Published in final edited form as:

J Ethn Subst Abuse. 2020 ; 19(4): 521–536. doi:10.1080/15332640.2018.1548319.

Viewing images of alcohol use in PG-13-rated movies and alcohol initiation in Mexican-heritage youth

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Abstract

Mexican-American adolescents report high rates of alcohol consumption as well as media use. Viewing alcohol images in the media is associated with increased alcohol consumption; however, to date, this association has not been examined across different ethnic groups in the United States (U.S.). To bridge this gap, we examined the association between viewing alcohol use images in PG-13-rated movies and alcohol initiation in Mexican heritage adolescents. A cohort of 1,154 Mexican heritage youth, average age 14 years, was followed for 2 years; in 2008–09, participants reported alcohol use in the past 30 days and again in 2010–11. Exposure to alcohol use images in PG-13-rated movies was estimated from 50 movies randomly selected from a pool of 250 of the top-box office hits in the U.S. using previously validated methods. A series of Generalized Linear Models, adjusting for age, gender, peer and family alcohol use, family functioning, anxiety, sensation seeking tendency, and acculturation were completed. Multiple imputation was utilized to address missing data. Overall, N=652 participants reported no alcohol use in 2008–09, by 2010–11, 33.6% (n=219) had initiated alcohol use. Adjusted models indicated an independent association between exposure to alcohol use images in PG-13-rated movies and alcohol initiation (comparing quartiles 3 to 1: RR=1.53; 95% CI=1.11–2.10). The findings emphasize that the relationship between viewing alcohol use scenes in American films and alcohol initiation holds among Mexican heritage adolescents and underscore the need to limit adolescents' exposure to such powerful images in PG-13 rated movies.

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Declaration of potential conflicts of interests:

The authors declare that they have no potential conflicts of interest.

Keywords

Alcohol initiation; PG-13 Movies; Mexican heritage adolescents

INTRODUCTION

Among Hispanic Americans, the largest ethnic group in the United States (U.S.) (U.S. Census Bureau, 2015), 76.2% of 12th graders report drinking alcohol at least once, compared with between 42.7% and 62.3% of youth from other ethnic minority groups (Centers for Disease Control and Prevention, 2015). Even more concerning is that approximately one in five Hispanic adolescents report “binge drinking,” which is defined as drinking at least five alcoholic drinks in a row in the past 30 days. Although this rate is slightly lower than the rate among non-Hispanic whites, it is significantly higher than the rates among adolescents from other ethnic minority groups (Swendsen et al., 2012) in the U.S. Alcohol use during childhood can lead to binge drinking and other substance use (Clark, Bukstein, & Cornelius., 2002), both of which likely influence brain development and function in adolescents (Peeters, Vollebergh, Wiers, & Field., 2014).

A growing body of literature indicates that adolescents who are exposed to alcohol messages in the media (Scott, Muirhead, Shucksmith, Tyrrell, & Kaner, 2017; Smith & Foxcroft, 2009), and in particular in movies, are more likely to consume alcoholic drinks (Sargent, Wills, Stoolmiller, Gibson, & Gibbons, 2006). A study conducted in Latin America, for instance, found that among middle age school students, those who were categorized in the higher quartiles of exposure to alcohol images in films were 99% more likely to have consumed alcohol in the past 30 days, and 68% more likely to have consumed more than four or five drinks in a row, compared with those in the lowest category of exposure (Mejia et al., 2016). In a heterogeneous sample of European youth who had a low affinity for alcohol use, exposure to the highest compared to the lowest levels of alcohol use in movies increased the incidence of alcohol onset by about 30% (Hanewinkel et al., 2014). A dose-response link was also reported; each additional hour of viewing alcohol images in popular movies increased the risk of alcohol onset by 15% for up to two years later among U.S. youth (Sargent et al., 2006).

Today, adolescents, mostly in western countries, in addition to traditional advertising and marketing efforts, also are exposed to alcohol posts and images on a daily basis via multiple modalities such as social media, internet, movies and television programs (Scott et al., 2017; Smith & Foxcroft, 2009). The proliferation of streaming and mobile devices in the past decade has provided youth with unprecedented opportunities to access movie content (Vandewater & Denis, 2011), which places them at a higher risk of alcohol use due to the elevated exposure to alcohol messages and scene images. Hispanic American youth might be at an even higher risk of alcohol use because, on average, they have 1.5 times greater exposure to daily media, and the total time spent watching movies in movie theaters is 2.5 times more than their non-Hispanic white counterparts (Rideout, Foehr, & Roberts, 2010).

