Published in final edited form as:

Subst Use Misuse. 2014 June ; 49(8): 1025–1038. doi:10.3109/10826084.2013.852585.

Problematic substance use in Hispanic adolescents and young adults: Implications for prevention efforts

Timothy J. Grigsby^{1,*}, Myriam Forster¹, Daniel W. Soto¹, Lourdes Baezconde-Garbanati¹, and Jennifer B. Unger¹

¹Institute for Health Promotion and Disease Prevention, Keck School of Medicine, University of Southern California

Abstract

Using data collected between 2005–2012 from a longitudinal study of acculturation patterns and substance use among Hispanic youth in Southern California (N = 2,722), we fit multivariate logistic regression models to estimate the association of type and frequency of drug use, friend and parent drug use, cultural orientation (measured by the ARSMA-II), and psychological distress (CES-D score) in 10th grade with problematic substance use (measured with the RAPI) in (i) 11th grade and (ii) young adulthood. We conclude that future intervention efforts with Hispanic adolescents and young adults should target polysubstance and problem users and emphasize inter-individual, structural and cultural processes as they relate to problematic substance use.

Keywords

problematic substance use; drug related consequences; depression; Hispanic/Latino; acculturation; friend drug use; parent drug use; polysubstance use

Introduction

According to census estimates, Hispanics are the largest and most rapidly growing ethnic minority group in the United States (U.S.), and it is estimated that in coming decades they will constitute 30% of the youth population (U.S. Census Bureau, 2011). Currently, Hispanic youth have some of the highest rates of licit and illicit drug use underscoring the need for prevention programs to interrupt the progression towards addiction. Before age 13, Hispanic youth have the highest prevalence of smoking a cigarette (12.6%), drinking alcohol (27.1%) and trying marijuana (10.3%) compared with other racial/ethnic groups in the U.S. During the high school years they report the highest rates of smoking cigarettes (51%) and the second highest use of cigars/cigarillos (20.8%). They are second to non-Hispanic whites in alcohol use (42.9%) and binge drinking (44.4%) and outpace other ethnic groups in rates for experimenting with illicit substances: marijuana (39.9%), cocaine (9.4%), ecstasy (14.0%), methamphetamine (5.7%), and heroin (3.3%) (CDC YRBS, 2009).

*Corresponding Author: Timothy Grigsby, University of Southern California Keck School of Medicine, Department of Preventive Medicine, Soto Street Building, SSB, 2001 N Soto Street, Los Angeles, CA, 90033, tjgrigsb@usc.edu, Phone: 949-923-1499.

The majority of studies examining the antecedents of substance use among Hispanic adolescents have focused on tobacco (Vega, Gil & Zimmerman, 1993; Balcazar, Peterson & Cobas, 1996; Unger et al., 2000; Everhart, Ferketich, Browning & Wewers, 2009), alcohol (Epstein, Botvin, Griffin, & Diaz, 2001; Lopez et al., 2008), and marijuana (Farhat, Simons-Morton & Luk, 2011; Lac et al., 2011), or combinations of the three (Fraser, Placentini, Van Rossem, Hien, & Rotheram-Borus, 1998; Delva et al., 2005; Unger, Ritt-Olsen, Soto, & Baezcondi-Garbanati, 2009; Kopak, Ayers, Lopez & Stevenson, 2011). Moreover, these studies typically report initiation or experimental use as opposed to exploring the onset of adverse consequences of alcohol or drug use. Over the past few decades alcohol use research has examined alcohol related consequences as a proxy measure for problematic drinking behavior (White & Labouvie, 1989). However, there has been little work examining the antecedents of drug related consequences for substances other than alcohol. It is important to distinguish experimental or occasional users from those who continue to use drugs despite negative consequences, a diagnostic criterion for many substance use disorders (e.g., dependency or abuse). The recognition and classification of characteristics associated with these two groups will allow tailored prevention/intervention programs to address the needs of individuals on divergent substance use trajectories (i.e., experimental or occasional users as opposed to problem users) (Berkowitz & Perkins, 1986; Colder & Chassin, 1999; Ginzler, Garrett, Baer, & Peterson, 2007). We define problematic substance use (PSU) as an individual's recognition of intrapersonal or interpersonal consequences resulting from their drug use. This paper will contribute to the literature that examines sociocultural factors associated with PSU within a subset of a population already experiencing drug use.

Acculturation has been implicated as an important element in adolescent substance use among Hispanics given the higher tolerance of drug and alcohol experimentation within the U.S. relative to Latin American countries (Arnett, 1992; Eide, Acuda, Khan, Aaroe, & Loeb, 1997). Acculturation is a process that occurs as an individual adapts to life within a dominant culture while concomitantly balancing the conflicting cultural practices and perspectives of their family, country of origin, and host culture (Berry, 1998; Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Empirical studies have found that a preference for an Anglo-American lifestyle (e.g., language use, food preference, media consumption, etc.) can elevate risk for numerous health compromising behaviors whereas the retention of a Hispanic or Latino orientation buffers individuals from risk behaviors such as substance use (Vega, Khoury, Zimmerman, Gil, & Warheit, 1995; Ebin et al., 2001; Unger et al., 2006; Luk, Wang, & Simons-Morton, 2010). Furthermore, Gil and Vega (1998) have argued that the discrepant rate and direction of parent and child acculturation, language difficulty and cultural incompatibilities are especially stressful and therefore increase risk of substance use or experimentation. Because the relationship between cultural orientation, traditional cultural values, and substance use has found support in the literature (Vega, Warheit, Zimmerman, Apospori, & Gil 1993; Unger et al, 2006; Szapocznik, Prado, Burlew, Williams, & Santisteban, 2007), we included acculturation as distal predictor of PSU. This may be particularly relevant in the present study as 72% percent of our student sample was of Mexican descent, but born in the United States to foreign-born parents. We also postulate that the proximity of Southern California to the Mexican border, and nativity of parents, may be important factors that explain when, and to what degree, participants retain or reject

traditional Hispanic values. This generational status difference could be a source of familial tension as parent-child discrepancies in acculturation patterns can undermine family cohesion, an established protective factor among immigrant populations and their children (Kaplan, Napoles-Springer, Stewart, & Perez-Stable, 2001). We assumed that a loss of traditional Hispanic values that emphasize conformity to familial and community norms would be associated with PSU.

Friend and parent substance use are among the most consistent and robust predictors of substance use in adolescence (Beal, Austello, & Perrin, 2001; Johnston, O'Malley, Bachman, & Schulenberg, 2002; Best et al., 2005; O'Donnell et al., 2008). As early social learning theorists (Bandura & Walters, 1963) suggest, the family-peer-individual drug use association is a result of modeling the behaviors of those in our social context. As role models, parents hold a unique role as exemplars of health, morality, and well-being. However, during adolescence, peers become the primary resource for forming one's identity, establishing social norms, and building relationships (Nickerson & Nagle, 2005). As such, adolescents are likely to show similarities in their substance use patterns through a combination of processes (e.g., peer selection and peer influence) (Brown, Clasen, & Eicher, 1986; Hoffman et al., 2006). Provided that access and exposure to drugs through drug using family members or peers has evidenced a strong association with drug use patterns, in general, it was investigated here in relation to PSU.

