Ecodevelopmental Predictors of Early Initiation of Alcohol, Tobacco, and Drug Use Among Hispanic Adolescents

Guadalupe A. Bacio[1], **Yannine Estrada**[2], **Shi Huang**[2], **Marcos Martínez**[3], **Krystal Sardinas**[2], and **Guillermo Prado**[2]

[1]Department of Psychology, University of California-Los Angeles

[2]Department of Public Health Sciences, University of Miami

[3]School of Social Work, Arizona State University

Abstract

The purpose of this cross-sectional study was to test the transactional relationships of risk and protective factors that influence initiation of alcohol, tobacco, and drug use among Hispanic youth. Ecodevelopmental theory was used to identify factors at multiple ecological levels with a focus on four school-level characteristics (i.e. school socioeconomic status, school climate, school acculturation, and school ethnic composition). A sample of 741 Hispanic adolescents (*M* age =13.9, *SD* =.67) and their caregivers were recruited from 18 participating middle schools in Miami-Dade County, FL. Structural equation modeling was used to test the hypothesized ecodevelopmental model of early substance use, accounting for school clustering effects. Results provided strong support for the model (CFI = .95; RMSEA =.03). School SES was indirectly related to the likelihood of starting to use substances through perceived peer use norms (β =.03, *p* <.02). Similarly, school climate had an indirect effect on substance use initiation through family functioning and perceptions of peer use norms ($\beta = -.03$, *p* < .01). Neither school ethnic composition nor school acculturation had indirect effects on initiation of substance use. Results highlight the importance of the interplay of risk and protective factors at multiple ecological levels that impact early substance use initiation. Further, findings underscore the key role of school level characteristics on initiation of substance use and present opportunities for intervention.

Introduction

According to the most recent population estimates (U.S. Census Bureau, 2011), the Hispanic community is the largest ethnic minority group in the United States (U.S.), accounting for 16% of the total population, and it is projected to reach 30% by 2050. Further, 23% of youth

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

under the age of 18 are of Hispanic origin (U.S. Census, 2013). Epidemiological studies suggest that Hispanic teens are at high risk for early initiation of drinking, smoking, and drug use (CDC, 2010; Johnston, O'Malley, Bachman & Schulenberg, 2014). For example, Hispanic and African-American teens are more likely to get drunk and try marijuana before age 13 (CDC, 2010) compared to non-Hispanic White teens. Similarly, the prevalence of smoking a whole cigarette before age 13 among Hispanic teens (11.8%) is higher than the prevalence among non-Hispanic White (9.8 %) and African American (8.8%) youth (CDC, 2014). By the 8th grade, Hispanic teens report higher prevalence rates of binge drinking (8%) in the past two weeks compared to non-Hispanic White (4%) and African-American (5%) youth, as well as higher rates of overall drug use than teens of other racial/ethnic backgrounds (Johnston, et al., 2014).

The high rate of early initiation of substance use among Hispanic teens represents a major public health concern given the immediate and long-term negative repercussions associated with it. For example, early substance use initiation (before age 15) has been identified as a strong risk factor for developing substance use dependence later in life (Grant & Dawson, 1998; Hingson, Heeren, & Winter, 2006). In addition, substance use is a risk factor for a host of negative consequences including academic problems, interpersonal problems with teachers, friends, and family (e.g. Windle et al., 2008). Specific to Hispanics, smoking is associated with heart disease and stroke, the two major causes of death among this population (CDC, 2014). Thus, initiation of substance use among Hispanic youth merits targeted attention as it may affect the successful transition of Hispanic adolescents to young adulthood and, over time, contribute to the ethnic/racial, socioeconomic and health disparities observed in the population at large. Identifying key risk and protective factors within the multiple levels of the developmental context of Hispanic adolescents may provide opportunities for effective prevention efforts. The increased developmental salience of the school context for early adolescents presents a critical target to examine the direct and indirect effects of school characteristics on initiation of substance use among early adolescent Hispanic youth.

Substance use initiation among Hispanic teens is multiply determined by the interplay of risk and protective factors. The variety and complexity of these factors operate at different levels of the environment. For instance, some function at the level of the family or peers, while others operate at the school, community, or societal levels. To this end, ecodevelopmental theory offers opportunities to test models that integrate risk and protective factors to better understand the multiple determinants of risky behaviors among young adolescents (e.g. Pantin, Schwartz, Sullivan, Prado, & Szapocznik, 2004), including substance use initiation. For example, ecodevelopmental theory has been tested empirically by Prado and colleagues (2010) to examine HIV risk behaviors among Hispanic youth. This study found that the parent-adolescent acculturation gap and the parent's U.S. acculturation orientation had indirect effects on these behaviors through risk and protective factors related to family functioning, academic functioning, and peers. For Hispanic families in particular, acculturation has an impact on family processes and youth outcomes. Through the school context, adolescents are more greatly immersed in U.S. culture compared to parents and therefore teens may become more acculturated. This may create conflict due to differing cultural values between youth and parents, which can lead to substance use (Martinez, 2006;

Schwartz, Pantin, Sullivan, Prado, & Szapocznik, 2006). Further, parents may also rely on their more acculturated adolescent as a source of information, cultural navigation and language interpretation which can invert the parental hierarchy and create a loss of parental authority (Unger, Ritt-Olson, Wagner, Soto, & Baezconde-Garbanti, 2009) leading to weakened protective factors and increased risk factors.

Ecodevelopmental theory (Pantin et al., 2004; Prado et al., 2010; Szapocznik & Coatsworth, 1999; Schwartz, Coatsworth, Pantin, & Szapocznik, 2003) integrates three key elements (social-ecological theory, social interactions, and developmental theory) to help understand the factors associated with adolescent risk and protection. Social-ecological theory (Bronfenbrenner, 1979) proposes that the multiple factors influencing adolescent development can be organized within four social contexts: macrosystem, exosystem, mesosystem, and microsystem. In applying this framework, ecodevelopmental theory posits that the social interactions within and across the contexts of the social ecology result in the observed risk and protective effects, and integrates a developmental perspective by highlighting the changing and evolving nature of both the adolescent and the social context throughout the lifespan. That is, both the adolescent and the social context are evolving throughout the life span and have a reciprocal effect on each other.

The present cross-sectional study used secondary data analysis to examine two (social-ecological theory and social interactions) of the three components of ecodevelopmental theory; the third was not examined because testing longitudinal relationships among constructs was beyond the scope of this manuscript. Specifically, it tested the risk and protective factors at each of the four social-ecological levels, described below in detail, as well as the interplay of social interactions within and across levels, with a focus on school-level factors. This cross-sectional study extends the literature by using the ecodevelopmental framework to test the 'trickle down' effects of key risk and protective factors that impact substance use initiation (i.e., smoking, drinking, and drug use) in early adolescence among Hispanic youth with special attention on characteristics of the school environment. Understanding these relationships may highlight opportunities for intervention that can be implemented at different levels, including the school context, to more effectively prevent the initiation of substance use among this at risk population.

Figure 1 depicts the relationships that were tested within and across multiple levels of the social ecology. The macrosystem includes the overarching philosophical and societal values that characterize a particular culture or community (Schwartz, et al., 2003), such as the community created by a school setting. For immigrant Hispanic families, factors such as immigration policies and type of reception upon coming to the U.S. are salient macrosystemic characteristics with cascading effects that influence where parents establish a home and, as a result, the schools their children can attend. Given that attending school in the U.S. is compulsory, the school context plays a significant role in the lives of children of immigrants. Particularly because school systems assume critical responsibilities in the education and development of youth, as well as the integration of individuals into the fabric of society. Consequently, studying the direct and indirect effects of school characteristics on early initiation of substance use is necessary. The present study examined four characteristics of the school macrosystem: school socioeconomic status (SES), school

climate, school ethnic composition, and school acculturation. While these four school factors do not fully encompass the school macrosystem, they may have important direct and indirect effects on the likelihood that Hispanic teens will start using substances in early adolescence.