To date, despite the growing body of literature, only a few studies have examined the relationship between viewing alcohol images and alcohol use among specific ethnic groups

(Gibbons et al., 2010), and none have examined Hispanic Americans in general, or specifically, in Mexican-Americans, the largest ethnic subgroup of Hispanic Americans (U.S. Census Bureau, 2015). To expand our understanding of this important association across different ethnic groups, we aim to examine the relationship between viewing alcohol images in PG-13-rated movies (parental guidance suggested for children under 13 years of age) and alcohol initiation among Mexican heritage youth, while controlling for associated risk factors that are particularly relevant to our study population, such as family interrelationship, acculturation, family and peer alcohol use, anxiety and drug and alcohol-seeking tendencies. We hypothesized that viewing images of alcohol use in PG-13-rated movies will increase the risk of alcohol initiation in Mexican heritage youth.

METHODS

Participant recruitment

Participants were recruited from a cohort of Mexican-American households residing in Houston in 2001, known as the Mexican-American Cohort Study (MACS). Households were initially recruited via probability random-digit dialing, door-to-door recruitment, intercepts, and networking approaches. A detailed description of the MACS recruitment methodology has been published (Chow et al., 2017; Wilkinson et al., 2005). In 2005, a total of 3,000 households with potential age-eligible participants (adolescents between 11 and 13 years) were identified from the MACS database. Parents or legal guardians were contacted to assess their interest in enrolling their eligible children in a youth cohort study. A total of 1,328 parents agreed and enrolled their child in the Mexican-American Tobacco Use in Children (MATCH) Study. The Institutional Review Boards at The University of Texas M. D. Anderson Cancer Center and The University of Texas Health Science Center at Houston approved all aspects of this study.

Data collection procedures

In 2005–06, after the participants consented to join the study, a short interview was conducted in which basic demographic data were obtained. Afterwards, participants completed a survey on a personal digital assistant (PDA) to ensure confidentiality. Data were gathered in English or Spanish based on the participant's preference. All participants received a \$25 gift certificate after each home interview. A detailed description of the baseline data collection procedures has been published (Wilkinson et al., 2008). Of the 1,328 participants enrolled in 2005–06, 1,154 (87%) participated in 2008–09, and 1,002 (75%) participated in 2010–11. Alcohol use questions were gathered in 2008–09 and 2010–11 only. Therefore, we focus on these two waves of data, with 2008–09 serving as the baseline in our analysis.

Study variables

Main outcome—Alcohol initiation was based on two questions: 1. “During your life, on how many days have you had at least one drink of alcohol?” and 2. “How old were you when you had your first drink of alcohol other than a few sips?” Participants who answered “none” to the first question and “I have never had a drink of alcohol other than a few sips” to the second question were coded as “0” indicating that participant never initiated alcohol use. All

others were coded as “1,” indicating that the participant reported alcohol use. The final analysis included participants who were coded as “0” in 2008–09 and who completed a follow-up in 2010–11.

Main exposure—Alcohol use images in PG-13-rated movies was based on the participants’ exposure to alcohol use images in PG-13 movies and was estimated using the “Beach Method,” a validated method developed at Dartmouth Medical School (Sargent, Worth, Beach, Gerrard, & Heatherton, 2008). Briefly the alcohol coding process was as follows: trained coders reviewed each movie and measured the duration of time of alcohol use occurrences on-screen. An alcohol use occurrence was counted whenever a major or minor character handled or used alcohol in a scene or when alcohol use was shown in the background (e.g. extras drinking alcohol in a bar scene) (Hanewinkel et al., 2014). The Interrater reliability for the determination of on-screen alcohol use was 0.96 (Sargent et al., 2006). In 2008–09 exposure to alcohol use in movies was calculated when participant indicated whether or not s/he had seen 50 movies randomly selected from a pool of 250 of the top box office hits in the U.S. for the years 2003–07. Then based on the movies each adolescent had reported, and the time of alcohol use content in each movie, exposure to alcohol use images from the 50 movies was computed. The total time was then adjusted to account for differences in the aggregate number of scenes depicting alcohol use per random selection of 50 movies by scaling the estimate so that it reflected the total exposure to scenes depicting alcohol use in the larger selection of 250 movies (Sargent et al., 2008). To be consistent with previous work (Hanewinkel et al., 2014), we divided the total time of exposure to images of alcohol use into quartiles, with the lowest quartile serving as the reference category.