Substance use and depressive symptomology often co-occur (Grant et al., 2004; Davis, Uezato, Newell, & Frazier, 2008; Bolton, Robinson, & Sareen, 2009; Substance Abuse and Mental Health Services Administration, 2009; Witkiewitz & Villarroel, 2009; Verster, Brady, Galanter, & Conrad, 2012; Mackie, Conrod, & Brady, 2012). Since research has evidenced that those with depressive symptoms are more likely to use, or misuse, substances, we evaluated this relationship within our broader sociocultural approach as this relationship has not been extensively studied in samples of Hispanic adolescents or young adults (King, Iacono, & McGue, 2004; Mason, Hitchings, & Spoth, 2009; Marmorstein, 2009).

Conceptual Framework

We have adopted a theoretical approach that incorporates aspects from a life course perspective (Elder, 1974; Elder 1998) and considers the neurobiological influences on adolescent brain and behavior development. The life course perspective posits that the impact of early life experiences, shaped by the social and cultural context, can have long-term consequences (Shanahan, 2000). These experiences and events will have differential effects over the life course contingent upon when they occur and will either enhance or diminish developmental risk. Therefore, we argue that we need to examine PSU and the social/contextual factors included in this study within a framework that considers the relationship between temporal ordering of events and significant changes in the brain during adolescence. Figure 1 illustrates the hypothesized temporal relationship between substance use by adolescence, PSU in adolescence and young adulthood, and potential negative outcomes later in life while accounting for brain development and the social/contextual factors that influence this behavior.

The Present Study

The aim of the present study is to examine factors that predict PSU in adolescence and young adulthood in a sample of Hispanic adolescents from Southern California. Identifying the correlates of PSU is an important issue as problematic use is an antecedent of adverse long-term outcomes such as substance abuse, addiction, poor academic performance, unemployment, incarceration, and premature mortality. Moreover, understanding the risk and protective factors of PSU can enhance the efficacy of school-based preventive interventions of substance use with at-risk populations. The present study explores the relationship between established correlates of substance use with PSU in a longitudinal study of Hispanic adolescents as they transition into late adolescence and young adulthood. Specifically, we hypothesize:

- (H1) Using different types of drugs (i.e., licit and illicit) frequently by 10th grade will be the strongest predictor of PSU (a) in 11th grade and (b) in young adulthood.
- (H2) Parents who use drugs in 10th grade will be associated with PSU (a) in 11th grade and (b) in young adulthood.
- (H3) Having more close friends who use drugs in 10th grade will increase the odds of PSU (a) in 11th grade, but (b) not in young adulthood.
- (H4) Experiencing psychological distress (i.e., depressive symptomology) in 10th grade will be associated with PSU in (a) 11th grade and (b) in young adulthood.
- (H5) A Hispanic orientation in 10th grade will be negatively associated with PSU (a) in 11th grade and (b) young adulthood. Conversely, we hypothesize that an Anglo-American orientation will be positively associated with PSU at both time points.

Methods

School recruitment

Project RED (Reteniendo y Entendiendo Diversidad para Salud) is a longitudinal study of acculturation patterns and substance use among Hispanic adolescents in Southern California. The participants in this study were students attending seven high schools in the Los Angeles area. Schools were approached and invited to participate if 70% or more of the student body identified as Hispanic as indicated by data from the California Board of Education and were not participating in other studies or interventions designed to address variables of interest in this study. School principals and/or district superintendents provided approval for the study before recruitment and procedures began.

Participants

We invited 3,218 ninth-grade students in Los Angeles County to participate in the study. Of those, 2,420 (75%) provided parental consent and student assent, and 2,222 (92%) completed the initial survey. A total of 1,963 (88%) self-identified as Hispanic or Latino or reported a Latin American country of origin. Students completed measures in the 10th and 11th grades as well. Between the 9th and 10th grade surveys, one school district divided and

transferred students from one of the participating schools to a new school. Therefore, we included the 10th grade class from the new school in the sample as well as any new students who moved to the participating schools, resulting in an additional 704 Hispanic participants in 10th grade. An additional 43 students joined the sample in 11th grade as a result of joining a participating school. The present analysis uses multiply imputed data for 2,722 students who self-identified as Hispanic, Latino, or reported a Latin American country of origin.

Procedures

High school survey—Trained research assistants visited the students' classrooms, explained the study, and distributed consent forms for the students to take home for their parents to sign. If students did not return the consent form, a designated research assistant telephoned the parents to explain the study and request verbal parental consent. Students with written or verbal parental consent were allowed to participate. Students were independently given the opportunity to assent or decline to participate. Data collectors returned to the schools when the students were in 10th and 11th grade. Students who could be located in the same schools (as well as students who had transferred to another school participating in the study) completed follow-up surveys in their classrooms. Tracking procedures were used to locate the students who had transferred schools. During the 9th grade survey, students provided their contact information and the contact information for a family friend to help locate them should they move during the course of the study. School personnel also provided forwarding information if available. Data collectors telephoned the missing students in the evenings and surveyed them by telephone. There were no statistically significant differences in self-reported substance use between the students who completed their surveys in the classroom and those who completed their surveys by telephone. A total of three waves of data collection for the original Project RED study were collected in the 9th, 10th, and 11th grade years in 2005, 2006, and 2007, respectively. Study procedures were approved by the University of Southern California Institutional Review Board and by the ethics committees from the school districts from which adolescents were recruited. Additional information regarding the original procedures is provided elsewhere (Unger, Ritt-Olson, Wagner, Soto, & Baezconde-Garbanati, 2007).

Emerging adulthood survey—In 2011–2012, the study team attempted to re-establish contact the Hispanic participants who had participated in any wave of the high school survey to take part in an Emerging Adulthood (EA) survey. Research assistants began by sending letters to the respondents' last known address and invited them to visit the study website or call a toll-free phone number to complete the survey. If this was not successful, the study team began to contact the participants via all information on file, including the phone numbers, email addresses, and phone numbers of parents and family friends. If participants could not be contacted, research staff searched for them online using publicly available search engines (e.g., Google) as well as social networking sites (e.g., Facebook). Participants who verified their identity and participation in the original Project RED study were invited to participate in the follow-up survey by phone or online. Overall, there were a total of 7,799 observations nested within 2,722 Hispanic participants, of whom 274 had data at 1 time point, 576 had data at 2 time points, 1,116 had data at 3 time points, and 756 had data at all 4 time points. Participants received \$20 for completing the survey and \$3 for updating their

contact information in the database for future surveys. The present analysis uses data from the 9th grade, 10th grade, 11th grade and emerging adulthood surveys.

Measures

Predictors

Type and frequency of drug use: To measure substance use in 10th grade, we combined items measuring lifetime use and past month use. We began by combining lifetime use reported on the 9th and 10th grade surveys to develop categories of drug use. The initial categories were licit only (tried cigarettes or alcohol), illicit only (tried marijuana, cocaine, methamphetamine, ecstasy, hallucinogens, and/or inhalants), or both (any combination of licit and illicit lifetime use). If participants indicated lifetime use and one or more instances of use in the past month, they were coded as frequent users. Lifetime users who did not report past month use were coded as infrequent users. Due to the small number of illicit only users, we collapsed the category to reflect history of use but not frequency (i.e., the illicit only group included all participants who had used illicit drugs but not licit drugs, regardless of frequency of use). The final categories for analysis reflected substance use by 10th grade and included: no history of use, infrequent licit drug use only, frequent licit drug only, illicit use, infrequent use of both, and frequent use of both. In cases where a participant reported past month use of licit, illicit or both types of drugs but did not report lifetime use, they were categorized as an infrequent user as it was assumed this was the first instance they had tried a particular substance or combination of substances.

