ALCOHOL USE BEHAVIOR GROWTH TRAJECTORIES DURING DEVELOPMENTAL TRANSITION FROM ADOLESCENCE TO YOUNG ADULTHOOD AMONG ASIAN AMERICAN ADOLESCENTS

by

Hyeon Suk Kim

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Nursing)
in The University of Michigan
2010

Doctoral Committee:

        Professor Carol J Loveland-Cherry, Chair
        Professor Joanne Pohl
        Associate Professor Cleopatra Howard Caldwell
        Associate Professor Kerby A. Shedden
        Research Associate Professor C Raymond Bingham

Hyeon Suk Kim

Table of Contents

List of Tables

Table

List of Figures

Figure

ABSTRACT

ALCOHOL USE BEHAVIOR GROWTH TRAJECTORIES DURING DEVELOPMENTAL TRANSITION FROM ADOLESCENCE TO YOUNG ADULTHOOD AMONG ASIAN AMERICAN ADOLESCENTS

by

Hyeon Suk Kim

Chair: Carol J. Loveland-Cherry

Studies on alcohol use among Asian American adolescents have been limited, although this population is increasing. The sample for this study was Asian American adolescents. The purpose was to identify trajectories of alcohol use and to investigate the significant predictors of alcohol use from early adolescence to young adulthood. The specific aims were: 1) investigate predictors of different ages of onset of alcohol use; 2) determine the impact of acculturation and psychosocial factors on alcohol use trajectories; and 3) identify the influence of parent, peer, school, and neighborhood factors on alcohol use trajectories at the individual-level, and the school and neighborhood-level.

This study was a secondary analysis using a nationally representative longitudinal data set from the National Longitudinal Study of Adolescent Health. Hierarchical Linear

Modeling was used for growth curve analyses. Kaplan-Meier survival analysis and logistic regression were employed to identify predictors of age of alcohol use onset. SAS were used to handle the design effects of a weighted stratified cluster sample. Multiple imputation of missing values was conducted using IVEware.

The findings of this study were that the predictors of initiation of alcohol use were different across age groups of onset of alcohol use. Additionally, the most acculturated adolescents tended to drink more alcohol on average than those who were least acculturated. Depressive symptoms and self-esteem were not significantly associated with alcohol use, but greater religiosity was associated with less alcohol use over time. Peer and father's alcohol use and poor adolescent-father relationships predicted increased adolescent alcohol use. School factors such as strong school bonding, few school absences, and high academic achievement were strongly and negatively associated with alcohol use, whereas, perceived neighborhood factors had no significant influence. At the school level, school prevention programs and policies against alcohol use were not significantly associated with alcohol use among Asian American adolescents.

The findings support the need for prevention and education programs against alcohol use and health policies for health promotion for Asian American adolescents. Interventions to delay the onset of alcohol use and decrease alcohol use should focus on peer and parental influences and promotion of positive school outcomes.

Chapter I

Introduction and Conceptual Framework

Adolescence, as a developmental stage, is characterized by the initiation of risky health behaviors, such as alcohol use, smoking, and use of other substances (Hawkins et al., 1992). Risky behaviors are often initiated in early-to-middle adolescence and reach peak levels in young adulthood (ages 18-25), after which they decline (Schulenberg et al., 1997). During the transition from early adolescence to young adulthood, alcohol use typically begins and use is either maintained or accelerates. During this period, family, peer, school, and neighborhood environments are significant factors related to substance use (Schulenberg et al.). According to Healthy People 2010, adolescent substance use, including alcohol, continues to be a major health concern for the nation (USDHHS, 2000). The developmental period of adolescence is, therefore, a critical time for the study of the relationships between alcohol use behaviors and adolescents' characteristics (Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996).

The Asian American population has been increasing among American racial groups in the last few decades. However, MEDLINE data showed that only 0.01% of all published research articles were on Asian Americans (Ghosh, 2003; Price, Risk, Wong, & Klingle, 2002). In addition, there is a dearth of studies about risk and protective factors

for alcohol use among Asian American adolescents compared to other race and ethnic groups in America. Therefore, it is important to understand the predictors of alcohol use from early to late adolescence and in young adulthood among Asian American adolescents in order to tackle developing alcohol problems early and successfully.

Factors influencing alcohol use among adolescents may vary over the period from middle to high school (Hawkins et al., 1992; Newcomb, 1997). A number of factors need to be considered to understand alcohol use behavior. They include intrapersonal factors such as acculturation (Hahm, Lahiff, & Guterman, 2003), and psychosocial issues such as depressive symptoms (Crum, Brown, Liang, & Eaton, 2001) and self-esteem (Belgrave, 2002; Dolcini & Adler, 1994). Interpersonal factors, including parental, peer, school and neighborhood constructs (White, Johnson, & Buyske, 2000; Griffin, Botvin, Epstein, Doyle, & Diaz, 2000; Henry & Slater, 2007; Ennett, Flewelling, Lindrooth, & Norton, 1997; Duncan et al., 2002) are also important factors related to adolescent alcohol use.

The current longitudinal study used data from the National Longitudinal Study of Adolescent Health (Add Health) to examine the alcohol use of Asian American adolescents from 7th grade to young adulthood. Add Health is a nationally representative longitudinal survey of adolescents' health and health-related behaviors. Data were collected throughout the United States from 1994 to 2002 (Udry, 2003).

The major purpose of the current study was to examine the development of alcohol use through the identification of trajectories and investigation of predictors of alcohol use from early through late adolescence and in young adulthood among Asian American adolescents. The specific aims for the study were:

1. Indentify the correlates of the age of alcohol use onset among Asian American adolescents from 7th through 12th and in young adulthood.

2. Estimate the growth trajectories of alcohol use and determine the association of acculturation and psychosocial factors such as religiosity, depressive symptoms, and self-esteem on alcohol use trajectories among Asian American adolescents from 7th through 12th and in young adulthood.

3. Identify the relationship of individual-level variables such as parent, peer, school and neighborhood factors, and school-and neighborhood-level variables with alcohol use trajectories among Asian American adolescents from 7th through 12th grade.

Design of Add Health Data

Add Health is a school-based, nationally representative longitudinal survey conducted in grades 7-12 and in young adulthood throughout the United States from 1994 through 2002 (Udry, 2003). These data include information about families, friends, schools, and communities which may affect health behavior. Add Health data were collected from students, parents, school administrators, and others (other household members).

Procedures for Add Health Data

Data were collected by in-home, school, contextual, and parent questionnaires. A rigorous security system was established to protect participants' privacy. To ensure confidentiality, data were collected by recording responses on a laptop computer at home,

using both a computer-assisted personal interview (CAPI) and an audio computer-assisted self interview (ACASI). The surveys included information about health and health related behaviors, emotional well being and the family and school environments. Sensitive questions were asked using the ACASI. This method of data collection allowed respondents to answer more sensitive questions, including those about substance use, delinquency, and sexual behavior, in a more private and confidential manner.

The average length of a complete in-home interview was 134 minutes. The laptop interview took approximately 90 minutes and the face-to-face interview took around 44 minutes. Most interviews were conducted in respondents' homes. The content included data on adolescents' behavior, families, friendships, romantic relationships, peer groups, schools, neighborhoods, and communities.

For the adolescents' interviews, informed consent was obtained from legal guardians, along with assent from the adolescents. The University of North Carolina (UNC), School of Public Health collected the data, and the UNC Institutional Review Board approved the procedures for the Add Health Study. In addition, the University of Michigan Institutional Review Board approved the procedures for the current study.

Sampling of Add Health Data

The first three waves of the Add Health set include in-home surveys conducted over a period of 8 years (Udry, 2003): Wave I conducted in 7th grade (1994-1995); Wave II administered in 12th grade (1996); and Wave III in young adulthood (2001-2002). Wave I consisted of the school sample (stage 1) and an in-home sample (stage 2). Subsequent waves only included an in-home sample.

The Add Health data were collected using a stratified cluster sampling design. The primary sampling for the school sample (stage 1) used a stratified random sample from all high schools in the United States. Using this procedure, 80 high schools and 52 middle schools in the U.S. were selected with unequal probability. This sample is nationally representative of schools in the U.S. regarding geographic regions, urbanicity, school types, school size, and race/ethnicity.

The in-home (stage 2) sample comprised a core sample from each community and special oversamples. The oversamples included Black adolescents from well-educated families, as well as Chinese, Cuban and Puerto Rican adolescents. The in-home Wave I sample surveyed in 1994-1995 was followed-up one year later with the Wave II survey, and again six years later with the Wave III survey in 2001-2002. The Wave I in-home interview included 20,745 adolescents. Wave II interviews were conducted with 14,738 Wave I participants, and Wave III with 15,197 Wave I respondents, resulting in response rates of 75%, 77%, and 76% in Waves I, II, and III respectively.

Sample for the Study

The participants of the current study were Asian American adolescents who participated in any of the three waves (see Table 1.1). The sample size of Asian Americans was 1,582 (weighted n=1480) in Wave I, 1,088 (weighted n=1010) in Wave II, and 1,268 (weighted n=876) adolescents in Wave III. For participants in Wave I, the mean age was 16.01 years, 16.68 for Wave II and 22.27 for Wave III (unweighted number). The unweighted sample included approximately 52% males and 48% females in each wave.

The mean age of the weighted samples was 15.58 in Wave I, 16.24 in Wave II, and 21.11

in Wave III. Sampling weights were applied in the data analyses for the current study.

Table1.1

The cross-sectional samples used in the current study

	Wave I		Wave II		Wave III	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Total	1582	1480	1088	1010	1268	876
Male	824	773	556	519	656	449
	(52.08%)	(52.23%)	(51.10%)	(51.39%)	(51.73%)	(51.26%)
Female	758	707	532	491	612	427
	(47.92%)	(47.77%)	(48.89%)	(48.61%)	(48.27%)	(48.74%)
Mean age	16.01	15.58	16.68	16.24	22.27	21.11

This dissertation is organized into five chapters, including three papers. The first

chapter includes an introduction to the research and the conceptual framework. The three

papers appear in Chapter 2, Chapter 3 and Chapter 4. The fifth chapter includes

discussion and conclusions of results from across all three papers.

The first paper examines correlates of age of alcohol use onset in each of four age

groups among Asian American adolescents using three cross-sectional waves of data. The

second paper examines the relationships of acculturation and psychosocial factors such as

religiosity, depressive symptoms and self-esteem to alcohol use trajectories examining

the longitudinal sub-sample across the three waves. The third paper examines the

relationships between alcohol use trajectories and individual-level factors, including parental, peer, school, and neighborhood factors, and school types and locations, and education and rules against alcohol at the community-level in the longitudinal sub-sample of Asian American adolescents across Waves I and II.

Data Analysis

Add Health data were collected through a stratified cluster sampling design. In order to adjust for non-response and unequal probability of selection, design weights were employed. Post-stratification weights were also used to adjust distributions among the populations. Analyses employed population-based sampling weights to adjust estimates for the complex sampling design and post-stratification. If the weights were not applied, the calculation of standard errors and confidence intervals for estimated statistics could possibly be incorrect, and the model would not be correctly specified. In order to ensure the generation of representative point estimates of the statistical parameters, the appropriate weights were applied to all analyses in the current study. Thus, all estimates reported here have been weighted, so the estimates are nationally representative.

Regarding missing data, Little and Rubin (2002) classify these into several types including missing completely at random (MCAR), missing at random (MAR), and not missing at random (NMAR). If data are MCAR, the probability that responses are missing is independent of all observed variables and unobservable parameters. Data are MAR if the probability that responses are missing is dependent on the set of observed responses, but does not depend on unobservable missing values. If data are NMAR, the probability a measurement missing depends on unobservable missing data, and may be

dependent on observed variables, as well (Little & Rubin, 1987; Weiner et al., 2003).

The test for MCAR, was performed by dividing respondents into those with and those without missing data, resulting in a dichotomous indicator where 1=missing values for at least one variable, and 0=not missing values for any variable. The test was performed to compare the two missing data groups on the variables in the data set using logistic regression. If no differences were identified between the two missing data groups, then it would be concluded that the data were not MCAR, but they still might be MAR or NMAR. The analyses were repeated for the other variables for all cases. Cases with and without any missing data differed significantly for age (p<.001), acculturation (p=0.010), English use at home (p=0.001), and born in U.S. (p=0.022), suggesting that the data were not MCAR.

The data were not tested for MAR, but missing data were imputed assuming that the data were MAR. Most approaches for imputing incomplete data are based on the assumption that unobserved values are missing at random (MAR) (Jaeger, 2006), but listwise and pairwise deletion of cases may be used only if the data are MCAR. If data are MAR missing values must be imputed in order to ensure unbiased estimates.

In the current study, data were multiply imputed (Rubin, 1976) using IVEware, which can handle missing data for different types of variables (Raghunathan et al, 2001). A linear, logistic, or polytomous regression model was used to impute categorical, binary, count and continuous missing values, as appropriate for each variable. For the imputation process, restrictions were put in place due to skip patterns in the questionnaire. For instance, "number of years since quit smoking" is defined only for former smokers, hence the imputation process for this variable was restricted to former smokers. In a similar

manner, other contingent variables were restricted from imputation (Raghunathan et al., 2001). There was a total of 60 restricted variables.

Imputation produced five imputed complete replicates as described by Raghunathan et al. (2001). Previous literature on Survey Methodology (Ragunathan et al., 2001) has suggested that five imputations are sufficient and that little is gained by performing more than five-10 imputations in terms of confidence interval coverage for the multiple imputation estimates and variance estimates (Rubin, 1987). Finally, the results were combined and the average estimate across the five data sets was reported as the point estimate, while the standard errors were computed using the combining rules outlined in Little and Rubin (2002). IVEware software for imputation and variance estimation was developed by the Survey Methodology Program at the University of Michigan's Survey Research Center, Institute for Social Research (download from **http://www.isr.umich.edu/src/smp/ive/**).

IVEware output for multiple imputation showed that a total of 101 variables were used, and 96 variables had missing data which were imputed (i.e., 96% of the variables had missing values). Among the imputed variables, there were 60 single items and 36 summary scales. Imputations were conducted using a horizontal file, containing variables at all three waves for each sample case. After imputation, all respondents had complete data for each of the three waves. Scale scores, rather than individual items were imputed due to their greater reliability (Graham, 2009). Imputed data sets were compared with observed data sets using descriptive statistics generated by IVEware, including observed and imputed cases, minimum, maximum, mean and standard deviation. IVEware output

also indicated extreme or out of range values generated by the imputation processes. For this study, no out of range imputed values occurred.

Sample weights are not included in the multiple imputation process, because imputation is based on the relationships among variables and not inferences to the general population. In most surveys employing complex sample designs, the analysis of complete data should be design based even though the imputation process ignores the complex sample design characteristics. Even if the imputation process does not provide valid design-based inferences, it maintains the robustness of underlying the design-based analysis to a certain degrees (Ragunathan et al., 2001). Finally, descriptive analyses, survival analyses, and logistic regression models were conducted using IVEware in combination with SAS version 9.1 procedures for complex sampling designs. Growth curve models were tested using HLM (Hierarchical Linear Model), which is designed to appropriately combine multiply imputed data.

In Chapter 2, the Kaplan-Meier survival analysis using SPSS 17, as a standard survival analysis method, was used to estimate the cumulative age-specific probability of initiation of alcohol use. Logistic regression analysis using IVEware REGRESS module was used to assess the association between age of initiation of alcohol use and parental and peer alcohol use across four age groups. In Chapter 3, hierarchical multiple regression analysis using Hierarchical Linear Modeling (HLM) was used to estimate growth trajectories, and identify the relationships of cultural and psychosocial factors to adolescent alcohol use over time. In Chapter 4, multilevel analysis using HLM was conducted to estimate growth trajectories. Linear Hierarchical multiple regression

analysis was employed to identify the relationships between individual-level and community-level factors and alcohol use over time.