Demographic variables

Girls served as the reference category for gender, Mexico was the reference category for the country of birth, and age was treated as a continuous variable. Parental educational attainment (“less than high school” vs. “high school/general educational development equivalency or more”), provided by at least one parent and was examined as a marker of socioeconomic status rather than household income, because more than 40% of the parents did not report their income.

Study covariates

Study covariates (Table 1) were selected based on previous studies that showed well-established associations with alcohol initiation among Hispanic Americans such as acculturative gaps (Goldbach, Berger Cardoso, Cervantes, & Duan, 2015), family cohesion and conflict (Caetano, Vaeth, & Canino, 2017), anxiety (Johannessen, Andersson, Bjorngaard, & Pape, 2017), sensation-seeking tendencies (Wilkinson, Shete, Spitz, & Swann, 2011) and family and peer drinking (Cambron, Kosterman, Catalano, Guttmanova, & Hawkins, 2017).

Statistical analysis

Differences among covariates by levels of alcohol initiation (Yes vs. No) were assessed by Pearson’s chi-square (χ^2) for categorical covariates and Student’s t-test for continuous

covariates (Table 2). We used analysis of variance to examine differences for continuous covariates and Pearson's χ^2 for categorical covariates, by exposure levels of alcohol use images in PG-13-rated movies (Table 3). Post-hoc comparisons of significant mean differences were completed; a Bonferroni adjustment was used to correct for multiple comparisons in the case of equal variances, Tamhane's T2 adjustment when equal variances were not assumed, and Pearson's χ^2 for each pair of binomial variables. Additionally, we performed nonparametric tests for trend analysis across ordered groups.

Next, we conducted a series of Generalized Linear Models (GLMs) for the univariate and multivariable analyses using the binomial family and the probit link function to examine the crude and adjusted relative risks (RR) and associated 95% confidence intervals (95% CI) for each independent variable separately and for alcohol initiation. We then developed full models in which we included all covariates that displayed a bivariate association ($p < 0.25$) (Mickey & Greenland, 1989) with alcohol initiation. Likelihood ratio tests were used to remove covariates demonstrating the least significant association ($p > 0.05$) with alcohol initiation to eventually create the most parsimonious models (Table 4). Age and gender were forced into the final models as control variables. Multiple imputations by chained equations were performed to impute missing values ($< 9\%$, $n = 40$) of the independent variables that were included in the most parsimonious models: number of family members who drink ($n = 4$), number of close peers who drink ($n = 24$) and sensation-seeking tendencies ($n = 12$) and the pattern of the missing data was missing at random. We imputed missing values five times using the program RStudio, version 0.99.484 and verified that the distribution of the imputed data was similar to that of the observed data. We summarized the results of the five complete data sets into single estimates of relative risks and associated 95% CI (Sterne et al., 2009). Prior to completing these analyses, we compared the variables of interest among those lost in 2008–09 with those that remained in the sample in 2010–11 using Pearson's χ^2 for categorical covariates and Student's t-test for continuous covariates. A p -value < 0.05 was adopted as the significance level.

RESULTS

The total analytic final sample includes 652 Mexican-heritage youth who reported no use of alcohol in 2008–09 and who completed the follow-up in 2010–11. Participants lost to follow-up ($n = 86$) had higher drug and alcohol-seeking scores (0.88 vs. 0.58; $p = 0.011$), were slightly older (mean age 14.7 vs. 14.2 years; $p = 0.0001$) and had a higher prevalence of smoking (12.8% vs. 5.9%) than those included.

Descriptive Statistics

Table 2 presents the incidence of alcohol initiation by demographic and risk factors among the 652 participants. Overall, 51% were girls, 26% were born in Mexico, and the average age in 2008–09 was 14.1 ± 1.0 years (mean $\pm$ SD). By 2010–11, 33.6% of the 652 participants reported alcohol initiation, with a higher prevalence among boys (37.9%) vs. girls (29.4.0%; $p = 0.022$). Participants reported viewing an average of 99.2 minutes (SD = 71.0 minutes, 95% CI: 94–104.3 minutes) of alcohol use images in the PG-13-rated movies. The median duration of alcohol use images was 107.9 minutes (interquartile range: 48.5–172.9 minutes).