Friends' substance use: The 10th grade survey asked participants to name their five closest friends at school and whether or not they had ever tried cigarettes or marijuana or consumed alcohol at least once a month. The EA survey asked participants whether or not their five closest friends used cigarettes, alcohol, marijuana or other drugs, but did not ask for their names. Moreover, the possible responses on the EA survey were "None," "1-2," "3-4," or "all 5." The responses from the 10th grade survey were condensed into the same categories for comparison as we controlled for current friend use in the young adult analysis.

Parent substance use: Three items asked how many of the participant's parents or guardians used cigarettes, alcohol or marijuana. Possible responses were one parent, both parents or neither and the separate items were combined into a single measure of parental substance use for analysis.

Psychological distress: The Center for Epidemiologic Studies Depression (CES-D) scale is a 20-item short form measure to assess depressive symptomology that was designed specifically for research purposes (Radloff, 1977). Items assess the frequency of depressive symptoms over the previous seven days (e.g., feeling sleepy, not eating well, having crying spells, etc.) with responses ranging from 0 "Less than one day or never" to 3 "5-7 days." Four positively worded items were reverse coded before scoring. The internal consistency for the measure was good ($\alpha = 0.89$).

Acculturation: A short version of the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II) developed by Cuellar, Arnold, and Maldonado (1995) was used to assess

acculturation. Items were chosen based on previous pilot testing and factor analysis. The measure includes two subscales measuring Anglo-American (7 items, $\alpha = 0.74$) and Hispanic orientation (6 items, $\alpha = 0.90$). Sample items of the Anglo-American subscale include “My thinking is done in the English language” and “I enjoy listening to English language music.” Sample items of the Hispanic American orientation include “I enjoy listening to Spanish language music” and “My thinking is done in the Spanish language.” The subscales are scored such that a higher mean score indicates higher levels of Anglo-American or Hispanic orientation.

Outcome

Problematic substance use: We operationalized problematic substance use (PSU) as the occurrence of one or more drug use consequences. Seven items from the Rutgers Alcohol Problem Index (RAPI), a scale that was developed originally to assess adolescent problem drinking (White & Labouvie, 1989), were included in the 11th grade ($\alpha = 0.75$) and EA ($\alpha = 0.83$) surveys to measure drug use consequences. Previous work (Ginzler et al., 2007) has reported that the RAPI is a reliable and valid measure of polysubstance use consequences. In the present study, the instructions were revised to ask participants if they experienced particular events as a result of any substance use within the last month. The instructions and items as presented to participants are shown in Table 1 in addition to the frequency and percent of the sample experiencing specific events in 11th grade and as young adults. Possible responses were “Never,” “Rarely (1–2 times),” “Sometimes (3–4 times),” or “Often (5+ times).” For analysis, responses were coded 0 if participants indicated never to all items or 1 if they indicated any event occurred regardless of the frequency due to the highly skewed nature of the distribution.

Missing Data

Missing data is a familiar problem in longitudinal studies. Traditional approaches to handle missing data were to use only complete data, a process known as listwise deletion, or single imputation methods such as mean imputation. However, these procedures are believed to produce biases in parameter estimates that can negatively impact the interpretation and generalization of research results (Graham, 2012). As more powerful statistical analysis software has become available in recent decades, an array of techniques to handle missing data has become available and pragmatic for analysts (see Schafer & Graham, 2002 or Graham, 2012 for a review).

Multiple imputation, as described by Rubin (1987), was used to handle missing data in the present study. This technique involves substituting multiple values for the missing observation, as opposed to a single value, in order to account for the uncertainty of the true value (Graham, 2012). Multiple imputation was completed using the multiple imputation by chained equations (MICE) approach outlined by van Buuren and colleagues (1999). We followed the recommendation of White, Royston, and Wood (2011) and used a total of 65 imputations which is 100 times greater than the largest fraction of missing information produced in our analyses to account for the greater proportion of missing data at the emerging adulthood time point resulting from attrition.

Analysis

Two separate models using multivariate logistic regression analysis were conducted to predict PSU (i.e., the occurrence of a drug use consequence). The first analysis examined the occurrence of PSU in 11th grade, with frequency and type of drug use, friend use, parent use, and psychological distress in 10th grade as predictors. The second model included the predictor variables in 10th grade described above to predict PSU at the EA time point. Additionally, we examined close friend use at the EA time point to account for changes in social networks as students separate from their schools, homes and communities, and controlled for the outcome during 11th grade. Gender was included as a covariate in both models. Logistic regression was used because no transformation could correct the highly right skewed nature of the outcome variable to satisfy the normality and linearity assumptions of linear regression. Due to possible interclass correlation (ICC) resulting from students completing the survey measures within schools, we used random effects modeling with the XTLOGIT command in STATA. Preliminary results did not show that the random effect of the school was significantly different from zero for either analysis (year 3: $p = 0.21$; young adulthood: $p = 0.21$). Moreover, previous studies using data from this sample have found no evidence of clustering by school (Okamoto et al., 2009; Wagner et al., 2010). Therefore, final models did not include school as a random effect. Finally, we calculated the unadjusted and adjusted odds ratios (OR) and 95% confidence intervals (95% CI) for each variable for ease of interpretation. We present both the unadjusted and adjusted models predicting PSU in eleventh grade (Table 3) and young adulthood (Table 4), but we only discuss the adjusted odds ratios from the multivariate models in the results and discussion sections. All analyses were completed using STATA version 12.

Results

Demographics

During the 10th grade assessment in 2006, the average age of participants was 15 (SD = 0.45), and approximately 53% of the participants were female. While all participants included in the present analysis self-reported that they were of Hispanic/Latino origin, respondents were given the option to choose more than one ethnic category. As such, 68% identified themselves as Hispanic, 67% as Latino/a, 72% as Mexican or Mexican-American, 7% as Central American, 3% as South American, 27% as Chicano or Chicana, 10% as La Raza, and 1% as Mestizo. The majority of participants were born in the U.S. (69.5%) followed by Mexico (7.5%) whereas their parents were more likely to be born outside the U.S. About half of the sample reported speaking English and another language equally at home, approximately 23% reported speaking mostly or only English at home and roughly 16% spoke another language predominately at home (Table 2). Among participants reporting any drug use by 10th grade, approximately 42% were classified as problem users by 11th grade and 47% as problem users by young adulthood.

PSU in eleventh grade

Table 3 shows the unadjusted and gender-adjusted odds ratios for factors in 10th grade predicting PSU in eleventh grade adjusting for gender. Being a non-frequent user of licit drugs in 10th grade was not associated with PSU in eleventh grade, but frequent use of licit

drugs was significantly associated with an increased risk (OR = 1.79, 95% CI = 1.27 – 2.52). Lifetime use of a licit substance only by 10th grade was marginally associated with problematic use in eleventh grade (OR = 1.65, 95% CI = 0.92 – 2.95, $p = 0.09$). Users of both licit and illicit substances by 10th grade were at an increased risk of PSU in 11th grade whether they reported being non-frequent (OR = 1.77, 95% CI = 1.27 – 2.47) or frequent (OR = 3.30, 95% CI = 2.47 – 4.41) users. Frequent users of both drug types were at the greatest risk of all categories of users when compared to those with no lifetime use of a substance.

