status using the Minnesota Smoking Index. Those that never tried a cigarette or only had a few puffs in their life were included in this study. The primary outcome of interest, escalation in smoking status, was defined as moving up the Minnesota Smoking Index by 2010–2011. The current analysis is based on 973 participants of whom 48.2% were male, mean age=11.8 (SD=0.8), and 26.0% were born in Mexico.

By 2010–2011, 283 (29%) escalated their smoking status and 690 (71%) remained the same. Being older (OR=1.30; CI=1.07–1.57), male (OR=1.88, CI=1.40–2.53), having higher levels of anxiety (OR=1.03, CI=1.02–1.05), intending to smoke (OR=1.70, CI=1.18–2.46), having friends who smoke (OR=1.73, CI=1.12–2.70) and having parents' friends who smoke (OR=1.38, CI=1.02–1.88) increased risk for smoking escalation. Higher levels of subjective social status (OR=0.91, CI= 0.83–0.99) were protective against smoking escalation.

Contrasting previous work in smoking experimentation, parents' friends influence was a stronger predictor than the family household influence. Preventative interventions for Mexican American youth could address this risk factor to reduce smoking escalation.

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Corresponding author: Anna V. Wilkinson, Michael & Susan Dell Center for Healthy Living; The University of Texas School of Public Health, Austin Regional Campus, 1616 Guadalupe St., Suite 6.300, Austin, TX 78701; anna.v.wilkinson@uth.tmc.edu; Telephone: 512.391.2528; Fax: 512.482.6185.

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## Keywords

Adolescent smoking; Smoking escalation; Mexican American youth; Minnesota Smoking Index

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## Introduction

Smoking causes many types of cancers, remaining the leading cause of cancer-related death in the United States (U.S.)<sup>1</sup> and contributes to the overall burden of disease.<sup>2,3</sup> Despite the fact that rates of cigarette use on the whole have been decreasing annually<sup>4</sup>, over 400,000 deaths per year in the last decade are attributed to smoking.<sup>1</sup> In addition, cigarette smoking greatly reduces the quality of cognitive and physical performance.<sup>5,6</sup> Using the U.S. National Health Interview Survey data from 1997 to 2004, Jha et al.<sup>7</sup> estimated hazard ratios of a smoker's death as compared to a non-smoker, adjusting for age, education level, adiposity, and alcohol consumption, and noted that smokers lost at least 10 years of their life compared to non-smokers. Thus, cigarette smoking remains a major issue in cancer prevention and overall health.

About 9 out of 10 smokers began smoking before the age of 18.<sup>8</sup> Previous research has shown that those who initiate smoking early have lower first quit attempt rates than those who initiate later<sup>9</sup> and also continue to smoke.<sup>10-12</sup> Because of how dangerous early smoking initiation is, many studies over the years have identified risk factors related to cigarette experimentation and smoking initiation among adolescents.<sup>13-16</sup> Our group has focused on identifying risk factors for smoking experimentation and initiation among the Mexican heritage population in the United States. We have found that that low to moderate subjective social status combined with holding positive outcome expectations for smoking resulted in higher risk of adolescent experimentation<sup>17</sup> and that family conflict is associated with an increased risk for adolescent smoking while family cohesion decreases the risk.<sup>18</sup> Increased levels of anxiety,<sup>19</sup> age, sex, cognitive susceptibility, peer influence, and household smoking behavior were all associated with smoking experimentation as well.<sup>20</sup> The relationships of acculturation and birth place to smoking behaviors among Latino is complex<sup>21</sup> and parental education along with family status are also related to children's smoking experimentation and future smoking.<sup>22</sup>

These population specific studies are of significance because the Mexican population is the largest Hispanic group in the United States, with a quarter of the population residing within Texas.<sup>23</sup> Due to this population's projected growth, further assessments of the Mexican American adolescent population are needed to better understand their smoking behaviors. To the best of our knowledge, factors associated with escalation, or an individual's transition from just experimentation to a higher intake, have not been studied in adolescent Mexican Americans. Using a population based cohort of Mexican American households in Texas, we analyzed adolescents who had never smoked or had only experimented with cigarettes in 2005–2006 but had escalated to a higher intake by the 2010–2011 follow up.<sup>20</sup> This study aims to provide information that can be used in interventions to prevent smoking escalation in this underrepresented and growing population.