Conceptual Framework

The current study drew its theoretical foundation from the Social Development Model (SDM) (Hawkins & Weis, 1985) and Acculturation Theory (Berry et al, 1987). The SDM (Hawkins & Weis) is an integrated model, which includes individual and social factors. Acculturation Theory (Berry et al.) is related to cultural factors affecting adaptation of immigrants to their new cultural surroundings. In this study, Acculturation Theory was used to conceptualize factors related to alcohol use behavior of adolescents who have immigrant parents.

The SDM (Hawkins & Weis) identifies the reciprocal nature between predictors and outcomes, and consists of four distinct socialization periods in the developmental life span: preadolescence, early adolescence, middle adolescence, and late adolescence. This model combines Social Cognitive Theory (Bandura, 1977), Social Control Theory (Hirschi, 1969; Elliot, 1985) and Differential Association Theory (Sutherland, 1973), making it an integrated theoretical approach. Applying the SDM to alcohol use, adolescents who bond to peers and others who engage in alcohol use behavior would tend to initiate alcohol use earlier and increase their own alcohol use behaviors. Hence, bonding to others who drink alcohol represents a risk factor for alcohol use. Additionally, adolescents learn patterns of behavior from socializing units such as family, school, peers and community institutions.

From a developmental perspective, the most significant social relationships during late childhood and early adolescence (12-14 years old) tend to be those with family members and peers. Children spend less time with their parents and more time with their peers when they begin the transition to early adolescence. Parents significantly influence early adolescents' lives, but adolescents' relationships with their parents change as their argumentative ability, cognitive development, reproductive maturity, and autonomy increases (Smetana, 1988).

During middle adolescence (15-17 years old), considerable psychosocial development takes place. Adolescent personality, behavioral opinions, identity, independence and responsibility become more developed during this period, although these characteristics grow throughout adolescence. From the beginning of early adolescence, adolescents gradually spend less time with their parents, but more time with peers. This tendency may continue through middle adolescence. Over this period, adolescents have less conflict with parents as well as increased independence from them (Berger & Thompson, 1995; Fuligni, 1998).

In this developmental process, parenting factors predicting adolescent alcohol are parental emotional warmth and support, parental monitoring, and spending time with parents (Windle et al., 2008). During adolescence, peers significantly influence adolescents on risky and antisocial behavior even if parents maintain their influence on adolescents' education and morality. Specifically, peers affect issues of popular culture and personal style (Fuligni, 1998). Adolescents are not equally influenced by peers to engage in risky behaviors such as alcohol use. Adolescents having poorer parent or family relationships are more likely to be involved in problematic peer relationships.

Consequently, when adolescents have more problematic relationships with their parents, they are more likely to be influenced by peers who are more delinquent and to engage in more risky behavior like alcohol use (Fuligni, 1998; Fuligni, Eccles & Barber, 2001).

The SDM identifies etiological and developmental processes influencing behaviors such as alcohol use. This theory predicts determinant factors for alcohol use and focuses on individuals, social development and social interaction. The SDM includes the process of socialization and incorporates the influences of risk or protective factors on alcohol use. One protective factor is authenticity of social rules and behavior. Three risk factors are the perception of fewer costs and greater benefits to engage in alcohol consumption, attachment to persons who engage in alcohol use, and belief in the value of alcohol use. Among these three risk factors, the current study included attachment to persons who engage in alcohol use.

Consideration of the influence of protective and risk factors within the SDM leads to the following conclusions. Adolescents are more likely to decrease alcohol use if they believe in the moral validity of social rules that oppose adolescent alcohol use. In terms of costs and benefits, adolescents are more likely to engage in alcohol use behaviors if they perceive few costs and many benefits related to alcohol use. Adolescents' bonding to others who engage in alcohol use is predicted to increase the likelihood of adopting the norms and behaviors of those to whom they bond. That is, parental and peer alcohol use are risk factors for adolescent alcohol use. Additionally, the degree of involvement and interaction, such as parent-adolescent and peer-adolescent relationships also influence adolescent alcohol use behavior. Adolescents who value alcohol use are hypothesized to increase participation in alcohol use behaviors.

Additionally, the SDM includes three exogenous constructs proposed to affect the socialization process: individual constitutional factors such as intelligence, depressive symptoms, and personality; social structural position including race and gender; and external constraints like family supervision or monitoring and legal sanctions (Guo et al., 2001; Catalano & Hawkins, 1996). The socializing processes may lead to a social bonding to others, so adopting alcohol use behaviors of people with whom adolescents are bonded is more likely to increase adolescent alcohol use.

Therefore, the SDM provides a framework to examine predictors of alcohol use across developmental periods. While the SDM incorporates multiple domains of influence, this study focuses on individual, parent, peer, school, and neighborhood constructs. However, the SDM provides a limited explanation in the adaptation of cultural influences on alcohol use. Consideration of cultural influences is relevant in the examination of alcohol use in Asian American adolescents, and Acculturation Theory adds the ability to explain the cultural impact on adolescent alcohol use.

Acculturation Theory (Berry et al, 1987) provides a framework for understanding alcohol use through adaptation to cultural differences for Asian American adolescents. According to this theory, there are four types of cultural orientations or adaptations as outcomes of the acculturation process: assimilation, separation, integration or biculturalism, and marginalization. Assimilation represents a rejection of previous cultural values, instead of accepting the dominant culture. Integration denotes maintenance of the previous cultural identity as well as adoption of the dominant cultural values. Separation stands for maintenance of previous cultural norms and non-acceptance of the predominant group's cultural norms. Marginalization is associated with non-

participation in the previous culture or predominant group's cultural values. Acculturation is important to understanding various adaptation processes. In the developmental process, adolescents during early and middle adolescence focus on themselves and are more interested in friends and schools. Thus, acculturation in these periods may influence the adoption of risky health behavior such as alcohol and drug use among adolescents as they may be susceptible to peer influences and their environments (Elder et al., 2000; Gutmann, 1999; Hahm, Lahiff, & Guterman, 2003; McQueen, Getz, & Bray, 2003). According to Hahm and colleagues (2003), Asian American adolescents who were the most acculturated were the highest risk group for alcohol use.

Within the conceptual framework for this study (see Figure 1.1) that is based on the SDM and Acculturation Theory, the dependent variables were age of alcohol use onset (Chapter 2) and alcohol consumption (combined frequency and quantity) (Chapter 3 & 4). Independent variables were categorized by individual-level factors and community-level factors. At the individual–level, there were five categories of independent variables: socio-demographic, cultural-psychological, parent, peer, school and neighborhood factors. The variables of community-level factors included type of school, metropolitan region of schools (urbanicity), school education against alcohol use, and state policies against alcohol use (Figure 1.1.).

Individual-Level Factors

Socio-demographic Factors
Age
Gender
Socioeconomic status

Cultural-psychological Factors
Acculturation
Depressive symptoms
Self-esteem

Parental Factors
Parental alcohol use
Parent-adolescent relationship

Peer Factors
Peer alcohol use
Peer-adolescent relationship

School Factors
School absence without excuse
School bonding
Academic achievement

Neighborhood Factors
Perceived social cohesion in neighborhood
Perceived safety in neighborhood
Perceived happiness living in neighborhood

Community-Level Factors
School type
Metropolitan regions of school
School education against alcohol use
State policy against alcohol use

**Age of
alcohol use onset**

Alcohol consumption
(frequency*quantity)

Figure1.1. Conceptual Framework

Major study Variables

As a dependent variable for two papers, alcohol consumption was measured by

multiplying the frequency and quantity of alcohol use. The age of alcohol use onset was a

dependent variable for paper 1. The independent variables consisted of individual-level

and community-level variables. At the individual-level, independent variables measuring

intrapersonal factors included adolescent factors consisting of socio-demographic factors,

and cultural-psychological factors. Socio-demographic factors include age, gender, and

socioeconomic status. The level of parental education was used as a proxy for

16

socioeconomic status. Cultural and psychological factors included acculturation, religiosity, depressive symptoms and self-esteem. Regarding interpersonal factors at the individual level, parental factors consisted of parental alcohol use and the parent-adolescent relationship. Peer factors included peer alcohol use and peer-adolescent relationship. School factors consisted of school absence without excuse, school bonding, and academic achievement. Neighborhood factors consisted of perceived neighborhood social cohesion, feeling safe in the neighborhood, and happiness in living within the neighborhood. While the factors can be grouped usefully into six separate categories, it is important to emphasize that the categories are not mutually exclusive. Rather, they are interdependent and interact with each other.

At the individual level, factors directly related to alcohol consumption (frequency $\times$ quantity) and age of alcohol use onset were considered. Additionally, community-level factors were related to alcohol consumption directly while also being associated with individual-level factors (Figure 1.1).

Background and Significance

Adolescents tend to engage in alcohol use behaviors and harmful alcohol-related behaviors such as increased risk of violence, injury, and unprotected sexual activity (Perkins, 1992; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). According to Healthy People 2010 (USDHHS, 2000), adolescent substance use including alcohol use is a major health concern in the United States. Early onset of drinking is associated with greater alcohol consumption later in life among multiple race groups (P. L.

Ellickson, Tucker, & Klein, 2003). In addition, adolescents who initiate using alcohol by age 14 have been found to be abusive or hazardous drinkers two years later in New Zealand (Fergusson, Horwood, & Lynskey, 1995). Schulenberg and associates (1996) reported that among 9,945 participants in the 1976-85 high school senior year cohorts from the Monitoring the Future project, 60% of 18-year-old adolescents continued binge drinking six years later. Thus, it is important to understand adolescent alcohol use behaviors and factors that predict age of alcohol use onset and continued high levels of alcohol consumption in adolescents.

Adolescent alcohol use is associated with various factors. Historically, scholars argued that adolescent development is not affected by cultural or social contexts, but by biological or evolutionary status (Hall, 1904; Freud, 1958). However, other researchers assert that adolescence is related to cultural and social background, not just biological or evolutionary factors (Mead, 1950). In this vein, many studies have been conducted to define the relationship between adolescent alcohol use and social structure based on human development. The current study focused on cultural and social contexts related to adolescent alcohol use, specifically for Asian American adolescents.

The factors related to alcohol use are varied and complicated. Thus, it is a difficult task to identify how risk and protective factors are interrelated with alcohol use from a developmental perspective. Adolescent alcohol use is related to potential protective and risk factors at the individual-level in two ways: intrapersonal factors including socio-demographic, cultural and psychological factors; and interpersonal factors such as parent, peer, school, and perceived neighborhood factors (S. C. Duncan, Duncan, & Strycker, 2002; Hawkins, Catalano, & Miller, 1992; Newcomb, 1997). At the school and

18

neighborhood-level, in a predominantly White sample, stricter school policies against

alcohol use in school environments negatively affected adolescent substance use in

college (Knight et al., 2003). Neighborhood characteristics such as high poverty (Duncan

et al., 2002) and location in suburban areas in a predominantly White student sample

(Martino, Ellickson, & McCaffrey, 2008) were associated with increased alcohol use

among adolescents.

Individual-Level Variables on Alcohol Consumption

Individual-level factors include socio-demographic, cultural and psychological

factors. Socio-demographic factors include age, gender, and socioeconomic status. Older

adolescents tend to drink more alcohol than younger adolescents among White, Asian,

Latino, and African American participants (Newcomb, 1997). Male adolescents were

more likely to drink than female adolescents using Add Health data (Maney, Higham-

Gardill, & Mahoney, 2002) and in a sample of Asian American adolescents (Tosh &

Simmons, 2007). Lower socioeconomic status is positively related to alcohol use

(Hawkins et al, 1992; Newcomb, 1997). Cultural and psychological factors consist of

acculturation, religiosity, depressive symptoms and self-esteem. Acculturation was

positively associated with increased alcohol use among Asian American adolescents

(Hahm, Lahiff, & Guterman, 2003). Additionally, a low level of religious involvement or

spiritual engagement was positively associated with increased alcohol use (Miller, 1998).

Depressive symptoms were found to be positively associated with alcohol use in Asian

Americans (Nakashima & Wong, 2000). Self-esteem was negatively associated with

drinking behavior among White adolescents (Lewis, Phillippi, & Neighbors, 2007).

Female adolescents with lower self-esteem were more likely to use drugs including

alcohol, than those with higher self-esteem among African American girls (Belgrave, 2002).

Variables at the individual-level are represented by parent, peer, school and neighborhood factors. Parental factors include parental alcohol use and the parent-adolescent relationship factors including attachment or bonding. In the current study, parental alcohol use is an important risk factor for alcohol use among adolescents. Parent-adolescent relationships are related to adolescent alcohol use. According to Hawkins et al (1992) and Newcomb (1997), parent management practices including inadequate maternal control, inconsistent parental discipline, and parental permissiveness are positively associated with adolescent alcohol use. A close adolescent-parent relationship may protect against alcohol use among White and African American adolescents (Simons-Morton, Haynie, Crump, Eitel, & Saylor, 2001)

Peer factors consist of peer alcohol use and the peer-adolescent relationship. Adolescents having more friends who drink alcohol are more likely to drink alcohol than those with no drinking friends (Simons-Morton et al., 2001). While parental alcohol use is related to early onset of alcohol use, peer alcohol use is related to late onset of alcohol use in adolescents (Brook, Brook, Gordon, Whiteman, & Cohen, 1990). Peer alcohol use is a much stronger risk factor of alcohol use than is the influence of parents in late adolescence among White respondents (Griffin, Botvin, Epstein, Doyle, & Diaz, 2000). Adolescents who perceive peer rejection and low acceptance by peers are more likely to drink alcohol (Hawkins et al, 1992; Newcomb, 1997).

School factors are associated with adolescent alcohol use, as well. Adolescents who drink more frequently and occasionally drink heavily have lower academic

achievement (Bahr, Marcos, & Maughan, 1995; Casswell, Pledger, & Pratap, 2002; Hawkins et al., 1992; Jackson, 1997; Muthen & Muthen, 2000; van Oers, Bongers, van de Goor, & Garretsen, 1999), low educational commitment (Bahr et al., 1995; Hawkins et al., 1992), low educational goals (Wood, Sher, & McGowan, 2000) and a higher rate of academic failure (Hawkins et al., 1992; Jackson, 1997; Rose, 1999). White adolescents with low grade-point averages have, by varying degrees, higher levels of alcohol and marijuana use (Schulenberg, Bachman, O'Malley, & Johnston, 1994). If adolescents have lower academic competence and lower school bonding (Kumpfer & Turner, 1990), they are more likely to have a higher level of alcohol use. School underachievement, failure, and dropout in adolescence are also linked to alcohol use among White and Latino adolescents (Flannery, Vazsonyi, & Rowe, 1996; Lerner & Galambos, 1998). Adolescents who perceive a lack of social cohesion were more likely to drink alcohol than those experiencing more social cohesion in their neighborhoods (Brook, Nomura, & Cohen, 1989).

Community-Level Variables and Alcohol Use

At the community-level, school environments as well as neighborhood conditions are important factors in adolescents' alcohol use. Comprehensive policies against alcohol use may reduce drinking and drink/driving among students (based on a sample of 119 colleges) (Wechsler, Lee, Nelson, & Lee, 2003). In the current study, the variables at the community level consisted of school type, metropolitan region of school, school education against alcohol use, and school policies against alcohol use.