Having three or more close friends who used cigarettes, alcohol or marijuana in the 10th grade was significantly associated with an increased risk of PSU by 11th grade. The odds of experiencing PSU a year later when all five of a participant's closest friends used drugs was 2.3 times the odds (95% CI = 1.57 – 3.37) of PSU among those with no close friends who used. Having a parent who used cigarettes, alcohol or marijuana was marginally significantly related to PSU in 11th grade (OR = 1.20, 95% CI = 0.99 – 1.46, $p = 0.06$).

Experiencing psychological distress in 10th grade was not associated with PSU in 11th grade. Having a Hispanic orientation in tenth grade was protective against PSU in the 11th grade (OR = 0.91, 95% CI = 0.83 – 0.99), but having an Anglo-American orientation was not associated with PSU. Finally, gender was not associated with PSU in 11th grade.

PSU in young adulthood

Table 4 presents the unadjusted and adjusted odds ratios for factors in 10th grade predicting PSU, measured as experiencing a drug use consequence, in young adulthood adjusting for friend use in young adulthood, experiencing prior problematic substance use, and gender. Examining type and frequency of drug use in 10th grade found that using both licit and illicit drugs frequently was a significant predictor of PSU in young adulthood (OR = 2.84, 95% CI = 1.72 – 4.68), but using licit or illicit drugs or both infrequently by 10th grade was not associated with PSU in young adulthood.

Friend use in 10th grade was not associated with PSU in young adulthood. Yet, if three or four close current friends at the EA time point were users, then the risk of PSU was greater (OR = 2.68, 95% CI = 1.10 – 6.50) than those with no friends who used. The odds of experiencing PSU for those with five current friends who used drugs were 6.53 (95% CI = 2.67 – 15.96) times the odds as those with no close friends who used drugs.

Having a parent who used drugs, experiencing psychological distress, and cultural orientation in tenth grade was not predictive of PSU in young adulthood. Females were at significantly lower risk of PSU compared to males (OR = 0.60, 95% CI = 0.46 – 0.79), and experiencing PSU in the 11th grade was marginally associated with an increase in the odds of PSU in young adulthood (OR = 1.36, 95% CI = 1.00 – 1.84, $p = 0.05$).

We refer the reader to figure 2 for a side-by-side graphical comparison of the odds ratios and confidence intervals of PSU in 11th grade and young adulthood based on predictors in 10th grade using results from the multivariate models presented in tables two and three, respectively. The strength of the associations weakens when the outcome, PSU, is observed

in young adulthood with the exception of gender where the protective effect of being female becomes stronger.

Discussion

Understanding, identifying, and preventing PSU is an important public health issue given its relation to a multitude of adverse outcomes including, but not limited to addiction, poor academic performance, unemployment, incarceration, and premature mortality. Our study was predicated on a theoretical framework that attempted to explain the sociocultural influences that impact substance use behavior during adolescence and young adulthood when the brain is at a crucial stage of development. Specifically, we explored the relationship between empirically established correlates of substance use with PSU in Hispanic adolescents as they transitioned into late adolescence and young adulthood. To date, such research has only been applied toward the study of alcohol misuse, and this is the first study to examine drug use consequences more broadly.

We found support for the hypothesis (H1) that Hispanic teenagers using both licit and illicit drugs frequently by tenth grade were most likely to experience PSU in eleventh grade and young adulthood compared to those who did not report using either type of drug. The significant increase in the odds of PSU by young adulthood for tenth graders reporting the use of *both* licit and non-licit drugs *frequently* supports the extant literature on the unique hazards associated with the concurrent use of multiple substances. Explanations for this phenomenon vary due to the unique cumulative effects of polysubstance use leading to different neurochemical responses in the developing brain and the established relationship between polysubstance use and higher levels of risk taking and/or comorbid mental health issues (Lynskey et al., 2006; Pirard, Sharon, Kang, Angarita & Gastfriend, 2005; Schilt et al., 2008). The purchase of illegal substances implies that an adolescent is willing to expose him or herself to more dangerous situations (as compared to acquiring more readily available substances such as tobacco, alcohol, or prescription medications) and interact with other high-risk individuals who may in turn expose them to additional harm or promote other risk behaviors. It has been argued that non-conforming peer groups may in part be symptomatic of broader cultural stressors and/or marginalization among minority youth. For example, Ogbu's (1986) "oppositional cultural hypothesis" asserts that children who perceive a low probability of future success—as dictated by the dominant culture's expectations—may select into peer groups whose normative behaviors and attitudes are adopted in defiance of mainstream western ideals of achievement oriented perspectives and practices. Indeed, Farkas and colleagues (2002) found that minority boys attending low-income city public schools were particularly at risk for oppositional peer group associations. Based upon our findings we intend to further explore how peer group attitudes, cultural expectations and stressors influence negative health behaviors in this sample. For instance, if these participants have also experienced higher levels of victimization or trauma in high school, then continued risk taking may suggest a failure to cope effectively with cumulative distress. This, in turn, if left untreated, can negatively affect an individual's ability to achieve optimal outcomes in adulthood. Identifying polysubstance users early in adolescence may allow educators and public health practitioners to address the unique needs of teenagers and/or those most vulnerable to developing comorbid conditions in order to

interrupt the progression toward chronic use and/or maladaptive psychological and behavioral patterns.

Participants who reported that their parents drank alcohol, smoked cigarettes or used marijuana in 10th grade were not at an increased risk of PSU in 11th grade or young adulthood, which did not support our hypothesis (H2). However, an increase in the number of close friends who used drugs in 10th grade was significantly associated with PSU in 11th grade. It is quite likely that having more friends who engage in a specific behavior is indicative of greater identification with such behavior. Utilizing peer group leaders to model, promote and normalize positive health behaviors within schools may prove beneficial during a developmental phase when peer acceptance and bonding becomes a salient feature in the acquisition and socialization of behaviors while family and adult influences diminish (Valente, Gallaher, & Mouttapa, 2004; Nickerson & Nagle, 2005). Of note, friend use in 10th grade was not associated with PSU in young adulthood thus only partially supporting our hypothesis (H3). It is likely that the influence of one's high school friends may not persist beyond high school (figure 2) which explains this finding.

We did not find evidence to support our hypothesis that experiencing psychological distress in tenth grade would be associated with PSU in eleventh grade or young adulthood (H4). This finding challenges previous work relating depressive symptomology with substance use (Shedler & Block, 1990; Hanna, Yi, Dufour, & Whitmore, 2001; Espada, Sussman, Huedo-Matina, & Alfonso, 2011). Indeed, depression is a heterogeneous disorder (Shafer, 2006) as evident in the variable criteria required by psychologists for a diagnosis of major depression (American Psychiatric Association, 2000). While the CES-D is an established measure of depressive symptomology, we did not have a proper diagnostic tool capable of detecting the facets of depression that correlate with co-morbid and maladjusted substance use. For instance, previous findings have linked anhedonia (an inability to experience pleasure) with cigarette smoking relapse (Niaura et al., 2001; Leventhal, Waters, Kahler, Ray, & Sussman, 2009), and a debate continues regarding the relevant importance of positive and negative affect at the individual level in the manifestation and chronicity of substance use. Additionally, we relied on a single assessment of depressive symptomology and this might not reflect the chronic nature of mood disorders such as depression.

