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Risk and Protective Factors for Early Substance Use Initiation: A Longitudinal Study of Mexican-Origin Youth

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Abstract

Substance use initiation in adolescence is a critical issue, given its association with substance dependency and associated problems in adulthood. However, due to the dearth of fine-grained, longitudinal studies, the factors associated with early initiation are poorly understood, especially in minority youth. The present study examined substance use initiation in a sample of Mexican-origin youth ($N=674$) assessed annually from age 10 to 16. Using discrete-time survival analyses, we found that initiation escalated rapidly from late childhood to adolescence, and we identified a wide range of factors, from the individual to the cultural level of analysis, that significantly increased or decreased risk for early initiation. These findings have important implications for programs aimed at preventing early substance use by Mexican-origin youth.

Keywords

substance use; development; adolescence; Mexican-origin families; longitudinal

Due to the prevalence of alcohol, tobacco, and illicit substance use, the United States spends more than \$600 billion dollars per year on costs associated with higher rates of crime, reduced job productivity, and an increased burden on the healthcare system (NIDA, 2012). Early initiation of substance use can have long-term adverse consequences, including increased risk for academic failure, mental health problems, antisocial behavior, physical illness, precocious and risky sex, and the development of substance use disorders (Dawson et al., 2008; Hingson, 2006; King & Chassin, 2007; Martinez, Eddy, & DeGarmo, 2003; Odgers et al., 2008). Given this constellation of negative outcomes, there has been increasing scientific attention directed to studying risk for substance use and mechanisms that increase resilience to such risk (Gonzales-Castro & Nieri, 2010; Griffin, 2010).

The present study examined the initiation of substance use in a relatively neglected, but rapidly expanding group in the United States: Mexican-origin youth. Latinos are the nation's largest ethnic minority group, and two-thirds (66%) of them are of Mexican heritage (Humes, Jones, & Ramirez, 2010). Early onset of substance use occurs at an above average rate among Latino children in the United States, and Latinos report the highest usage rates for some types of drugs (e.g., marijuana) compared to other ethnic groups (Johnston et al.,

2014). The current size, expected growth, and prevalence of substance use in the Mexican-origin population underscore the importance of improving scientific understanding of risk and resilience for substance use among Mexican-origin youth.

Using data from a longitudinal study of Mexican-origin youth, the present research will examine year-by-year changes in the probability of substance use initiation from childhood (age 10) to adolescence (age 16), and test the influence of a wide range of risk and protective factors. Our hypotheses about risk and resilience factors associated with substance use initiation are generated from the Family Stress Model (Conger, 1997; Conger et al., 2012), which is part of a broader class of biopsychosocial models that adopt an ecological, multi-level perspective on development (Bronfenbrenner, 1979; Griffin, 2010; Moffitt, 1993). The Family Stress Model conceptualizes risk and resilience processes at multiple levels of analysis, ranging from individual to interpersonal to environmental to cultural factors, and specifies the mediating and moderating pathways that link these multiple levels of risk and resilience factors to developmental outcomes, such as substance use initiation.

Recent reviews suggest that sampling these risk and protective factors from across different ecosystem levels and examining how they manifest *within* particular ethnic/racial groups is necessary to understand the etiology of substance use in minority populations (Marsiglia & Smith, 2010). Expanding this existing framework by including culturally-relevant factors (e.g., the traditional cultural value of “familism”) as another level of the ecosystem unique to Mexican-origin youth and examining how it interacts with commonly studied risk and resilience factors is crucial for developing successful interventions for risky behavior (Gil, Wagner, & Tubman, 2004; Gonzales-Castro & Nieri, 2010). Because research on interventions for substance use in Mexican-origin samples is sparse, a better understanding of both general and ethnically-oriented risk and protective factors for this understudied population will facilitate the development of more targeted and culturally sensitive programs designed to reduce early initiation of substance use (Gonzales-Castro & Nieri, 2010). Below we describe each of the risk and protective factors examined in the present study, and review the relevant literature, if any, on Latino youth. Although some of these factors have been studied extensively in majority, Caucasian populations, their prospective influence on substance use initiation by Mexican-origin youth is not well established due to the dearth of longitudinal research on this ethnic group.

Risk and Resilience Factors at Multiple Levels of Analysis

Individual

Individual-level factors are necessarily the most proximal influences on substance use initiation. Some of the most commonly studied individual-level factors include substance use cognitions, access to substances, temperamental traits, and gender. Youth who report that they would be willing to try, intend to use, or have plans to use substances are more likely to use and/or abuse substances (Trucco, Colder, Bowker, & Wiczorek, 2011; Trudeau, Spoth, Lillehoj, Redmond, & Wickrama, 2003). Youth who report having greater access to drugs are more likely to engage in substance use in adolescence (Johnston et al., 2014; SAMHSA, 2012; Stanley, Henry, & Swaim, 2011). Youth who are highly impulsive and have poor self-control are more likely to use substances (Stautz & Cooper, 2013; Williams et al., 2010;

Wills & Dishion, 2004). Finally, on average, boys are more likely than girls to engage in substance use (Chen & Jacobson, 2012; Johnston et al., 2014; SAMHSA, 2012).

However, there are few longitudinal studies examining these individual factors in Latinos, despite the growing recognition that it is critical to investigate whether commonly studied risk and resilience factors generalize to ethnic minority populations. For example, researchers have noted the paucity of studies examining whether substance use intentions prospectively predict substance use initiation among Mexican-origin youth (Maddahian, Newcomb, & Bentler, 1988; Ndiaye, Hecht, Wagstaff, & Elek, 2009). Similarly, Stautz and Cooper (2013) found that ethnicity moderated the effect of effortful control on problematic alcohol use, but concluded that there was not enough ethnic variation to draw firm conclusions because the vast majority of the samples in their meta-analysis were predominantly Caucasian. In general, Latino boys are more likely than Latino girls to use marijuana, but not alcohol and cocaine (Delva et al., 2005), but we know of no fine-grained analysis of the emergence of these gender differences in Latino youth. Finally, it is possible that gender may serve as a moderator of the effects of risk and protective factors on early initiation. Given the prevalence of traditional gender roles in Mexican culture, the differential socialization of adolescent boys and girls may lead to exacerbated or diminished effects of factors from multiple levels of analysis on substance use initiation.