School SES has been found to impact risky behaviors among adolescents including Hispanic youth. For example, the effects of school poverty include a higher level of disciplinary problems, chaotic learning environments characterized by less-qualified teachers/ administrators, and lower academic achievement (Escarce, 2003) which are risk factors for substance use (Englund, Egeland, Oliva, & Collins, 2008). Interestingly, studies show that low academic achievement is a risk factor for substance use among low SES schools (measured as urban schools in an economically disadvantaged community) but not in high SES schools (characterized as suburban schools in an economically prosperous community), highlighting the unique contribution of SES to adolescent risk within a school setting (Ansary, McMahon, & Luthar, 2011). In turn, the quality of education and the resources available to students is largely impacted by the wealth, or lack thereof, of the community in which schools are located.

School climate has been identified as an important contextual characteristic for risky behaviors among adolescents (e.g. Osterman, 2000; Espinoza & Juvonen, 2011). Studies suggest that a positive school climate is associated with lower levels of substance use (Bond, Butler, & Thomas, 2007; Mayberry, Espelage, & Koenig, 2009). Although studies on the interplay of school climate with parent or adolescent level factors among Hispanic youth are scarce, there is some evidence that school climate (measured with multiple items related to interpersonal perceptions of school belonging, fairness, and safety) and behavioral norms may be particularly important for the well-being of Hispanic teens (Espinoza & Juvonen, 2011; Garcia-Reid, Reid, & Peterson, 2005). For example, Espinoza and Juvonen (2011) found that, in comparison to White youth, school climate was only associated with rule breaking for Hispanic students. In addition, this relationship was partially explained by perceptions of rule breaking norms only among Hispanic youth. These findings suggest that school climate may not only have an important direct impact on initiation of substance use in early adolescence, but may also interact with other contextual factors to influence risky behaviors among Hispanic youth.

Another macro-systemic school-level variable that may influence substance use is school ethnic composition. The congruence of adolescents' ethnic background with the ethnic composition of the school which they attend has been found to impact sense of school belonging/attitudes, as well as emotional and behavioral problems (Benner & Graham, 2009; Georgiade, Boyle, & Fife, 2012). However, the existing literature on school ethnic composition (measured as the percentage of Hispanic adolescents per school) and adolescent substance use in specific is limited and mixed (Kulis, Marsiglia, Nieri, Sicotte, & Hohmann-Marriott, 2004). For example, one study found that in a predominantly white school setting, Hispanic students were more likely to smoke and had higher rates of inhalant use (Cook, Ungemack & Mark, 2001). Furthermore, other research indicates that it may not be the school's ethnic composition, but rather the school's level of acculturation, assessed as preference for speaking English vs. Spanish or both, that is important for Latino youth: less

acculturated schools exhibit lower levels of substance use (Kulis, et al., 2004). In efforts to clarify these relationships, the effects of both school ethnic composition and school acculturation were tested in the present study.

Most studies that have examined the associations of school level factors on risk behaviors have focused on the direct effects of school characteristics. However, less is known about the trickle down effects of school context characteristics on risky outcomes through other key factors such as parental level (e.g. parental school involvement) and peer level factors (e.g. perception of peer substance use norms). Although more research is needed, findings point to the influence of school environment characteristics on substance use initiation and their distal but impactful role on risk and protective factors associated with substance use in the social ecology.

The exosystem contains contexts in which the teen does not interact directly, but impact key members of the teen's life (i.e., parents). For instance, it encompasses the resources, or lack thereof, available to parents including education level, parental stressors, and available social support networks, among other factors. Parental resources help determine the quality of the environments in which adolescents develop, including the family and school settings which in turn impact meso- and micro- level factors. For example, adolescents in families with low parental resources (i.e., exosystem factor) may receive little supervision (i.e., mesosystem factor) which can result in increased likelihood for risky behaviors such as substance use (i.e., microsystem factor; Escarce, 2003; Richardson, Radziszewska, Dent, & Flay, 1993) and impact family functioning (Conger, Conger, & Martin, 2010). Parent level factors such as parent education and social support may be related to parental stress levels (exosystemic factors) which can then have a rippling effect on meso level factors, including parenting practices; indeed, parental stress has been identified as a central factor in determining parenting behaviors (Joshi & Gutierrez, 2006). Further, research has shown that social support for parents functions as a protective factor in regards to adolescent substance use (e.g., Wills, Vaccaro, & McNamara, 1992).

The mesosystem refers to the interactions between key members of contexts in which adolescents participate directly. During early adolescence, the school and family environments continue to be the two dominant physical environments for youth (Windle et al., 2008). Further, peers become increasing salient during adolescence and play an important role in normative development (e.g. Brown & Larson, 2009; Hoffman, Sussman, Unger, Valente, 2006). Consequently, the mesosystem encompasses the interactions between adolescents' school, parental, and peer contexts such as parental monitoring of peers and parental school involvement. A decrease in parental monitoring, for example, appears to be related to increased rates of alcohol use among Hispanic youth (Mogro-Wilson, 2008). In addition, for Hispanic teens who report having friends who engage in substance use, parental monitoring has a protective effect against substance use initiation (e.g. Lopez et al., 2009). Similarly, parental school involvement, such as being involved in school assignments, has been negatively correlated with substance use across different gender and ethnic groups (e.g., Pilgrim, Schulenberg, O'Malley, Bachman, & Johnston, 2006). In turn, these meso-system factors can then have an impact on micro level influences such as sense of school belonging, family functioning, and perceived peer norms of use.

The microsystem comprises the relationships between adolescents and each context that is developmentally salient during this period: family, peers, and school. Adolescent's substance use is impacted by the simultaneous influences of family, school, and peer factors. As such, it is important to study these relationships individually and collectively. The family plays a central role in youth development, especially in the Hispanic culture (Perrino, Gonzalez-Soldevilla, Pantin, & Szapocznik, 2000). Family functioning has been identified as a mediator in the prevention of substance use among Hispanic youth (Prado & Pantin, 2011). As well, family-oriented values appear to be protective against drinking during adolescence (Castro, Stein, & Bentler, 2009; Gil, Wagner, & Vega, 2000). In turn, the erosion of said family values is thought to increase the risk for alcohol use and may partially explain why U.S.-born teens report worse outcomes than their non-U.S.-born counterparts (Barrera, Gonzales, López, & Fernández, 2004; Mogro-Wilson, 2008).

The relationship between adolescents and their school also plays an important role in adolescent substance use. For example, high levels of academic achievement may serve as a protective factor for alcohol abuse (Englund et al., 2008). In addition, school belonging has been associated with a multitude of positive outcomes including less likelihood of using substances and early initiation of sexual activity (McNeely, Nonnemaker, & Blum, 2002); having a positive school orientation is also a protective factor against substance use (Syvertsen, Cleveland, Gayles, Tibbits, & Faulk, 2011).

Given the increased salience of peer relationships during adolescence, peer influences, including perceived peer norms, have long been studied in the development of adolescent problem behaviors (Duan, Chou, Andreeva, & Pentz, 2009); an association with substance-using peers is a key predictor for substance use among Hispanic teens (Bacio, Mays, & Lau, 2013; Prado et al., 2009). Perceived peer norms may further explain the role of peer influences in adolescent substance use initiation; some theorists suggest that the adolescent's perception of what goes on in the environment is more important than the actual reality of that environment. For example, some studies have found that adolescents' own substance use was more influenced by perceived views of their peers' use than by their peers' actual use (Duan et al., 2009). In regards to perceived peer substance use norms, studies have found that as youth levels of misperception increase, substance use likelihood increases (Wambeam, Canen, Linkenbach, & Otto, 2014).

In sum, ecodevelopmental theory lends itself to the examination of the transactional or trickle-down effects of risk and protective factors at the macro-, exo-, meso-, and microsystem. To this end, the purpose of the present cross-sectional study was to use ecodevelopmental theory to empirically test direct and indirect effects of school-related factors within the macro-, exo-, meso-, and micro- systems that impact the risk of initiating alcohol, tobacco, and drug use in early adolescence among Hispanic youth. In the current study, each of the school level macrosystemic characteristics (i.e. school SES, school climate, school ethnic composition and school acculturation) were hypothesized to have indirect effects on substance use initiation through the teen's sense of school belonging, perception of substances use norms, and family functioning at the microsystem level. The school macrosystemic characteristics were also expected to have indirect effects on substance use initiation through their relationship with parental involvement (i.e. parental

monitoring of peers and school involvement) at the mesosystem level. In addition, parental education, at the exosystem level, was expected to have an indirect effect on substance use initiation through the school's SES, at the macrosystem level, and school belonging, family functioning, and perceptions of peer norms of use, at the microsystem level.