Neighborhood factors also play a role in the actualization of risk in adolescent alcohol use. A neighborhood characterized by poverty or by urban, high-density living has been found to be positively related to risk formation among ethnically and geographically diverse samples (Bisset, Markham, & Aveyard, 2007; Casswell, Pledger, & Hooper, 2003; Wilson, Syme, Boyce, Battistich, & Selvin, 2005). Several studies reported that structural or demographic characteristics of neighborhoods such as physical location and economy are related to adolescent delinquent behaviors (Ingoldsby & Shaw, 2002; Martino, Ellickson, & McCaffrey, 2008; Valois, MacDonald, Bretous, Fischer, & Drane, 2002). Ennett and colleagues (1997) note that characteristics of neighborhoods and schools are statistically significantly associated with lifetime alcohol use among adolescents of various races. Neighborhood factors influence alcohol use both directly and indirectly through school characteristics. Among African American and White adolescents, living in neighborhoods with higher poverty and less social cohesion was positively associated with adolescent alcohol use (S. C. Duncan et al., 2002). However, Ennett and colleagues (1997) found that the rates of lifetime alcohol use are higher in schools located in neighborhoods with greater social advantages (Ennett, Flewelling, Lindrooth, & Norton, 1997). Ennett and associates' findings argue a previous research conclusion that perception of higher neighborhood disorder and a lower sense of hope are positively associated with increased alcohol use (Wilson et al., 2005). Thus, it has been and is still debated whether neighborhoods with poverty and less social cohesion are positively associated with alcohol use or not.

In addition, a study of trajectories during adolescence is critical to understand age of onset of Asian American adolescent alcohol use and the increase or decrease of

alcohol use (S. L. Ellickson, Tucker, Klein, & McGuigan, 2001), because Asian American adolescents have been under-studied. Thus, in the current study, Paper 1 investigated correlates of age of onset of drinking among Asian American adolescents. Paper 2 examined the relationships of acculturation and psychological factors to trajectories of alcohol consumption among Asian American adolescents from 7th-12th grades and in young adulthood. In paper 3, alcohol consumption of Asian American adolescents from 7th-12th grades was examined in the context of individual-level socio-demographic, parent, peer, school, and neighborhood factors, as well as community-level factors.

References

Bahr, S. J., Marcos, A. C., & Maughan, S. L. (1995). Family, educational and peer influences on the alcohol use of female and male adolescents. *J Stud Alcohol, 56*(4), 457-469.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev, 84*(2), 191-215.

Belgrave, F. Z. (2002). Relational theory and cultural enhancement interventions for African American adolescent girls. *Public Health Rep, 117 Suppl 1*, S76-81.

Berry, J. W., Kim, U., Minde, T. & Mok, D. (1987). Comparative studies of acculturative stress. International Migration Review, 21, 491-511.

Berger, K.S. & Thompson, R.A. (1995). The developing person: Through childhood and adolescence. New York: Worth Publishers. Feek, W. (Ed). (1990). On-Line: The drugs learning package. London, The Commonwealth Secretariat.

Bisset, S., Markham, W. A., & Aveyard, P. (2007). School culture as an influencing factor on youth substance use. *J Epidemiol Community Health, 61*(6), 485-490.

Brook, J. S., Nomura, C., & Cohen, P. (1989). A network of influences on adolescent drug involvement: neighborhood, school, peer, and family. *Genet Soc Gen Psychol Monogr, 115*(1), 123-145.

Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: a family interactional approach. *Genet Soc Gen Psychol Monogr, 116*(2), 111-267.

Catalino, R.F. and Hawkins, J.D. The social development model: A theory of antisocial *behavior*. In: Hawkins, J.D. (Ed.) Delinquency and Crime: Current Theories, New York: Cambridge Univ. Press, 1996, pp. 149-197.

Casswell, S., Pledger, M., & Hooper, R. (2003). Socioeconomic status and drinking patterns in young adults. *Addiction, 98*(5), 601-610.

Casswell, S., Pledger, M., & Pratap, S. (2002). Trajectories of drinking from 18 to 26 years: identification and prediction. *Addiction, 97*(11), 1427-1437.

Crum, R. M., Brown, C., Liang, K. Y., & Eaton, W. W. (2001). The association of depression and problem drinking: analyses from the Baltimore ECA follow-up study. Epidemiologic Catchment Area. *Addict Behav, 26*(5), 765-773.

Dolcini, M. M., & Adler, N. E. (1994). Perceived competencies, peer group affiliation, and risk behavior among early adolescents. *Health Psychol, 13*(6), 496-506.

Duncan, S. C., Duncan, T. E., & Strycker, L. A. (2002). A multilevel analysis of neighborhood context and youth alcohol and drug problems. *Prev Sci, 3*(2), 125-133.

Elder, J. P., Campbell, N. R., Litrownik, A. J., Ayala, G. X., Slymen, D. J., Parra-Medina, D., et al. (2000). Predictors of cigarette and alcohol susceptibility and use among Hispanic migrant adolescents. *Prev Med, 31*(2 Pt 1), 115-123.

Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2003). Ten-year prospective study of public health problems associated with early drinking. *Pediatrics, 111*(5 Pt 1), 949-955.

Ellickson, S. L., Tucker, J. S., Klein, D. J., & McGuigan, K. A. (2001). Prospective risk factors for alcohol misuse in late adolescence. *J Stud Alcohol, 62*(6), 773-782.

Elliot, K.S, Huizinga, D., & Ageton, S.S. (1985). *Explaining delinquency and drug*

use.Beverly Hills, CA;Sage.

Ennett, S. T., Flewelling, R. L., Lindrooth, R. C., & Norton, E. C. (1997). School and neighborhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *J Health Soc Behav, 38*(1), 55-71.

Fergusson, D. M., Horwood, L. J., & Lynskey, M. T. (1995). The prevalence and risk factors associated with abusive or hazardous alcohol consumption in 16-year-olds. *Addiction, 90*(7), 935-946.

Flannery D.J., Vazsonyi A.T., Rowe D.C., (1996). Caucasian and Hispanic early adolescent substance use: parenting, personality, and school adjustment, *Early Adolesc*. 16(1), 71-89.

Freud, S. (1958). Contributions to a discussion on masturbation. In J. Strachey (Ed. &Trans.), The standard edition of the complete psychological works of Sigmund Freud (Vol.12, pp. 239-254). London: Hogarth.

Fuligni, A.J. (1998). Parental authority, adolescent autonomy, and parent-adolescent relationships: a study of adolescents from Mexican, Chinese, Filipino, and European backgrounds. *DevPsychol.*;34(4):782–792.

Fuligni, A.J, Eccles J.S, Barber B.L, (2001). Clements M. Early adolescent peer orientation and adjustment during high school. *DevPsychol.* 2001;37(1):28–36.

Ghosh, C. (2003). Healthy People 2010 and Asian Americans/Pacific Islanders: defining a baseline of information. *Am J Public Health, 93*(12), 2093-2098.

Graham J.W. (2009). Missing Data Analysis: Making It Work in the Real World, *Annu. Rev. Psychol.*, 60, 6.1–6.28.

Griffin, K. W., Botvin, G. J., Epstein, J. A., Doyle, M. M., & Diaz, T. (2000). Psychosocial and behavioral factors in early adolescence as predictors of heavy drinking among high school seniors. *J Stud Alcohol, 61*(4), 603-606.

Guo, J., Hawkins, J. D., Hill, K. G., Abbott, R. D., Lonczak, H. S., Huang, B., et al. (2001). Childhood and adolescent predictors of alcohol abuse and dependence in young adulthood, *J Stud Alcohol, 62*(6), 754-762.

Gutmann, M. C. (1999). Ethnicity, alcohol, and acculturation. *Soc Sci Med, 48*(2), 173-184.

Hahm, H. C., Lahiff, M., & Guterman, N. B. (2003). Acculturation and parental attachment in Asian-American adolescents' alcohol use. *J Adolesc Health, 33*(2), 119-129.

Hall, G. Stanley. (1904). *Adolescence: Its Psychology and Its Relations to Physiology,Anthropology, Sociology, Sex, Crime, Religion, and Education*. 2 vols. New York, Appleton.Hirschi, T. (1969) *Causes of Delinquency*, Berkeley, CA: Univ. of California Press, 1969.

Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. *Psychol Bull, 112*(1), 64-105.

Hawkins, J.D., and Weis, J.G., (1985). The social development model: An integrated approach to delinquency prevention. *Journal of Primary Prevention*, 6, 73-97.

Henry, K. L., & Slater, M. D. (2007). The contextual effect of school attachment on young adolescents' alcohol use. *J Sch Health, 77*(2), 67-74.

Ingoldsby, E. M., & Shaw, D. S. (2002). Neighborhood contextual factors and early-starting antisocial pathways. *Clin Child Fam Psychol Rev, 5*(1), 21-55.

Jackson, C. (1997). Initial and experimental stages of tobacco and alcohol use during late childhood: relation to peer, parent, and personal risk factors. *Addict Behav, 22*(5), 685-698.

Jaeger, M. (2006). *On testing the missing at random assumption*, Springer, Berlin, Heidelberg.

Knight, J. R., Harris, S. K., Sherritt, L., Kelley, K., Van Hook, S., & Wechsler, H. (2003). Heavy drinking and alcohol policy enforcement in a statewide public college system. *J Stud Alcohol, 64*(5), 696-703.

Kumpfer, K. L., & Turner, C. W. (1990). The social ecology model of adolescent substance abuse: implications for prevention. *Int J Addict, 25*(4A), 435-463.

Lerner, R. M., & Galambos, N. L. (1998). Adolescent development: challenges and opportunities for research, programs, and policies. *Annu Rev Psychol, 49*, 413-446.

Lewis, M.A., Phillippi, J., & Neighbors, C. (2007) Morally based self-esteem, drinking motives, and alcohol use among college students, *Psychol Addict Behav* , 21(3),398-403.

Little R. J. A. and Rubin. D. B. (1987). *Statistical analysis with missing data*. New York, John Wiley & Sons, Inc.

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data.* New York: JohnWiley & Sons.

Maney, D. W., Higham-Gardill, D. A., & Mahoney, B. S. (2002). The alcohol-related psychosocial and behavioral risks of a nationally representative sample of adolescents. *J Sch Health, 72*(4), 157-163.

Martino S.C., Ellickson, P.L., and McCaffrey, D.F. (2008). Developmental trajectories of substance use from early to late adolescence: a comparison of rural and urban youth, *Journal of Studies Alcohol Drugs*, 69(3), 430-40.

McQueen, A., Getz, J. G., & Bray, J. H. (2003). Acculturation, substance use, and deviant behavior: examining separation and family conflict as mediators. *Child Dev, 74*(6), 1737-1750.

Mead, M.(1950). *Coming of Age in Samoa*, New York: New American Library. Miller, W. R. (1998). Researching the spiritual dimensions of alcohol and other drug problems. *Addiction, 93*(7), 979-990.

Muthen, B. O., & Muthen, L. K. (2000). The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *J Stud Alcohol, 61*(2), 290-300.

Nakashima, J., & Wong, M. M. (2000). Characteristics of alcohol consumption, correlates of alcohol misuse among Korean American adolescents. *J Drug Educ, 30*(3), 343-359.

Newcomb, M. D. (1997). Psychosocial predictors and consequences of drug use: a developmental perspective within a prospective study. *J Addict Dis, 16*(1), 51-89.

Perkins, H. W. (1992). Gender patterns in consequences of collegiate alcohol abuse: a 10-year study of trends in an undergraduate population. *J Stud Alcohol, 53*(5), 458-462.

Price, R. K., Risk, N. K., Wong, M. M., & Klingle, R. S. (2002). Substance use and abuse by Asian Americans and Pacific Islanders: preliminary results from four national epidemiologic studies. *Public Health Rep, 117 Suppl 1*, S39-50.

Raghunathan, T. E., Lepkowski, J., VanHoewyk, J., and Solenerger, P.(2001). A

multivariate technique for multiply imputing missing values using a sequence of regression models. *Survey Methodology*, 27 (1), 85-95.

Rose, C. D. (1999). Peer cluster theory and adolescent alcohol use: an explanation of alcohol use and a comparative analysis between two causal models. *J Drug Educ, 29*(3), 205-215.

Rubin, D.B. (1987). Multiple Imputation for Nonresponse in Surveys, New York, John Wiley & Sons, Inc Rubin, D. B. (1976). Inference and Missing Data (with discussion.), *Biometrika,* 63, 581-592.

Schulenberg, J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1994). High school educational success and subsequent substance use: a panel analysis following adolescents into young adulthood. *J Health Soc Behav, 35*(1), 45-62.

Schulenberg, J. Maggs, L. & Hurrelmann K. (Eds.)(1997), *Health risks and development transitions during adolescence.* New York: Cambridge University Press.

Schulenberg, J., O'Malley, P. M., Bachman, J. G., Wadsworth, K. N., & Johnston, L. D. (1996). Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *J Stud Alcohol, 57*(3), 289-304.

Simons-Morton, B., Haynie, D. L., Crump, A. D., Eitel, S. P., & Saylor, K. E. (2001). Peer and parent influences on smoking and drinking among early adolescents. *Health Educ Behav, 28*(1), 95-107.

Smetana, J. (1988). Adolescents' and parents' conceptions of parental authority. *Child Dev.*59(2):321–335.

Steinberg, L. (1988). Reciprocal relation between parent-child distance and pubertal maturation. *Dev Psychol.*24(1):122–128.

Sutherland E.H. (1973) *Development of the theory*. In: SCHUESSLER, K. (Ed.) Edwin Sutherland on Analyzing Crime, Chicago, IL: Univ. of Chicago Press, pp. 13-29.

Tosh, A. K., & Simmons, P. S. (2007). Sexual activity and other risk-taking behaviors among Asian-American adolescents. *J Pediatr Adolesc Gynecol, 20*(1), 29-34.

Udry, J.R. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.US Department of Health and Human Services, *Healthy People 2010*: Understanding and Improving Health, 2nd ed. Washington, DC: US.Government Printing Office,November 2000.

Valois, R. F., MacDonald, J. M., Bretous, L., Fischer, M. A., & Drane, J. W. (2002). Risk factors and behaviors associated with adolescent violence and aggression. *Am J Health Behav, 26*(6), 454-464.

van Oers, J. A., Bongers, I. M., van de Goor, L. A., & Garretsen, H. F. (1999). Alcohol consumption, alcohol-related problems, problem drinking, and socioeconomic status. *Alcohol Alcohol, 34*(1), 78-88.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college. A national survey of students at 140 campuses. *Jama, 272*(21), 1672-1677.

Wechsler, H., Lee, J. E., Nelson, T. F., & Lee, H. (2003). Drinking and driving among college students: the influence of alcohol-control policies. *Am J Prev Med, 25*(3), 212-218.

Weiner, I. B., Freedheim, D.K., Velicer, W. F., Schinka, J. A., & Lerner, R. M. (2003).

Handbook of Psychology. New York, John Wiley and Sons, Inc.

White, H. R., Johnson, V., & Buyske, S. (2000). Parental modeling and parenting behavior effects on offspring alcohol and cigarette use. A growth curve analysis. *J Subst Abuse, 12*(3), 287-310.

Wilson, N., Syme, S. L., Boyce, W. T., Battistich, V. A., & Selvin, S. (2005). Adolescent alcohol, tobacco, and marijuana use: the influence of neighborhood disorder and hope. *Am J Health Promot, 20*(1), 11-19.

Wood, M. D., Sher, K. J., & McGowan, A. K. (2000). Collegiate alcohol involvement and role attainment in early adulthood: findings from a prospective high-risk study. *J Stud Alcohol, 61*(2), 278-289.