We only found partial support for our final hypothesis (H5). We observed that having a Hispanic orientation was protective against PSU in adolescence, but not in young adulthood. This finding may stem from our conceptualization of cultural identity as a bidimensional process whereas previous studies have conceived ethnic identity as a unidimensional process that assumes retaining one's cultural heritage disavows the adoption of host culture perspectives. Cross-cultural studies have suggested that the importance of family and strong bonds among Hispanic families may account for the protective effect of culture of origin orientations among youth (Vega, 1990; Hill, Bush, & Roosa, 2003; Prado, Szapocznik, Maldonado-Molina, Schwartz, & Pantin, 2008). Nonetheless, there are several conceptualizations of acculturation as it encompasses many facets associated with a merging of two cultures. Our finding that a Hispanic orientation was no longer protective as participants entered young adulthood may have several explanations. First, previous research has examined the protective effect of culture of origin with substance use, but not

PSU, which suggests that problematic users may indeed be on a unique neurobiological trajectory toward addiction compared to experimental, occasional or regular users. It is also plausible that as PSU progresses, one's cultural orientation becomes less predictive vis à vis other psychosocial variables associated with drug use such as drug use within proximal social networks. Second, previous findings have indicated that cultural orientation itself does not confer risk, but rather, that the loss or rejection of a personal connection to the cultural values that inhibit substance use drive the culture-risk relationship. Moreover, it has been suggested that marginalization and isolation (i.e., a limited personal attachment to a culture and its values), specifically, promotes acculturative stress and increases the risk of psychological or behavioral maladaptation (Berry, 1990).

Albeit not predicted, we observed an interesting relationship between gender and PSU. Namely, we found that being female was not associated with PSU in adolescence, but was negatively associated with problem use in young adulthood. National and community samples have established that female drug use, both in adolescence and adulthood, is significantly lower than that of males (CDC YRBS, 2009; NIDA, 2009).

Limitations and Conclusions

Several limitations should be considered when interpreting the findings of this study. First, we used multiple imputation by chained equations (MICE) to handle missing data. While multiple imputation has become an established method for handling missing data, MICE does not have a theoretical justification as robust as normal multivariate imputation methods. As such, there is a possibility that incompatible conditional models can be built for which no joint multivariate distribution exists. However, simulation studies have found that MICE procedures produce reasonable error estimates and are efficacious in practice (White, Royston & Wood, 2011). Second, we used drug use consequences as an indicator of PSU, and there is a possibility that self-reported consequences were isolated incidents that do not reflect long-term problematic substance misuse. Third, we were not able to disentangle the type of frequency of parental drug use, and we did not have measures assessing harder drug use among participant's parents. Future work should attempt to explain the relationship between parental problem use and PSU in adolescent and young adult offspring. Finally, this sample is not representative of the general population of Hispanic youth in the U.S., and consisted primarily of Mexican-Americans. Therefore, the reader is cautioned against inferring the implications of these findings until it has been replicated in other Hispanic and non-Hispanic groups that are preferably representative of the larger population of interest.

Despite these limitations, the present paper contributes to existing literature examining Hispanic substance use, and we have identified possible areas for future prevention and intervention research. Studies that examine adolescent polysubstance use, its antecedents and young adulthood consequences are rare and have important clinical and public health implications. Given the high cost of polysubstance use to the individual and society any effort to identify youth early in the trajectory towards chronic drug use and/or maladaptive psychological and behavioral syndromes will contribute to the reduction of the life course morbidity associated with these conditions. It has been theorized that adverse events and unfavorable conditions have a cumulative effect particularly when experienced in childhood

and early adulthood (Elder, 1974) underscoring the need for early detection and intervention. Future work should attempt to accomplish two specific goals. First, there is a need to examine how cultural, structural, and interpersonal factors can serve as either or risk enhancing or protective mechanisms in the pathway towards polysubstance use among Hispanic teenagers and young adults. Second, interventions targeted at adolescents and young adults should utilize a secondary prevention strategy. Whereas primary prevention strategies focus on the prevention of disease before it occurs, secondary prevention strategies attempt to identify health problems as early as possible with the goal of reducing further harm. National estimates suggest that the nearly half of all youth in the U.S. are likely to have consumed a licit or illicit substance before they graduate high school, and Hispanic youth are more likely to have tried marijuana, heroin and cocaine prior to graduating than any other ethnic group (YRBS, 2011). Therefore, developing and testing an intervention strategy specifically for polysubstance or problem users (i.e., those incurring physical, social, or emotional harm from their drug use) during adolescence and young adulthood could substantially reduce the incidence of adverse health outcomes in this at-risk subpopulation of drug users.

References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: Author; 2000. text rev
- Arnett J. Socialization and adolescent reckless behavior: A reply to Jessor. *Developmental Review*. 1992; 12:391–407.
- Balcasar H, Peterson G, Cobas JA. Acculturation and health-related risk behaviors among Mexican American pregnant youth. *American Journal of Health Behavior*. 1996; 20(6):425–433.
- Bandura, A.; Walters, RH. Social learning and personality development. New York: Holt, Reinhart & Winston; 1963.
- Beal AC, Austello J, Perrin JM. Social influences on health-risk behaviors among minority middle school students. *Journal of Adolescent Health*. 2001; 28(6):474–480. [PubMed: 11377991]
- Berry, JW. Psychology of acculturation. In: Berman, J., editor. *Cross-cultural perspectives: Current theory and research in motivation*. Lincoln, NE: University of Nebraska Press; 1990. p. 201–234.
- Berry JW. Intercultural relations in plural societies. *Canadian Psychology*. 1998; 40:12–21.
- Best D, Gross S, Manning V, Gossop M, Witton J, et al. Cannabis use in adolescents: the impact of risk and protective factors and social functioning. *Drug and Alcohol Review*. 2005; 24(6):483–488. [PubMed: 16361204]
- Behrendt S, Wittchen HU, Hofler M, Lieb R, Beesdo K. Transitions from first substance use to substance use disorders in adolescence: Is early onset associated with a rapid escalation? *Drug and Alcohol Dependence*. 2009; 99(1–3):68–76. [PubMed: 18768267]
- Berkowitz AD, Perkins HW. Problem drinking among college students: A review of recent research. *Journal of American College Health*. 1986; 35:21–28. [PubMed: 3771936]
- Bolton JM, Robinson J, Sareen J. Self-medication of mood disorders with alcohol and drugs in the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Affective Disorders*. 2009; 115(3):367–375. [PubMed: 19004504]
- Breslau N, Peterson EL. Smoking cessation in young adults: age at initiation of cigarette smoking and other suspected influences. *American Journal of Public Health*. 1996; 86(2):214–220. [PubMed: 8633738]
- Brower V. Loosening addiction's deadly grip. *EMBO Reports*. 2006; 7(2):140–142. [PubMed: 16452925]
- Brown BB, Clasen DR, Eicher SA. Perceptions of peer pressure, peer conformity dispositions, and self-reported behavior among adolescents. *Developmental Psychology*. 1986; 22:521–530.