Method

Participant Recruitment

Participants were recruited from randomly selected middle schools in the Miami-Dade County Public School (MDCPS) system. A total of 18 schools, across 24 cohorts, participated in the study; this total constituted approximately 20% of all middle schools across the county school system. Entry to the multiple schools was gained by collaborating with top-level school administrators at the county level and at the school level. At the county level, a subcontract agreement was established with MDCPS administrators. At the school level, each school was visited by research study staff, the study was explained to school administrators (i.e., principals, assistant principals, and/or school counselors) and the school was invited to participate. The study was completed in three waves across two academic school years. Each wave consisted of approximately six to nine schools. The criteria at the participant level included (a) female and male adolescents of Hispanic parents (i.e., parents had to identify as Hispanic), (b) adolescents attending 8th grade at baseline, (c) adolescents living with an adult primary caregiver who was willing to participate and (d) families must have been living within the catchment areas of the 18 participating middle schools.

Participants were recruited utilizing letters that were sent home with students. These letters indicated that interested parents should call a study number to set up an appointment. Interested parents were brought in for a face-to-face meeting at the school and were instructed to bring his or her adolescent to the meeting. Parents and adolescents were consented separately to ensure participant privacy and to prevent any parental coercion for adolescent study participation.

Procedures

Parents and adolescents completed the assessment battery immediately after the consent procedures. Assessments were completed on computer equipment provided by the research team and utilized audio computer-assisted (ACASI) software. Parents received $40 for completing the assessment; adolescents received a movie ticket.

Participants

Table 1 illustrates the demographic characteristics of adolescent participants, their caregivers, and their schools. Participants for this study were 741 Hispanic 8th grade adolescents (52% male ($n = 387$), 48% female ($n = 354$); M age = 13.9 years, $SD = 0.67$) and their primary caregivers (17% male ($n = 124$), 83% female ($n = 614$); M age = 42.3 years, $SD = 7.2$). Fifty-five percent ($n = 407$) of the adolescents were born in the U.S., whereas 88% of parents were immigrants. Immigrant adolescents ($n = 334$, 45%) were born primarily in Cuba (40.4%), Colombia (13.8%), Argentina (6.0%) and Nicaragua (5.7%). Of foreign-born adolescents, 38.0% had been living in the U.S. for less than or equal to four

years, whereas the remaining had either been living in the U.S. between 4–9 years (n = 108; 32.3%) or more than 9 years (n = 99; 29.6%). Only 33% of the families reported household incomes greater than $30,000 per year.

Measures

The measures section is organized into four subsections targeting each of the systems in ecodevelopmental theory (i.e., macrosystem, exosystem, mesosystem, and microsystem) and a subsection on lifetime substance use. Table 2 includes a sample item, the response categories, and Cronbach's α for each of the constructs measured in the study. Table 3 depicts descriptive statistics for each variable, as well as the correlations among all study characteristics.

Macrosystemic processes—Macrosystemic processes were measured by four school level variables: school SES, school climate, school acculturation, and school ethnic composition. The percentage of students receiving free or reduced school lunch was used as a proxy for school SES. The percentage of students receiving free or reduced school lunch ranged from 9% to 87%. School climate was measured with three items (α = .76) from the Bonds with School subscale (Murray and Greenberg, 2001) that assessed whether adolescents felt that they were safe at school, that school was a nice place to be, and that other students had a good chance to grow up and be successful. Adolescents rated each statement on a 4-point scale ranging from "*not at all true*" to "*very true*." The percentage of Hispanic student enrollment was used to measure school ethnic composition. Percentage of Hispanic students ranged from 48% to 96% across schools. The percentage of students reported by schools to be English Language Learners (ELL) was used as a proxy for school acculturation. ELL learners ranged from 3.6% to 28.5% across all schools. The percentage of students recruited from each school ranged from 5.6% to 36.8%.

Exosystemic processes—Exosystemic processes were operationalized as social support for parents, parental stressors, and parental education level. Social support for parents was measured using the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet & Farley, 1988). The 12-item MSPSS assesses three domains of social support from family, friends, and significant other (α = .93). Parental stressors were measured using the Hispanic Stress Inventory (Cervantes, Padilla, & Salgado de Snyder, 1991). The occupation/economic stressors subscale (5 items α =.68) and the immigration stressors subscale (5 items; α =.68) from the Hispanic Stress Inventory were used to assess parental degree of extra-familial stress. A parental stress scale was derived by summing the occupational/economic and the immigration stress subscales (α =.80). Parental education level was measured by one question that asked parents to report on the highest grade completed in school (including graduate or professional training). Response options ranged from none (0) to 17 (graduate or professional). These exosystemic measures were completed by parents only.

Mesosystemic processes—Mesosystemic processes were operationalized as parental involvement in school and parental monitoring of peers. Parental involvement in school (α =.84) was assessed using 10 items from the Parenting Practices Scale (PPS; Gorman-Smith,

Tolan, Zelli, & Huesmann, 1996) which asks parents to report on how often they check how their youth are doing in school. Parental monitoring of peers (5 items; α =.86) was measured using the Parent Relationship with Peer Group Scale (Pantin, 1996), which asks parents to indicate the extent to which they supervise the adolescent's activities with friends and whereabouts. These measures were completed by parents only.

Microsystemic processes—Microsystemic processes were measured in three domains: (a) family functioning, (b) perceived peer norms of substance use, and (c) sense of school membership. Family functioning was assessed using adolescent reports of four indicators: (1) parental involvement, (2) positive parenting, (3) family communication, and (4) parent-adolescent communication. Parental involvement (15 items, α = .87) and positive parenting (9 items, α = .79) were assessed using the corresponding subscales from the PPS (Gorman-Smith et al., 1996). The positive parenting subscales assess positive parenting, rewards, and acknowledgments given in response to positive behaviors. Family communication (3 items, α = .72) was assessed using the corresponding subscale from the Family Relations Scale (Gorman-Smith, Tolan, Zelli, & Huesmann, 1996). The Parent-Adolescent Communication Scale was used to measure effective communication (Barnes & Olsen, 1985). It consisted of two subscales with a total of 20 items (α = .90). The subscales were open family communication and problems in family communication.

Perceived peer norms of substance use was measured using an adaptation of the substance use items from the Monitoring the Future Survey (Johnston et al., 2014), a national epidemiologic study to assess the prevalence of substance use in the United States. Perceived peer norms of substance use included peer social norms regarding drinking, smoking cigarettes, using marijuana and other drugs (4 items, α = .79). Higher scores on perceived peer norms corresponded to less positive peer norms for substance use.

Adolescent sense of school membership was assessed with the Psychological Sense of School Membership Scale (PSSM; Goodenow, 1993; 18 items, α =.86). The PSSM measures adolescents' perceptions of belonging or psychological membership within the school context.

Initiation of substance use—Initiation of substance use in early adolescence was assessed using items similar to those used in the Monitoring the Future Study (Johnston et al., 2014). For this study, a binary variable was created to indicate whether adolescents had ever smoked tobacco, drank alcohol, or used an illicit drug, including a prescription drug, without a prescription or taken more than what was prescribed.

Analytic Plan

Study hypotheses were tested in three steps using M*plus (*v7) (Muthén & Muthén, 1998–2006). First, a confirmatory factor analysis (CFA) was conducted to ascertain the feasibility of collapsing four indicators (i.e. parental involvement, positive parenting, family communication, and parent-adolescent communication) into a latent family functioning construct. Second, we estimated the hypothesized model (Figure 1) using a structural equation model. The fit of the hypothesized structural equation model was evaluated using the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and

the χ^2 statistic. Though the χ^2 statistic is reported, it was not used in the interpretation as it tests the null hypothesis of a perfect fit to the data, which is almost always false (Preacher, Cai, & MacCallum, 2007). Good model fit can be assumed if CFI .95 and RMSEA .05, whereas adequate model fit can be assumed if CFI .90 and RMSEA .08 (Kline, 2010).