Chapter II

Age of alcohol use onset and its association with parental and peer alcohol use from adolescence to young adulthood among Asian American adolescents

Introduction

This chapter identifies predictors of age of alcohol use onset, and examines the relationship between age of alcohol use onset and subsequent levels of alcohol use among Asian American adolescents.

There are numerous studies of adolescent alcohol use, but very few have examined the age of alcohol use onset among Asian American adolescents. Asian Americans are under-represented in research compared to other races and ethnic groups, although the Asian American population has been increasing in the U.S. during the last few decades (Ghosh, 2003; Price, Risk, Wong, & Klingle, 2002). Studies of the prevalence and incidence of alcohol use within ethnic minority groups usually include African Americans and Hispanics, but not Asian Americans (Harachi et al, 2001). The prevalence of alcohol use and abuse among Asian Americans has not been exactly determined. This lack of data may be because Asian Americans are underrepresented in

substance use related studies (McNeece & DiNitto, 1998). Furthermore, Asian Americans are often excluded in national databases such as the National Household Survey on Drug Abuse conducted in 1988-1989 and the Monitoring the Future Study (1984). Additionally, Asian Americans are often collapsed into a single "other" category that includes many ethnic groups (Ja & Aoki, 1993).

Heterogeneity among subgroups within Asian American populations that have been included in research is problematic. In epidemiological studies, diverse subgroups of Asian Americans have been combined in samples meant to be representative of the overall population (CSAT, 2001). The lifetime prevalence of alcohol use among Asian American adolescents is 13.5% in 2000, which is a lower prevalence than in other racial or ethnic groups; yet, the lifetime alcohol use prevalence between White adolescents and certain subgroups in Asian American adolescents (Japanese Americans and Filipino Americans) is similar. In contrast, other subgroups among Asian American adolescents (Chinese Americans and Vietnamese Americans) reported lower rates (Price et al., 2002). Therefore, these studies in variations of alcohol use may fail to notice important differences between diverse subgroups and other races. It is critical to investigate alcohol use for the Asian American population, even though their alcohol use rate is lower, as a mixed group, than that of other races or ethnic groups.

Earlier onset of alcohol use has often been associated with increased subsequent alcohol use (Duncan, Alpert, Duncan, & Hops, 1997; P. L. Ellickson, Tucker, & Klein, 2003), alcohol misuse among White adolescents (S. L. Ellickson, Tucker, Klein, & McGuigan, 2001), and alcohol dependence among various race groups (Grant & Dawson, 1997).

The age of alcohol use onset in adolescents has been shown to be influenced by parents, peers, and social environments (Hawkins, Catalano, & Miller, 1992). In particular, adolescents are more likely to initiate alcohol use when their parents drink alcohol (P. L. Ellickson & Hays, 1991; Hawkins et al., 1997), and when their closest friends drink alcohol (African American and White adolescent samples) (Urberg, Degirmencioglu, & Pilgrim, 1997). In addition, the initiation of alcohol use among adolescents has been associated with perceived parental permissiveness (Brook, Gordon & Whiteman, 1985), perceived parental approval of drinking among White adolescents (Krahn et al., 1996) and positive parental attitudes toward alcohol use (Andrews, Hops, & Ary, et al., 1993). Parental and peer influences have been shown to be more powerful predictors than psychological factors (Hawkins et al., 1997; Pedersen & Skrondal, 1998; Pitkanen, Lyyra, & Pulkkinen, 2005). Furthermore, late initiation of alcohol use has been considered to be important in preventing alcohol abuse in samples including respondents from various racial and ethnic groups in California and Oregon (P.L. Ellickson, Tucker, & Kelin, 2003).

Consequently, many studies have explored the predictors of the age of alcohol use onset based on cohorts of adolescents in grade seven or above but have not examined the influential factors for age of alcohol use onset across different age groups. The factors influencing the age of alcohol use onset may be different at different points from childhood to young adulthood, such that the predictors of age of alcohol use onset for younger adolescents may be different from the predictors of alcohol onset among older adolescents. Thus, it may be meaningful to determine whether predictors of age of alcohol use onset vary by developmental stage (i.e., preadolescence, early adolescence,

31

middle adolescence, late adolescence, and young adulthood). This is especially true among Asian Americans adolescents who as a group have been underrepresented in alcohol use studies.

The purpose of the current study was to examine predictors of age of alcohol use onset by exploring parental and peer alcohol use in different age groups of Asian American adolescents.

Conceptual Framework

The Social Development Model (SDM) (Hawkins & Weis, 1985) provides a framework for specifying predictors of health behavior. This model integrates three theories: social control theory, social learning theory, and differential association theory. The SDM is a general theory of human behavior that hypothesizes that adolescents learn patterns of behavior through socialization processes from parents, peers, and others that promote prosocial or antisocial behavior. In addition, this model can account for a developmental life course perspective, and specifically four distinct phases (Elliott, 1994) - preschool, elementary school, middle school and high school periods. This theory has been also applied to predict substance use during preadolescence and through early adulthood (Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000; Lonczak et al., 2001).

Adolescents experienced strong cognitive, emotional, and physical changes. During early adolescence (12-14 years old), adolescents are expected to experience the onset of puberty, self-consciousness, detachment from parents, as well as the emergence of more advanced reasoning abilities and a shift in interest from family to peer relations

(Berger & Thompson, 1995). During middle adolescence (15-18 years old), adolescents continue to make new friends and emphasize the importance of peer relationships. With age, their conflicts with parents often decrease, they become less egocentric, build personal identities, and start forming close friendships with girls or boys and gradually develop comfort with separation from family (Berger & Thompson).

Based on developmental perspectives, parents and families can greatly influence the growth and development of their children. Parents continue to influence adolescent lives although adolescent spend less time with their parents as they move through this developmental stage (Fuligni, 1998). Adolescents' time spent with parents and families is gradually replaced by increased time with peers outside the home (Larson & Richards, 1991). Early onset of alcohol use during adolescence is associated with a subsequent increase in risky behaviors such as increased deviant peer influences, increased conflicts with parents, and peer and parental alcohol use. Age of alcohol use onset is predictive of illicit drug use (Keyes, Iacono, McGue, 2007).

The current study investigates social interactions between adolescents and their parents and peers as predictors of age of the onset of adolescent alcohol use (Fig.2.1). In particular, the conceptual model examines how parental and peer alcohol use influence the age of alcohol use onset from early adolescence to young adulthood.

Based on SDM, it was hypothesized that bonding to others who engage in alcohol use promotes adoption of such behavior, thereby increasing the likelihood of alcohol use. Socio-demographic factors including age, gender, and socioeconomic status also may be related to age of alcohol use onset. Thus, the SDM offers an appropriate means of

examining parent and peer alcohol use as possible predictors of age of alcohol use onset

among adolescents (see conceptual framework in Figure 2.1).

Socio-demographic Factors **Age** **Gender** **Socioeconomic status** **Social Factors** **Father's alcohol use** **Mother's alcohol use** **Peer alcohol use**	→ **Age of Alcohol use onset**
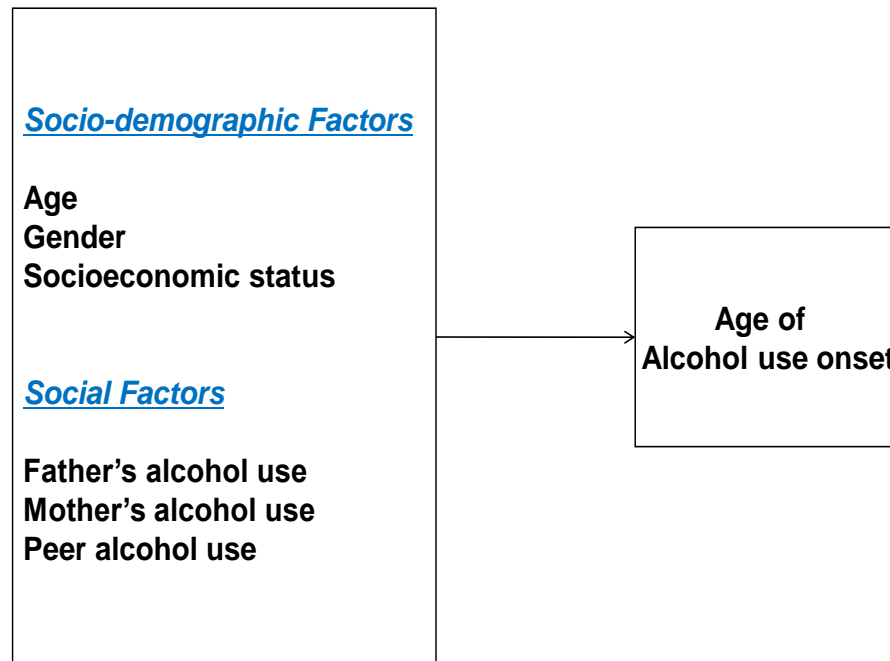
Figure 2.1. Conceptual Framework

Background and Significance

Age of alcohol use onset and adolescent alcohol use

The initiation of alcohol use in early adolescence has been found to be related to

continued alcohol use in a sample of various races in California and Oregon (P. L.

Ellickson et al., 2003), other drug use (P. L. Ellickson, Hays, & Bell, 1992), a higher

level of alcohol use in late adolescence (Hawkins et al., 1997), and alcohol problem

behaviors later in life (Duncan et al., 1997; Schulenberg, O'Malley, Bachman, Wadsworth, & Johnston, 1996). Early alcohol use was a strong predictor of subsequent use of alcohol, regardless of gender, in a longitudinal cohort of White adolescents from 56 middle and junior high schools (Scheier, Botvin, & Baker, 1997). In another longitudinal study, early alcohol use predicted later alcohol use (Kandel, Yamaguchi, & Chen, 1992). According to Ellickson and colleagues (2001), in a grade 7 sample of adolescents that was 67% White and 33% minority respondents (Asian 8.1%), those who had early drinking onset and reported parental drinking problems were more likely to report alcohol misuse five years later, indicating that early onset of alcohol use is related to higher levels of alcohol use later in life.

Additionally, earlier age of alcohol use onset among adolescents is associated with parental alcohol use (P. L. Ellickson & Hays, 1991; Hawkins et al., 1997; Pedersen & Skrondal, 1998), peer alcohol use (D'Amico & McCarthy, 2006; Urberg et al., 1997), parental attitudes toward drugs (P. L. Ellickson & Hays, 1991), parental approval of alcohol use (Krahn et al., 1996), and relationships with peers who drink alcohol (P. L. Ellickson & Hays, 1991; Hawkins et al., 1997; Pedersen & Skrondal, 1998; Weber, Graham, Hansen, Flay, & Johnson, 1989).

In studies of predominantly White samples, adolescents exposed to parental alcohol use were more likely to drink alcohol than those who were not exposed (Chassin, Curran, Hussong, & Colder, 1996; Coffelt et al., 2006; Jackson, Henriksen, & Dickinson, 1999; Jackson, Henriksen, Dickinson, & Levine, 1997). This finding was consistent with another longitudinal study of a sample of adolescents that was 89% White (White, Johnson, & Buyske, 2000).

Additionally, parental alcohol use was a strong risk factor for younger age of alcohol use onset among adolescents in a seven year longitudinal study (Hawkins et al., 1997). In particular, adolescents who perceived their parents as drinking high levels of alcohol initiated alcohol use at a younger age (Pedersen & Skrondal, 1998). Seventh grade adolescents initiated alcohol use within one year after they recognized their father's drinking (P. L. Ellickson & Hays, 1991). In a similar study, adolescents' awareness of father's alcohol use was shown to affect the onset of adolescents' (9-10th grade) alcohol use two years later (Brook, Gordon & Whiteman, 1985). These findings suggest that parental alcohol use is a risk factor associated with the earlier initiation of alcohol use among adolescents.

In a longitudinal study, peer alcohol use was most strongly related to the age of alcohol use onset among White and African American adolescents (Jackson, 1997). In addition, the initial level of peer alcohol use was a predictor of later drinking and elevated levels of adolescent alcohol use among Hispanic and Caucasian adolescents (Curran, Stice, & Chassin, 1997). In another longitudinal study, friends' drinking predicted the onset of drinking among adolescent abstainers in seventh grade (P. L. Ellickson & Hays, 1991). Further, adolescents having more friends who drank alcohol were more likely to have an early age of alcohol use onset in Norway (Pedersen & Skrondal, 1998). Thus, both parent and peer alcohol use are important risk factors for early age of alcohol use onset among adolescents. However, peer alcohol use appears to have a greater influence on the timing of adolescent alcohol use onset than did parental alcohol use in various racial groups (Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Zhang, Welte, & Wieczorek, 1997) as well as White adolescents (Bogenschneider, Wu, Raffaelli, & Tsay,

1998). There were many risk and protective factors related to the age of onset of adolescent alcohol use, but parent and peer influences were stronger predictors than psychological factors (Hawkins et al., 1997; Pedersen & Skrondal, 1998; Pitkanen et al., 2005).

The age of alcohol use onset might be affected by different influencing factors at different points in development. Thus, it is useful to investigate predictors of age of alcohol use onset across different ages and stages of development.

Hypotheses

The following hypotheses were tested in this study:

1) Asian American adolescents having parents who drink more alcohol will report an earlier age of alcohol use onset than those having parents who drink less alcohol.

2) Asian American adolescents having peers who drink alcohol will report earlier age of alcohol use onset than those not having peers who drink.

3) The relationships between father, mother, and peer alcohol use, and age of alcohol use onset in Asian American adolescents vary across age groups.

Methods

Design and Sample of Add Health Data

The current study was a secondary analysis of data from the National Longitudinal Study of Adolescent Health (Add Health), a longitudinal and nationally

representative survey of adolescents in grades 7-12 (Udry, 2003). The primary sampling unit of the Add Health study was schools, and in-home data were collected based on the school sample. The selection process used multiple methods to oversample certain groups including Chinese, Black, Cuban, and Puerto Rican adolescents. Wave I data were collected between 1994 and 1995 and Wave II data were collected one year later. Wave III data were collected from 2001 to 2002. Wave I data included 20,745 in-home interviews, Wave II, 14,738 and Wave III, 15,197.

Add Health data used systematic sampling methods and stratification to ensure that the selected schools were representative U.S. schools. Students were stratified by gender and grade in school. Add Health data employed design weights to adjust for non-response within sampling clusters with unequal probability of selection. Post-stratification weights were used to adjust distributions to the population. In-home data were collected during two hour interviews with a laptop computer using both a computer-assisted personal interview (CAPI) and an audio computer-assisted self interview (ACASI) for measuring sensitive topics such as sexual, delinquent, and health behavior.

Sample

The study reported here used the in-home data samples from Add Health. The samples consisted of Asian American adolescents who participated in either Wave I, II, or III interviews. The total sample sizes of Asian Americans were 1,582 adolescents in Wave I, 1,088 in Wave II, and 1,268 in Wave III. The mean ages were 16.01 in Wave I, 16.68 in Wave II, and 22.27 in Wave III, with an overall range from 12 to 27 years. The number of males was 824 (52.08%) and the number of females was 758 (47.92%). The

sample consisted of approximately 52% males and 48% females in each wave. Weighted

sample sizes were 1,480 in Wave I, 1010 in Wave II, and 876 in Wave III. Sample

weights were employed in the data analyses (Table 2.1).