Interpersonal (Microsystem)

Adolescents who grow up in single-parent households are more at risk for substance use than individuals who grow up in two-parent households (Dornbusch et al., 1985; Hemovich & Crano, 2009). Past studies of single- versus two-parent households have primarily used Caucasian, non-ethnic minority youth, prompting researchers to emphasize the importance of examining these effects in other ethnic groups (Eitle, 2006; Thomas, Farrell, & Barnes, 1996). Indeed, evidence of these effects on substance use in Mexican-origin youth is mixed, with some studies showing no effect (Warren, Wagstaff, Hecht, & Elek, 2008), and other studies showing that Mexican-origin youth in single-parent families initiate substance use sooner than those in two-parent families (Amey & Albrecht, 1998).

Another critical aspect of the family is how well parents supervise adolescent behavior. Greater parental monitoring is associated with lower levels of substance use (Clark, Shamblen, Ringwalt, & Hanley, 2012; Farrell & Dintcheff, 2006; Yabiku et al., 2010). Similarly, youth who spend time at home without adult supervision (i.e., “latchkey kids”) are at increased risk for substance use (Mahoney & Parente, 2009; Mott et al., 1999; Mulhall, Stone & Stone, 1996; Posner & Vandell, 1994; Richardson et al., 1993). These findings raise the possibility that living in a single-parent household or spending time at home unsupervised influence substance use initiation because they both lead to lower levels of parental monitoring. In fact, in studies of Mexican-origin youth, parental monitoring has been shown to mediate the link between family structure and substance use (Wagner et al., 2010; Warren, Wagstaff, Hecht, & Elek, 2008). Similarly, spending time at home unsupervised may not significantly increase risk for substance use initiation in and of itself, but rather, the degree to which parents manage and control their child’s behaviors and

whereabouts may play a greater role in the developmental processes that lead to adolescent substance use initiation.

Another family factor involves sibling influence. Youth who grow up with one or more older siblings tend to engage in higher rates of substance use, presumably because they model their siblings' antisocial behavior and are more often exposed to older, deviant peer groups (Wagner, Ritt-Olson, Soto, & Unger, 2008; Whiteman, Jensen, & Maggs, 2013). Consistent with this, youth who grow up with an older sibling who engages in deviant acts are at even greater risk for substance use (Bahr, Hoffman, & Yang, 2005; Haynie & McHugh, 2003; Rowe & Gulley, 1992; Stormshak, Comeau, & Shepard, 2004). However, the robustness of sibling influences on substance use, and whether the effect holds across ethnic groups, remains open to debate (Altonji, Cattani, & Ware, 2013).

As children transition into adolescence, they begin to spend less time with their parents and more time with peers, and consequently, peers begin to have a stronger socializing influence. Research on Mexican-origin youth suggests that association with antisocial peers is a major risk factor for adolescent substance use (Barrera, Biglan, Ary, & Li, 2001; Latimer et al., 2004), presumably because deviant peers shape substance use intentions and attitudes, provide access to substances, and model use (Bauman & Ennett, 1996; Trucco, Colder, Bowker, & Wiczorek, 2011; Wagenaar et al., 1996). Likewise adolescents who have deviant *older siblings* may be more likely to have older and shared deviant peer groups with their siblings, which then leads them to initiate earlier. Disentangling the separate and interrelated effects of individual and interpersonal factors on substance use initiation will provide a clearer basis for the development of prevention and intervention programs aimed at reducing substance use initiation in late childhood and adolescence for minority youth.

Environmental (Exosystem)

Within the broader environment, factors such as socioeconomic status and the ethnic composition of the neighborhood may also affect substance use initiation in Mexican-origin youth. Adolescents from economically disadvantaged families are more likely to use substances than adolescents from affluent families (Bachman et al., 2011; Galea, Nandi, & Vlahov, 2004; SAMHSA, 2012). However, the findings are less consistent when SES is examined at the neighborhood level. Some studies have found that adolescents living in economically disadvantaged neighborhoods are more likely to use substances, whereas other studies have found that substance use is more prevalent in affluent communities (Brooks-Gunn, Duncan, Klebanov, & Sealander, 1993; Hays, Hays, & Mulhall, 2003; Kadushin, Reber, Saxe, & Livert, 1998).

For minority youth in particular, the extent to which the surrounding community has an impact on adolescent substance use may depend on the ethnic make-up of the community. For example, immigrant enclaves – neighborhoods where there are a high proportion of immigrant families – tend to have lower rates of adolescent substance use, compared to communities comprised mostly of non-immigrant families (Kulis, Marsiglia, Sicotte, & Nieri, 2007; Molina, Alegria, & Chen, 2012). These findings demonstrate a need to parse apart factors *within* the neighborhood context, such as neighborhood affluence and ethnic

enclaves, and disentangle their effects relative to risk and resilience factors at other levels of analysis.

Cultural (Macrosystem)

At the most distal level, factors unique to Mexican culture may provide risk for or resilience to substance use initiation in adolescence. Previous research suggests that familism – an emphasis on family closeness and responsibility – is a protective factor for drug use and other forms of antisocial behavior (Gil, Wagner, & Vega, 2000; Ramirez et al., 2004; Unger et al., 2002; but see Soto et al., 2011 and Shih et al., 2010). However, these studies were either cross-sectional or conducted late in adolescence (e.g., at the end of high school). Thus, further research is needed to determine whether this important cultural value is a prospective predictor of early substance use initiation by Mexican-origin youth.

Aside from examining the basic effect of familism, there have been recent calls to examine the mediating processes through which familism and other cultural values affect adolescent outcomes (Grau, Azmitia, & Quattlebaum, 2009; Peterson & Bush, 2013). For example, familism is associated with positive parenting practices (Santisteban et al., 2012), which raises the possibility that familism shapes how Mexican adults parent and monitor their children, which then leads their children to engage in fewer problem behaviors; that is, parental monitoring might mediate the effects of familism on substance use initiation. To better understand the developmental mechanisms through which familism influences risk for substance use initiation, we examine a wide range of other possible mediating factors, including environmental factors (e.g., familism may influence a family's choice of neighborhood) and more proximal traits, cognitions, and behaviors (e.g., familism may promote effortful control, deter association with deviant peers and siblings, and reduce access and intent to use substances).