Next, the asymmetric distribution of products test (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002) was used to test the hypothesized mediational paths. This test is more statistically powerful than more traditional methods of testing mediation (MacKinnon et al., 2007) and is based on the sampling distribution of the paths that comprise the hypothesized mediation relationship. Partial mediation is assumed if the confidence interval for this product does not include zero. Finally, to determine whether the hypothesized model varied across gender and place of birth (non-U.S.-born vs. U.S.-born), model invariance was tested by both gender and nativity. We first tested whether the family functioning latent variable had measurement invariance across gender. Then two SEM models were estimated to test for model invariance: the first with paths unconstrained across gender and the second with paths constrained across gender. Because the mean and variance adjusted weighted least square estimator (WLSMV) was used in model estimation, the difference chi-square test, "DIFFTEST" in M*plus,* was used to examine the difference between the two models. Missing data in this sample ranged mostly from .13% to .54%, except for one case that was missing 5.09%. All cases were included in the analyses using full information maximum likelihood estimation except for five cases that were dropped because they were missing data on exogenous variables (i.e. school climate and parental support). The final analytic sample was 741. The intraclass correlation coefficient (ICC) and design effect of early initiation of substance use was calculated to determine whether the clustering of students by school needed to be accounted for in the tested model (personal communication, Bengt Muthén). The obtained ICC of .031 and design effect of 2.2 suggested that the clustering effects at the school level needed to be accounted for using complex survey design in order to obtain accurate standard error estimates.

Results

Measurement Model

Family functioning—The CFA indicated that the four indicators of family functioning loaded significantly onto a single construct: parent involvement, .91, positive parenting .74, family communication .60, and parent-adolescent communication .69. The model provided a good fit to the data, χ^2 (1) = 0.40, p = 0.53; CFI= .999, RMSEA=0.001.

Structural Equation Model- Hypothesized Model

The hypothesized model shown in Figure 1 provided an adequate fit to the data χ^2 (69) = 113.131, p < .01; CFI = .95, RMSEA=.03). Results for the hypothesized paths are reported below. Figure 2 illustrates only the significant direct effects.

Macrosystemic Processes to Microsystemic Processes—School SES was related to perception of norms of peer use (β = .10, p < .01) and was not related to sense of school membership. School climate was related to sense of school membership (β = .41, p < .001),

perception of peer use norms ($\beta = -.14$, $p < .001$), and family functioning ($\beta = .44$, $p < .001$). School acculturation was related to sense of school membership ($\beta = .04$, $p < .03$) but not related to norms of peer use. School ethnic composition was not related to either sense of school membership or perceptions of peer use norms.

Macrosystemic Processes to Mesosystemic Processes—School SES was not related to parental school involvement. School climate was related to parental school involvement ($\beta = .11$, $p < .001$).

Exosystemic Processes to Macrosystemic Processes—Parental education was negatively related to the school's SES ($\beta = -.29$, $p < .001$).

Exosystemic Processes to Mesosystemic Processes—Parental social support was positively related to parental school involvement ($\beta = .31$, $p < .001$) and parental monitoring of peers ($\beta = .31$, $p < .001$). Parental stress and parental education were not related to parental school involvement. Similarly, parental stress and parental education were not associated with parental monitoring of peers.

Exosystemic Processes to Microsystemic Processes—Parental education ($\beta = .09$, $p < .02$), parental stress ($\beta = .075$, $p < .01$) and parental social support ($\beta = .13$, $p < .001$) were positively related to family functioning.

Relationships among Exosystemic Processes—Parents' years of education ($\beta = -.16$, $p < .001$) and parental social support ($\beta = -.10$, $p < .05$) were inversely related to parental stress.

Mesosystemic Processes to Microsystemic Processes—Parental school involvement ($\beta = .11$, $p < .001$) and parental monitoring of peers ($\beta = .20$, $p < .001$) were positively correlated with family functioning. Parental school involvement was not related to sense of school membership or perceived peer norms of substance use. Parental monitoring of peers was not related to adolescents' psychological sense of school membership or perceived norms of substance use.

Relationships among Mesosystemic Processes—Parental school involvement and parental monitoring of peers were positively correlated ($\beta = .37$, $p < .001$)

Relationships among Microsystemic Processes—Family functioning was positively related to adolescents psychological sense of school membership ($\beta = .33$, $p < .001$), and negatively related to perceived substance use norms ($\beta = -.24$, $p < .001$). Perceived peer norms and adolescent psychological sense of school membership were not correlated.

Microsystemic Processes to Initiation of Substance Use—Family functioning was negatively associated with substance use initiation ($\beta = -.31$, $p < .001$). Whereas perceived peer use norms ($\beta = .31$, $p < .001$) was positively related to initiation of substance use. Psychological sense of school membership was not related to initiation of substance use.

Mediational Paths-Indirect Effects—The school's SES was indirectly associated with substance use initiation through perceived peer substance use norms (standardized $\beta = .03$, $p < .02$, 95% CI [.005, .055]). School climate had an indirect effect on initiation of substance use through perceived peer substance use norms ($\beta = -.04$, $p < .01$, 95% CI [-.07,-.02]). Similarly, school climate was indirectly related to substance use initiation through family functioning, and perceived peer substance use norms ($\beta = -.03$, $p < .001$, 95% CI [-.048,-.02]). Neither school ethnic composition nor school acculturation had indirect effects on initiation of substance use. Parents' years of education were indirectly related to substance use initiation through the teen's middle school socioeconomic status (SES) and perceived peer substance use norms ($\beta = -.009$, $p < .05$, 95% CI [-.017, -.000][1]). Parents' years of education had an indirect effect on initiation of substance use through parental stress, family functioning, and perceived peer substance use norms ($\beta = .001$, $p < .02$, 95% CI [.000-.002][1]). Parents' years of education were indirectly related to substance use initiation through family functioning ($\beta = -.03$, $p < .05$, 95% CI [-.056, -.002]).

Post Hoc Analyses

Testing measurement invariance of a latent factor (i.e. family functioning) is an important requisite in multigroup structural equation modeling. Consequently, before comparing whether there were differences in the SEM model by gender or place of birth (metric invariance), measurement invariance for the latent family functioning factor was verified across groups. Results below are presented in this order.

Measurement invariance for the family functioning latent factor was tested with a configural invariance model where the latent family functioning factor was attached to the same indicator item at each gender group. The configural invariance model fit the data adequately for family functioning across gender, $\chi^2 (2) = 1.338$, $p = 0.512$; CFI = .999; RMSEA = 0.001. Compared to the configural invariance model, constraining factor loadings across gender (metric invariance) did not significantly worsen the model fit ($\chi^2 (3) = 4.259$, $p = 0.235$). Invariance of paths in SEM model was tested next. Specifically, two SEM models were compared: the first with unconstrained paths across gender and the second with paths constrained across gender. The difference in chi-square between the constrained and unconstrained models were nonsignificant across gender ($\chi^2 (37) = 50.691$, $p =.07$).

Similarly, the configural invariance model fit the data adequately for family functioning across place of birth, $\chi^2 (2) = 0.43$, p= 0.807; CFI = .999; RMSEA = 0.001. Compared to the configural invariance model, constraining factor loadings across place of birth (metric invariance) did not significantly worsen the model fit ($\chi^2 (3) = 1.362$, $p = 0.714$). Invariance of paths in the SEM model were tested next. Again, two SEM models were compared: one with unconstrained paths across place of birth and the second with paths constrained across place of birth. The difference in chi-square between the constrained and unconstrained models were non-significant across place of birth ($\chi^2 (37) = 40.177$, $p =.331$).

[1]Although the lower or upper confidence limit is shown as 0.000, it technically is not zero. MPlus output only prints estimates with three decimals.

Discussion

The aim of this study was to use an ecodevelopmental framework to test the 'trickle down' effects of key risk and protective factors that multiply determine the initiation of alcohol, tobacco, and drug use in early adolescence among Hispanic youth with an emphasis on four macrosystemic school characteristics: school SES, school climate, school ethnic composition, and school acculturation. Findings supported several pathways hypothesized to have trickle down effects on early substance use initiation among Hispanic teens as illustrated in Figure 2. As discussed in more detail below, school SES and school climate impacted initiation of substance use indirectly through their associations involving exo- and microsystemic factors. On the other hand, school ethnic composition and school acculturation did not have trickle down effects on early initiation of substance use. Study results provide further empirical support to the advantages of using ecodevelopmental theory to frame and examine the interplay of risk and protective factors at multiple contextual levels (e.g. Pantin et al., 2004; Prado et al., 2010).