Table 2.1

The sample of the current study

	Wave I		Wave II		Wave III	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Total	1582	1480	1088	1010	1268	876
Male	824	773	556	519	656	449
	(52.08%)	(52.23%)	(51.10%)	(51.39%)	(51.73%)	(51.26%)
Female	758	707	532	491	612	427
	(47.92%)	(47.77%)	(48.89%)	(48.61%)	(48.27%)	(48.74%)
Mean age	16.01	15.58	16.68	16.24	22.27	21.11

Measures

The age of alcohol use onset as a dependent variable was measured by the

question, "Think about the first time you had a drink of beer, wine, or liquor when you

were not with your parents or other adults in your family. How old were you then?" The

beginning of alcohol use was coded as a continuous variable ranging from 1 for one year

of age to 19 for nineteen years and older. In Waves I and II, participants were asked

about their age of onset of drinking. The reported age was used as the actual age of

alcohol use onset in Waves I and II, but participants in Wave III were not asked this

question. Thus, to create the prospective age of initiation measure, if respondents did not

initiate drinking alcohol at Waves I and II, but they answered "drink alcohol once" in

Wave III, the prospective age of onset was calculated by age at the last interview minus

three (because the interval between Wave II and III was six years, the midpoint of the

interval period was estimated as three). Drinker status was coded as drinkers=1 and non-

drinkers=0 and used to test differences between drinkers and non-drinkers for descriptive

purposes.

The age of alcohol use onset was categorized into four groups: under age 12; ages

12-14; ages 15-18; and age 19 and above. These categories corresponded roughly with

school period, such that under age 12 was elementary school or preschool, ages 12-14

was middle school, ages 15-18 represented high school, and ages over 18 were post-high

school (Elliott, 1994).

Control variables were gender and socioeconomic status. Gender was coded as

male=1 and female=2. Socioeconomic status was measured by father's and mother's

education at Wave I. Parental education was used as an indicator of family

socioeconomic status, and was assessed by the highest level of fathers' or mothers'

education (Hussong & Hicks, 2003; Jones, Hussong, Manning, & Sterrett, 2008). The

level of education consisted of 10 options from 1 (for eighth grade or less) to 9 (for

professional training beyond a four-year college or university), and 10 (for never went to

school). In the current study, 10 for "never went to school" was recoded as 0.

Independent variables consisted of father's, mother's and peers' alcohol use.

Father's and mother's alcohol use were each measured by one item obtained from the

adolescents' parents: "How often do you drink alcohol?" This item used a six-point

response scale ranging from (1) "never", (2) "once a month or less", (3) "two or three

days a month", (4) "once or twice a week", (5) "three to five days a week", (6) "nearly

every day". The higher scores designated higher levels of alcohol use.

Perceived peer alcohol use was measured by the following: "Of your three best

friends, how many drink alcohol at least once a month?" This item ranged from zero (0)

to three (3) friends who drank alcohol. This measure reflected peer influence on alcohol

use by adolescents (Griffin, Botvin, Epstein, Doyle, & Diaz, 2000; Rose, 1999; Kandel &

Andrews, 1987).

For the Kaplan-Meier survival analysis, father, mother and peer alcohol use were

used. The father's alcohol use was separated into three groups: 0=non-drinkers; 1= father

drinks alcohol once a month/ two-three days per month/ once or twice a week; 2= father

drinks alcohol three to five days a week/ nearly every day. The mother's alcohol use was

separated into three groups: 0=non-drinkers; 1=mother drinks alcohol once a month/ two-

three days per month/ once or twice a week; 2=mother drinks alcohol three to five days a

week/ nearly every day. Peer alcohol use was separated into four groups using the

number of peers who drink alcohol: 0=adolescent has no friends who drink alcohol;

1=adolescent has one friend who drinks alcohol; 2=adolescent has two friends who drink

alcohol; and 3=adolescent has three friends who drink alcohol.

Data analysis

The current study had three hypotheses: (1) Asian American adolescents having

parents who drink more alcohol will report an earlier age of alcohol use onset than those

having parents who drink less alcohol; (2) Asian American adolescents having peers who drink alcohol will report earlier age of alcohol use onset than those having peers who do not drink; (3) The relationships between father, mother, and peer alcohol use, and age of alcohol use onset in Asian American adolescents vary across age groups. For the first and second hypotheses, Kaplan-Meier survival analysis was used to determine the relationship of age of alcohol use onset and the levels of parental (first hypothesis) and peer alcohol use (second hypothesis) among Asian American adolescents. To address the third hypothesis, logistic regression analysis was performed to determine if predictors of age of alcohol use onset differ across cross-sectional age groups of Asian American adolescents.

Add Health data were collected using complex sample designs such as a stratified cluster sampling. Add Health data employed design weights to adjust for non-response within clusters and unequal probability of selection, and used post-stratification weights to adjust distributions among the populations. All reported estimates were weighted according to the population-based sampling weights for the complex sampling design. In order to ensure the generation of representative point estimates of statistical parameters, the weights were applied to all analyses, which yielded nationally representative estimates. In order to address missing values, the data were tested to determine if they were missing completely at random (MCAR), and results indicated that the data were not MCAR. Missing at random (MAR) was not tested; however, missing data were imputed assuming that the data were MAR (Jaeger, 2006).

Missing data were multiply imputated (Raghunathan, Lepkowski, VanHoewyk, & Solenberger, 2001) using IVEware (Rubin, 1976; Little & Rubin, 2002). IVEware in

combination with SAS 9.1 was used to conduct descriptive analyses while adjusting for the complex sampling design using t-tests and χ^2 tests comparing drinkers and non-drinkers. Survival analysis was used to estimate the cumulative age-specific probability of alcohol use onset. Kaplan-Meier survival analysis as a standard survival analysis method was used to derive the age-specific risk and the cumulative risk of age of alcohol use onset over the seven-year observation interval. Kaplan-Meier survival analysis was conducted using SPSS 17 with each imputed data set separately. The results of the Kaplan-Meier survival analysis showed a similar tendency in each imputed data set, so this study used one graph based on data from one imputed data set as a representative of all five data sets. In the survival analysis, age of alcohol use onset was treated as the survival time and the adolescent was treated as "right-censored" with a survival time of their current age if they had not reported drinking by the last interview (Kaplan & Meier, 1958). This procedure provided interpretation of the comparability of survival functions among groups. The groups compared were males and females; three groups of adolescents defined by their father's current alcohol use; three groups of adolescents defined by their mother's current alcohol use; and four groups of adolescents defined by the number of peers who drink alcohol. For censoring, adolescents who did not drink yet were coded as 1 and drinkers were coded as 0.

Logistic regression analysis using the IVEware REGRESS module with five imputed data sets was performed to assess the association of age of alcohol use onset and parental and peer alcohol use across the four age groups (under age 12; ages 12-14; ages 15-18; and age 19 and above). Alcohol use was coded as drinkers=1 and non-drinkers=0. The logistic regression analyses were performed using IVEware in combination with

SAS 9.1 with the five imputed data sets. Logistic regression analysis was conducted

independently in each age group. The current study used three waves of data, and the

weighting variable was employed in the analyses. In these analyses, socio-demographic

variables were included in the model to control for their potentially confounding effects.

Results

Socio-demographic background between Drinkers and Non-drinkers

The descriptive statistics on background characteristics of Asian American

adolescents in the three cross-sectional waves of data are shown in Table 2.2-2.4. The

range of alcohol consumption (frequency $\times$ quantity) was from 0 for non-drinkers to 1

through 18 for drinkers. Older adolescents drank more than younger adolescents, a

finding which was significant in Waves I ($p<0.001$) and II ($p<0.001$). In particular, the

proportions of adolescents using alcohol at Wave III were around two times that of

adolescents at Waves I and II (38% in Wave I, 35% in Wave II, and 68% in Wave III).

Males drank more alcohol than females across all three waves, but this finding was

statistically significant only at Wave III ($p<0.001$). Drinkers reported a higher mean value

of father's alcohol use (2.42) than non-drinkers at Wave I (1.87) ($p<0.001$). Adolescent

alcohol consumption was higher at Wave I ($p=0.008$) for adolescents whose mothers

consumed greater amounts of alcohol. Furthermore, adolescents whose peers drank

alcohol reported higher alcohol consumption at Wave I and II ($p<0.001$) (Table 2.2-2.4).

Table 2.2

Descriptive Statistics of Asian Americans in Wave I (weighted N=1480)

	Wave I										
	All respondents			Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
Characteristics	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	Coefficient	Pr > F
alcohol use overall by gender											
Alcohol Use	1480	1.49(0.17)	0-18	565(38.18)	4.12(0.33)	1-18	915 (61.82)	0	-	19.73****	<0.001
Gender Male	773 (52.23)	1.57(0.20)	0-15	298(38.55)	4.30(0.38)	1-15	475 (61.45)	0	-	0.47	0.493
Female	707 (47.77)	1.40 (0.22)	0-18	267(37.77)	3.93(0.42)	1-18	440 (62.23)	0	-		
Socio-demographic factors, and parents' and peers' alcohol use											
Age	1480	15.58(0.24)	12-20	565(38.18)	16.10(0.20)	12-20	915 (61.82)	15.29 (0.28)	12-20	19.73****	<0.001
Level of education of parents	1374	6.38(0.19)	0-9	542 (39.45)	6.65(0.24)	0-9	832 (60.55)	6.22(0.21)	0-9	3.10	0.082
Father's alcohol use	802	2.06(0.17)	1-6	308(38.40)	2.42(0.21)	1-6	494 (61.60)	1.87(0.16)	1-6	13.48****	<0.001
Mother's alcohol use	937	1.50(0.08)	1-6	366 (39.06)	1.66(0.11)	1-6	571 (60.94)	1.41(0.07)	1-6	7.37**	0.008
Peer alcohol use	1450	0.88(0.07)	0-3	558 (38.48)	1.63(0.10)	0-3	892 (61.52)	0.45(0.05)	0-3	148.25****	<0.001

* P<0.05 *** p<0.01 **** p<0.001

Table 2.3.

Descriptive Statistics of Asian Americans in Wave II (weighted N=1010)

Characteristics	All respondents			Wave II — Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	Coefficient	Pr > F
Alcohol use	1010	1.35 (0.19)	0-18	357 (35.35)	4.15(0.46)	1-18	653 (64.65)				
Gender male	519 (51.39)	1.43 (0.24)	0-18	172 (33.14)	4.9 (0.65)	1-18	347 (66.86)	0	-	0.45	0.505
female	491 (48.61)	1.25 (0.22)	0-18	185(37.68)	3.49(0.46)	1-18	306 (62.32)	0	-		
Socio-demographic factors, and peers' alcohol use											
Age	1010	16.24(0.27)	13-20	357 (35.35)	16.64(0.30)	13-22	653(64.65)	16.05(0.26)	13-22	11.61****	<0.001
Level of education of parents	943	6.35(0.21)	0-9	337(35.74)	6.60(0.29)	0-9	606 (63.64)	6.23(0.24)	0-9	1.32	0.254
Peer alcohol use	997	0.81(0.07)	0-3	356 (35.71)	1.46(0.11)	0-3	641 (64.29)	0.49(0.05)	0-3	87.32****	<0.001

* P<0.05 *** p<0.01 **** p<0.001

46

Table 2.4

Descriptive Statistics of Asian Americans in Wave III (weighted N=876)

Characteristics	All respondents			Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	Coefficient	Pr > F
alcohol use overall by gender											
Alcohol use	876	3.26(0.29)	0-18	591 (67.47)	5.25 (0.32)	1-18	285 (32.53)	0	-		
Gender Male	449 (51.26)	4.15 (0.40)	0-18	315 (70.16)	6.16 (0.46)	1-18	134 (29.84)	0	-	19.52****	<0.001
Female	427 (48.74)	2.28 (0.29)	0-18	276 (64.64)	4.05 (0.34)	1-18	151 (35.36)	0	-		
Socio-demographic factor											
Age	876	21.11(0.27)	18-25	591 (67.47)	21.10(0.30)	18-25	285(32.53)	21.11 (0.29)	18-25	0.00	0.945

* P<0.05 *** p<0.01 **** p<0.001

47

In this sample of Asian American adolescents, 3.53% initiated alcohol use under age 12, 15.06% began drinking between age 12 and 14, 33.42% started drinking between age 15 and 18, and 16.24% started alcohol drinking over age 18 (weighted proportions). Thirty –two percent (31.76%) reported never drinking by the third Wave of data collection. Among drinkers, the mean age of alcohol use onset was 15.9 (95% CI: 15.18-16.54) years for all adolescents. For males' the mean age of alcohol use onset was 16.2 years and for females' the mean age of alcohol use onset was 15.5 years (Table 2.5).

Table 2.5

Age groups of age of alcohol use onset

Age of alcohol use onset	Number (%) (unweighted)	Number (%) (weighted)
Group1 (Age group under 12)	52 (3.28)	30 (3.53)
Group2 (Age group 12-14)	234 (14.79)	128 (15.06)
Group3 (Age group 15-18)	429 (27.12)	284 (33.42)
Group4 (Age group over 18)	146 (9.23)	138 (16.24)
Non-drinkers	721 (45.58)	270 (31.76)
Total	1582 (100.00)	850(100.00)

Kaplan-Meier survival function of age of alcohol use onset

The lifetime cumulative Kaplan-Meier estimate of the survival curves for age of

onset of drinking alcohol use is shown in Figure 2.2-2.5.

Kaplan-Meier Functions

Figure 2.2. The Kaplan-Meier estimates of the survival curves for age of alcohol
use onset for adolescents by gender.

The survival rate was assessed using the Kaplan-Meier method. Figure 2.2 shows

the estimated cumulative probability of initiation of alcohol use by gender. When

adolescents were 16 years old, the estimated cumulative probability for age of alcohol use

onset was 35% regardless of gender. Gender was not significantly associated with age of

alcohol use onset.

Kaplan-Meier Functions

Figure 2.3. The Kaplan-Meier estimates of the survival curves for age of
alcohol use onset for adolescents by father's alcohol use

* father's alcohol use 0=non-drinkers
                           1=once a month, two-three days per month, once or twice a week
                           2=three to five days a week, nearly every day

Figure 2.3 shows the estimated cumulative probability of age of alcohol use onset

for father's alcohol use. By the time the adolescents were 16 years old, the estimated

50

cumulative probability for age of alcohol use onset was 23% for adolescents having a

father who did not drink alcohol, 37% for those having a father who drank alcohol from

once a month to once or twice a week, and 55% for those having a father who drank

alcohol from three to five days a week or nearly every day.

Father's alcohol use was significantly related to the age of alcohol use onset (F=

9.18, p<.001). Adolescents having a father who drank alcohol initiated drinking at an

earlier age and those who had a father who did not drink alcohol showed later age of

alcohol use onset (Fig 2.3). The mean age of alcohol use onset of adolescents having a

father who did not drink alcohol was 20.50 years (SE: 0.20, median: 20.00); that of

adolescents having a father who drank alcohol from once a month to once or twice a

week was 19.63 years (SE: 0.23, median: 18.00); and that of adolescents having a father

who drank alcohol from three to five days a week to nearly every day was 17.13 years

(SE: 0.48, median: 16.00).