Another factor related to the macrosystem is generational status. In general, first-generation immigrants maintain attitudes, values, and practices rooted in their heritage culture, whereas later generation immigrants are more likely to maintain attitudes, values, and practices associated with the receiving culture. Previous research has found that first-generation immigrants are less likely to engage in substance use than later generation immigrants (Maldonado-Molina, Reingle, Jennings, & Prado, 2011; Peña et al., 2008). This finding, together with a broader set of findings suggesting that recent immigrants have fewer behavioral and mental health problems than more acculturated individuals, has been labeled the *Immigrant Paradox* (Garcia-Coll & Marks, 2011, but see Teruya & Bazargan-Hejazi, 2013). The Immigrant Paradox also raises the possibility that the developmental pathways leading to substance use initiation may differ for 1st vs. later generation youth. That is, generational status may moderate the effect of other risk and protective factors on early substance use initiation. For example, because highly acculturated youth tend to be more immersed in mainstream peer contexts, the effect of peer deviance on substance use initiation may be magnified for more acculturated youth in comparison to 1st generation immigrants.

The Present Study

The present study examined the early initiation of substance use in a sample of Mexican-origin youth followed longitudinally from age 10 to 16. We addressed several questions regarding how risk and resilience factors from multiple levels of analysis predict substance use initiation in this minority sample. First, we examined the extent to which *individual* (i.e., intent to use substances, access to substances, effortful control, gender), *interpersonal* (i.e., single-parent family, latchkey status, parental monitoring, number of older siblings, association with deviant siblings and peers), *environmental* (i.e., socioeconomic status, ethnic enclave), and *cultural* (i.e., familism, generational status) factors predict substance use initiation in adolescence. Second, we tested whether these associations were moderated by gender or generational status. Third, we examined a wide range of mediating processes, focusing in particular on the developmental mechanisms that might account for any observed effect of familism on substance use initiation.

Based on previous research and theory, we predict that the following factors will increase risk for early initiation: intent to use substances, access to substances, being male, having older and deviant siblings, associating with deviant peers, hours spent at home unsupervised, and living in a single-parent household. In contrast, we predict that the following factors will serve a protective function, decreasing risk for early initiation: effortful control, parental monitoring, growing up in an affluent family or neighborhood, living in an ethnic enclave, being a first-generation immigrant, and endorsing traditional familism values. More generally, based on Bronfenbrenner's (1979) Ecological Systems model, we expect that individual-level factors, which are more proximal to the adolescent, will have the largest effects on substance use initiation, followed by more distal features of the environment, ranging from interpersonal to environmental to cultural factors. Similarly, we would expect that mediating processes associated with earlier initiation will move from more distal factors to more proximal factors (e.g., macrosystem factors will be mediated by individual-level factors).

The present study fills several gaps in the current literature. First, although several nationally representative cross-sectional studies have examined age differences in substance use initiation in ethnically heterogeneous samples, such studies do not allow researchers to draw strong conclusions about *developmental change* in substance use initiation for Mexican-origin youth. The longitudinal design of the present study allowed us to examine the trajectory of risk for substance use initiation in this critically important yet understudied ethnic group. Second, we assessed substance use annually, providing a more fine-grained analysis of the precise trajectory of substance use initiation during late childhood and adolescence. Third, most previous longitudinal studies have examined substance use later in development, after initiation has already occurred. By beginning our assessments at age 10, we were able to examine early risk and protective factors that existed *prior* to when the vast majority of youth initiate substance use. Fourth, we assessed a wide range of different substances, allowing us to compare their different trajectories during the transition from childhood to adolescence. Fifth, many of the common risk and protective factors for substance use have yielded mixed findings with regard to the magnitude (and even the direction) of the effect, and/or have not been studied in Latino populations. Further, few

studies have examined such a wide range of risk and protective factors, allowing us to systematically compare their relative effect sizes within the same study, and examine plausible mediating processes. Finally, we are examining two risk and protective factors that are unique to ethnic minority youth – familism and generational status. Given the dearth of evidence-based interventions available for Mexican-origin adolescents, a better understanding of both general and culture-specific risk and protective factors, as well as the moderating and mediating processes that link these multiple levels of analysis, is needed to identify individual, interpersonal, environmental and cultural points of intervention to reduce early initiation of substance use.

Method

Participants and Procedures

The data came from the California Families Project, a longitudinal study of Mexican-origin youth and their parents ($N=674$). Children were drawn at random from rosters of students from the Sacramento and Woodland, CA, school districts. The focal child had to be in the 5th grade, of Mexican origin, and living with his or her biological mother. The children were assessed annually from 5th (M_{age} at Wave 1=10.86, $SD=0.51$) through 11th grade (M_{age} at Wave 7=16.79 $SD=0.50$); the sample is 50% female. Participants were interviewed in their homes in Spanish or English, depending on their preference. Retention rates were 85%, 86%, 89%, 91%, 89%, and 90% at Waves 2 through 7, respectively.

Measures

Substance use—Participants were asked about their lifetime use of 7 different substances: cigarettes; beer; wine, or wine coolers; hard liquor; marijuana; inhalants; and ‘other drugs’ such as cocaine, crack, ecstasy, LSD, speed, heroin, etc. For example, participants responded “yes” or “no” to the question, “*Have you ever used or tried marijuana – also called a jay, or pot, weed, grass, hash, bud?*” At each annual assessment from age 10 to 16, we created a composite variable to indicate whether the participant reporting using *any* of the seven substances at that wave or any earlier wave. This variable had a value of “0” if the participant had never used any drugs and a value of “1” if he/she had used any drugs at any point in his/her lifetime.

Intent to use—This scale assesses the willingness to use particular substances and plans to use those substances in the next year (Gibbons et al., 2004). Three items involved alcohol use (e.g., “*How likely is it that you will drink alcohol in the next year?*”), three cigarette use, and three “illegal drug” use. Participants responded on a 3-point or 4-point scale ranging from 1 (*Do not plan to/Definitely will not/Not at all willing*) to either 3 (*Very willing*) or 4 (*Do plan to/Definitely will*). Scores were computed by calculating the mean of the 9 items (after standardizing the items to account for scale differences) at each annual assessment from age 10 to 16, except for age 11, which was omitted because approximately half of the sample was missing data due to a computer error.