Testing the proposed ecodevelopmental framework highlighted the interplay of distal and proximal school characteristics with other parental and peer factors at different systemic levels in predicting initiation of substance use. For example, factors at the exosystemic level (i.e. parental education) helped determine early substance use initiation through their relationship with macrosystemic processes (i.e. school SES), and microsystemic processes (i.e. peer perception of substance use). Specifically, parental education (exosystem) influenced substance use initiation through two pathways that involved school (macrosystem) and peer (microsystem) factors. That is, adolescents whose parents had less years of education attended schools with lower SES and, in turn, teens were more likely to initiate substance use in early adolescence. In addition, teens whose parents reported lower education and were more likely to be in lower SES schools, endorsed more positive norms of peer substance use and, as a result, were more likely to start using substances in adolescence. This set of findings are consistent with the respective individual associations found in the literature between school SES, perceptions of peer use norms, and parental resources with substance use among adolescents in general, including Hispanic youth (e.g. Ansary et al., 2011; Escarce, 2003; Prado et al., 2009; Windle et al., 2008). Further, the current study extends this literature by showing how both parental education and school SES can pose risk factors for initiation of substance use at a distal level through their interplay with more proximal factors.

In addition, school climate, a macrosystemic characteristic, influenced initiation of substance use indirectly through its associations with two microsystemic factors: perception of peer norms of use and family functioning. That is, adolescents in schools with more positive climates reported lower perceptions of use norms among their peers and, in turn, were less likely to start using substances. In addition, youth who endorsed a more positive school climate reported more positive family functioning, lower perception of use norms among peers, and consequently were less likely to start using substances in early adolescence. These findings were also consistent with the literature on the direct effects of family functioning and school climate on adolescent substance use (e.g. Mayberry et al., 2009). The present study highlights, however, the interplay of school, family, and peer

factors influencing initiation of substance use. Further, these results demonstrate how positive school climate and family functioning can be a protective factor in the face of perception of peer substance use.

On the other hand, school ethnic composition and school acculturation did not indirectly influence initiation of substance use in early adolescence. These findings may have been influenced by the demographics of the sample for the parent study from which data for the current analyses were gathered. To be eligible for the major study, schools had to serve predominantly Hispanic populations, which ranged from 48% to 96% across all schools in this study. Consequently, it may be likely that there was not sufficient variability in this sample to detect effects of school ethnic composition and school acculturation. Further, the limited research on these two factors has been conducted on samples of mostly Mexican origin (e.g. Kulis et al., 2004) and it is possible that these constructs are not as relevant for adolescents of other ancestries, such as the current sample, who were mostly of Cuban and Colombian origin. Nevertheless, future studies should include more ethnically/racially diverse schools to test the indirect effects of these two important school level characteristics on initiation of substance use among Hispanic youth.

Findings related to direct effects are consistent with the literature (Bacio et al., 2013; Pantin et al., 2004; Prado et al., 2010). Microsystemic processes included both risk and protective factors. Specifically, positive family functioning was protective against early substance use initiation, whereas perceived peer substance use norms (i.e. acceptability of use among peers) was a risk factor for early initiation of use. The relationships among factors within and across different levels of the system were also consistent with the literature (e.g., Lopez et al., 2009; Mogro-Wilson, 2008; Prado et al., 2010). For example, parental social support improved family functioning, positive family functioning was associated with lower perceptions of peer use of substances, and, in turn, lower perceptions of peer use was protective against early initiation of alcohol and drug use.

Results from the present study also revealed additional results. First, school belonging was unexpectedly not significantly related to initiation of substance use. Although this may have been a measurement issue, we used a validated and commonly used assessment of school membership (Goodenow, 1993) which also exhibited good internal consistency in this study ($\alpha = 0.86$). On the other hand, it may be that school climate, a macrosystemic factor, seemed to be more relevant to initiation of substance use than school belonging, a more proximal microsystemic factor. It is possible that school belonging may be more important to frequency of substance use for those who have already started using substances than for initiation.

Second, parental stress was positively related to family functioning, meaning that increased parental stress was associated with higher level of family functioning. This finding may be a function of the type of stress being assessed. For this study, we measured parental stress with a focus on immigration and occupational stress. It may be possible that culturally-based stressors bring families together due to shared experiences of discrimination and marginalization. Given the Hispanic's culture strong emphasis on familism, families may

rally around a shared common goal of succeeding in the U.S. when confronted with immigration and occupational stress.

Of note, study findings revealed that the model tested did not vary by gender (males vs. females) or by place of birth (U.S.-born vs. non-U.S.-Born). That is, the overall fit of the model and the relationships among the tested constructs were invariant across both gender and place of birth.

In sum, findings on this set of trickle down effects highlights the important role of social determinants of health (e.g. Prado, Lightfoot, & Brown, 2013) on substance use and provides insight into intervention opportunities at different levels. For example, some factors such as school SES can be addressed at the policy level, whereas others factors including peer perception of substance use and school climate can be addressed at the school level. School psychologists, in accordance with the National Association of School Psychologists principles for comprehensive and integrated professional services (2010), are at a unique place within the education system to play key roles to address factors that contribute to substance use initiation among early adolescent Hispanic teens. For example, school psychologists can use these type of empirical studies to advocate at the policy level for equality in resources for schools located within neighborhoods of lower socioeconomic status. Similarly, school psychologists can work toward enhancing the family-school collaboration to reduce substance use initiation that may be more essential for Hispanic students whose parents report lower levels of education. In addition, school psychologists and school communities can deliver interventions that target perceived peer norms of use and improve perceptions of school climate. For instance, interventions that address and change perceived peer norms at the school level may impact individual level factors that lead to substance use initiation and may signal the need for macro-level interventions such as a social norms marketing campaign (Wambeam et al., 2014). Structural interventions can bring about normative shifts in how people view substance use and can potentially produce widespread effects (Fisher, 2010). Furthermore, these take into account powerful contextual factors such as norms, macroeconomic and social forces that impact substance use-- individuals do not engage in substance use solely because of personal characteristics or family characteristics (Fisher, 2010). Thus, ecodevelopmental theory offers opportunities to empirically test hypotheses that may point to multiple levels of intervention. These findings point to the need for a multi-pronged approach in the prevention of substance use initiation among Hispanic youth and the critical role that school psychologists and educators can play toward this goal.

Limitations

Study findings should be interpreted in light of several limitations. This study only focused on four characteristics of the macrosystemic school environment and did not measure other aspects of the macrosystem that may influence substance use initiation such as the impact of culture, societal values and promotion of substance use in the media, community characteristics that promote substance use (e.g. number of liquor stores in the community, drug related crimes), or other school level characteristics that act as risk and protective factors for substance use (e.g. number of students suspended or spelled for substance use;

implementation of prevention programs at the school or within health classes), among others. In addition, the measure used to approximate school SES is a proxy and may not completely capture the schools' SES. Similarly, school acculturation was estimated as the percentage of English language learners at each school. This index captured all the English language learners at the school level and may have included adolescents who were not Hispanic. Nevertheless, this number was likely very small given that the schools served a student body that was, on average, 80% Hispanic and that the majority of non-English speaking recent immigrants in Miami-Dade County are Hispanic. The cross-sectional nature of the study does not allow for the testing of relationships between these constructs across time; thus, it is not appropriate to infer causality or directionality of effects. Future studies should use a longitudinal design to test for causality and aspects of adolescent development over time. Similarly, the country of origin of participants in this study may be different than other regions of the U.S. and therefore results may not generalize. In fact, most empirical studies on Hispanic populations in the U.S. have been conducted solely with Mexican communities, the largest population of Hispanics in the country. However, our sample included a large proportion of individuals of Colombian, Argentine, and Nicaraguan descent, which may have influenced study results in ways that cannot be accounted given the dearth of research in communities of these national origins. Future studies should consider the great diversity in the origins of Hispanic communities in the U.S. given that, for immigrant families, national origin can have different macrosystemic implications for immigration policies and societal acceptance, which in turn, indirectly affect the development of Hispanic youth.