Kaplan-Meier Functions
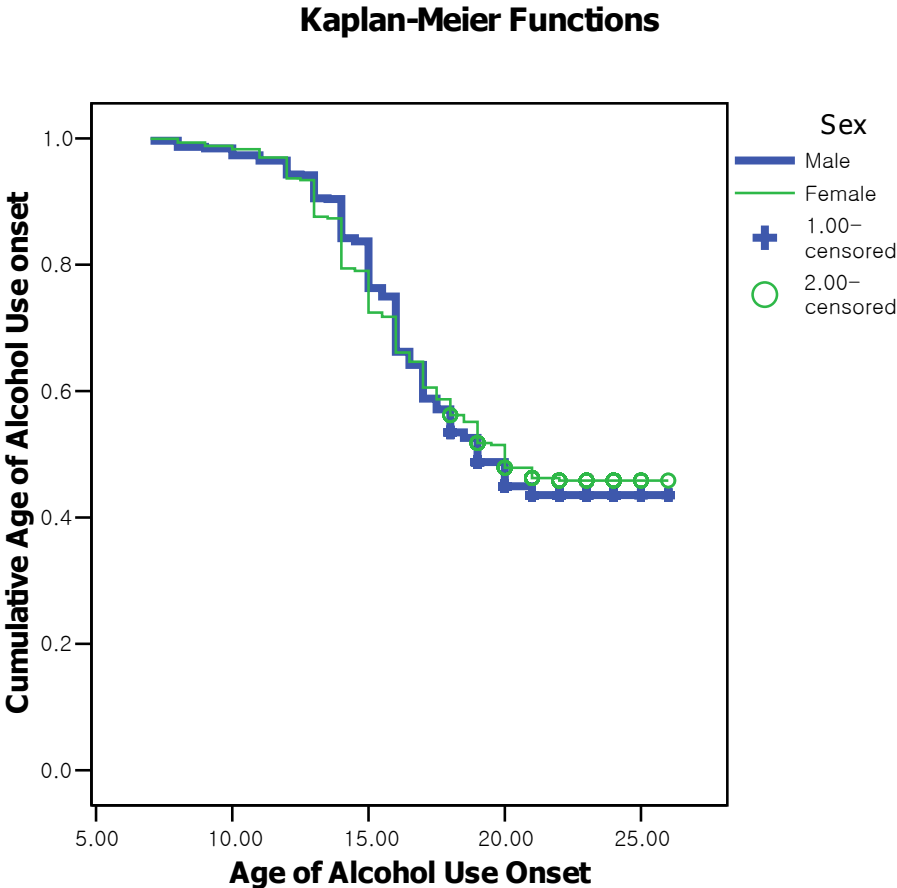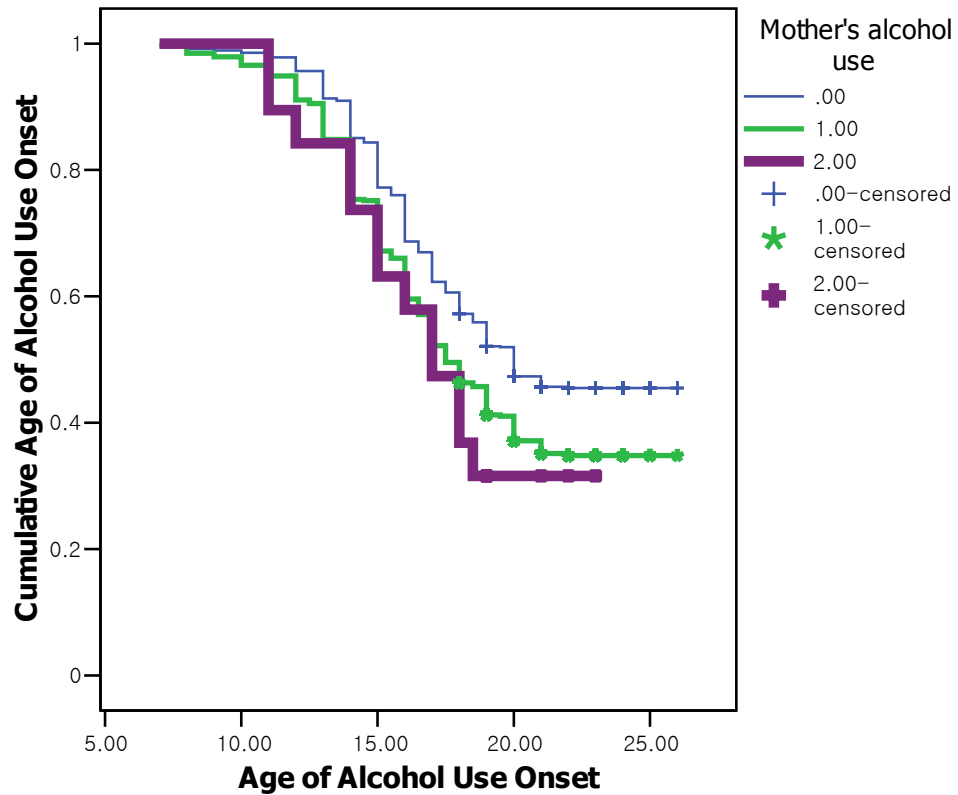

Figure 2.4. The Kaplan-Meier estimates of the survival curves for age of alcohol use onset for adolescents by maternal alcohol use

 * mother's alcohol use 0=non-drinkers
                                        1=once a month, two-three days per month, once or twice a week
                                        2=three to five days a week, nearly everyday

Figure 2.4 shows the estimated cumulative probability of age of alcohol use onset for mother's alcohol use. When adolescents were 16 years old, the estimated cumulative probability for age of alcohol use onset was 23% for adolescents having a mother who did not drink alcohol, 33% for those having a mother who drank alcohol from once a month to once or twice a week, and 42% for those having a mother who drank alcohol from three to five days a week to nearly every day.

Comparing the age of alcohol use onset by mother's alcohol use, adolescents who had a mother who did not drink alcohol showed later age of alcohol use onset than those having a mother who drank alcohol (Fig 2.4: F=3.22, p<0.044).

The mean age of alcohol use onset of adolescents having a mother who did not drink alcohol was 20.55 years (SE: 0.19, median: 20.00); that of adolescents having a mother who drank alcohol from once a month to one or twice a week was 19.13 years (SE: 0.24, median: 17.50); and that of adolescents having a mother who drank alcohol from three to five days a week to nearly every day was 17.61 years (SE: 0.97, median: 17.00).

Kaplan-Meier Functions
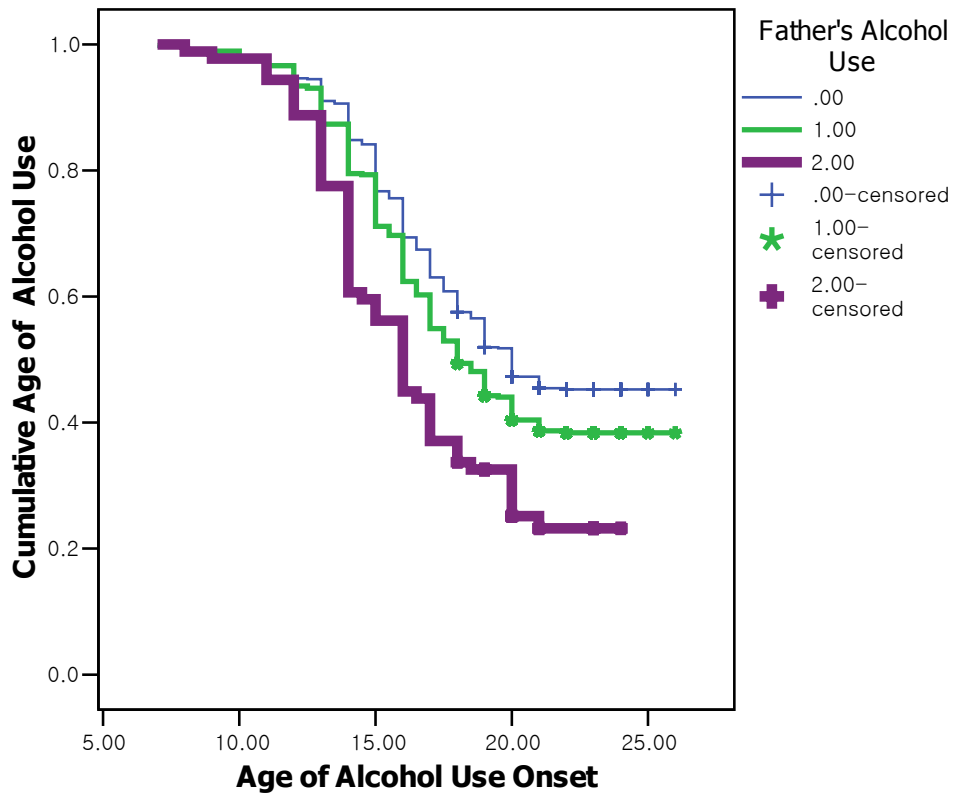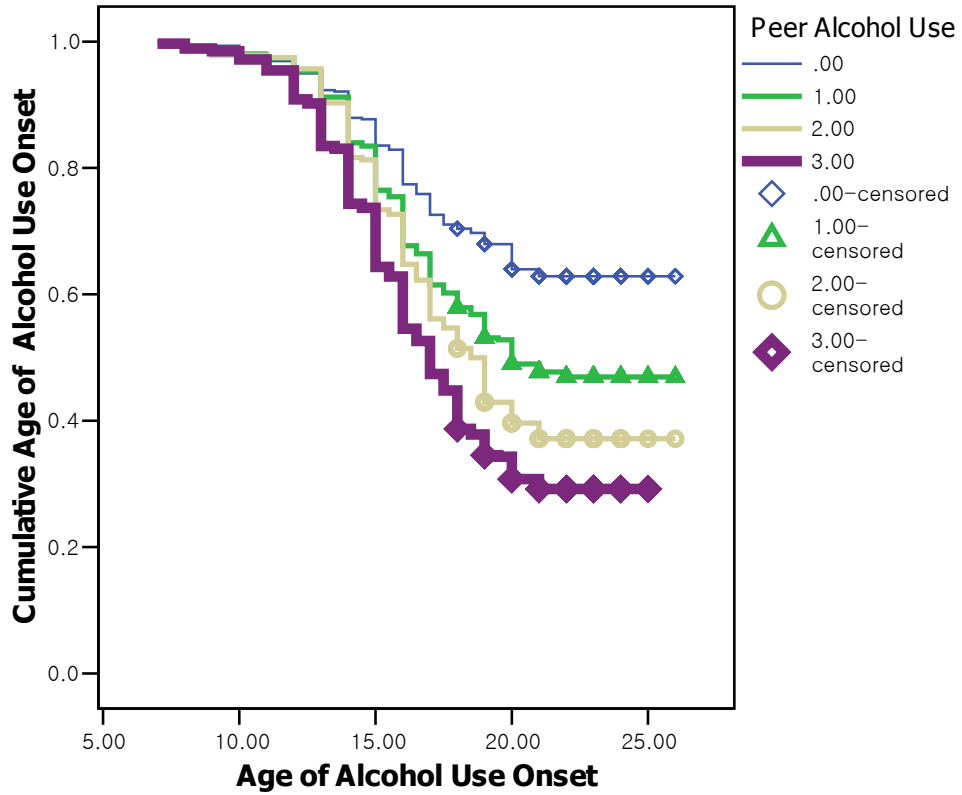

Figure 2.5. The Kaplan-Meier estimates of the survival curves for age of alcohol use onset for adolescents by the number of peers who drink alcohol

Figure 2.5 shows the estimated cumulative probability of age of alcohol use onset for adolescents having peers who drank alcohol. By the time the adolescents were 16 years old, the estimated cumulative probability for alcohol use initiation was 21% for those having no friends who drank alcohol, 30% those having one friend who drank alcohol, 33% for those having two friends who drank alcohol, and 46% for adolescents having three friends who drank alcohol.

Comparing the survival rate by the number of peers who drank alcohol, adolescents who had more friends who drank alcohol showed significantly earlier age of alcohol use onset than those having few friends who drank alcohol (Fig 2.5: F=12.97, p<0.001).

The mean age of alcohol use onset of adolescents having no friends who drank alcohol was 22.17 years (SE: 0.25, median: not available); that of adolescents having one friend who drank alcohol was 20.61 years (SE: 0.28, median: 20.00); that of adolescents having two friends who drank alcohol was 19.69 years old (SE: 0.46, median: 18.50); and that of those having three friends who drank alcohol was 18.21 years (SE: 0.23, median: 17.00).

Logistic regression models of age of alcohol use onset within each age group

To examine influencing factors within cross-sectional age groups on alcohol use onset, logistic regression was performed using IVEware in conjunction with SAS 9.1. The age of alcohol use onset varies among adolescents. Table 6 shows factors related to alcohol use onset for each age group. Groups 1, 2, 3 and 4 represent the age of alcohol use onset in adolescents whose ages are less than 12, 12-14, 15-18 and greater than 18, respectively.

Peer alcohol use and mother's alcohol use were significantly associated with the age of alcohol use onset at age less than 12 (group 1). With each increase in the number of best friends drinking alcohol, the odds of drinking increased by 95% (p<0.01), holding all other variables fixed. If the mother was currently drinking (i.e., mother's alcohol use=1), the odds of drinking increased by 67% (p<0.05), relative to adolescents with

mothers that are not currently drinking (i.e., mother's alcohol use=0), controlling for other covariates. Gender, level of parental education, and father's alcohol use were not associated with group 1.

In group 2, gender, parental education and peer and father's alcohol use were significantly associated with the age of alcohol use onset at age 12-14. The odds of males beginning alcohol use between the ages of 12-14 were twice than that of females. An increase in parent's education resulted in a 20% ($p<0.05$) increase in the odds of drinking onset in the second group, holding all other variables fixed. In particular, an addition of one friend who drank alcohol increased the chance of drinking onset of adolescents by 130% ($p<0.001$), holding all other variables fixed. If the father drank alcohol (i.e., father's alcohol use=1), the odds of drinking onset between ages 12-14 increased by 37% ($p<.01$) relative to adolescents with fathers that didn't drink (i.e., father's alcohol use=0), while controlling for other covariates.

In group 3, with each increase in the number of best friends drinking alcohol, the odds of drinking onset between ages 15-18 increased by 34% ($p<0.001$), holding all other variables fixed. If the father drank alcohol (i.e., father's alcohol use=1), the odds of drinking onset between ages 15-18 increased by 35% ($p<0.05$) relative to adolescents with fathers that didn't drink alcohol (i.e., father's alcohol use=0), holding all other variables fixed. The odds of female adolescents initiating alcohol use between ages 15-18 increased the odds of drinking by 59% compared to males but this did not achieve significance ($p=0.053$).

In group 4 (age of alcohol use onset at age greater 18), none of the predictors were significantly associated with beginning using alcohol (Table 2.6).

Table 2.6

Multiple logistic regression models using at risk analysis among groups of age of alcohol use onset (weighted)

Age of alcohol use onset	Group 1 (age less than 12)	Group 2 (age 12-14)	Group 3 (age 15-18)	Group 4 (age greater than18)
	O.R (95% CI)	O.R (95% CI)	O.R (95% CI)	O.R (95% CI)
Gender	2.23 (0.49-10.10)	1.80 (1.07-3.03)*	0.59 (0.34-1.01)	0.67 (0.27-1.66)
Level of parental education	0.97 (0.75-1.25)	1.20 (1.03-1.40)*	1.03 (0.91-1.16)	0.97 (0.83-1.14)
Number of Peer alcohol use	1.95 (1.25-3.03)**	2.30 (1.72-3.07)***	1.34 (1.05-1.70)*	0.90 (0.44-1.85)
Father's alcohol use	0.93 (0.61-1.44)	1.37(1.13-1.65)**	1.35 (1.06-1.72)*	1.17 (0.80-1.70)
Mother's alcohol use	1.67 (1.12-2.50)*	1.25 (0.96-1.63)	1.03 (0.78-1.36)	0.87 (0.58-1.32)

* age of alcohol use onset
  Group 1 (age less than 12: age of alcohol use onset = 1, Otherwise including non-drinkers, group2, group3, and group4 = 0)
  Group 2 (age 12-14: age of alcohol use onset = 1, Otherwise including non-drinkers, group3, and group4= 0)
  Group 3 (age 15-18: age of alcohol use onset = 1, Otherwise including non-drinkers, group4 = 0)
  Group 4 (age greater than18: age of alcohol use onset = 1, Otherwise including non-drinkers = 0)
  OR: odds ratio, 95% CI: 95% Confidence Interval
  * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Discussion and Conclusions

The current study showed that 15.6% of Asian American adolescents initiated alcohol use between the ages of 12 and 14, and 33.4% started drinking between ages 15 and 18. Additionally, the mean age of alcohol use onset was 15.9 years: 16.2 years for males and 15.5years for females. In the United States, the age of alcohol use onset often occurs prior to age 15 and the peak age for alcohol use onset is between13 and 15 years (Johnston, O'Malley, & Bachman, 1994). Hawkins et al. (1997) noted that White adolescents were more likely to start drinking at a younger age than non-White adolescents. Kosterman et al. (2000) reported a similar finding that Asian American adolescents were more delayed in the onset of alcohol use than White adolescents. Thus, the current study's findings were consistent with other literature.