Access to substances—Participants rated their access to the 7 substances under study: cigarettes; beer; wine/wine coolers; hard liquor; marijuana; inhalants; and ‘other drugs’

(adapted from the Drug Availability Scale, US DHHS, 1997). A sample item is, “*How easy would it be for you to get beer?*” Items were rated on a scale ranging from 1 (*extremely difficult or impossible*) to 4 (*extremely easy*). We computed a composite score by averaging the 7 items at each annual assessment from age 10 to 16, except for age 11, which was omitted because approximately half of the sample was missing data due to a computer error.

Effortful control—We used the 16-item Effortful Control scale from the *Early Adolescent Temperament Questionnaire – Revised* (Ellis & Rothbart, 2001). Both child and mother reports of the child’s effortful control were collected when the child was 10, 12, 14, and 16 years old. The response scale ranged from 1 (*not at all true*) to 4 (*very true*). A sample item is, “[*You/your child*] *puts off working on projects until right before they are due.*” We created a standardized composite of the child and mother reports at each age.

One- or two-parent household—We determined whether the child resided in a one- or two-parent household based on mother reports of household composition at each annual assessment from age 10 to 16. All single-parent families included mothers.

Latch key—Participants reported how many days per week, and hours per day, they were left at home to care for themselves without adult supervision at each annual assessment from age 10 to 16. We created a dichotomous variable with a value of “0” if the child was never left unsupervised at home and a value of “1” if the child spent time one or more hours unsupervised.

Parental monitoring—We used a 14-item scale that asked participants about the ways in which they are monitored by their parents (adapted from Small & Kerns, 1993; Small & Luster, 1994). Items included, “*Your [mother, father] knew what you were doing after school*”. Items were rated separately for mothers and fathers, using a scale ranging from 1 (*almost never or never*) to 4 (*almost always or always*). We created a standardized composite of mother and father’s level parental monitoring. This measure was collected when the child was 10, 12, 14, and 16 years old.

Older siblings—We created a dichotomous variable indicating whether the child had older siblings (including step- or half siblings) living in the same house when the focal child was 10 years old.

Older sibling and peer deviance—Participants who had older siblings (64%) completed a 23-item scale that measured the degree to which their older sibling(s) engaged in antisocial or delinquent behavior (items were taken from the Delinquent Behavior Scale, Thornberry et al., 1994; Self-Report Delinquency Scale, Elliott, 1990; and Gang Membership Inventory, Pillen & Hoewing-Roberson, 1992). Items included, “*Did [sibling name] purposely damage, destroy, or tag property that did not belong to him/her?*” Participants with *multiple* older siblings responded on scale ranging from 1 (*none of them*) to 5 (*all of them*); responses were recoded to be dichotomous (“none of them” vs. all other response options) so that they paralleled the response scale used for participants with one older sibling. We computed the mean number of deviant acts each participant’s older

sibling(s) engaged in. This measure was collected when the child was 10, 12, 14, and 16 years old.

Participants also completed the same 23-item scale to assess how many of their peers engage in deviant acts. Items were rated on a scale ranging from 1 (*none of them*) to 5 (*all of them*). We computed the mean of the 23 items at each annual assessment from age 10 to 16.

Family socioeconomic status—At the first assessment, mothers reported their own and their child's biological fathers' total years of education. A parent education variable was created by averaging the mother's and father's education level (for single-parent families, we used the mother's education level). The resulting variable ranged from 0 to 19 years ($M=9.3$, $SD=3.3$). 63% of mothers and 65% of fathers had less than a high school education.

Total annual household income was reported by the mothers at the first assessment using a 20-point ordinal response scale, with response options increasing in \$5,000 increments (1="Less than \$5,000", 2="\$5,000-\$10,000", ..., up to 20="95,000 or more"). We recoded this response scale into dollar value by taking the midpoint dollar range for each response option (1="\$2,500", 2="\$7,500", ..., up to 20="\$100,000") ($M=\$35,000$). We divided total household income by household size to compute per capita income ($M=\$6,841$, $SD=\$5,283$). Socioeconomic status (SES) was computed as a standardized composite of parent education level and per capita income ($r=.34$).

Neighborhood socioeconomic status—Block-group level data from the 2000 U.S. Census were used to assess median family income ($M=.23$, $SD=.09$, range = .00 to 1.00) and the percentage of households on public assistance ($M=12.1\%$, $SD=9.7\%$), based on family addresses at the first assessment. Given the correlation between these variables ($r=-.75$), we computed a standardized composite (public assistance reverse scored) representing neighborhood affluence.

Ethnic enclave—Block-group level data from the 2000 U.S. Census were used to determine the percentage of Hispanic individuals ($M=33.7\%$, $SD=14.1\%$) and Spanish-speaking households ($M=26.3\%$, $SD=13.0\%$) in the neighborhood, based on family addresses at the first assessment. Given the correlation between these variables ($r=.91$), we computed a standardized composite representing the degree to which the neighborhood was an ethnic enclave.

Familism—We used the 16-item 'Familism' subscale from the Mexican-American Acculturation/Enculturation Scale (Knight et al., 2010), which measures the degree of valuing family support and closeness and obligation to the family. Items were rated on a scale ranging from 1 (*not at all*) to 4 (*very much*), and included questions such as "*It is always important to be united as a family.*" This measure was collected from the children, mothers, and fathers at ages 10, 12, and 14, and from children only at age 16. We computed the mean of the 16 items, separately for children, mothers, and fathers, and then computed a standardized composite of child, mom, and dad reports to get an overall measure of the family's value of familism.

Generational status—Participants were categorized as 1st generation if their birth country was Mexico (29%); as 2nd generation if his/her birth country was the U.S., and only one of their parents was reported as being born in the U.S. (62%); and as 3rd generation if his/her birth country and both parents were born in the U.S. (9%). Because of the low percentage of 3rd generation youth, we created a dichotomous generational status variable comparing 1st generation to 2nd+ generation youth.