Further, in this study, we used a p value of .05 to evaluate statistical significance. We did not correct for multiple testing as Muthén recommends that using Bonferroni adjustments in SEM is overly conservative, given that the multiple tests are not independent of one another (Muthén, 2005). Thus, we followed this recommendation, which is generally used in these types of analyses (e.g. Ullman, 2006). However, it is important to note that if we had used a more stringent significance level of $p < .01$, six of our direct and indirect effects would not have been significant at this level (direct effect of parental education on family functioning ($\beta = .09$, $p = .016$); direct effect of school acculturation on sense of school membership ($\beta = .04$, $p = .026$); indirect effect of parental education on initiation through school SES and perceived peer use norms ($\beta = -.009$, $p = 0.04$); indirect effect of parental education on substance use initiation through family functioning ($\beta = -.03$, $p = 0.035$); parental education indirect effect on initiation through parent stress, family functioning, and perceived peer substance use ($\beta = .001$, $p = 0.016$); school SES indirect effect on substance use initiation through perceived peer substance use norms ($\beta = .03$, $p = 0.018$)). It is also worth noting that although several of the coefficients were statistically significant, the standardized betas were small (suggesting that the effect sizes are also small). As a result, these effects should be interpreted with caution. Further studies in this area are necessary to confirm the direct and indirect effects identified in the present study. Additionally, some self-report measures such as parenting practices and family relations relied only on adolescent reports. Consequently, results could have been influenced by potential inflated estimates due to shared source effects. Lastly, parent measures such as social support and stress were only completed by one caregiver.

Conclusions

In summary, this study illustrates the role of school characteristics in the interplay of risk and protective factors that determine early substance use initiation among Hispanic adolescents, a fast growing segment of the U.S. population. Using an ecodevelopmental framework, results highlighted the associations among factors at different levels of the adolescent's system that impact their likelihood of starting to use alcohol, tobacco, and drugs in early adolescence directly and indirectly. Findings have important implications for identifying risks across multiple systems and levels of influences on substance use initiation, which in turn, may inform the development of preventive interventions targeted within and across these levels, including the school, family, peer, and individual. School psychologists and educators are in a unique position to use ecodevelopmental studies to advocate for interventions at each of these levels to reduce disparities in the education, well-being, and successful transition of Hispanic youth to young adulthood.

Acknowledgments

References

Allen ML, Elliott MN, Fuligni AJ, Morales LS, Hambarsoomian K, Schuster M. The relationship between Spanish language use and substance use behaviors among Hispanic youth: A social network approach. Journal of Adolescent Health. 2008; 43:372–379. [PubMed: 18809135]

Ansary NS, McMahon TJ, Luthar SS. Socioeconomic context and emotional-behavioral achievement links: Concurrent and Prospective association among low- and high-income youth. Journal of Research on Adolescence. 2011; 22(1):14–30. [PubMed: 23129975]

Bacio GA, Mays VM, Lau AS. Drinking initiation and problematic drinking among Hispanic adolescents: Explanations of the immigrant paradox. Psychology of Addictive Behaviors. 2013; 27(1):14–22. [PubMed: 23025707]

Barnes HL, Olson DH. Parent-adolescent communication and the Circumplex Model. Child Development. 1985; 56:438–447.10.1111/j.1467-8624.1985.tb00118.x

Barrera, M., Jr; Gonzales, NA.; López, V.; Fernández, AC. Problem behaviors of Chicana/o and Latina/o adolescents: An analysis of prevalence, risk, and protective factors. In: Valasquez, R.; Arellano, LM.; McNeill, BW., editors. The handbook of Chicana/o psychology and mental health. Mahwah, NJ: Erlbaum; 2004. p. 83-109.

Benner AD, Graham S. The transition to high school as a developmental process among multiethnic urban youth. Child Development. 2009; 8(2):356–376. [PubMed: 19466997]

Bond I, Butler H, Thomas I. Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. Journal of Adolescent Health. 2007; 40:9–18.

Bronfenbrenner, U. The ecology of human development: Experiments by nature and design. Cambridge, MA: Harvard University Press; 1979.

Brown, BB.; Larson, J. Peer relationships in adolescence. In: Lerner, RM.; Steinberg, L., editors. Handbook of Adolescent Psychology. 3. New York: Wiley; 2009. p. 74-103.

Castro FG, Stein JA, Bentler PM. Ethnic pride, traditional family values, and acculturation in early cigarette and alcohol use among Hispanic adolescents. The Journal of Primary Prevention. 2009; 30:265–292. [PubMed: 19415497]

Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2009. MMWR. 2010; 2010:59, SS-5. Retrieved from http://www.cdc.gov/mmwr/pdf/ss/ss5905.pdf.

Centers for Disease Control and Prevention. Hispanic or Hispanic populations. 2013. Retrieved from http://www.cdc.gov/minorityhealth/populations/REMP/hispanic.html

Centers for Disease Control and Prevention. Cigarette smoking in the United States. 2014. Retrieved from http://www.cdc.gov/tobacco/campaign/tips/resources/data/cigarette-smoking-in-united-states.html#by_age

Cervantes RC, Padilla AM, Salgado de Snyder N. The Hispanic Stress Inventory: A culturally relevant approach to psychosocial assessment. Psychological Assessment: A Journal of Consulting and Clinical Psychology. 1991; 3:438–447.

Conger R, Conger K, Martin M. Socioeconomic status, family processes, and individual development. Journal of Marriage and Family. 2010; 72(3):685–704. [PubMed: 20676350]

Cook, MJ.; Ungemack, JA.; Mark, H. Patterns of recent alcohol, tobacco, and other drug use among Caucasian, Black, and Hispanic students attending racially homogeneous and heterogeneous school districts. 2001. Retrieved from http://www.mathewjcook.com/pdf/APHA2001.pdf

Duan L, Chou C, Andreeva VA, Pentz MA. Trajectories of peer social influences as long-term predictors of drug use from early through late adolescence. Journal of Youth and Adolescence. 2009; 38:454–465. [PubMed: 19636757]

Englund MM, Egeland B, Oliva EM, Collins A. Childhood and adolescent predictors of heavy drinking and alcohol use disorders in early adulthood: A longitudinal developmental analysis [Supplement]. Addiction. 2008; 103:23–35. [PubMed: 18426538]

Escarce JJ. Socioeconomic status and the fates of adolescents. Health Services Research. 2003; 38:1229–1234.10.1111/1475-6773.00173 [PubMed: 14596387]

Espinoza G, Juvonen J. Perceptions of the school social context across the transition to middle school: Heightened sensitivity among Latino students? Journal of Educational Psychology. 2011; 103(3):749–758.

Fisher, DA. Environmental prevention strategies: An introduction and overview. 2010. Retrieved January 27, 2012, from http://wch.uhs.wisc.edu/docs/SIG/fisherEnvironmentalPreventionStrategies.pdf

Garcia-Reid P, Reid RJ, Peterson NA. School engagement among Latino youth in an urban middle school context: Valuing the role of social support. Education and Urban Society. 2005; 37(2):257–275.

Georgiades K, Boyle M, Fife KA. Emotional and behavioral problems among adolescent students: The role of immigrant, racial/ethnic congruence, and belongingness in schools. Journal of Youth and Adolescence. 2013; 42:1473–1492. [PubMed: 23192451]

Gil AG, Wagner EF, Vega WA. Acculturation, familism, and alcohol use among Hispanic adolescent males: Longitudinal relations. Journal of Community Psychology. 2000; 28(4):443–458.

Goodenow C. The psychological sense of school membership among adolescents: Scale development and educational correlates. Psychology in the Schools. 1993; 30(1):79–90.

Gorman-Smith D, Tolan PH, Zelli A, Huesmann LRa. The relation of family functioning to violence among inner-city minority youths. Journal of Family Psychology. 1996; 10(2):115–129.10.1037//0893-3200.10.2.115

Grant BF, Dawson DA. Age of onset of drug use and its association with DSM-IV drug abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. Journal of Substance Abuse. 1998; 10(2):163–173. [PubMed: 9854701]

Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: age at onset, duration, and severity. Archives of Pediatrics & Adolescent Medicine. 2006; 160(7):739–746.10.1001/archpedi.160.7.739 [PubMed: 16818840]

Hoffman BR, Sussman S, Unger JB, Valente TW. Peer influences on adolescent cigarette smoking: A theoretical review of the literature. Substance Use and Misuse. 2006; 41(1):103–155. [PubMed: 16393739]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Monitoring the future national survey results on drug use, 1975–2013: Volume I, Secondary school students. Ann Arbor: Institute for Social Research; 2014.

Joshi A, Gutierrez BJ. Parenting stress in parents of Hispanic adolescents. North American Journal of Psychology. 2006; 8:209–216.