## Methods

### Study Population

Participants in this study were recruited from a population based cohort of Mexican American households instituted and maintained by the Department of Epidemiology at The University of Texas M.D. Anderson Cancer Center, called the Mexican American Cohort Study (MACS).<sup>24,25</sup> In 2005 to 2006, a nested longitudinal cohort within the Mexican American Cohort Study was initiated to study smoking behavior in Mexican American adolescents aged 11 to 13. This cohort became known as the Mexican American Tobacco Use in Children (MATCh). The details of study recruitment and participants' characteristics are given in Wilkinson et al.<sup>26</sup> MACS households with at least one boy or girl between the ages of 11 to 13 years were eligible to participate in the study. IRB trained, bilingual interviewers contacted adults in these households via the telephone to explain the goals of the MATCh study and invite the household to participate. Of the 3,000 MACS households eligible for the study, 1,328 households were successfully recruited. From each household, one child was identified as a participant and a short in-person interview was conducted to obtain informed parental consent and participant assent, as well as demographic and acculturation data. The participants answered the remaining survey questions for this study using a personal digital assistant (PDA). The use of the PDA avoided parental and peer influences on the participants' responses. The baseline and final interviews were conducted in the participants' homes so they would feel more comfortable. A total of 1,328 participants took part in the baseline home interviews and surveys from 2005 to 2006. Final home interviews and surveys were conducted from 2010 to 2011 in which 1,001 participants took part.<sup>27</sup>

### Measures

**Outcomes**—The primary outcome measure of interest in this study was change in smoking status from baseline to follow-up. The Minnesota Smoking Index<sup>28</sup> is a scale with eleven possible response statements about smoking status; participants select the statement that most closely reflects his or her current smoking status. Adolescents who responded with items “Never tried a cigarette” or “Had one or more puffs in my life, but not a whole cigarette” at baseline were included in this study. At follow-up the survey was taken a second time and responses to the Minnesota Smoking Index were looked at again. If the participant responded as they did at baseline (i.e. no progression along the smoking continuum), then they were a control, coded as 0, and labeled as stable. If a participant responded differently, by moving up the scale in any way, which reflected increased smoking behavior, then they were cases, coded as 1, and labelled as an escalator.

**Predictors**—We investigated several demographic and psychosocial variables, all assessed at baseline, to examine their possible roles in changing smoking patterns over time. These demographic predictors included age, sex, birthplace, subjective social status, linguistic acculturation, and parental education. Psychosocial predictors included anxiety, behavioral intentions, peer influence, family influence, family cohesion and conflict, as well as positive and negative outcome expectations.

Subjective social status was examined using the 10-point MacArthur Scale of Subjective Social Status-Youth Version.<sup>29</sup> This variable reflects the adolescents' perception of his or her social status relative to fellow students at school. Responses are made on a ladder, where the bottom rung is 1 or the worst ranking, and top rung is 10 or the best ranking.

Linguistic acculturation was assessed using four items that observed whether Spanish or English was the dominant language used, via a language use subscale on Marin et al.'s acculturation measure.<sup>30</sup> The four items asked what language the participant generally used to read, speak at home, think, and speak with friends. Responses were made on a 5-point Likert scale, ranging from "Only Spanish" to "Only English" (Cronbach's alpha=0.75). The four responses were averaged to create the measure of linguistic acculturation.

Parental education was used as a proxy measure for socioeconomic status as the overwhelming majority of parents reported on their educational attainment, but not household income. Responses were categorized into three groups: "less than high school," "completed high school" and "more than high school".

Speilberger's trait anxiety scale a reliable and validated measure<sup>31</sup>, was used to assess anxiety. Participants responded to twenty personal statements about their general emotional state (e.g. "I usually feel calm" and "I usually feel stressed"). Responses were made on a 4-point Likert scale; response options ranged from "Not at all" to "Very much." The anxiety score for each participant was calculated by adding up the responses for all twenty items (Cronbach's alpha=0.86).

Behavioral intentions were measured using one item that asked "Do you think you will try a cigarette soon?"<sup>32</sup> The responses were collapsed into two categories, "Definitely not" and "Probably not/Probably yes/Definitely yes."

Social influence was assessed using two questions that asked about the smoking behavior of people close to the adolescents.<sup>33</sup> The questions were "How many of your friends smoke?" and "How many of your parents' friends smoke?" Responses were made on a 4-point scale ranging from "none" to "all." These responses were collapsed to either "none" or "a few/some/all."

Family influence was assessed using five questions asking whether their father, mother, brother, sister, and/or anyone else living in their home smoked.<sup>34</sup> The responses were used to calculate the total of smokers in the household and were categorized as "0 individuals," "1 individual," or "2-4 individuals" in the household that smoked. Family cohesion and conflict were assessed using the Family Life Questionnaire,<sup>18,35-37</sup> which has been validated for use in this population<sup>18</sup>. Four items assessed family cohesion (e.g. "In my family we really help and support one another") and four more assessed family conflict (e.g. "We don't often fight in my family"). Responses were made on a 4-point Likert scale with a range of "Strongly Disagree" to "Strongly Agree". Both family cohesion (Cronbach's alpha=0.65) and conflict variables (Cronbach's alpha=0.55) were calculated by averaging the responses to their respective items.