Participants who reported alcohol initiation had on average a higher number of family members who drink alcohol (1.05 vs. 0.68, $t=5.9$, $df=646$; $p=0.0001$) and a higher number of peers who drink alcohol (0.75 vs. 0.30; $t=7.9$, $df=615$; $p=0.0001$) compared with their counterparts who did not initiate alcohol use.

Bivariate Analysis

As can be seen in Figure 1, alcohol initiation increased across quartiles of exposure for alcohol use images and is consistent with Table 3, wherein the lowest quartile, only 19% initiated alcohol use, whereas in the second through the highest quartile this proportion increased from 35% to 41%. In addition, most of the study's covariates varied across quartiles of alcohol use images in the expected direction. For example, the proportion of smoking increased from 4% to 9% at the highest quartile, and all three subscales of sensation seeking tendencies increased by a quartile of exposure (p -trend <0.05 for all); drug and alcohol seeking, increased by a quartile of exposure from 0.51 ± 0.95 (Mean $\pm$ SD) to 0.77 ± 1.17 at the highest exposure (p -trend=0.013), thrill and adventure seeking increased from 4.94 ± 3.25 to 7.28 ± 3.34 at the highest exposure (p -trend <0.001) and social disinhibition increased from 1.65 ± 1.47 to 2.52 ± 1.34 at the highest exposure (p -trend <0.001). Notably, only family cohesion, family conflict, and anxiety did not significantly change with increasing exposure to images of alcohol use ($p>0.05$ for all).

Multivariable analysis

Table 4 presents results from the multivariable analysis using generalized linear models. Based on the final model with the imputed missing values, exposure to alcohol use images in movies was significantly associated with alcohol initiation ($RR_{Q1vs.Q3}=1.53$; 95% CI: 1.11–2.10; $p=0.008$) after controlling for significant covariates: anxiety, smoking status, family members and number of peers who drink alcohol. The likelihood tests indicated that the most parsimonious model provided as good a fit as the full model ($\chi^2=0.96$ ($df=5$) $p=0.657$) for alcohol initiation. Another way to present the result is from the prevention prospective: youth in the lowest quartile of exposure (viewing on average 20 minutes of images of alcohol use) were 32% less likely to have initiated alcohol use by the end of the follow-up compared to youth in the highest level of exposure (viewing on average 193 minutes of images of alcohol use); ($RR=0.68$; 95% CI: 0.49–0.93; $p=0.016$; data not shown).

DISCUSSION

Here, we report for the first time that the association between viewing images of alcohol use in movies, and the risk for alcohol onset also applies to Mexican heritage youth. Higher levels of exposure to images of alcohol use in PG-13-rated movies increased the risk of alcohol initiation by 49% to 53% up to two years later in Mexican heritage adolescents, after controlling for risk factors associated with alcohol initiation such as smoking status, number of households with members that drink, as well as risk factors that could promote both increased alcohol onset and increased interest in films that depict drinking, such as peer drinking, and drug and alcohol sensation-seeking-tendency.

In the current study we analyzed alcohol images only in PG-13-rated movies, since those movies are allowed for adolescents aged 13 years or older without parental oversight, which corresponds to the cut-off age in our study sample. In addition, movies rated PG-13 account for more minutes of alcohol use exposure than movies rated G/PG or R (Dal Cin et al., 2008). Roughly 88% of PG-13-rated movies include at least one scene in which alcohol is used. Of particular concern, roughly 27% of young adolescents in the U.S. are exposed to PG-13-rated movies (Sargent et al., 2006).

Cultural norms in Mexico dictate that alcohol is typically consumed at social and festive events, and alcohol use is less common among Mexican youth compared to American youth (Benjet, Borges, Mendez, Casanova, & Medina-Mora, 2014). Exposure to imagery of alcohol use in American movies may influence norms and expectations about alcohol use; this influence might be particularly powerful among youth as they acculturate. Accordingly, some Mexican heritage youth might initiate alcohol use as in an attempt to emulate U.S. norms during adolescence and the transition to young adulthood (Thrasher et al., 2014).