Statistical Analyses

All analyses were conducted using Mplus V. 6 (Muthén & Muthén, 2006). We used discrete-time survival analyses to examine the probability of substance use initiation from age 10 to 16, and how the probability of initiation varies as a function of our set of risk and protective factors (Singer & Willett, 2003). Discrete-time survival analyses can tell us the probability that an adolescent will initiate substance use, given that he/she has not used substances previously, as well as the percentage of increased or decreased risk from a given covariate. For the present study, we examined both time-varying (intent to use, access to substances, effortful control, household composition, latchkey status, parental monitoring, older sibling deviance, peer deviance, and familism) and time-invariant (gender, older siblings, generational status, family and neighborhood socioeconomic status, ethnic enclave) predictors. For time-varying covariates, substance use initiation at each age was regressed on to its respective age-matched covariate. Each covariate was specified so that there was a proportional effect on substance use initiation at each age, given the estimated baseline thresholds.

Results

Changes in Lifetime Prevalence Rates from Age 10 to 16

Figure 1 shows the cumulative percentage of youth who had, at some point in their life, used substances at each wave, separately for the “any substance” composite and each individual substance. Consistent with our goal of assessing substance use prior to when most youth initiate, we found virtually no substance use in 5th grade and escalating rates of use from age 10 to 16. Substance use initiation began earliest, and increased most rapidly, for beer, followed by hard liquor, marijuana, and wine/wine coolers. Cigarette use also begins around age 12 or 13, but in contrast to marijuana, hard liquor, and wine/wine coolers, it showed a relatively flat trajectory with relatively little increase in use from age 13 to 16, suggesting that many individuals smoking at age 16 had already begun at age 13. Virtually none of the youth in our sample reported using inhalants or other hard drugs, even at age 16.

Individual, Interpersonal, Environmental, and Cultural Effects on Substance Use Initiation

Table 1 shows the proportional hazard odds ratios and 95% confidence intervals for each of our predictors on the risk of initiating substance use. Several factors significantly increased or decreased risk for initiation. Adolescents who reported that they intended to use any substance, or were willing to try any substance, were over four times more likely to initiate substance use. Adolescents who reported having more access to substances were about two times more likely to initiate substance use than adolescents who reported having little to no access to substances. Youth who have *more* effortful control were 42% *less* likely to initiate

substance use. As for deviance, adolescents with older siblings or peers who engage in more deviant behaviors were 76% and over two times more likely to initiate substance use, respectively. Youth who spend one or more hours at home alone were 30% more likely to initiate use; and similarly, youth with *more* parental monitoring were 44% *less* likely to initiate. Youth with older siblings were 34% more likely to initiate substance use. Finally, adolescents growing up in families with stronger familism values were 25% *less* likely to engage in substance use. No significant effects were found for gender, household composition, family or neighborhood SES, ethnic enclave, or immigrant status.

We repeated the survival analyses separately for each *type* of substance, focusing on alcohol (beer, wine, and hard liquor combined), cigarettes, and marijuana because of their higher base rates (see Table 1 for odds ratios). The findings generally mirror those observed for the aggregate substance use variable (i.e., “any substance”). Finally, when we entered all 15 risk and protective factors into the same model, only three individual predictors (intent to use, access to substances, and association with deviant peers) remained significant, suggesting that, consistent with Bronfenbrenner’s model, more distal influences operate through more proximal processes.

Moderating Effects of Gender and Generational Status

We conducted multiple group analyses to examine whether gender and generational status moderated the individual effects of each predictor on substance use initiation, by testing whether equality constraints on the estimated thresholds were significantly different across groups. We found three significant effects. Gender moderated the association between parental monitoring and substance use initiation, such that the protective influence of parental monitoring on initiation was stronger for girls than boys ($OR_{females}=.45$, 95% CI [.34, .59] and $OR_{males}=.65$, 95% CI [.52, .81]; Wald Test=4.21). Neighborhood affluence had opposite effects on girls and boys ($OR_{females}=1.11$, 95% CI [.94, 1.32] and $OR_{males}=.87$, 95% CI [.74, 1.03]; Wald Test=4.06), but the effects were non-significant in both cases. Generational status moderated the association between peer deviance and substance use initiation, such that associating with deviant peers was a stronger risk factor for 2^{nd+} than 1st generation youth ($OR_{2nd+}=2.98$, 95% CI [2.37, 3.74] and $OR_{1st}=1.58$, 95% CI [1.18, 2.11]; Wald Test=11.37).

Tests of Mediating Processes

Given the number of predictors, it would not be possible to test all possible mediation pathways. Consequently, we conducted a more limited set of mediation tests guided by previous research and theory, focusing on processes that might account for the effects of our culturally-relevant predictor, familism, as well as several other mediation pathways that have been suggested in the literature. Specifically, we conducted structural equation modeling (SEM)-based discrete-time survival mediation models (see Fairchild et al., 2013). Because many of our risk and protective factors are time-varying, we conducted latent growth curve models to examine the trajectory of these constructs over time. By using the intercept at Wave 1 as the predictor and the slope as the mediator, we were able to establish temporal order and account for the development of the mediating constructs over time. To fit the best trajectories for each construct, we compared no growth, linear growth, and latent basis

models. In all cases, the latent basis models were the best fitting models to the data (except for familism and older sibling deviance, where linear growth models were the best fit to the data). For the latent basis models, the age 10 slope was fixed at '0' and the age 16 slope was fixed at '6', with all other ages freely estimated. See Figure 2 for a graphical representation of the full, SEM-based discrete-time survival mediation models.

Table 2 shows the unstandardized direct and indirect effects from the mediation models. With regard to mediation pathways suggested by previous research and theory, we found that access to substances significantly mediated the association between peer deviance and substance use. Further, peer deviance significantly mediated the relationship between older sibling deviance and substance use. With regard to mediation pathways that might explain the effects of familism, we found that access to substances, intent to use substances, and association with deviant peers significantly mediated the association between familism and substance use. None of the other risk and resilience factors accounted for the effects of familism, suggesting that familism is an important protective factor for Mexican-origin youth that influences substance use initiation via more proximal individual and interpersonal processes.

Discussion

The present study examined the early initiation of substance use in a large sample of Mexican-origin youth followed longitudinally from age 10 to 16. Our fine-grained, year-by-year assessments allowed us to track the precise trajectory of risk for substance use over time. Moreover, because we began tracking the participants prior to when the vast majority of youth initiate substance use, we were able to pinpoint the precise age when youth initiated use of various forms of substances, and examine individual, interpersonal, environmental, and cultural risk and protective factors that predate the onset of use.