Outcomes expectations were assessed using a twelve-item scale developed by Dalton et al.<sup>38</sup> Seven of the twelve items reflected whether the adolescents' believed that smoking would have positive effects in their future and the other five items observed whether they believed that smoking would have negative effects. Responses for each item were made on a 4-point Likert scale ranging from "strongly disagree" to "strongly agree." The average responses for the positive items and negative items were calculated separately to create a measure of positive outcome expectations (Cronbach's alpha=0.87) and another of negative outcome expectations (Cronbach's alpha=0.66).

## Statistical Methods

Means, proportions, and standard deviations were calculated to describe the general characteristics of the population. Univariate logistic regressions were performed and odds ratios were calculated to examine the association between becoming an escalator in 2010–11 and each of the independent predictors assessed in 2005–06. Those predictors that had univariate p-value less than 0.25, a standard screening criteria for variable selection based on univariate analyses recommended by<sup>39</sup>, were used for developing a multivariable logistic regression model. A multivariable logistic regression model was obtained via a backward elimination process such that those predictors with a p-value higher than 0.05 in the multivariable model were removed. All statistical tests and calculations were used using R Studio.<sup>40</sup>

## Results

### Descriptive Univariate Analysis

At baseline 1,328 participants took part in the survey and 1,001 of them, or 75%, took part in the 2010–11 follow up. Participants with missing relevant data were removed along with those who were already smokers at baseline. The final sample size for this study included 973 participants.

The descriptive univariate analysis results are presented in Table 1. From this sample, 283 participants became escalators (29.1%) and 690 participants remained stable (70.9%). Older adolescents were more likely to be escalators than stable ( $p<0.001$ ), as were males ( $p<0.001$ ). On average, the escalators had a lower subjective social status ( $p<0.001$ ) and tended to use English more ( $p<0.05$ ) compared to the stable participants. The mean anxiety score for all escalators ( $M=40.89$ ,  $SD=9.73$ ) was higher than the stable participants ( $M=36.63$ ,  $SD=9.87$ ;  $p<0.001$ ). Adolescents who thought they would probably or definitely try a cigarette soon were more likely to become an escalator than stay stable (30.4% vs. 13.6%;  $p<0.001$ ). Adolescents with at least a few friends that smoked were more likely to escalate than not (21.6% vs. 8.3%;  $p<0.001$ ) and those with at least a few parents' friends that smoked were more likely to escalate than not (59.7% vs. 45.5%;  $p<0.001$ ). The more individuals in the household that smoked, the more likely the adolescent would become an escalator ( $p<0.001$ ).

The mean family cohesion for escalators was lower than the stable participants ( $p<0.001$ ) implying lower levels of positive family experiences. Similarly, the mean family conflict for

escalators was lower than the stable participants' ( $p < 0.01$ ) implying higher levels of negative family experiences. On an average, the escalators also tended to believe that smoking could have positive social outcomes in their life ( $p < 0.001$ ) compared to the average stable participant. However, birth place, parental education, and negative outcome expectations were not associated with escalation ( $p$ -values 0.123, 0.430, and 0.616, respectively).

### Multivariable Logistic Regression Model

Variables that demonstrated an association (univariate  $p < 0.25$ ) with smoking progression (see Table 1) were included in a multivariable logistic regression model. The Supplementary Table 1 shows the results of this analysis (without variable selection). The final multivariable logistic regression model obtained after backwards elimination (using  $p < 0.05$  threshold) is shown in Table 2. Older adolescents were more likely to be an escalator (OR=1.30; CI=1.07–1.57) than younger adolescents. Being male increased the risk of escalating compared to being female (OR=1.88; CI=1.40–2.53). Every unit increase in subjective social status decreased the chance of becoming an escalator (OR=0.91, CI= 0.83–0.99).

Every unit of increase in the anxiety score (OR=1.03; CI=1.02–1.05) was significantly associated with becoming an escalator, as was holding intentions to smoke cigarettes in the future (OR=1.70, CI=1.18–2.46). If the adolescent had at least a few friends who smoked, the likelihood of becoming an escalator increased (OR=1.73, CI=1.12–2.70) and if they had at least a few parents' friends who smoked, they were more likely to be escalators (OR=1.38, CI=1.02–1.88).