Our findings are consistent with previous studies in the arena (Dal Cin, Worth, Dalton, & Sargent, 2008; Hanewinkel & Sargent, 2009; Hanewinkel et al., 2014; Hanewinkel et al., 2012; Sargent et al., 2006). For example, a study based on a nationally representative sample of U.S. adolescents found that exposure to alcohol use in movies was directly linked to alcohol use and indirectly linked to an increase in their friends' alcohol use (Sargent et al., 2006). Hanewinkel et al. (2009) reported a 24% to 34% increased risk for alcohol initiation among German youth due to exposure to alcohol use images in movies. A cross-sectional study with 13,295 middle school students from Mexico and Argentina found that students at the higher quartiles of exposure for alcohol use images in films were significantly more likely to drink alcohol in the past 30 days by 99%, and to drink more than 4 or 5 drinks in a row for females and males, respectively by 68%, after controlling for peer drinking, sensation seeking, parenting style, and media access (Mejia et al., 2016).

In contrast to other studies (Dal Cin et al., 2008; Hanewinkel et al., 2014; Mejia et al., 2016; Sargent et al., 2006; Stoolmiller, Gerrard, Sargent, Worth, & Gibbons, 2010), we did not observe a linear dose-response relationship between quartiles of exposure and alcohol initiation in the fully adjusted model (although we did in the crude model). There are number of possible explanations. One, we did not include other rated movies in our analysis such as R-rated movies, which is one of the more powerful predictors of alcohol initiation (Stoolmiller et al., 2010). Two, we did not measure with whom the participants watched the movies; with their Mexican and/or American friends or family members, and where (e.g. mobile device, theatre), which might influence participants' attention and perception of all/ some alcohol scenes, specifically at the higher levels of exposure. Three, our study sample was relatively small and not diverse to statistically reveal such links, as opposed to other studies that analyzed national surveys with heterogeneous samples (Hanewinkel et al., 2014; Hanewinkel et al., 2012; Sargent et al., 2006).

The current study has both strengths and limitations. The first strength is the study population, a large ethnically homogenous and predominantly low-income sample of Mexican heritage youth, which is an understudied population. The multivariable analysis

included well-established risk-factors associated with both alcohol initiation and interest in films with drinking such as drug and alcohol seeking tendency, peer and family alcohol experience, as well as covariates related to the Mexican heritage population such as acculturation, family functioning, and country of birth. Another strength is the prospective design, as to date, only a handful of studies have longitudinally examined the initiation of early drinking following exposure to alcohol use images in movies (Hanewinkel & Sargent, 2009; Hanewinkel et al., 2014). In addition, we used the well-established “Beach Method” to measure exposure to alcohol portrayed in PG-13-rated movies that had been validated and used in leading studies in this field (Hanewinkel & Sargent, 2009; Hanewinkel et al., 2014; Mejia et al., 2016). Finally, the retention rate was high over roughly 24 months, as 87% of the youth provided data at both contacts.

One limitation of this study is that the participants are all of Mexican heritage, and therefore, the results cannot be generalized to youths in other Hispanic American subgroups. We used parental education as our main marker of socioeconomic status, rather than income level, which might be more associated with alcohol use. Residual confounding, due to unknown risk factors, which might increase interest in both movies and drinking alcohol, cannot be ruled out. Our acculturation measure did not include elements related to language preference when watching movies. Therefore, the level of attention and understanding of American films may differ among students who watched films in Spanish vs. English. We cannot conclude from our study sample whether the effect of movies on alcohol initiation was immediate, had latent effects, or both. In addition, other sources of media exposure were not included in the analysis, such as TV viewing and internet use, which include imagery of alcohol use and might contribute to the manifestation of alcohol initiation. Of importance, study participants who were lost to follow-up reported higher drug and alcohol-seeking tendencies than those who completed the follow-up, which might serve to attenuate the relationship toward the null.

CONCLUSIONS

Viewing images of alcohol use in PG-13-rated American movies is associated with alcohol initiation among Mexican heritage adolescents, the most rapidly growing ethnic group in the U.S. The finding has important implications for prevention since it underscores the need to limit adolescents’ exposure to such powerful images in PG-13 rated movies. Additional research is needed, however, to further understand the mechanisms by which other aspects of media influence youth drinking behavior including youth from different ethnic groups.