Kline, RB. Principles and Practice of Structural Equation Modeling. 3. New York: The Guildford Press; 2010.

Kulis S, Marsiglia FF, Nieri T, Sicotte D, Hohmann-Marriott B. Majority rules? The effects of school ethnic composition on substance use by Mexican heritage adolescents. Social Focus. 2004; 37(4): 371–392.

Lopez B, Wang W, Schwartz SJ, Prado G, Huang S, Brown CH, Szapocznik J. School, family, and peer factors and their association with substance use in Hispanic adolescents. Journal of Primary Prevention. 2009; 30:622–641. [PubMed: 19949868]

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods. 2002; 7(1):83–104. [PubMed: 11928892]

Martinez C. Effects of differential family acculturation on Latino adolescent substance use. Family Relations. 2006; 55(3):306–317.10.1111/j.1741-3729.2006.00404.x

Mayberry ML, Espelage DL, Koeng B. Multilevel modeling of direct effects and interactions of peers, parent, and community influences on adolescent substance use. Journal of Youth and Adolescence. 2009; 38:1038–1049. [PubMed: 19636769]

McNeely CA, Nonnemaker JM, Blum RW. Promoting school connectedness: Evidence from the National Longitudinal Study of Adolescents. Journal of School Health. 2002; 72(4):138–146. [PubMed: 12029810]

Mogro-Wilson C. The influence of parental warmth and control on Hispanic adolescent alcohol use. Hispanic Journal of Behavioral Sciences. 2008; 30(1):89–105.

Murray C, Greenberg MT. Relationships with teachers and bonds with school: Social emotional adjustment correlates for children with and without disabilities. Psychology in the Schools. 2001; 38(1):25–41.

Muthen, LK.; Muthen, BO. Mplus: Statistical analysis with latent variables: User's guide. Los Angeles: Muthen & Muthen; 1998–2006.

Muthén, B. Multiple comparisons. 2005. Retrieved from http://www.statmodel.com/discussion/messages/11/614.html?1141669639

National Association of School Psychologists. Model for Comprehensive and Integrated School Psychological Services. 2010. Retrieved from http://www.nasponline.org/standards/2010standards/2_PracticeModel.pdf

Osterman KF. Students' need for belonging in the school community. Review of Educational Research. 2000; 70(3):323–367.

Pantin, H. Ecodevelopmental measures of support and conflict for Hispanic youth and families. Miami, FL: University of Miami School of Medicine; 1996.

Pantin H, Schwartz SJ, Sullivan S, Prado G, Szapocznik J. Ecodevelopmental HIV prevention programs for Hispanic adolescents. American Journal of Orthopsychiatry. 2004; 74:545–558. [PubMed: 15554814]

Perrino T, Gonzalez-Soldevilla A, Pantin H, Szapocznik J. The role of families in adolescent HIV prevention: A review. Clinical Child and Family Psychology Review. 2000; 3(2):81–96. [PubMed: 11227063]

Pilgrim CC, Schulenberg JE, O'Malley PM, Bachman JG, Johnston LD. Mediators and moderators of parental involvement on substance use: A national study of adolescents. Prevention Science. 2006; 7:75–89.10.1007/s11121-005-0019-9 [PubMed: 16572302]

Prado G, Huang S, Maldonado-Molina M, Bandiera F, Schwartz SJ, de la Vega P, Pantin H. An empirical test of ecodevelopmental theory in predicting HIV risk behaviors among Hispanic youth. Health Education & Behavior. 2010; 37:97–114. [PubMed: 20130302]

Prado G, Huang S, Schwartz S, Maldonado-Molina M, Bandiera FC, de la Rosa M, Pantin H. What accounts for differences in substance use among U.S.-born and immigrant Hispanic adolescents? Results from a longitudinal prospective cohort study. Journal of Adolescent Health. 2009; 45(2): 118–125. [PubMed: 19628137]

Prado G, Lightfoot M, Brown C. Macro-level approaches to HIV prevention among ethnic minority youth: State of science, opportunities, and challenges. American Psychologist. 2013; 68(4):286–289. [PubMed: 23688095]

Prado G, Pantin H. Reducing substance use and HIV health disparities among Hispanic youth in the U.S.A.: The Familias Unidas program of research. Psychosocial Interventions. 2011; 20:63–73.10.5093/in2011v20n1a6

Preacher, KJ.; Cai, L.; MacCallum, RC. Modeling contextual effects in longitudinal studies. In: JAB; Little, TD.; Card, NA., editors. Alternatives to traditional model comparison strategies for covariance structure models. Mahwah, NJ: Lawrence Erlbaum Associates; 2007. p. 33-62.

Richardson JL, Radziszewska B, Dent CW, Flay BR. Relationship between after-school care of adolescents and substance use, risk taking, depressed mood, and academic achievement. Pediatrics. 1993; 92:32–38. [PubMed: 8516082]

Schwartz, SJ.; Coatsworth, JD.; Pantin, H.; Szapocznik, J. Ecodevelopmental theory. In: Miller, JR.; Lerner, RM.; Schiamberg, LB.; Anderson, PM., editors. Human ecology: An encyclopedia of children, families, communities, and environments. Santa Barbara, CA: ABC-CLIO; 2003. p. 198-201.

Schwartz SJ, Pantin H, Sullivan S, Prado G, Szapocznik J. Nativity and years in the receiving culture as markers of acculturation in ethnic enclaves. Journal of Cross-Cultural Psychology. 2006; 37:345–353.10.1177/0022022106286928 [PubMed: 16799700]

Syvertsen AK, Cleveland MJ, Gayles JG, Tibbits MK, Faulk MT. Profiles of protection from substance use among adolescents. Prevention Science. 2010; 11:185–196. [PubMed: 19844790]

Szapocznik, J.; Coatsworth, JD. An ecodevelopmental framework for organizing the in uences on drug abuse: A developmental model of risk and protection. In: Glantz, MD.; Hartel, CR., editors. Drug abuse: Origins and interventions. Washington, DC: American Psychological Association; 1999. p. 331-366.

Ullman JB. Structural equation modeling: Reviewing the basics and moving forward. Journal of Personality Assessment. 2006; 87(1):35–50. [PubMed: 16856785]

Unger JB, Ritt-Olson A, Wagner KD, Soto DW, Baezconde-Garbanati L. Parent-child acculturation patterns and substance use among Hispanic adolescents: A longitudinal analysis. Journal of Primary Prevention. 2009; 30:293–313.10.1037//1040-3590.9.3.212 [PubMed: 19384604]

U. S. Census Bureau. The Hispanic population: 2010. 2011. Retrieved from http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf

U.S. Census Bureau. Annual estimates of the resident population by sex, age, race, and Hispanic origin for the United States and States: April 1 2010 to July 1 2012. 2013. Retrieved from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk

Wambeam RA, Canen EL, Linkenback J, Otto J. Youth misperceptions of peer substance use norms: A hidden risk factor in state and community prevention. Prevention Science. 2014; 15:75–84. [PubMed: 23512125]

Wills TA, Vaccaro D, McNamara G. The role of life events, family support, and competence in adolescent substance use. American Journal of Community Psychology. 1992; 20:349–374. [PubMed: 1415032]

Windle M, Spear LP, Fuligni AJ, Angold A, Brown JD, Pine D, Dahl RE. Transitions into underage and problem drinking: Developmental processes and mechanisms between 10 and 15 years of age. Pediatrics. 2008; 121(4):S273–S289. [PubMed: 18381494]

Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. Journal of Personality Assessment. 1988; 52:30–41.
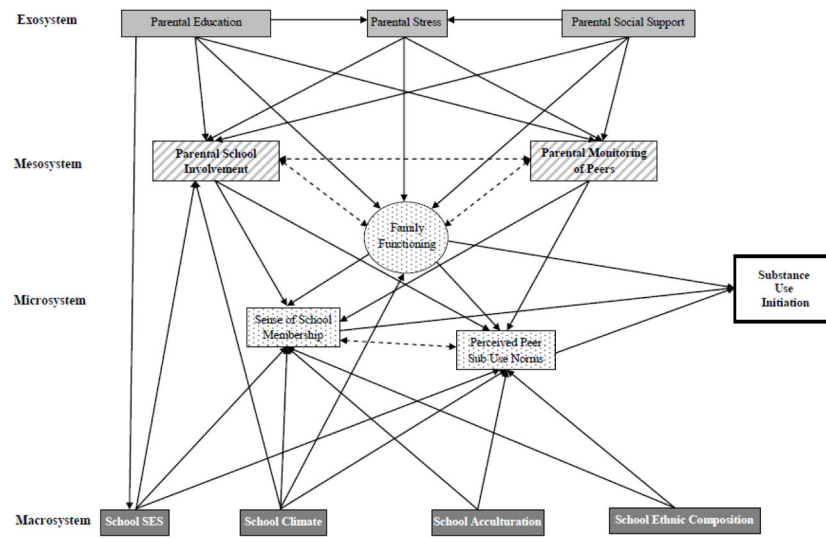
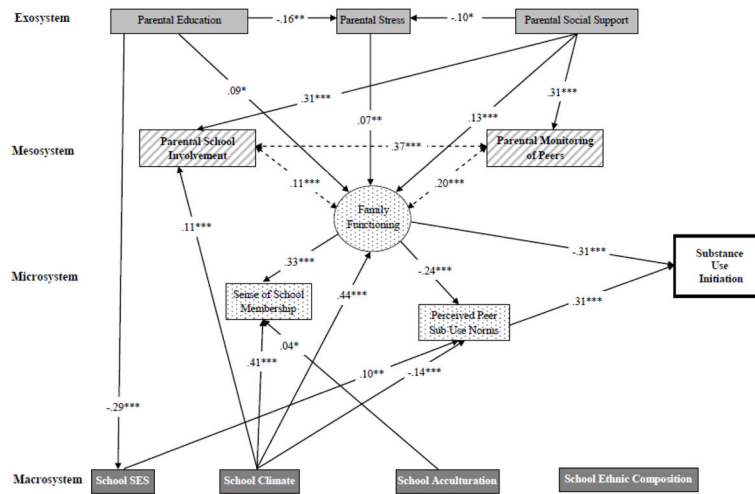**Figure 1.**
Hypothesized model illustrating ecodevelopmental predictors of substance use initiation among early adolescent Hispanics.

Figure 2.
Model illustrating ecodevelopmental predictors of substance use initiation among early adolescent Hispanics with significant paths and standard coefficients.

Table 1

Sociodemographic characteristics of adolescents, caregivers, and schools

Variable	Percent or Means
Adolescent Characteristics	
Total	$N = 741$
Place of Birth	
U.S.-Born	55%
Non-U.S.-Born	45%
Time in the U.S. for non-U.S.-Born	
4 Years	38.0 %
4–9 Years	32.3 %
9+ Years	29.6 %
Gender	
Female	48%
Male	52%
Age	$M = 13.9$, $SD = 0.67$
Country of Birth for non-US-Born	
Argentina	6.0%
Colombia	13.8%
Cuba	40.4%
Dominican Republic	5.1%
Honduras	4.5%
Nicaragua	5.7%
Puerto Rico	4.5%
Other	20.0%
Caregiver Characteristics	
Age	$M = 42.3$, $SD = 7.2$
Place of Birth	
U.S.-Born	12%
Non-U.S.-Born	88%
Gender	
Female	83%
Male	17%
Education	
Years of Education	$M = 12.5$, $SD = 2.7$
Family income?	
$30,000	33.0%
School Characteristics	
Average percentage of students with free or reduced lunch	66.3%
Average Hispanic student population	80.1%
Average English Language Learner population	15.4%

Table 2

Participant Measures

Measure	Cronbach's α	Respondent	Sample Question	Responses
Multidimensional Scale of Perceived Social Support	α = 0.93	Caregiver	"I get the emotional help and support I need from my family."	Very Strongly Disagree; Strongly Disagree; Mildly Disagree; Neutral; Mildly Agree; Strongly Agree; Very Strongly Agree
Hispanic Stress Inventory	α = 0.80	Caregiver	"My income has not been sufficient to support my family or myself."	Yes; No
Parent Relationship with Peer Group Scale	α = 0.86	Caregiver	"How often during a typical week do you supervise your child and his/her best friends spending time together?"	Not at all; A little bit; Somewhat often; Pretty often; Extremely often
Parenting Practices Scale	α = 0.79 (Positive parenting)	Adolescent	"When you have done something that your parents like or approve of, how often does your mother give you a wink or a smile?"	Never; Hardly ever; Sometimes; Most of the time; Always
	α = 0.87 (Parental Involvement)	Adolescent	"How often did your mom talk with you about what you had actually done during the day?"	This is certainly not true;.....; This is certainly true
	α = 0.84 (Parental School Involvement)	Caregiver	"If there are problems with my child, I initiate contact with the teacher."	
School Climate -- School Bonding subscale	α = 0.76	Adolescent	"I feel safe at my school"	Not at all true; Not really true; Somewhat True; Very true;
Family Communication Scale	α = 0.72	Adolescent	"My family and I have the same views about what is right and wrong."	Not at all true; Hardly ever true; True a lot; Almost always or always true;
Parent-Adolescent Communication Scale	α = 0.90	Adolescent	"I can discuss my beliefs with my mother without feeling restrained or embarrassed."	Strongly disagree; Disagree; Agree; Strongly Agree;
Perceived peer norms of substance use	α = 0.79	Adolescent	"If your friends found out that you drank sometimes, how do you think they'd feel?	They would approve; They wouldn't care; They would disapprove but still be my friends; They would disapprove and stop being my friends;
Psychological Sense of School Membership	α = 0.86	Adolescent	"I can really be myself at this school."	Not at all true; .....; Completely True
Initiation of Substance Use -- Monitoring the Future adaptation		Adolescent	"Have you ever smoked cigarettes?" "Have you ever had any beer, wine, wine coolers, or liquor to drink- more than just a few sips?" "Have you ever used drugs?"	Yes; No

Measure	Cronbach's α	Respondent	Sample Question	Responses
			"Have you ever, even once, taken a prescription drug without a prescription or taken more than what was prescribed?" "Have you ever, even once, taken a prescription drug without a prescription or taken more than what was prescribed?"	

Table 3

Means, standard deviations, and correlations among all variables in the model

Variable	M (SD) / %	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. School SES	66.2 (20.0)	-															
2. School Ethnic Composition	80.1 (14.0)	.481**	-														
3. School Climate	7.0 (1.9)	−.206**	.000	-													
4. School English Learners	15.4 (6.0)	.227**	.500**	.086*	-												
5. Parental Social Support	69.6 (12.4)	−.004	.077*	.060	.070	-											
6. Parental Stress	2.8 (2.6)	.263**	.204**	−.002	.090*	−.107**	-										
7. Parental Education	12.5 (2.7)	−.295**	−.075*	.092*	−.011	.139**	−.188**	-									
8. Parental School Involvement	35.2 (7.8)	−.019	−.006	.137**	.095**	.307**	.025	.049	-								
9. Parental Monitoring of Peers	11.7 (4.7)	.015	.069	.067	.051	.305**	.018	.005	.426**	-							
10. Family Communication	6.0 (2.1)	−.029	.035	.407**	.034	.100**	.046	.132**	.139**	.140**	-						
11. Positive Parenting	22.2 (6.8)	.058	.082*	.214**	.081*	.190**	.038	.050	.145**	.197**	.452**	-					
12. Parental Involvement	38.0 (10.0)	−.009	.028	.313**	.046	.168**	.008	.102**	.152**	.211**	.550**	.681**	-				
13. Parent-Adolescent Communication	70.0 (14.8)	−.016	.033	.361**	.027	.129**	.072	.092*	.160**	.186**	.619**	.512**	.633**	-			
14. Sense of School Membership	70.1 (11.9)	−.125**	.019	.564**	.089*	.085*	−.008	.106**	.165**	.160**	.474**	.301**	.371**	.438**	-		
15. Perceived Sub Use Norms	7.0 (2.7)	.126**	−.008	−.256**	−.093*	−.044	−.041	−.074*	−.099**	−.120**	−.287**	−.128**	−.243**	−.275**	−.238**	-	
16. Initiation of Sub Use	20.3%	.065	−.085*	−.233**	−.068	−.154**	−.017	−.102**	−.115**	−.132**	.260**	.186**	.251**	.292**	.215**	316**	-

*
  p <.05,

**
  p < .01