### Discussion

Consistent with other findings,<sup>41,42</sup> our final model results show that other individuals in the adolescents' lives can have a huge influence on their attitudes and behavior towards smoking. Both friends and parents' friends were significant factors in becoming an escalator. In terms of peer influence, peer pressure is a well-known phenomenon that pushes youth to do things that they may not be comfortable doing in order to gain approval of others and avoid ridicule.<sup>43–45</sup> For this reason, we can recognize that adolescents observe and care about what others think of them. When they interact with their peers who smoke, adolescents could feel pressured or even directly coerced into smoking with them. These adolescents might be more focused on the immediate positive effects of social acceptance rather than the long term negative effects of smoking.

One of the novel findings from our study is role of smoking behavior of parents' friends, who do not reside in the same household as the participant, also exerted a significant influence on adolescent escalation. This is in contrast with our previous work, where we have found household social influence is associated with experimenting with cigarettes<sup>46</sup>. Familial relations in the Mexican American community are more complex and are more involved in individuals' lives than in other American households.<sup>47</sup> Therefore, parents are not the only major adult influences in these adolescents' lives. For example, *padrinos* are the godparents of children, who are expected to actively participate in their godchildren's lives.<sup>48</sup> It is possible that when asked about whether their parents' friends smoked, they could have been thinking of important extended family members like these. The more adults

in these adolescents' lives, the higher chance there is of exposure to smoking acceptance attitudes. As secondary parental role models, they could have an impact on adolescents' attitudes on smoking. To our knowledge, this is the first study to find links between the smoking behavior of parents' friends and their friends' children movement along the smoking trajectory.

Related to social pressure, we found that subjective social status was an important protective factor for escalation. Since this scale presents how the adolescents perceive themselves in comparison to their peers, we can note that self-image plays an important role in their smoking behavior, which has been seen in other risk taking behavior studies.<sup>49</sup> If these adolescents believe that they are in worse standing than others, then they might be more inclined to smoke, especially if they think it will raise their social status to their peers' level.<sup>17</sup> We also found that adolescents who think that they are going to smoke in the future were more likely to escalate. This finding really exemplifies the strength of the favorable attitudes toward smoking in affecting actual smoking behavior.<sup>34,50</sup>

We further found that every unit increase in anxiety was associated with an increased likelihood in smoking escalation. Smoking is also considered as stress reliever for all ages.<sup>42,51,52</sup> Adolescents who feel stressed because of their school, home, and/or social life may desire an outlet to relieve this tension. Cigarette smoking is a socially accepted/ tolerated<sup>53,54</sup> and easily available<sup>55,56</sup> mode to relieve stress. Because of this, the adolescents may see smoking as an acceptable behavior.

As in other studies examining experimentation with smoking, we found that age and gender were associated with smoking escalation. The older the adolescents are, the more capable they are of purchasing cigarettes,<sup>57</sup> which is possibly demonstrated in our results where the older adolescents had higher escalation risk. In Mexican families, male smoking is more socially acceptable than females.<sup>58</sup> Consistent with this fact, we found boys were also more likely to escalate their smoking behavior than girls.

Socio-economic status (SES) is also known to be associated with smoking behavior.<sup>59</sup> However in our study, parental education, a proxy measure of SES, was not significant in the univariate analysis. To assess impact of including this factor, we ran an additional logistical regression model with parental education along with the factors that were significant in our final model. These results are presented in Supplementary Table 2. The results were qualitatively unchanged from those presented in Table 2. All the factors that were significant in our final model remained so, even in the presence of parental educational and as expected, parental education level was still not statistically significant. This may be related to the lack of variability in SES in the parent cohort from where are sample is drawn<sup>24</sup>.

In contrast to previous work, linguistic acculturation, country of birth, household smoking, positive outcome expectations, as well as family cohesion and conflict were not significantly associated with escalation.<sup>18,20</sup> However, these factors were associated with smoking experimentation in previous studies.<sup>18,20</sup> This discrepancy may be due to the difference between the nature of escalation and experimentation. Experimentation has been measured as only trying a cigarette or even a puff, implying that it could be a temporary action,

possibly impulsive or something done simply for the experience.<sup>20</sup> In this study, escalation involves repeated usage, implying a possibly deeper addictive behavior. As a result the phenotypes are distinct—escalation reflects a greater extent of smoking behavior compared to experimentation; accordingly we do not expect to find identical risk and protective factors.

Taken as a whole, these findings suggest that intervention programs should focus on the community as a whole rather than focusing on the at-risk adolescents alone. Such community-wide approaches have been developed for smoking cessation.<sup>60</sup> One intervention targeting low-to-middle income African-Americans improved smoking cessation outcomes<sup>61</sup> and another experimental intervention targeting adult Mexican Americans helped limit second-hand smoke exposure,<sup>62</sup> showing that culturally targeted approaches can yield positive results in behaviors and attitudes to smoking.