Acknowledgements

This study was supported by the National Cancer Institute (R01 CA105203 to MRS and K07 CA126988 to AVW). We thank the Mano a Mano cohort staff for their ongoing work with participant recruitment and follow-up. The Mano a Mano cohort is funded by funds collected pursuant to the Comprehensive Tobacco Settlement of 1998 and appropriated by the 76th legislature to the University of Texas M.D. Anderson Cancer Center; by the Caroline W. Law Fund for Cancer Prevention; and by the Dan Duncan Family Institute for Cancer Prevention and Risk Assessment. We would like to express our gratitude to the participants of this study and the MATCH research team for their hard work collecting the data.

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Figure 1:
Percent of initiating alcohol use until 2010–11 by quartile of exposure to images of alcohol use in PG-13 movies in 2008–09

Table 1

Description of Study Covariates

Construct	Description
Covariates assessed in 2008–09	
Linguistic Acculturation	Assessed using four items that ascertain the language used when reading, speaking at home, speaking with friends, and thinking (Norris, Ford, & Bova, 1996). Responses were made on a five-point Likert scale ranging from “only Spanish” to “only English” and were averaged to create a summary score (Cronbach’s alpha=0.92); higher scores reflect greater use of English than Spanish and reflect higher linguistic acculturation
Family Cohesion & Family Conflict	Assessed using the Family Life Questionnaire (FLQ) (Foxcroft & Lowe, 1995), which assesses the youth’s perception of family functioning in their environment. The structure of the items in the FLQ was validated among adolescents (Foxcroft & Lowe, 1991). For each item, a four-point Likert scale ranging from “strongly disagree” (1-point) to “strongly agree” (4-points) was used. The family cohesion subscale included four items. For each subscale, the responses were averaged to create a summary score (Cohesion: Cronbach’s alpha=0.83) (Conflict: Cronbach’s alpha=0.65). Higher scores in each scale reflect higher levels of cohesion and lower levels of conflict.
Anxiety	Assessed using Spielberger’s trait anxiety scale (Spielberger, 1985), which consists of 20 items that are validated with Spanish-speaking populations in the U.S. (Novy, Nelson, Smith, Rogers, & Rowzee, 1995). Anxiety scores (Cronbach’s alpha=0.86) reflect the average of all items. The variables ranged from 20 to 80 and a higher score indicated higher levels of anxiety.
Sensation-Seeking Tendencies	Assessed using the Sensation Seeking Scale for Children (Russo et al., 1993) a 26-item scale consisting of three subscales: thrill and adventure-seeking-tendency (Cronbach’s alpha=0.81), drug and alcohol-seeking-tendency (Cronbach’s alpha=0.72), and social disinhibition (Cronbach’s alpha=0.68). Two items (Item number 2 and 26) on the social-disinhibition subscale relating to movie preferences were excluded to reduce potential bias. Subscale values ranged from 0 to 12, 0 to 7, and 0 to 5, respectively. Higher values indicated higher levels of sensation-seeking tendencies for each subscale
Smoking Status	Assessed using the single standard item: “Have you ever smoked a cigarette, even a puff?” Participants were coded “1” if they answered “yes,” and “0” otherwise
Covariates assessed in 2010–11	
Family Alcohol Use	Assessed based on the number of household members who currently drank. For each potential household member (i.e., father, mother, sister/s, brother/s) the participant answered, “Does your <father> drink alcohol?” and “Do you live with your <father>?” The number of household members who currently drink and reside with the study participant was summed up. The variable was coded as “0,” “1,” or “2 or more,” with zero as the reference category
Peer Alcohol Use	Assessed using: “How many of your three closest friends drink alcohol?” Response options were coded as “0,” “1,” or “2 or more,” with zero as the reference category.

Table 2

Incidence of alcohol use initiation at 2010–11 by demographic characteristics and study covariates assessed in 2008–09.