Consistent with national trends, substance use escalated rapidly from late childhood to adolescence (Johnston et al., 2014). At ages 10 and 11 (5th–6th grade), virtually none of the youth were using substances, whereas by age 16 (11th grade) over half (66.2%) of the Mexican-origin adolescents in our sample had tried at least one substance. Youth initiated drinking beer earliest in development, and the escalation of use followed the most rapid trajectory. Adolescent use of hard liquor and wine, as well as marijuana, followed similar trends across adolescence, but with less rapid escalation and consequently, lower prevalence by age 16. Substantially fewer adolescents reported using cigarettes, with even lower counts for use of inhalants and other hard drugs by age 16. Overall, these individual substance use trends are comparable to, but somewhat lower than, results from a nationally representative sample, which show that lifetime prevalence by 12th grade for youth is 66% for alcohol, 44% for marijuana, 34% for cigarettes, 23% for illicit drugs other than marijuana, and 6% for inhalants (Johnston et al., 2014).

A number of individual-level covariates – intent to use, access to substances, and effortful control – demonstrated risk and/or protective influences on the initiation of substance use throughout adolescence, which is consistent with previous research. However, contrary to some previous studies, the risk of substance use initiation did not differ by gender. Based on

these findings, if we were to create a profile of a Mexican-origin youth at high risk for initiating substance use, the youth would have cognitions related to the desire or willingness to try drugs, greater access to drugs, worse attention and concentration, and a reduced capacity to control his/her impulses. These findings highlight several points of prevention and intervention, including disrupting developmental pathways toward positive cognitions about drug use, creating programs aimed at reducing early access to drugs, and developing interventions to increase self-control in children and adolescents (Piquero, Jennings, & Farrington, 2010). Finally, the absence of a gender difference in our sample of 10- to 16-year olds suggests that programs aimed at preventing early use need to target Mexican-origin boys and girls equally.

Interpersonally, we identified a number of protective factors that markedly reduced the risk of initiation throughout adolescence. Taken together, our findings suggest that Mexican-origin youth who come from single parent homes, are left alone at home without adult supervision, experience less overall parental monitoring and supervision, and who have older siblings, especially those engaging in deviant behavior, are at greatest risk for early substance use. Thus, family-based interventions should consider not only parenting behaviors, but also how siblings influence each other's problematic behavior (Austin et al., 2010; Castro et al., 2006; Gonzales et al., 2012). Contrary to our expectation, the effects of being raised in a single-parent home or being left alone unsupervised were not mediated by low levels of parental monitoring. Interestingly, the effects of parental monitoring on substance use initiation were stronger for girls than boys. Given the prevalence of traditional gender roles in Mexican culture, it is possible that Mexican-origin parents engage in different monitoring strategies for girls than boys (e.g., preventing the girls from going out at night vs. allowing the boys to go out but monitoring their whereabouts), which may contribute to different levels of access to substances or use. Future research should examine these processes more closely to investigate *how* and *why* girls benefit more from parental monitoring than boys.

Previous research suggests that adolescents follow their older sibling's poor examples, or have shared peer groups, which exposes them to substance use, and other antisocial behaviors and norms. Our mediation analyses support the idea that adolescents who have deviant older siblings initiate earlier in part because they are also associating with deviant peers. Future research should investigate whether the adolescent is adopting "deviant" characteristics that they share with both of these interpersonal groups, or whether having deviant older siblings subjects the adolescent to shared, older and deviant peer groups.

Previous research suggests that deviant peers may not only be a source for providing access to substances, but also a socializing factor that serves to shape adolescents' attitudes about drugs and their willingness to try substances. Our mediation analyses support the idea that socializing with deviant peers facilitates access to substances, which then markedly increases risk for early initiation. However, we did not find evidence to support the notion that deviant peers are necessarily influencing the adolescent's intentions to use drugs. The tendency for youth who associate with deviant peers to engage in early substance use was significantly exacerbated for 2nd+ generation youth, in comparison to 1st generation youth. This result is consistent with the idea that more acculturated youth are more influenced by

deviant peers to engage in problem behavior (Garcia-Coll & Marks, 2011). Future research should continue to investigate the developmental pathways, and moderating conditions, that explain when and why associating with deviant peers increases risk for substance use by Mexican-origin youth.

Unique to Mexican-origin youth, adolescents who come from families who adopt *stronger* values of familial obligations and closeness demonstrated *decreased* risk of initiating substance use. Our tests of multiple mediation pathways revealed that familism had a direct effect on substance use initiation in almost all cases. The only significant mediators were access to substances, intent to use substances, and association with deviant peers, suggesting that the broader cultural value of familism exerts its influence via more proximal mechanisms. Specifically, youth who endorse traditional familism values are less likely to initiate substance use because they have less access to drugs, less intent to use drugs, and fewer deviant peers. The robustness of the familism effect highlights the need to examine culturally-relevant factors in studies on the etiology of drug use (Gonzales-Castro & Nieri, 2010), and suggests avenues for future research to examine the developmental pathways through which familism might exert its influence on substance use. Thus, research and practice of family-based interventions should consider not only parenting behaviors and parent-child relationship quality for Mexican-origin youth, but also traditional familial values as another layer to be added to family-based interventions for Mexican-origin families, more specifically (Austin et al., 2010; Castro et al., 2006; Gonzales et al., 2012).

Contrary to prior research, risk of substance use initiation was not associated with several of the most distal variables, including the socioeconomic status, the ethnic composition of the neighborhood, or generational status. The one exception is that 2nd + generation youth were more likely to use marijuana than 1st generation youth. This finding, which is consistent with the *Immigrant Paradox* (Garcia-Coll & Marks, 2011), raises further questions about how becoming more acculturated leads to increased risk for problem behaviors, in this case marijuana use.

Finally, we found that the effects of intent to use, access to substances, and association with deviant peers remained significant predictors of substance use initiation when all 15 risk and protective factors were entered into the *same* model. This supports a basic principle of ecological systems theory, in that more distal socio-cultural factors operate through more proximal individual and interpersonal processes. This does not, of course, mean that the more distal risk and protective factors are less important determinants of substance use initiation, just that their influence might require a sequence of cascading developmental processes. Moreover, it is worth noting from a methodological perspective that when a sufficiently large number of highly intercorrelated predictors are all competing for the same variance, the partial effects are difficult to interpret. Nonetheless, it is likely that many of the risk and resilience factors examined in the present study are reciprocally related over time and their influence on substance use does not simply progress uni-directionally from distal to proximal factors. Thus, future research should explore the transactional developmental processes through which these factors lead to substance use initiation in Mexican-origin youth.