Reminding adults that there are young impressionable children whose health depends on their behavior and attitudes, may compel them to be less accepting of smoking in the community and present “better” smoking behavior in front of family and community members.<sup>62</sup> Because of the complex family structures in the Mexican American community,<sup>47</sup> and because we found that parents’ friends behavior exerts a strong impact on youth in this community, intervention programs could recruit other Mexican American adults whose lives have been negatively impacted by their own previous smoking habits. Rather than focusing on numbers and medical facts about the negative health consequences of smoking, combining this information with personal stories from adults who have suffered the consequences of smoking could be carry more influence with these adolescents, especially if the person is perceived as an influential figure like the *padrino* or *madrina*.

### Study Limitations and Strengths

A limitation of this study is that the data from the adolescents are self-reported; as a result the true smoking prevalence may be under reported. However as a counter measure, the adolescents were informed during the consent process that they might need to provide a saliva sample in order to check their smoking status. Even though this did not actually take place, believing that this might happen has been shown to increase the validity of their self-reports of smoking status among adolescents.<sup>63</sup> A second limitation is that the study focused exclusively on Mexican Americans and so these findings will not generalize to other populations. However the exclusivity of this population also is a strength as low-income Mexican Americans are an underrepresented group, and our results provided much needed data to inform intervention development. Another strength of our study is that the participants were balanced in regards to sex. The data are also longitudinal, allowing us to study the pattern of escalation in smoking, over a period of time that is important in adolescent social growth. There was a high rate of retention from the baseline to the follow up too. Confidentiality is another strength, since the responses were recorded on a personal digital assistant, so the adolescents did not have to worry about any judgment, promoting more honest results.



## Conclusions and Implications

Unlike other studies, our findings show the influence of other adults, who are not the parents and who do not reside with the adolescents, play a role in smoking escalation. In conclusion, these findings indicate that changes in the beliefs and behaviors in these adults, and changing how adolescents view and interact with one another, may reduce smoking escalation among these youth. Community-wide interventions, which target both at-risk adolescents and the adults who influence them, might be viable approaches to decrease the risk of smoking escalation in Mexican American adolescents.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## References

1. The Health Consequences of Smoking—50 Years of Progress. 2014. at <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/full-report.pdf>
2. Cancer Facts & Figures 2015. 2015. at <http://www.cancer.org/acs/groups/content/@editorial/documents/document/acspc-044552.pdf>
3. Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ*. 2004; 328:1519. [PubMed: 15213107]
4. Mendez D, Warner KE. Adult cigarette smoking prevalence: declining as expected (not as desired). *Am J Public Health*. 2004; 94:251–2. [PubMed: 14759934]
5. Doll R, Hill AB. The mortality of doctors in relation to their smoking habits: a preliminary report. 1954. *BMJ*. 2004; 328:1529–33. discussion 33. [PubMed: 15217868]
6. Richards M, Jarvis MJ, Thompson N, Wadsworth ME. Cigarette smoking and cognitive decline in midlife: evidence from a prospective birth cohort study. *Am J Public Health*. 2003; 93:994–8. [PubMed: 12773367]
7. Jha P, Ramasundarahettige C, Landsman V, et al. 21st-century hazards of smoking and benefits of cessation in the United States. *N Engl J Med*. 2013; 368:341–50. [PubMed: 23343063]
8. Preventing Tobacco Use Among Youth and Young Adults. 2012. at [https://www.cdc.gov/tobacco/data\\_statistics/sgr/2012/consumer\\_booklet/pdfs/consumer.pdf](https://www.cdc.gov/tobacco/data_statistics/sgr/2012/consumer_booklet/pdfs/consumer.pdf)
9. Ersler J, Leventhal H, Fleming R, Glynn K. The quitting experience for smokers in sixth through twelfth grades. *Addict Behav*. 1989; 14:365–78. [PubMed: 2782120]
10. Chassin L, Presson CC, Rose JS, Sherman SJ. The natural history of cigarette smoking from adolescence to adulthood: demographic predictors of continuity and change. *Health Psychol*. 1996; 15:478–84. [PubMed: 8973929]
11. Griffin KW, Botvin GJ, Doyle MM, Diaz T, Epstein JA. A six-year follow-up study of determinants of heavy cigarette smoking among high-school seniors. *J Behav Med*. 1999; 22:271–84. [PubMed: 10422618]