	Alcohol use initiation (N=652)		p-value
	No N (%)	Yes N (%)	
	433 (66.4)	219 (33.6)	
Alcohol images-Quartiles			<0.001
Q1-lowest	131 (80.4)	32 (19.6)	
Q2	107 (65.6)	56 (34.4)	
Q3	100 (61.4)	63 (38.6)	
Q4-Highest	95 (58.3)	68 (41.7)	
Gender			0.022
Girls	235 (70.6)	98 (29.4)	
Boys	198 (62.1)	121 (37.9)	
Age in years			0.043
Mean (SD)	14.2 (1.0)	14.0 (1.0)	
Country of birth			0.367
Mexico	117 (69.2)	52 (30.8)	
USA	316 (65.4)	167 (34.6)	
Parental educational			0.576
< High school	289 (68.0)	136 (32.0)	
High school	141 (64.1)	79 (35.9)	
Linguistic acculturation			0.272
Mean (SD)	3.52 (0.7)	3.45 (0.7)	
Number of family members who drink ^a			<0.001
None	202 (76.5)	62 (23.5)	
1	165 (67.1)	81 (32.9)	
2 or more	65 (47.1)	73 (52.9)	
Number of close peers who drink ^a			<0.001
None	310 (75.1)	103 (24.9)	
1	75 (58.1)	54 (41.8)	
2 or more	24 (32.0)	51 (68.0)	
Smoking status			<0.001
No	419 (68.4)	194(31.6)	
Yes	14 (35.9)	25 (64.1)	
Family cohesion			0.027
Mean (SD); Range	3.21 (0.5); 1–4	3.12 (0.5); 1–4	
Family conflict			0.096
Mean (SD)	2.75 (0.5);1–4	2.58 (0.5); 1–4	
Thrill & adventure seeking			<0.001
Mean (SD); Range	5.93 (3.3) 0–12	6.97 (3.3); 0–12	
Social disinhibition			<0.001

	Alcohol use initiation (N=652)		p-value
	No N (%)	Yes N (%)	
	433 (66.4)	219 (33.6)	
Mean (SD)	1.90 (1.4); 0–5	2.45 (1.3); 0–5	
Drug & alcohol seeking			0.004
Mean (SD); Range	0.50 (0.9); 0–7	0.73 (1.1); 0–7	
Anxiety			0.007
Mean (SD); Range	35.94 (9.4); 20–71	37.95 (8.1); 20–71	

Q=Quartile

^a Covariates assessed in 2010–11

Table 3:
Distribution of alcohol initiation and study covariates by quartile of exposure to alcohol use images in PG-13 rated movies

	Q1 (N=163)		Q2 (N=163)		Q3 (N=163)		Q4 (N=163)		p-trend
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		
Alcohol images in PG-13 rated movies (minutes)	20.16 (11.25) ^a		64.75 (14.85) ^b		117.52 (15.06) ^c		193.03 (32.40) ^d		<0.001
Proportion alcohol initiation (SE)	0.19 (0.03) ^a		0.35 (0.04) ^b		0.38 (0.04) ^b		0.41 (0.03) ^b		<0.001
Proportion boys (SE)	0.38 (0.03) ^a		0.47 (0.039) ^{ab}		0.52 (0.04) ^b		0.58 (0.04) ^b		<0.001
Proportion born in Mexico (SE)	0.30 (0.04) ^a		0.34 (0.04) ^a		0.26 (0.03) ^a		0.15 (0.03) ^b		<0.001
Proportion parents high school education (SE)	0.27 (0.04) ^a		0.31 (0.04) ^a		0.40 (0.03) ^a		0.39 (0.04) ^a		0.011
Linguistic acculturation	3.24 (0.68) ^a		3.42 (0.71) ^{ab}		3.55 (0.69) ^{bc}		3.68 (0.75) ^c		<0.001
Age (years)	13.89 (0.96) ^a		13.91 (1.07) ^a		14.13 (0.91) ^{ab}		14.31 (0.91) ^b		<0.001
Number of household members who drink	0.66 (0.73) ^a		0.84 (0.75) ^a		0.85 (0.79) ^a		0.87 (0.78) ^a		0.018
Number of close peers who drink	0.35 (0.64) ^a		0.45 (0.70) ^{ab}		0.42 (0.67) ^{ab}		0.60 (0.77) ^b		0.004
Proportion of smoking experience	0.04 (0.01) ^a		0.04 (0.01) ^a		0.08 (0.02) ^b		0.09 (0.02) ^b		0.022
Family cohesion	3.17 (0.49) ^a		3.24 (0.46) ^a		3.18 (0.46) ^a		3.14 (0.45) ^a		0.229
Family conflict	2.71 (0.59) ^a		2.77 (0.52) ^a		2.73 (0.49) ^a		2.70 (0.58) ^a		0.591
Thrill & adventure seeking	4.94 (3.24) ^a		6.07 (3.10) ^b		6.85 (3.18) ^{bc}		7.28 (3.34) ^c		<0.001
Social disinhibition	1.65 (1.47) ^a		1.79 (1.34) ^b		2.39 (1.38) ^{bc}		2.52 (1.34) ^c		<0.001
Drug & alcohol seeking	0.51 (0.95) ^a		0.50 (0.91) ^a		0.54 (0.94) ^a		0.77 (1.17) ^a		0.013
Anxiety	36.23 (8.70) ^a		36.32 (8.87) ^a		36.73 (9.09) ^a		37.10 (9.50) ^a		0.478