- Cauffman, E.; Steinberg, L. Researching adolescents' judgment and culpability. In: Grisso, T.; Schwartz, RG., editors. *Youth on trial: A developmental perspective on juvenile justice*. Chicago, IL: University of Chicago Press; 2000. p. 325-353.
- Centers for Disease Control and Prevention. Youth Risk Behavior Survey. 2009. Retrieved August 25, 2012 from www.cdc.gov/yrbs
- Colder CR, Chassin L. The psychosocial characteristics of alcohol users versus problem users: Data from a study of adolescents at risk. *Development and Psychopathology*. 1999; 11(2):321-348. [PubMed: 16506537]
- Cuellar I, Arnold B, Maldonado R. Acculturation rating scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic Journal of Behavioral Sciences*. 1995; 17(3):275-304.
- Davis L, Uezato A, Newell JM, Frazier E. Major depression and co-morbid substance abuse. *Current opinion in Psychiatry*. 2008; 21(1):14-18. [PubMed: 18281835]
- Delva J, Wallace JM Jr, O'Malley PO, Bachman JG, Johnston LD, Schulenberg JE. The epidemiology of alcohol, marijuana, and cocaine use among Mexican American, Puerto Rican, Cuban American, and other Latin American eighth-Grade students in the United States: 1991-2002. *American Journal of Public Health*. 2005; 95:696-702. [PubMed: 15798132]
- Ebin VJ, Sneed CD, Morisky DE, Rotheram-Borus MJ, Magnusson AM, Malotte CK. Acculturation and interrelationships between problem and health-promoting behaviors among Latino adolescents. *Journal of Adolescent Health*. 2001; 28(1):62-72. [PubMed: 11137908]
- Eide AH, Acuda SW, Khan N, Aaroe LE, Loeb ME. Combining cultural, social and personality trait variables as predictors for drug use among adolescents in Zimbabwe. *Journal of adolescence*. 1997; 20(5):511-524. [PubMed: 9368129]
- Elder, GH, Jr. *Children of the Great Depression: Social Change in Life Experience*. Chicago: University of Chicago Press; 1974.
- Elder, GH, Jr. *The Life Course and Human Development*. In: Damon, W.; Lerner, RM., editors. *Handbook of Child Psychology, Volume 1: Theoretical Models of Human Development*. 5. New York: Wiley; 1998.
- Epstein JA, Botvin GJ, Griffin KW, Diaz T. Protective factors buffer effects of risk factors on alcohol use among inner city youth. *Journal of Child and Adolescent Substance Abuse*. 2001; 11:77-90.
- Espada JP, Sussman S, Huedo Medina TB, Alfonso JP. Relation between substance use and depression among Spanish adolescents. *International Journal of Psychology and Psychological Therapy*. 2011; 11(1):79-90.
- Everhart J, Ferketich AK, Browning K, Wewers ME. Acculturation and misclassification of tobacco use status among Hispanic men and women in the United States. *Nicotine & Tobacco Research*. 2009; 11(9):240-247. [PubMed: 19246626]
- Farhat T, Simons-Morton B, Luk JW. Psychosocial correlates of adolescent marijuana use: Variations by status of marijuana use. *Addictive Behaviors*. 2011; 36:404-407. [PubMed: 21186082]
- Farkas G, Lleras C, Maczuga S. Does oppositional culture exist in minority and poverty peer groups? *American Sociological Review*. 2002; 67(1):148-155.
- Fraser D, Piacentini J, Van Rossem R, Hien D, Rotheram-Borus MJ. Effects of acculturation and psychopathology on sexual behavior and substance use of suicidal Hispanic adolescents. *Hispanic Journal of Behavioral Sciences*. 1998; 20(1):83-101.
- Fergusson DM, Horwood LJ, Ridder EM. Show me the child at seven: The consequences of conduct problems in childhood for psychosocial functioning in adulthood. *Journal of Child Psychology and Psychiatry*. 2005; 46(8):837-849. [PubMed: 16033632]
- Ginzler JA, Garrett SB, Baer JS, Peterson PL. Measurement of negative consequences of substance use in street youth: An expanded use of the Rutgers Alcohol Problem Index. *Addictive Behaviors*. 2007; 32(7):1519-1525. [PubMed: 17236724]
- Gogtay N, Giedd JN, Lusk L, Hayashi KM, Greenstein D, et al. Dynamic mapping of human cortical development during childhood through early adulthood. *Proceedings of the National Academy of Sciences*. 2004; 101:8174-8179.
- Graham, JW. *Missing data: Analysis and design*. New York: Springer; 2012.
- Grant BF, Stinson FS, Dawson DA, Chou SP, Dufour MC, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National

- Epidemiologic Survey on Alcohol and Related Conditions. Archives of General Psychiatry. 2004; 61(8):807–816. [PubMed: 15289279]
- Hanna EZ, Yi HY, Dufour MC, Whitmore CC. The relationship of early-onset regular smoking to alcohol use, depression, illicit drug use, and other risky behaviors during early adolescence: results from the youth supplement to the third national health and nutrition examination survey. Journal of substance abuse. 2001; 13(3):265–282. [PubMed: 11693451]
- Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychological Bulletin. 1992; 112(1):64–105. [PubMed: 1529040]
- Hill NE, Bush KR, Roosa MW. Parenting and Family Socialization Strategies and Children's Mental Health: Low-Income Mexican-American and Euro-American Mothers and Children. Child Development. 2003; 74(1):189–204. [PubMed: 12625445]
- 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 results on adolescent drug use. Overview of key findings. 2002
- Kalivas PW, Volkow ND. The neural basis of addiction: A pathology of motivation and choice. American Journal of Psychiatry. 2005; 162(8):1403–1413. [PubMed: 16055761]
- Kaplan CP, Nápoles-Springer A, Stewart SL, Pérez-Stable EJ. Smoking acquisition among adolescents and young Latinas: the role of socioenvironmental and personal factors. Addictive behaviors. 2001; 26(4):531–550. [PubMed: 11456076]
- Khantzian EJ. The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. Harvard Review of Psychiatry. 1997; 4:231–244. [PubMed: 9385000]
- King SM, Iacono WG, McGue M. Childhood internalizing and internalizing psychopathology in the prediction of early substance use. Addiction. 2004; 99:1548–1549. [PubMed: 15585046]
- Koob, GF.; Le Moal, M. Neurobiology of addiction. London: British Library Catalogue; 2006.
- Kopak AM, Ayers S, Lopez V, Stevenson P. Parental monitoring, alcohol, and marijuana use among Hispanic and non-Hispanic White adolescents: Findings from the Arizona Youth Survey. Journal of Drug Issues. 2011; 41(4):461–486.
- Lac A, Unger JB, Basanez T, Ritt-Olsen A, Soto DW, Baezconde-Garbanati L. Marijuana use among Latino adolescents: Gender differences in protective familial factors. Substance Use and Misuse. 2011; 46(5):644–655. [PubMed: 20977294]
- Leventhal AM, Waters AJ, Kahler CW, Ray LA, Sussman S. Relations between anhedonia and smoking motivation. Nicotine & Tobacco Research. 2009; 11(9):1047–1054. [PubMed: 19571250]
- Luk JW, Wang J, Simons-Morton BG. Bullying victimization and substance use among US adolescents: mediation by depression. Prevention Science. 2010; 11(4):355–359. [PubMed: 20422288]
- Lynskey MT, Fergusson DM. Childhood conduct problems, attention deficit behaviors, and adolescent alcohol, tobacco, and illicit drug use. Journal of Abnormal Child Psychology. 1995; 23:281–302. [PubMed: 7642838]
- Lynskey MT, Grant JD, Nelson EC, Bucholz KK, Madden PA, et al. Duration of cannabis use—a novel phenotype? Addictive Behaviors. 2006; 31(6):984–994. [PubMed: 16713122]
- Mackie, CJ.; Conrod, P.; Brady, K. Depression and substance use. In: Verster, JC.; Brady, K.; Galanter, M.; Conrod, P., editors. Drug abuse and addiction in mental illness: Causes, consequences and treatment. New York, NY: Springer; 2012. p. 275-283.
- Marmorstein NR. Longitudinal associations between alcohol problems and depressive symptoms: early adolescence through early adulthood. Alcohol Clinical and Experimental Research. 2009; 33:49–59.
- Mason WA, Hitchings JE, Spoth RL. Longitudinal relations among negative affect, substance use, and peer deviance during the transition from middle to late adolescence. Substance Use & Misuse. 2009; 44(8):1142–1159. [PubMed: 19544145]
- National Institute of Drug Abuse. Understanding Drug Abuse and Drug Addiction. 2010. Retrieved August 25, 2012 from www.drugabuse.gov