12. Silva MA, Rivera IR, Carvalho AC, de Guerra AH Jr, Moreira TC. The prevalence of and variables associated with smoking in children and adolescents. *J Pediatr (Rio J)*. 2006; 82:365–70. [PubMed: 16960638]
13. Alexander C, Piazza M, Mekos D, Valente T. Peers, schools, and adolescent cigarette smoking. *J Adolesc Health*. 2001; 29:22–30. [PubMed: 11429302]
14. Hoffman BR, Monge PR, Chou CP, Valente TW. Perceived peer influence and peer selection on adolescent smoking. *Addict Behav*. 2007; 32:1546–54. [PubMed: 17188818]
15. Conrad KM, Flay BR, Hill D. Why children start smoking cigarettes: predictors of onset. *Br J Addict*. 1992; 87:1711–24. [PubMed: 1490085]
16. Tyas SL, Pederson LL. Psychosocial factors related to adolescent smoking: a critical review of the literature. *Tob Control*. 1998; 7:409–20. [PubMed: 10093176]
17. Wilkinson AV, Shete S, Vasudevan V, Prokhorov AV, Bondy ML, Spitz MR. Influence of subjective social status on the relationship between positive outcome expectations and experimentation with cigarettes. *J Adolesc Health*. 2009; 44:342–8. [PubMed: 19306792]
18. Rajesh V, Diamond PM, Spitz MR, Wilkinson AV. Smoking Initiation Among Mexican Heritage Youth and the Roles of Family Cohesion and Conflict. *J Adolesc Health*. 2015; 57:24–30. [PubMed: 25911161]
19. Okeke NL, Spitz MR, Forman MR, Wilkinson AV. The associations of body image, anxiety, and smoking among Mexican-origin youth. *J Adolesc Health*. 2013; 53:209–14. [PubMed: 23669646]
20. Talluri R, Wilkinson AV, Spitz MR, Shete S. A risk prediction model for smoking experimentation in Mexican American youth. *Cancer Epidemiol Biomarkers Prev*. 2014; 23:2165–74. [PubMed: 25063521]
21. Gorman BK, Lariscy JT, Kaushik C. Gender, acculturation, and smoking behavior among U.S. Asian and Latino immigrants. *Soc Sci Med*. 2014; 106:110–8. [PubMed: 24561772]
22. Zaloudikova I, Hrubá D, Samara I. Parental education and family status--association with children's cigarette smoking. *Cent Eur J Public Health*. 2012; 20:38–44. [PubMed: 22571015]
23. The Hispanic Population: 2010. 2011. at <http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf>
24. Wilkinson AV, Spitz MR, Strom SS, et al. Effects of nativity, age at migration, and acculturation on smoking among adult Houston residents of Mexican descent. *Am J Public Health*. 2005; 95:1043–9. [PubMed: 15914831]
25. Chow WH, Chrisman M, CRD, et al. Cohort Profile: The Mexican American Mano a Mano Cohort. *Int J Epidemiol*. 2015
26. Wilkinson AV, Waters AJ, Vasudevan V, Bondy ML, Prokhorov AV, Spitz MR. Correlates of susceptibility to smoking among Mexican origin youth residing in Houston, Texas: a cross-sectional analysis. *BMC Public Health*. 2008; 8:337. [PubMed: 18822130]
27. Wilkinson AV, Koehly LM, Vandewater EA, et al. Demographic, psychosocial, and genetic risk associated with smokeless tobacco use among Mexican heritage youth. *BMC Med Genet*. 2015; 16:43. [PubMed: 26111525]
28. Pechacek TF, Murray DM, Luepker RV, Mittelmark MB, Johnson CA, Shutz JM. Measurement of adolescent smoking behavior: rationale and methods. *J Behav Med*. 1984; 7:123–40. [PubMed: 6716469]
29. Goodman E, Adler NE, Kawachi I, Frazier AL, Huang B, Colditz GA. Adolescents' perceptions of social status: development and evaluation of a new indicator. *Pediatrics*. 2001; 108:E31. [PubMed: 11483841]
30. Marin G, Sabogal F, Marin BV, Oterosabogal R, Perezstable EJ. Development of a Short Acculturation Scale for Hispanics. *Hispanic J Behav Sci*. 1987; 9:183–205.
31. Spielberger CD. Assessment of state and trait anxiety: Conceptual and methodological issues. *The Southern Psychologist*. 1985; 2:6–16.
32. Pierce JP, Choi WS, Gilpin EA, Farkas AJ, Merritt RK. Validation of susceptibility as a predictor of which adolescents take up smoking in the United States. *Health Psychol*. 1996; 15:355–61. [PubMed: 8891714]
33. Epstein JA, Botvin GJ, Diaz T. Social influence and psychological determinants of smoking among inner-city adolescents. *J Child Adolesc Subst*. 1999; 8:1–19.