Limitations

The present study has several limitations that merit attention. First, the study does not allow for strong conclusions regarding causal influences on substance use initiation. As in all passive observational designs, effects may be caused by third variables that were not assessed. Moreover, it is possible that the causal direction is reversed; for example, couples may be more likely to get divorced (and therefore become single-parent families) if they have a child who is engaging in substance use. Future research should examine such reciprocal relations and test the effects of theoretically-relevant third variables. Second, the present study is not based on a nationally representative sample and, therefore, the findings may not generalize to all Mexican-origin adolescents in the U.S., or to other Latino subgroups. For example, the family SES effects may have been attenuated by restriction of range because most of the families in our sample are low income, highlighting the need for further research using Mexican-origin samples with a broader SES distribution. Moreover, it is possible that the *experience* of economic stress and the *perception* of hardship and deprivation are more consequential for substance use initiation than objective indicators of family income and education. Third, we were unable to examine time-varying effects on the initiation of substance use for some of our predictors. For example, in the current study, it is possible that the neighborhood ethnic composition changed over time, or that the youth moved to different neighborhoods over the course of adolescence. Future research should examine how changes in the neighborhood context are associated with the initiation of substance use. Despite these limitations, the present findings lay the groundwork for studies that test more complicated developmental pathways through which the various risk and protective factors identified in the present study influence the course of substance use initiation.

Conclusions

The present study provides important new insights into the risk of substance use by Mexican-origin youth, a critically important yet understudied ethnic group in the U.S. The findings suggest that some previously identified individual, familial, and neighborhood/cultural risk and protective factors replicate in this ethnic minority sample, whereas others do not. Our investigation further demonstrates that evidence-based interventions aimed at multiple domains and contexts of individual functioning may be most effective at reducing the initiation of substance use, and further underscores the importance of taking into account the unique characteristics of ethnic minority youth and families in constructing theories of substance use and in designing preventive interventions.

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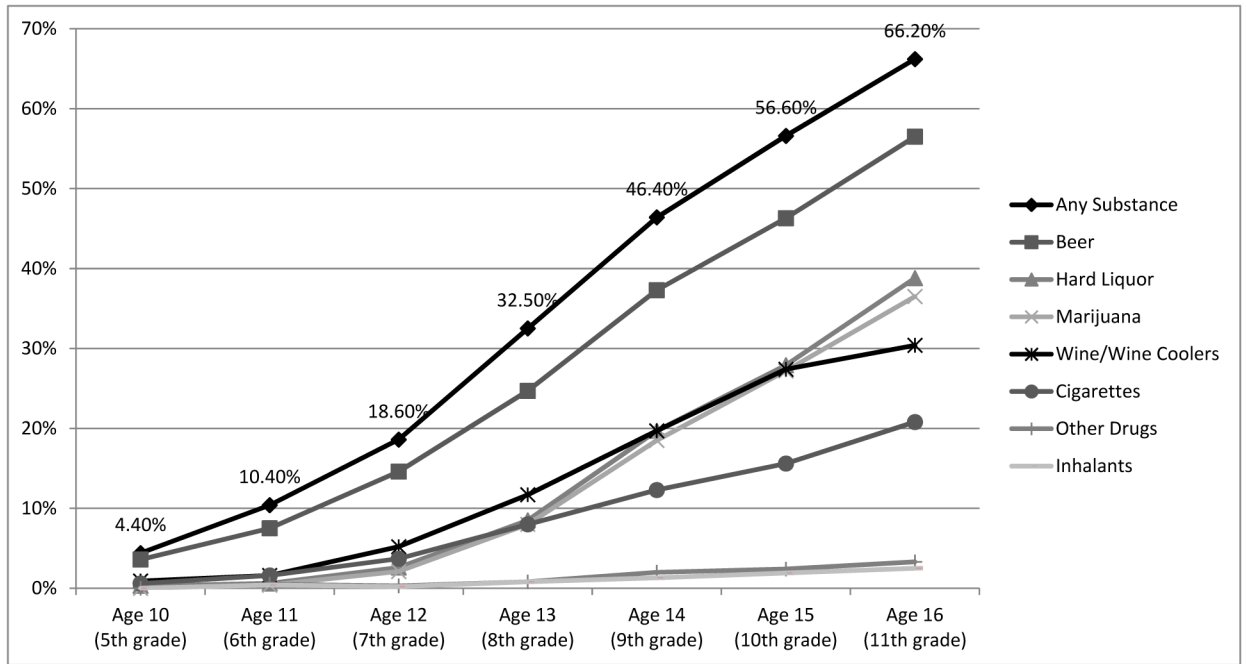


Figure 1. Lifetime prevalence of substance use initiation, separately for any substance and each individual substance.

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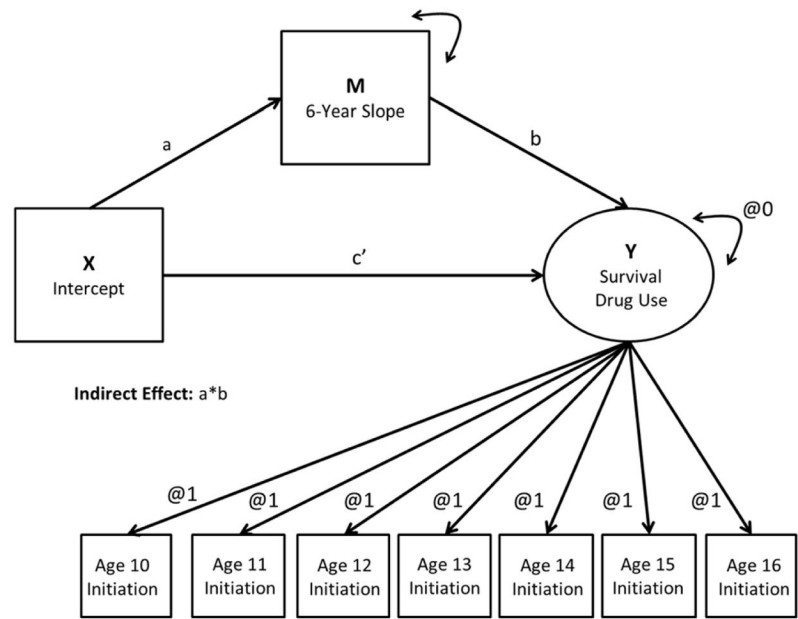


Figure 2.