Note. Means with the same letters are not statistically significantly different from each other. Conversely, means with different letters are statically significantly different from each other. Q=Quartile. SE=standard error.

Crude and adjusted relative risks and (95% CI) for alcohol use initiation (Yes vs. No) in 2010–11 among participants who had never tried more than a sip of alcohol at the beginning of the follow up in 2008–09

Table 4:

	Crude model (N=652)			Full model (N=612)			Reduced model (N=612)			Final Model MI (N=652)		
	RR	95% C.I	p-value	RR*	95% C.I	p-value	RR*	95% C.I	p-value	RR*	95% C.I	p-value
Alcohol images in PG-13 movies (ref-Q1)												
Q2	1.57	1.17–2.11	0.003	1.44	1.04–2.00	0.028	1.40	1.02–1.93	0.038	1.49	1.09–2.05	0.013
Q3	1.76	1.31–2.37	<0.001	1.51	1.09–2.10	0.014	1.48	1.07–2.04	0.018	1.53	1.11–2.10	0.008
Q4	1.91	1.42–2.56	<0.001	1.44	1.03–2.00	0.034	1.41	1.01–1.97	0.041	1.48	1.08–2.04	0.016
Age (years)	1.10	0.99–1.22	0.065	1.03	0.91–1.15	0.633	1.02	0.91–1.14	0.722	1.02	0.91–1.14	0.708
Gender (ref-girls)	0.79	0.65–0.97	0.022	0.86	0.67–1.09	0.220	0.86	0.69–1.08	0.185	0.87	0.70–1.08	0.222
Country of birth (ref-Mexico)	1.11	0.88–1.39	0.366	--	--	--	--	--	--	--	--	--
Number of households members who drink (ref-none)												
1	1.32	1.05–1.67	0.018	1.26	0.97–1.62	0.071	1.27	0.97–1.02	0.059	1.24	0.97–1.59	0.079
2 or more	2.21	1.69–2.89	<0.001	1.80	1.33–2.43	<0.001	1.01	1.35–2.45	<0.001	1.71	1.28–2.29	<0.001
Number of peers who drink (ref-none)												
1	1.60	1.24–2.78	<0.001	1.36	1.04–1.79	0.027	1.38	1.05–1.80	0.020	1.44	1.08–1.85	0.012
2 or more	3.14	2.27–4.34	<0.001	2.62	1.84–3.68	<0.001	2.62	1.84–3.71	<0.001	2.64	1.88–3.72	<0.001
Smoking status	2.31	1.52–3.51	<0.001	2.14	1.31–3.48	0.002	2.11	1.30–3.41	0.002	1.99	1.28–3.10	0.002
Family cohesion	0.79	0.63–0.97	0.028	0.88	0.66–1.16	0.366	--	--	--	--	--	--
Family conflict	0.86	0.71–1.03	0.096	1.02	0.80–1.23	0.892	--	--	--	--	--	--
Thrill & adventure seeking	1.06	1.03–1.09	<0.001	1.00	0.96–1.05	0.787	--	--	--	--	--	--
Social disinhibition	1.18	1.10–1.27	<0.001	1.07	0.98–1.18	0.137	1.08	0.99–1.17	0.056	1.08	0.99–1.16	0.054
Drug & alcohol seeking	1.15	1.05–1.27	0.004	0.99	0.88–1.13	0.938	--	--	--	--	--	--
Anxiety	1.02	1.00–1.03	0.007	1.01	1.00–1.02	0.104	1.01	1.00–1.03	0.041	1.01	1.00–1.03	0.016

* Note. Adjusted for all other variables presented in the reduced model. MI=Multiple Imputation. Ref=The reference group is identified in ().