Age of alcohol use onset and Kaplan-Meier survival function

In the current study, age of alcohol use onset was not significantly different between males and females. However, parental and peer alcohol use were significantly associated with age of alcohol use onset. In particular, adolescents having three peers who drank alcohol (46%) initiated alcohol use twice as early as adolescents who did not have any friends who drank alcohol (21%) by 16 years of age (Figure 2.3). In addition, paternal drinking emerged as a risk factor because adolescents who had a father who drank alcohol (three to five days a week and nearly every day) initiated alcohol use twice as early as those who had a father who did not drink. Maternal alcohol use had a similar influence to paternal alcohol use on age of alcohol use onset of adolescents. Higher levels

of paternal alcohol use, maternal alcohol use, and peer alcohol use predicted an earlier age of alcohol use onset. Thus, parental and peer alcohol use might be risk factors for earlier age of alcohol use onset among Asian American adolescents. These findings are consistent with several studies, including ones examining peer alcohol use among White and African American adolescents in a large mid-western city (Urberg et al., 1997), the effect of parental alcohol use amongst various race groups (Hawkins et al., 1997), and the impact of paternal alcohol use among White and non White race groups (Zhang et al., 1999). However, it is important to consider that different ages of alcohol use onset might be influenced by different risk factors. This issue will be discussed later in this section.

As shown in the Kaplan-Meier survival function in the current study (Figure 2.2), the alcohol use onset increased quickly from ages 13 to 18. During this five- year period, an additional 44% of the adolescents drank alcohol for the first time. By 18 years of age, cumulative age of alcohol use onset had reached 52%. From the ages of five to 13 years, however, the rate of alcohol use initiation remained low; over this 8-year period, just 8% of the sample used alcohol for the first time.

To see the differences in rates of alcohol among different races and ethnicities, the national Monitoring the Future Study was reviewed. The cumulative age of alcohol use onset by 18 years of age (12th graders in 2001) in the current study showed different rates of alcohol use than in the corresponding survey of 12th graders from the national Monitoring the Future Study (MFS) in 1999-2000 (combined) (Johnston, O'Malley & Bachman, 2001). In the national Monitoring the Future Study, the lifetime drinking rates of 12th graders were 82.0% in White Americans, 70.3% in African Americans, and 84.3% in Hispanics. In addition, the lifetime drinking rates of 10th graders in MFS (10th graders

in MFS is equivalent to 16 years of age in the current study) were 72.8% in White Americans, 61.2 % in African Americans, and 74.1% in Hispanics. However, in the current study, the rate of age of alcohol use onset in Asian Americans was 35%. This rate was lower than those of other races, based on the MFS data (Johnston, O'Malley & Bachman, 2001).

The reasons for the later age of alcohol use onset (or lifetime alcohol use) among Asian Americans might be explained by Asian Americans' cultural perspectives, family structure, parental expectations of adolescents, and peer relationships. Asian Americans who were less acculturated were less likely to drink alcohol, so less acculturation might influence the delay of age of alcohol use onset (Hahm, Lahiff, & Guterman, 2003). In addition, Asian Americans have a tendency to be more family oriented and have more family contact than other races in the U.S. (Triandis, 2001). They were more likely to live in a family, spend less time with their friends (Larson, Moneta, Richards, & Wilson, 2002), and have fewer friends in comparison to White American adolescents (Au & Donaldson, 2000; Lorenzo, Pakiz, Reinherz & Frost, 1995). Additionally, Asian American adolescents participated in fewer after school activities and less social relationships compared to White adolescents (Lorenzo, Pakiz, Reinherz & Frost). Newcomb and Bentler (1986) found that Asian Americans reported having fewer substance-using peers compared to White adolescents. These factors might influence the delayed age of onset among Asian American adolescents more than other races and ethnicities.

Logistic regression results among groups of age of alcohol use onset

Predictors of age of alcohol use onset

In the current study, four groups based on age of alcohol use onset were formed. In adolescents with alcohol use onset prior to age 12, maternal alcohol use and peer alcohol use were significantly associated with the alcohol use onset. This may be a result of younger adolescents having close attachments to parent figures and sharing more time with their mothers than fathers, resulting in mother's alcohol use having a stronger association with alcohol use onset in this age group.

In adolescents with alcohol use onset at age 12-14 (group 2; early adolescence), peer and paternal alcohol was associated with alcohol onset, but maternal alcohol use was not significantly associated. Specifically, adolescents whose fathers drank alcohol were 37 % more likely to start drinking at age 12-14 than those whose fathers were not currently drinking. This finding was in accordance with previous research (P. L. Ellickson & Hays, 1991). Also, adolescents who had more friends who drank alcohol were 130 % more likely to start drinking at age 12-14 than those who had no friends that drank alcohol, suggesting the importance of peers as socializing agents in this age-group.

During early adolescence (age 12-14), increased logical and abstract reasoning skills and biological, social, and cognitive changes often make adolescents become more argumentative and questioning of parents' authority. This may lead to more interfamilial conflict. At this time, emotional adaptation becomes necessary for both adolescents and their parents (Allison & Schultz, 2004). As adolescent autonomy and independence from parents increase in middle and late adolescence, less time is spent with parents and more time outside families with peers, at school or at work (Aseltine & Gore, 1993). Moreover,

adolescent individualism (Baer & Bray,1999), poor parental monitoring (Barnes, Welte, Hoffman, & Dintcheff, 1999), and poor adolescent-parent relationships (T. E. Duncan, Duncan, & Hops, 1994) have been associated with early age of alcohol use onset.

As a result of puberty related changes, adolescents become more conscious of their personal images and popularity. Moreover, curiosity about alcohol use increases, and they may try to mimic adult alcohol use, and attempt to purchase alcohol illegally (Wagenaar et al., 1996). With age, adolescents become aware of the potential benefits of drinking and become less convinced of its associated risks and costs (Johnson & Johnson, 1996). Moreover, adolescents consider themselves to be invulnerable, thinking no harm will come to them (Elkind, 1967). These aforementioned tendencies may explain increased rates of first time alcohol use among adolescents.

During this period, adolescents tend to have a greater focus on peer friendships, causing them to share their values and personal confidences with friends (Perry et al., 1993). Additionally, they may have conflicts with their parents due to their own decision-making, which can alter the nature of their relationships. However, Asian culture places more emphasis on interdependence, and is also family-oriented (Triandis, 2001; Heine et al., 1999; Kim, 2001). Further, family structure is more hierarchical, with the father wielding the most power (Bhattacharya, 1998). For example, Korean Americans, showed more compliance with the wishes of parents and relatives than White adolescents, and tended to emphasize interdependence and close family relationships (Bakalian, 1993; Okagaki & Sternberg, 1993). Korean American culture, like many non-European cultures, is more likely to be based on compliance and avoidance of open conflict (Markus & Lin, 1999). The culture of Asian Americans, specifically Korean Americans, reflects values

that stress an obligation of adolescents to respect and obey their parents (Bakalian, 1993; Kim & Choi, 1994). Thus, Asian cultural elements, such as interdependence among family members, obedience to parents, and hierarchical family structure, may delay alcohol use onset or decrease the level of alcohol use.

Ethnic minority groups, such as Armenians and Hispanics reported very low levels of self-assertion and high family interdependence, but the opposite was true of elders in these race groups (Phinney et al., 1998). Hispanics and Armenian Americans expressed greater autonomy among older populations as compared to younger populations, whereas interdependence with family did not vary across age groups. In contrast, White adolescents seem to have well-established autonomy reflective of their less subordinate role to their parents. Further, White adolescents showed less family interdependence compared to other groups; however they demonstrated more family concerns with age (Phinney et al.).

Korean Americans exhibit more consistency in values and family interdependence than Hispanics or White Americans, regardless of their age. This may reflect the stability of traditional Korean values, perhaps a natural result of the Asian–influenced preference to avoid conflict with others (Kim-Jo, 1993). Consequently, Asian cultural traits such as family interdependence, less autonomy and compliance with parental wishes may represent a protective factor that delays first time alcohol use.

Adolescents with alcohol use onset at age 15-18 (group 3; middle adolescence) were significantly affected by peer alcohol use and paternal alcohol use. With every one person increase in the number of best friends' who drink alcohol, adolescents were 34% more likely to initiate alcohol use in this age group. In other studies, peers' alcohol use

significantly predicted age of alcohol use onset in seventh to tenth grade students (P. L. Ellickson & Hays, 1991; Hawkins et al., 1997; Pedersen & Skrondal, 1998; Weber et al., 1989), whereas, Urberg and colleagues (1997) reported that the closest friend's alcohol use predicted age of alcohol use onset in grades 6, 8 and 10, among African American and White adolescents. In addition, the drinking onset of White adolescents in high school was related to a greater level of friends' alcohol use in a longitudinal study (Stice, Barrera, & Chassin, 1998). These findings suggest that friends' alcohol use is a risk factor in onset of drinking at both ages 12-14 and 15-18. In the current study, peer alcohol use was also a risk factor for age of onset of drinking in both age groups (age 12-14 and 15-18), but the degree of influence (OR: 2.30 at group 2, OR: 1.34 at group3) was greater in the 12-14 than the 15-18 year age group. This may suggest that peer alcohol use represents a greater risk factor to middle school students (age 12-14) than high school students (age 15-18).

The socialization processes during adolescence typically involves greater attached to friends and less reliance on parents (Perry et al., 1993) and behavioral standards are shaped by peers. Peer acceptance holds great importance for adolescents in this age group (Kandel, 1985), so peer alcohol use may contribute more strongly to alcohol use onset. During early and middle adolescence, adolescents are more susceptible to peer influences on alcohol use (Dielman, 1994) and similarities among peers encourage continued or increased alcohol use. Furthermore, adolescents tend to overestimate the prevalence of alcohol use by their peers, and overvalue drinking norms, so these factors may precipitate their alcohol use (Baer & Carney, 1993).

Finally, none of the variables were significantly associated with alcohol use onset at age greater than 18 (group 4; late adolescence). Adolescents who initiate drinking after 18 are already mature, and they may not live with their parents after entering college or gaining employment. Although they may live with their parents, they may not spend much time with their parents. Thus, parental influences in this period may be less than in childhood and adolescence. During late adolescence, young adults confront a transition from school to work places or colleges. For successful and optimal adaptation, practical skills and ideas may be needed, but the difficulties in negotiating this transition period may affect emergent health risk behavior or alcohol use (Schulenberg & Maggs, 2002).

In sum, since adolescents have different predictors of different age of alcohol use onset, these findings should be considered in the design of programs to delay and prevent alcohol use. Specifically, while males initiated alcohol use more in the middle school period more than females, females initiated alcohol use more in the high school period than males. Based on the current study's finding, prevention programs for Asian Americans should consider the content and timing of intervention. For example, although prevention and education should be implemented during the entire period of adolescent development, prevention programs for alcohol use may need to be implemented before middle school for males, whereas prevention programs could be established intensively at least before high school for females among Asian American adolescents. However, other studies revealed that alcohol prevention programs need to be implemented before middle school with repeat or booster programs to effectively prevent alcohol use (Loveland-Cherry, Leech, Laetz, & Dielman, 1996; Loveland-Cherry, Ross, & Kaufman, 1999; Donovan et al., 2004). Early intervention programs need to be considered to prevent or

delay the onset of alcohol use before children experience frequent alcohol use and alcohol related problems (Spoth, Redmond, Shin, & Azevedo, 2004). Further, alcohol prevention programs should be included in adolescents' education programs because adolescents with parents who drink alcohol might be at greater risk of alcohol use. Moreover, programs should target parents as well as adolescents. Parents should be taught to help their adolescents delay the onset of alcohol use. Alcohol prevention programs should consider teaching adolescents to resist or avoid the influence of peers who drink alcohol. Thus, the current findings suggest the importance of considering the risk factors of age of alcohol use onset in each different age group and understanding parents' and peer alcohol use in the course of alcohol use development among Asian American adolescents.

Strengths and Limitations

The current study identifies predictors of age of alcohol use onset across different onset age groups. This information contributes to building prevention and education programs due to the variance in the factors affecting age of alcohol use onset in each age group among Asian American adolescents.

The limitations of this study were as follows. Age of alcohol use onset was measured using a retrospective method, so recall bias may have distorted the data. Secondly, the data were collected through self-reports, so possible over- or under-reporting might impact the validity of data due to biased responses. Thirdly, data of parental alcohol use were collected only at Wave I, therefore maternal and paternal alcohol consumption patterns are unavailable for adolescents who first used alcohol at a

very early age. Furthermore, a test for missing at random (MAR) was not conducted in this study. However, the data for the current study were assumed to be MAR, and multiple imputation was performed.

Future implications

Although much research has been done to determine the risk factors for earlier age of alcohol use onset based on cohorts of adolescents (Hawkins et al., 1997; Kaplow, Curran, Angold, & Costello, 2001; Webb, Baer, McLaughlin, McKelvey, & Caid, 1991), there has been a lack of research to identify predictors of age of alcohol use onset across different age onset groups (Donovan, 2004). The results of this study suggest that the predictors of age of alcohol use onset might differ across adolescent age groups. For instance, the predictors of age of alcohol use onset among adolescents could be different from those of middle or high school adolescents. The predictors of age of alcohol use onset might also vary by race. This information should guide the development of future research and intervention programs so that appropriate interventions are administered. Future research should examine risk factors for onset of alcohol use based on different age of onset groups and races in longitudinal data.

The current study examined the individual level factors to determine predictors of the age of onset of alcohol drinking, but studies should consider including school and neighborhood level factors. Environmental factors, including school or the community outside of family and friends, may play a role in the age of alcohol use onset. In addition, this study examined parental alcohol use and peer alcohol use to predict each age group's age of alcohol use onset. Since Asian American adolescents might be influenced by

67

acculturation, acculturation needs to be considered in the prediction of age of alcohol use

onset.

References

Allison B.N, Schultz J. B. (2004). Parent-adolescent conflict in early adolescence, Adolescence, 39(153), 101-119.

Andrews J.A., Hops H., Ary D. et al., (1993). Paretnal influences on early adolescent substance use: Spedific and non specific effects. *Journal of Ealry adolescent*, 13, 285-310.

Aseltine, & R.H, Gore, S. (1993).Mental health and social adaptation following the transition from high school. *J Res Adolesc.*3(3), 247–270.