Graphical representation of SEM-based discrete-time survival mediation analyses. For time-varying predictors and mediators, we conducted latent growth curve models to calculate the growth trajectory over time of each construct. Then, we saved the intercepts (representing the value of the predictor at age 10) and slopes (representing growth over time in the mediator) to be used as manifest variables in the mediation models. Time-invariant predictors and mediators are entered as is into the model.

Table 1

Risk and Protective Factors Associated with Substance Use Initiation

	Any Substance Odds ratio [95% CI]	Alcohol Odds ratio [95% CI]	Cigarettes Odds ratio [95% CI]	Marijuana Odds ratio [95% CI]
Intent to use substances	4.42* [2.79, 7.00]	3.48* [2.90, 4.16]	2.03* [1.74, 2.38]	3.22* [2.65, 3.91]
Access to substances	2.06* [1.82, 2.33]	1.97* [1.74, 2.23]	2.17* [1.86, 2.54]	2.69* [2.32, 3.11]
Effortful control	.58* [.47, .72]	.55* [.45, .69]	.44* [.33, .59]	.53* [.41, .68]
Gender (girls vs. boys)	1.05 [.72, 1.17]	.99 [.80, 1.25]	1.30 [.91, 1.85]	1.22 [.92, 1.60]
Latchkey status (0 vs. 1+ hours)	1.30* [1.01, 1.67]	1.36* [1.05, 1.77]	1.54* [1.01, 2.35]	1.43* [1.03, 1.99]
Household status (2- vs. 1-parent)	1.24 [.91, 1.70]	1.14 [.83, 1.59]	1.89* [1.19, 3.01]	1.88* [1.29, 2.75]
Parental monitoring	.56* [.47, .66]	.56* [.48, .67]	.46* [.35, .59]	.43* [.34, .53]
Older siblings (0 vs. 1+)	1.34* [1.07, 1.68]	1.32* [1.05, 1.66]	2.43* [1.58, 3.74]	1.85* [1.37, 2.51]
Deviant older siblings	1.76* [1.35, 2.30]	1.77* [1.37, 2.28]	1.72* [1.33, 2.21]	2.21* [1.67, 2.92]
Assoc. with deviant peers	2.30* [1.78, 2.97]	2.02* [1.62, 2.54]	2.13* [1.75, 2.59]	2.63* [2.10, 3.31]
Family SES	.98 [.87, 1.11]	.96 [.85, 1.09]	.80 [.63, 1.01]	1.01 [.86, 1.18]
Neighborhood SES	.99 [.88, 1.11]	.97 [.86, 1.10]	.88 [.72, 1.07]	.87 [.75, 1.01]
Ethnic Enclave	1.01 [.90, 1.13]	1.01 [.90, 1.14]	1.12 [.92, 1.35]	1.00 [.86, 1.16]
Familism	.75* [.62, .90]	.78* [.65, .95]	.80 [.60, 1.07]	.68* [.53, .88]
Generational status (2 nd + vs. 1 st gen.)	.92 [.85, 1.30]	1.00 [.79, 1.28]	.87 [.58, 1.31]	.68* [.49, .94]

Note. Values in the table are proportional hazard odds ratios. The listed effect sizes are from separate, covariate models with substance use initiation. For dichotomous variables, the reference group is listed first, so odds ratios greater than 1 indicate increased risk in the second group, and odds ratios less than 1 indicate increased risk in the reference group. For continuous variables, the odds ratios are scaled by a 1 SD difference in the covariate.

* p < .05

Table 2

Mediation Pathways Leading to Substance Use Initiation

$X \rightarrow M \rightarrow Y$	$X \rightarrow Y$	$X \rightarrow M$	$M \rightarrow Y$	Indirect Effect (SE)
Assoc. with Deviant Peers \rightarrow Access to Substances \rightarrow Initiation	.69*	.03*	4.77*	.14* (.03)
Assoc. with Deviant Peers \rightarrow Intent to Use \rightarrow Initiation	.79*	-.00	5.69*	-.02 (.03)
Deviant Siblings \rightarrow Assoc. with Deviant Peers \rightarrow Initiation	.83*	.04*	2.32*	.08* (.03)
Latchkey Status \rightarrow Parental Monitoring \rightarrow Initiation	1.19*	.02	-2.24*	-.05 (.07)
Household Status \rightarrow Parental Monitoring \rightarrow Initiation	.21	-.01	-2.09*	.02 (.03)
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Familism \rightarrow Access to Substances \rightarrow Initiation	-.21	-.02*	5.42*	-.11* (.05)
Familism \rightarrow Intent to Use \rightarrow Initiation	-.18	-.02*	6.15*	-.10* (.04)
Familism \rightarrow Effortful Control \rightarrow Initiation	-.28*	.00	-2.29*	-.00 (.01)
Familism \rightarrow Single-Parent Family \rightarrow Initiation	-.27*	.00	3.27*	.00 (.01)
Familism \rightarrow Latchkey Status \rightarrow Initiation	-.28*	.00	4.13*	.00 (.01)
Familism \rightarrow Parental Monitoring \rightarrow Initiation	-.28*	.00	-2.14*	-.00 (.02)
Familism \rightarrow # of Older Siblings \rightarrow Initiation	-.25*	-.05	.27*	-.01 (.01)
Familism \rightarrow Deviant Older Siblings \rightarrow Initiation	-.26*	-.00	6.59*	-.02 (.04)
Familism \rightarrow Assoc. w/Deviant Peers \rightarrow Initiation	-.17	-.04*	2.71*	-.10* (.03)
Familism \rightarrow Family SES \rightarrow Initiation	-.28*	-.18*	-.04	.01 (.01)
Familism \rightarrow Neighborhood SES \rightarrow Initiation	-.28*	.07	-.01	-.00 (.00)
Familism \rightarrow Ethnic Enclave \rightarrow Initiation	-.28*	.03	.01	.00 (.00)

Note. SE=standard error. Values in the table are unstandardized coefficients from mediated discrete-time survival analyses predicting initiation of "any substance". See Figure 2 for a graphical representation of the models.

* p < .05