- Nickerson AB, Nagle RJ. Parent and peer attachment in late childhood and early adolescence. *The Journal of Early Adolescence*. 2005; 25(2):223–249.
- Niaura R, Britt DM, Shadel WG, Goldstein M, Abrams D, Brown R. Symptoms of depression and survival experience among three samples of smokers trying to quit. *Psychology of Addictive Behaviors*. 2001; 15:13–17. [PubMed: 11255933]
- O'Donnell L, Stueve A, Duran R, Myint-U A, Agronick G, et al. Parenting practices, parents' underestimation of daughters' risks, and alcohol and sexual behaviors of urban girls. *Journal of Adolescent Health*. 2008; 42(5):496–502. [PubMed: 18407045]
- Odgers CL, Caspi A, Nagin DS, Piquero AR, Slutske WS, et al. Is it important to prevent early exposure to drugs and alcohol among adolescents? *Psychological Science*. 2008; 19(10):1037–1044. [PubMed: 19000215]
- Ogbu, JU. The school achievement of minority children: New perspectives. 1986. The consequences of the American caste system; p. 19-56.
- Okamoto J, Ritt-Olson A, Soto D, Baezconde-Garbanati L, Unger JB. Perceived discrimination and substance use among Latino adolescents. *American Journal of Health Behavior*. 2009; 33(6):718–727. [PubMed: 19320620]
- Pirard S, Sharon E, Kang SK, Angarita GA, Gastfriend DR. Prevalence of physical and sexual abuse among substance abuse patients and impact on treatment outcomes. *Drug and Alcohol Dependence*. 2005; 78(1):57–64. [PubMed: 15769558]
- Prado G, Szapocznik J, Maldonado-Molina MM, Schwartz SJ, Pantin H. Drug use/abuse prevalence, etiology, prevention, and treatment in Hispanic adolescents: A cultural perspective. *Journal of Drug Issues*. 2008; 38(1):5–36.
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Rubin, DB. Multiple Imputation for Nonresponse in Surveys. New York: J. Wiley & Sons; 1987.
- Schafer JL, Graham JW. Missing data: our view of the state of the art. *Psychological methods*. 2002; 7(2):147. [PubMed: 12090408]
- Schilt T, Win MD, Jager G, Koeter MW, Ramsey NF, et al. Specific effects of ecstasy and other illicit drugs on cognition in poly-substance users. *Psychological medicine*. 2008; 38(09):1309–1317. [PubMed: 17988417]
- Schwartz SJ, Unger JB, Zamboanga BL, Szapocznik J. Rethinking the concept of acculturation: Implications for theory and research. *American Psychologist*. 2010; 65(4):237. [PubMed: 20455618]
- Shafer AB. Meta-analysis of the factor structures of four depression questionnaires: Beck, CES-D, Hamilton, and Zung. *Journal of Clinical Psychology*. 2006; 62:123–146. [PubMed: 16287149]
- Shanahan M. Pathways to Adulthood in Changing Societies: Variability and Mechanisms in Life Course Perspective. *Annual Review of Sociology*. 2000; (26):667–692.
- Shedler J, Block J. Adolescent drug use and psychological health: A longitudinal inquiry. *American Psychologist*. 1990; 45(5):612. [PubMed: 2350080]
- Substance Abuse and Mental Health Services Administration. NSDUH Series H-40. Rockville, MD: US Department of Health and Human Services; 2011. Mental Health Services Administration. State estimates of substance use and mental disorders from the 2008–2009 National Surveys on Drug Use and Health.
- Szapocznik J, Perez-Vidal A, Brickman AL, Foote FH, Santisteban D, et al. Engaging adolescent drug abusers and their families in treatment: A strategic structural systems approach. *Journal of Consulting and Clinical Psychology*. 1988; 56(4):552–557. [PubMed: 3198813]
- Szapocznik J, Prado G, Burlew AK, Williams RA, Santisteban DA. Drug abuse in African American and Hispanic adolescents: Culture, development, and behavior. *Annual Review of Clinical Psychology*. 2007; 3:77–105.
- Unger JB, Cruz TB, Rohrbach LA, Ribisl KM, Baezconde-Garbanati L, et al. English language use as a risk factor for smoking initiation among Hispanic and Asian American adolescents: Evidence for mediation by tobacco-related beliefs and social norms. *Health Psychology*. 2000; 19(5):403–410. [PubMed: 11007148]

- Unger JB, Ritt-Olsen A, Soto D, Baezcondi-Garbanati L. Parent-child acculturation discrepancies as a risk factor for substance use among Hispanic/Latino adolescents in Southern California. *Journal of Immigrant and Minority Health*. 2009; 11:149–157. [PubMed: 17922232]
- Unger JB, Ritt-Olsen A, Wagner K, Soto D, Baezconde-Garbanati L. A comparison of acculturation measures among Hispanic/Latino adolescents. *Journal of Youth and Adolescence*. 2007; 36(4): 555–565.
- Unger JB, Shakib S, Gallaher P, Ritt-Olsen A, Mouttapa M, et al. Cultural/interpersonal values and smoking in an ethnically diverse sample of Southern California adolescents. *Journal of cultural diversity*. 2006; 13(1):55. [PubMed: 16696546]
- U.S. Census Bureau. The Hispanic Population: 2010. 2011. Retrieved August 25, 2012, from <http://2010.census.gov/2010census/data/>
- Valente TW, Gallaher P, Mouttapa M. Using social networks to understand and prevent substance use: A transdisciplinary perspective. *Substance Use and Misuse*. 2004; 39:1685–1712. [PubMed: 15587948]
- van Buuren S, Boshuizen HC, Knook DL. Multiple imputation of missing blood pressure covariates in survival analysis. *Statistics in Medicine*. 1999; 18:681–694. [PubMed: 10204197]
- Vega WA. Hispanic families in the 1980s: A decade of research. *Journal of Marriage and the Family*. 1990; 52(4):1015–1024.
- Vega WA, Khoury EL, Zimmerman RS, Gil AG, Warheit GJ. Cultural Conflicts and problem behaviors in Latino Adolescents in home and school environments. *Journal of Community Psychology*. 1995; 23:167–179.
- Vega WA, Gil AG. A model for explaining drug use behavior among Hispanic adolescents. *Drugs & society*. 1998; 14(1–2):57–74.
- Vega WA, Gil AG, Zimmerman R. Patterns of drug use among Cuban-American, African-American, and White non-Hispanic boys. *American Journal of Public Health*. 1993; 83:257–259. [PubMed: 8427335]
- Vega WA, Zimmerman RS, Warheit GJ, Apospori E, Gil AG. Risk factors for early adolescent drug use in four ethnic and racial groups. *American Journal of Public Health*. 1993; 83(2):185–189. [PubMed: 8427320]
- Verster, VC.; Brady, K.; Galanter, M.; Conrad, P. *Drug Abuse and Addiction in Medical Illness; Causes, Consequences and Treatment*. New York: Springer; 2012.
- Wagner KD, Ritt-Olsen A, Chou CP, Pokhrel P, Duan L, et al. Associations between family structure, family functioning, and substance use among Hispanic/Latino adolescents. *Psychology of Addictive Behavior*. 2010; 24:98–108.
- White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol*. 1989; 50(1):30–37. [PubMed: 2927120]
- White IR, Royston P, Wood AM. Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*. 2011; 30:377–399. [PubMed: 21225900]
- Witkiewitz K, Villarroel NA. Dynamic association between negative affect and alcohol lapses following alcohol treatment. *Journal of Consulting and Clinical Psychology; Journal of Consulting and Clinical Psychology*. 2009; 77(4):633.