34. Spelman AR, Spitz MR, Kelder SH, et al. Cognitive susceptibility to smoking: Two paths to experimenting among Mexican origin youth. *Cancer Epidemiol Biomarkers Prev.* 2009; 18:3459–67. [PubMed: 19959696]
35. Foxcroft, DRaLG. Adolescent drinking, smoking and other substance use involvement: links with perceived family life. *Journal of Adolescence.* 1995; 18:159–77.
36. Foxcroft DR, Lowe G. Adolescent drinking behaviour and family socialization factors: a meta-analysis. *J Adolesc.* 1991; 14:255–73. [PubMed: 1835984]
37. Rajesh, V. Parental influence on adolescent smoking initiation among Mexican origin youth. University of Texas Health Science Center; 2011.
38. Dalton MA, Sargent JD, Beach ML, Bernhardt AM, Stevens M. Positive and negative outcome expectations of smoking: implications for prevention. *Prev Med.* 1999; 29:460–5. [PubMed: 10600426]
39. Hosmer, DW., Lemeshow, S. *Applied logistic regression.* 2. New York: Wiley; 2000.
40. RStudio: Integrated Development for R. RStudio, Inc; 2015. at <http://www.rstudio.com/>
41. Kobus K. Peers and adolescent smoking. *Addiction.* 2003; 98(Suppl 1):37–55. [PubMed: 12752361]
42. Tsai YW, Wen YW, Tsai CR, Tsai TI. Peer pressure, psychological distress and the urge to smoke. *Int J Environ Res Public Health.* 2009; 6:1799–811. [PubMed: 19578461]
43. Chein J, Albert D, O'Brien L, Uckert K, Steinberg L. Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Dev Sci.* 2011; 14:F1–10. [PubMed: 21499511]
44. Allen JP, Porter MR, McFarland FC, Marsh P, McElhaney KB. The two faces of adolescents' success with peers: adolescent popularity, social adaptation, and deviant behavior. *Child Dev.* 2005; 76:747–60. [PubMed: 15892790]
45. La Greca AM, Prinstein MJ, Fetter MD. Adolescent peer crowd affiliation: linkages with health-risk behaviors and close friendships. *J Pediatr Psychol.* 2001; 26:131–43. [PubMed: 11259515]
46. Wilkinson AV, Bondy ML, Wu X, et al. Cigarette experimentation in Mexican origin youth: psychosocial and genetic determinants. *Cancer Epidemiol Biomarkers Prev.* 2012; 21:228–38. [PubMed: 22028400]
47. Tienda MaM, M., editor. *Hispanics and the Future of America.* Washington (DC): National Academies Press (US); 2006.
48. Kana'iaupuni SM, Donato KM, Thompson-Colon T, Stainback M. Counting on kin: Social networks, social support, and child health status. *Soc Forces.* 2005; 83:1137–64.
49. Wild LG, Flisher AJ, Bhana A, Lombard C. Associations among adolescent risk behaviours and self-esteem in six domains. *J Child Psychol Psychiatry.* 2004; 45:1454–67. [PubMed: 15482505]
50. Jackson C. Cognitive susceptibility to smoking and initiation of smoking during childhood: a longitudinal study. *Prev Med.* 1998; 27:129–34. [PubMed: 9465363]
51. Nichter M, Nichter M, Carkoglu A. Tobacco Etiology Research N. Reconsidering stress and smoking: a qualitative study among college students. *Tob Control.* 2007; 16:211–4. [PubMed: 17565143]
52. Finkelstein DM, Kubzansky LD, Goodman E. Social status, stress, and adolescent smoking. *J Adolesc Health.* 2006; 39:678–85. [PubMed: 17046504]
53. Levinson AH, Campo S, Gascoigne J, Jolly O, Zakharyan A, Tran ZV. Smoking, but not smokers: identity among college students who smoke cigarettes. *Nicotine Tob Res.* 2007; 9:845–52. [PubMed: 17654297]
54. Moran S, Wechsler H, Rigotti NA. Social smoking among US college students. *Pediatrics.* 2004; 114:1028–34. [PubMed: 15466101]
55. Forster JL, Hourigan M, McGovern P. Availability of cigarettes to underage youth in three communities. *Prev Med.* 1992; 21:320–8. [PubMed: 1614994]
56. Marshall L, Schooley M, Ryan H, et al. Youth tobacco surveillance--United States, 2001–2002. *MMWR Surveill Summ.* 2006; 55:1–56.
57. Lenk KM, Toomey TL, Shi Q, Erickson DJ, Forster JL. Do Sources of Cigarettes Among Adolescents Vary by Age Over Time? *J Child Adolesc Subst Abuse.* 2014; 23:137–43. [PubMed: 24563604]