Figure 1.
Theoretical framework describing problematic substance use in adolescence and young adulthood.

Figure 2. Comparing odds ratios of problematic substance use in 11th grade and young adulthood by predictors in 10th grade using multiply imputed data.

Table 1

Rutgers Alcohol Problem Index (RAPI) items used in the present study to measure problematic substance use.

Item	Description	N (%) reporting event ¹	
Instructions	Different things happen to people while they are drinking <i>alcohol</i> or because of their <i>alcohol</i> drinking or use of <i>other drugs</i> . How many times has each of these things happened within the last month due to drinking or drug use?	11 th grade	Young adulthood
01	Not able to do your homework or study for a test.	621 (23)	221 (8)
02	Got into fights with other people (friends, relatives, strangers).	534 (20)	329 (12)
06	Neglected your responsibilities.	578 (21)	490 (18)
08	Felt that you needed more alcohol (or drugs) than you used to in order to get the same effect.	258 (9)	361 (13)
12	Felt that you had a problem with alcohol or drug use.	171 (6)	195 (7)
19	Kept drinking or using drugs when you promised yourself not to.	312 (11)	321 (12)
22	Felt physically or psychologically dependent on alcohol or drugs.	119 (4)	132 (5)

Note: Item numbers correspond to items on original scale as described in White and Labouvie (1989). The instructions are verbatim as presented to participants in the present study.

¹ Multiple imputation using an estimation-maximization (EM) algorithm was used to handle missing data when generating the frequencies and percentiles presented herein.

Table 2Demographics and characteristics of the study sample in 10th grade (N = 2,722).

Variable	Frequency	Percent
Gender		
Male	1,268	46.6
Female	1,428	52.5
Unknown	26	0.9
Age		
<i>M (SD)</i>	15 (0.45)	
Race/Ethnicity ¹		
Hispanic	1,851	68.0
Latino/a	1,824	67.0
Mexican-American	1,960	72.0
Central American	191	7.0
South American	82	3.0
Chicano/a	735	27.0
La Raza	272	10.0
Mestizo	27	1.0
Participant's country of origin		
United States	1,893	69.5
Mexico	204	7.5
Central America	10	0.4
South America	6	0.2
Other/Unknown	609	22.4
Mother's country of origin		
United States	486	17.9
Outside United States	1,865	68.5
Unknown	371	13.6
Father's country of origin		
United States	362	13.3
Outside United States	1,912	70.2
Unknown	448	16.5
Language use at home		
Only English	256	9.4
Mostly English	369	13.6
English and another language equally	49.3	49.3
Mostly another language	359	13.2
Only another language	87	3.2
Unknown	388	11.3

¹ Race/ethnicity was self-reported and participants had the option to mark one or more selections. Therefore, the total adds up to greater than 100%.

Table 3

Factors in 10th grade predicting problematic substance use* in 11th grade using multiply imputed data adjusted for gender

Predictors	Problematic substance use in 11 th grade			
	Unadj. OR	95% CI	Adj. OR	95% CI
Drug use type and frequency in 10 th grade				
None	1.00	Ref	1.00	Ref
Licit only, non-frequent	1.47	1.13, 1.92	1.26	0.95, 1.67
Licit only, frequent	2.43	1.79, 3.30	1.79	1.27, 2.52
Illicit only	1.99	1.13, 3.51	1.65	0.92, 2.95
Both, non-frequent	2.28	1.68, 3.10	1.77	1.27, 2.47
Both, frequent	5.13	4.03, 6.54	3.30	2.47, 4.41
Friend use in 10 th grade				
None	1.00	Ref	1.00	Ref
1–2	1.71	1.30, 2.26	1.32	0.98, 1.78
3–4	2.81	2.14, 3.68	1.63	1.18, 2.25
All 5	4.73	3.46, 6.46	2.30	1.57, 3.37
Parent use in 10 th grade	1.55	1.30, 1.85	1.20	0.99, 1.46
Psychological distress in 10 th grade	1.39	1.14, 1.69	1.16	0.93, 1.43
Hispanic orientation in 10 th grade	0.86	0.79, 0.93	0.91	0.83, 0.99
Anglo-American orientation in 10 th grade	1.10	0.94, 1.28	1.09	0.92, 1.29
Female	0.93	0.78, 1.09	0.96	0.80, 1.16

Note: Unadj. OR = Unadjusted Odds Ratio, Adj. OR = Adjusted Odds Ratio, 95% CI = Ninety-five percent confidence interval

* Problematic substance use is operationalized as experiencing one or more drug use consequences from the RAPI listed in table one.

Table 4

Factors in 10th grade predicting problematic substance use* in early adulthood using multiply imputed data adjusted for friend use in early adulthood, problematic use in 11th grade and gender.

Predictors	Problematic substance use in early adulthood			
	Unadj. OR	95% CI	Adj. OR	95% CI
Drug use type and frequency in 10 th grade				
None	1.00	Ref	1.00	Ref
Licit only, non-frequent	1.96	1.30, 2.93	1.46	0.94, 2.26
Licit only, frequent	2.45	1.53, 3.90	1.63	0.97, 2.74
Illicit only	1.94	0.87, 4.31	1.49	0.64, 3.45
Both, non-frequent	2.36	1.43, 3.89	1.68	0.96, 2.94
Both, frequent	5.32	3.57, 7.91	2.84	1.72, 4.68
Friend use in 10 th grade				
None	1.00	Ref	1.00	Ref
1–2	1.86	1.21, 2.85	1.27	0.78, 2.06
3–4	2.76	1.78, 4.26	1.32	0.77, 2.26
All 5	4.58	2.75, 7.64	1.70	0.93, 3.09
Friend use in early adulthood				
None	1.00	Ref	1.00	Ref
1–2	1.79	0.74, 4.30	1.63	0.67, 3.97
3–4	3.42	1.44, 8.15	2.68	1.10, 6.50
All 5	10.63	4.44, 25.44	6.53	2.67, 15.96
Parent use in 10 th grade	1.22	0.95, 1.56	0.90	0.67, 1.20
Psychological distress in 10 th grade	0.93	0.71, 1.22	0.92	0.67, 1.26
Hispanic orientation in 10 th grade	0.82	0.73, 0.91	0.92	0.80, 1.04
Anglo-American orientation in 10 th grade	1.16	0.92, 1.46	1.07	0.82, 1.40
Female	0.50	0.40, 0.64	0.60	0.46, 0.79
Drug use consequence in 11 th grade	2.04	1.58, 2.63	1.36	1.00, 1.84

Note: Unadj. OR = Unadjusted Odds Ratio, Adj. OR = Adjusted Odds Ratio, 95% CI = Ninety-five percent confidence interval.

* Problematic substance use is operationalized as experiencing one or more drug use consequences from the RAPI listed in table one.