58. Marin BV, Marin G, Perezstable EJ, Oterosabogal R, Sabogal F. Cultural-Differences in Attitudes toward Smoking - Developing Messages Using the Theory of Reasoned Action. *J Appl Soc Psychol.* 1990; 20:478–93.
59. Hiscock R, Bauld L, Amos A, Fidler JA, Munafo M. Socioeconomic status and smoking: a review. *Ann N Y Acad Sci.* 2012; 1248:107–23. [PubMed: 22092035]
60. Andrews JO, Newman SD, Heath J, Williams LB, Tingen MS. Community-based participatory research and smoking cessation interventions: a review of the evidence. *Nurs Clin North Am.* 2012; 47:81–96. [PubMed: 22289400]
61. Matthews AK, Sanchez-Johnsen L, King A. Development of a culturally targeted smoking cessation intervention for African American smokers. *J Community Health.* 2009; 34:480–92. [PubMed: 19728056]
62. Prokhorov AV, Hudmon KS, Marani SK, et al. Eliminating second-hand smoke from Mexican-American households: outcomes from Project Clean Air-Safe Air (CASA). *Addict Behav.* 2013; 38:1485–92. [PubMed: 23085392]
63. Murray DM, Oconnell CM, Schmid LA, Perry CL. The Validity of Smoking Self-Reports by Adolescents - a Reexamination of the Bogus Pipeline Procedure. *Addictive Behaviors.* 1987; 12:7–15. [PubMed: 3565116]

**Highlights**

- Over the course of 5 years, 29% of the adolescents escalated in smoking behavior.
- Higher levels of anxiety were associated with escalation in smoking.
- Intentions to smoke and having friends that smoke increased the risk of escalation
- Higher levels of subjective social status were protective against escalation.
- Parents' friends influence was stronger than household influence on escalation.

**Table 1**

Distribution of study participants by demographic and psychosocial factors

Variable	Escalator, n (%)	Stable, n (%)	Univariate <i>p</i> value
Overall	283 (29.1)	690 (70.9)	
Age at baseline			< 0.001
11	91 (32.2)	322 (46.7)	
12	98 (34.6)	214 (31.0)	
13 & 14	94 (32.2)	154 (22.3)	
Sex			< 0.001
Female	113 (39.9)	391 (56.7)	
Male	170 (60.1)	299 (43.3)	
Birthplace			0.123
Mexico	64 (22.6)	189 (27.4)	
U.S.A.	219 (77.4)	501 (72.6)	
Subjective Social Status, M (SD)	7.86 (1.64)	8.39 (1.65)	< 0.001
Language Acculturation, M (SD)	3.59 (0.81)	3.45 (0.86)	< 0.05
Parental Education			0.430
Less than high school	169 (63.3)	428 (66.3)	
Completed high school	47 (17.6)	103 (16.0)	
More than high school	51 (19.1)	114 (17.7)	
Anxiety Score (1–80), M (SD)	40.89 (9.73)	36.63 (9.87)	< 0.001
Behavioral Intentions: Do you think that you will try a cigarette soon?			< 0.001
Definitely not	197 (69.6)	596 (86.4)	
Probably not/definitely yes	86 (30.4)	94 (13.6)	
How many of your friends smoke?			< 0.001
None	222 (78.4)	633 (91.7)	
A few/some/all	61 (21.6)	57 (8.3)	
How many of your parents' friends smoke			< 0.001
None	114 (40.3)	376 (54.5)	
A few/some/all	169 (59.7)	314 (45.5)	
Family influence: How many individuals in your household smoke?			

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Variable	Escalator, n (%)	Stable, n (%)	Univariate <i>p</i> value
None	148 (52.3)	442 (64.1)	
One	97 (34.3)	197 (28.5)	
Two to four	38 (13.4)	51 (7.4)	
Family Cohesion, M (SD)	3.09 (0.46)	3.22 (0.48)	<0.001
Family Conflict, M (SD)	2.60 (0.52)	2.70 (0.55)	<0.01
Positive Outcome Expectations, M (SD)	1.32 (0.44)	1.20 (0.34)	<0.001
Negative Outcome Expectations, M (SD)	3.42 (0.54)	3.44 (0.56)	0.616

M= Mean; SD= Standard deviation

**Table 2**

Final Multivariable Model: Effects of demographic and psychosocial factors on escalation in smoking (N=973)

Variable	Odds ratio	95% CI	p value
Age	1.30	1.07 – 1.57	< 0.01
Sex	1.88	1.40 – 2.53	< 0.001
Subjective Social Status	0.91	0.83 – 0.99	< 0.05
Anxiety Score	1.03	1.02 – 1.05	< 0.001
Behavioral Intentions: Do you think that you will try a cigarette soon?	1.70	1.18 – 2.46	< 0.01
How many of your friends smoke?	1.73	1.12 – 2.70	< 0.05
How many of your parents' friends smoke	1.38	1.02 – 1.88	< 0.05

CI = Confidence Interval

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