Au, J. G., & Donaldson, S. I. (2000). Social influences as explanations for substance use differences among Asian-American and European-American adolescents. *J Psychoactive Drugs, 32*(1), 15-23.

Baer, P. E., & Bray, J. H. (1999). Adolescent individuation and alcohol use. *J Stud Alcohol Suppl, 13*, 52-62.

Baer, J. S., & Carney, M. M. (1993). Biases in the perceptions of the consequences of alcohol use among college students. *J Stud Alcohol, 54*(1), 54-60.

Bakalian, A. (1993). *Armenian-Americans*. New Brunswick, NJ: Transaction.

Barnes, G. M., Welte, J. W., Hoffman, J. H., & Dintcheff, B. A. (1999). Gambling and alcohol use among youth: influences of demographic, socialization, and individual factors. *Addict Behav, 24*(6), 749-767.

Berger, K.S. & Thompson, R.A. (1995). The developing person: Through childhood and adolescence. New York: Worth Publishers. Feek, W. (Ed). (1990). On-Line: The drugs learning package. London: The Commonwealth Secretariat.

Bhattacharya, G. (2000) The school adjustment of south Asian immigrant children in the United States. *Adolescence*, 35, 77–85.

Bogenschneider, K., Wu, M. Y., Raffaelli, M., & Tsay, J. C. (1998). Parent influences on adolescent peer orientation and substance use: the interface of parenting practices and values. *Child Dev, 69*(6), 1672-1688.

Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: a family interactional approach. *Genet Soc Gen Psychol Monogr, 116*(2), 111-267.

Brook, J. S., Gordon, A. S., & Whiteman, M. (1985). Stability of personality during adolescence and its relationship to stage of drug use. *Genet Soc Gen Psychol Monogr, 111*(3), 317-330.

Chassin, L., Curran, P. J., Hussong, A. M., & Colder, C. R. (1996). The relation of parent alcoholism to adolescent substance use: a longitudinal follow-up study. *J Abnorm Psychol, 105*(1), 70-80.

Coffelt, N. L., Forehand, R., Olson, A. L., Jones, D. J., Gaffney, C. A., & Zens, M. S. (2006). A longitudinal examination of the link between parent alcohol problems and youth drinking: the moderating roles of parent and child gender. *Addict Behav, 31*(4), 593-605.

Curran, P. J., Stice, E., & Chassin, L. (1997). The relation between adolescent alcohol use and peer alcohol use: a longitudinal random coefficients model. *J Consult Clin Psychol, 65*(1), 130-140.

D'Amico, E. J., & McCarthy, D. M. (2006). Escalation and initiation of younger adolescents' substance use: the impact of perceived peer use. *J Adolesc Health, 39*(4), 481-487.

Dielman, T. E. (1994). Correction for the design effect in school-based substance use and abuse prevention research: sample size requirements and analysis considerations. *NIDA Res Monogr, 139*, 115-125.

Donovan, J. E. (2004). Adolescent alcohol initiation: a review of psychosocial risk factors. *J Adolesc Health, 35*(6), 529 e527-518.

Donovan, J. E., Leech, S. L., Zucker, R. A., Loveland-Cherry, C. J., Jester, J. M., Fitzgerald, H. E., et al. (2004). Really underage drinkers: alcohol use among elementary students. *Alcohol Clin Exp Res, 28*(2), 341-349.

Duncan, S. C., Alpert, A., Duncan, T. E., & Hops, H. (1997). Adolescent alcohol use development and young adult outcomes. *Drug Alcohol Depend, 49*(1), 39-48.

Elkind, D., (1967). Egocentrism in adolescence. *Child Development* 38, 1025–1034.

Ellickson, P. L., & Hays, R. D. (1991). Antecedents of drinking among young adolescents with different alcohol use histories. *J Stud Alcohol, 52*(5), 398-408.

Ellickson, P. L., Hays, R. D., & Bell, R. M. (1992). Stepping through the drug use sequence: longitudinal scalogram analysis of initiation and regular use. *J Abnorm Psychol, 101*(3), 441-451.

Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2003). Ten-year prospective study of public health problems associated with early drinking. *Pediatrics, 111*(5 Pt 1), 949-955.

Ellickson, S. L., Tucker, J. S., Klein, D. J., & McGuigan, K. A. (2001). Prospective risk factors for alcohol misuse in late adolescence. *J Stud Alcohol, 62*(6), 773-782.

Elliott, D.S. (1994). Serious violent offenders: Onset, developmental course, and termination. *The American Society of Criminology*, Presidential Address, Criminology, 32, 1-21.

Fuligni A.J. (1998). Parental authority, adolescent autonomy, and parent-adolescent relationships: a study of adolescents from Mexican, Chinese, Filipino, and European backgrounds. *DevPsychol.*;34(4):782–792

Ghosh, C. (2003). Healthy People 2010 and Asian Americans/Pacific Islanders: defining a baseline of information. *Am J Public Health, 93*(12), 2093-2098.

Grant, B. F., & Dawson, D. A. (1997). Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. *J Subst Abuse, 9*, 103-110.

Griffin, K. W., Botvin, G. J., Epstein, J. A., Doyle, M. M., & Diaz, T. (2000). Psychosocial and behavioral factors in early adolescence as predictors of heavy drinking among high school seniors. *J Stud Alcohol, 61*(4), 603-606.

Hahm, H. C., Lahiff, M., & Guterman, N. B. (2003). Acculturation and parental attachment in Asian-American adolescents' alcohol use. *J Adolesc Health, 33*(2), 119-129.

Harachi, T. W., Catalano, R. F., Kim, S., & Choi, Y. (2001). Etiology and prevention of substance use among Asian American youth. *Prev Sci, 2*(1), 57-65.

Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. *Psychol Bull, 112*(1), 64-105.

Hawkins, J. D., Graham, J. W., Maguin, E., Abbott, R., Hill, K. G., & Catalano, R. F.

(1997). Exploring the effects of age of alcohol use initiation and psychosocial risk factors on subsequent alcohol misuse. *J Stud Alcohol, 58*(3), 280-290.

Hawkins, J.D., and Weis, J.G., (1985). The social development model: An integrated approach to delinquency prevention. *Journal of Primary Prevention*, 6, 73-97.

Heine, S. J., Lehman, D. R., Markus, H. R., & Kitayama, S. (1999). Is there a universal need for positive self-regard? *Psychol Rev, 106*(4), 766-794.

Hussong, A. M., & Hicks, R. E. (2003). Affect and peer context interactively impact adolescent substance use. *J Abnorm Child Psychol, 31*(4), 413-426.

Jackson, C. (1997). Initial and experimental stages of tobacco and alcohol use during late childhood: relation to peer, parent, and personal risk factors. *Addict Behav, 22*(5), 685-698.

Jackson, C., Henriksen, L., & Dickinson, D. (1999). Alcohol-specific socialization, parenting behaviors and alcohol use by children. *J Stud Alcohol, 60*(3), 362-367.

Ja,D. Y., & Aoki, B. (1993). Substance abuse treatment: Cultural barriers in the Asian-American community. Journal of Psychoactive Drugs, 25(1), 61-71.

Jaeger, M. (2006). *On testing the missing at random assumption*, Springer, Berlin, Heidelberg.

Johnson, P.B. and Johnson , H. L.(1996). Children's beliefs about the social consequences of drinking and refusing to drink alcohol. *J. Alcohol Drug Educ*, 41(3), 34-43.

Johnston, L.D., O'Malley, P.M. and Bachman, J.G., (1994). *National survey results on drug use from the Monitoring the Future Study 1975–1993*, National Institute on Drug Abuse, Washington, DC.

Johnston, L.D., O'Malley, P.M., & Bachman, J.G.(2001). *Monitoring the Future national survey resultson drug use, 1975-2000. Volume I: Secondary school students* (NIH Publication No. 01-4924).Bethesda, MD: National Institute on Drug Abuse.

Jones, D. J., Hussong, A. M., Manning, J., & Sterrett, E. (2008). Adolescent alcohol use in context: The role of parents and peers among African American and European American youth. *Cultur Divers Ethnic Minor Psychol, 14*(3), 266-273.

Kandel, D. B., & Andrews, K. (1987). Processes of adolescent socialization by parents and peers. *Int J Addict, 22*(4), 319-342.

Kandel, D.B., & Logan, J.A.(1984). Patterns of drug use from adolescence to young adulthood: I. Periods of risk for initiation, continued use, and discontinuation, *Am J Public Health.* 74(7), 660-666.

Kandel, D. B. (1985). On processes of peer influences in adolescent drug use: a developmental perspective. *Adv Alcohol Subst Abuse, 4*(3-4), 139-163.

Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: further evidence for the gateway theory. *J Stud Alcohol, 53*(5), 447-457.

Kaplan, E.L., and Meier, Paul. (1958). Nonparametric estimation from incomplete observations, Journal of American Statistics Association, 53, 457-481.

Kaplow, J. B., Curran, P. J., Angold, A., & Costello, E. J. (2001). The prospective relation between dimensions of anxiety and the initiation of adolescent alcohol use. *J Clin Child Psychol, 30*(3), 316-326.

Keyes, M.A, Iacono, W.G, McGue, M. (2007). Early onset problem behayoung adult psychopathology, and contextual risk. *Twin Res Hum Genet.*10(1):45–53.

Kim, B. S., Yang, P. H., Atkinson, D. R., Wolfe, M. M., & Hong, S. (2001). Cultural value similarities and differences among Asian American ethnic groups. *Cultur Divers Ethnic Minor Psychol, 7*(4), 343-361.

Kim-Jo, T. (2003). *Cultural values among Korean and Korean American adolescents.* Unpublished master's thesis, California State University, Los Angeles.

Kim, U., & Choi, S.-H. (1994). Individualism, collectivism, and child development: A Korean perspective. In P. Greenfield & R. Cocking (Eds.), *Cross-cultural roots of minority child development* (pp. 227-257). Hillsdale, NJ: Lawrence Erlbaum

Kosterman, R., Hawkins, J. D., Guo, J., Catalano, R. F., & Abbott, R. D. (2000). The dynamics of alcohol and marijuana initiation: patterns and predictors of first use in adolescence. *Am J Public Health, 90*(3), 360-366.

Krahn, D., Piper, D., King, M., Olson, L., Kurth, C., & Moberg, D. P. (1996). Dieting in sixth grade predicts alcohol use in ninth grade. *J Subst Abuse, 8*(3), 293-301.

Larson, R., Moneta, G., Richards, M. H., & Wilson, S. (2002). Continuity, stability, and change in daily emotional experience across adolescence. *Child Development, 73,* 1151–1165.

Larson, R., Richards M. (1991). Daily companionship in late childhood and early adolescence:changing developmental contexts, *Child Dev.* 62(2):284–300.

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data.* New York: JohnWiley & Sons.

Lonczak, H. S., Huang, B., Catalano, R. F., Hawkins, J. D., Hill, K. G., Abbott, R. D., et al. (2001). The social predictors of adolescent alcohol misuse: a test of the social development model. *J Stud Alcohol, 62*(2), 179-189.

Lorenzo, M.K, Pakiz, B., Reinherz, H.Z., & Frost , A. (1995). Emotional and behavioral problems of Asian American adolescents: A comparative study. *Child and Adolescent Social Work Journal*, 12, 197-212.

Loveland-Cherry, C. J., Leech, S., Laetz, V. B., & Dielman, T. E. (1996). Correlates of alcohol use and misuse in fourth-grade children: psychosocial, peer, parental, and family factors. *Health Educ Q, 23*(4), 497-511.

Loveland-Cherry, C. J., Ross, L. T., & Kaufman, S. R. (1999). Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol Suppl, 13*, 94-102.

Markus, H., & Lin, L. (1999). Conflictways: Cultural diversity in the meanings and practices of conflict. In D. Prentice&D. Miller (Eds.), *Cultural divides: Understanding and overcoming group conflict* (pp. 302-333). New York: Russell Sage.

McNeece,C.A., & DiNitto,D.M.(1998). Chemical dependency: A systems approach (2nd ed.).Englewood Cliffs,NJ: Prentice Hall.

Newcomb, M.D. & Bentler, P.M. (1986). Substance use and ethnicity: Differential impact of peer and adult models. *The Journal of Psychology*, 120, 83-95.

Okagaki, L., & Sternberg, R. (1993). Parental beliefs and children's school performance. *Child Development*, *64*, 36-56.

Pedersen, W., & Skrondal, A. (1998). Alcohol consumption debut: predictors and consequences. *J Stud Alcohol, 59*(1), 32-42.

Perry, C.L., Kelder, S.H., & Komro, K.A. (1993). The social world of adolescents:

family, peers, schools, and the community. In: S.G. Millstein, A.C. Peterson, & E.O. Nightingale (Eds.) *Promoting the health of adolescents: new directions for the twenty-first century,* p73-96. New York, NY: Oxford University Press.

Phinney, J.S., Osorio Saloniki, and Vilhjalmsdottir Perla, (1998). Autonomy and relatedness in adolescent-parent disagreements: ethnic and developmental factors, Journal of Adolescent Research, 20(1), 8-39.

Pitkanen, T., Lyyra, A. L., & Pulkkinen, L. (2005). Age of onset of drinking and the use of alcohol in adulthood: a follow-up study from age 8-42 for females and males. *Addiction, 100*(5), 652-661.

Price, R. K., Risk, N. K., Wong, M. M., & Klingle, R. S. (2002). Substance use and abuse by Asian Americans and Pacific Islanders: preliminary results from four national epidemiologic studies. *Public Health Rep, 117 Suppl 1*, S39-50.

Raghunathan T. E., Lepkowski J., VanHoewyk J., and Solenberger P.,(2001). A multivariate technique for multiply imputing missing values using a sequence of regression models. *Survey Methodology*, 27 (1), 85-95.

Rose, C. D. (1999). Peer cluster theory and adolescent alcohol use: an explanation of alcohol use and a comparative analysis between two causal models. *J Drug Educ, 29*(3), 205-215.

Scheier, L. M., Botvin, G. J., & Baker, E. (1997). Risk and protective factors as predictors of adolescent alcohol involvement and transitions in alcohol use: a prospective analysis. *J Stud Alcohol, 58*(6), 652-667.

Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *J Stud Alcohol Suppl*(14), 54-70.

Schulenberg, J., O'Malley, P. M., Bachman, J. G., Wadsworth, K. N., & Johnston, L. D. (1996). Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *J Stud Alcohol, 57*(3), 289-304.

Spoth, R., Redmond, C., Shin, C., & Azevedo, K. (2004). Brief family intervention effects on adolescent substance initiation: school-level growth curve analyses 6 years following baseline. *J Consult Clin Psychol, 72*(3), 535-542.

Stice, E., Barrera, M., Jr., & Chassin, L. (1998). Prospective differential prediction of adolescent alcohol use and problem use: examining the mechanisms of effect. *J Abnorm Psychol, 107*(4), 616-628.

Triandis, H. C. (2001). Individualism-collectivism and personality. *J Pers, 69*(6), 907-924.

Udry, J.R. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.

Urberg, K. A., Degirmencioglu, S. M., & Pilgrim, C. (1997). Close friend and group influence on adolescent cigarette smoking and alcohol use. *Dev Psychol, 33*(5), 834-844.

Wagenaar, A. C., Toomey, T. L., Murray, D. M., Short, B. J., Wolfson, M., & Jones-Webb, R. (1996). Sources of alcohol for underage drinkers. *J Stud Alcohol, 57*(3), 325-333.

Webb, J. A., Baer, P. E., McLaughlin, R. J., McKelvey, R. S., & Caid, C. D. (1991). Risk factors and their relation to initiation of alcohol use among early adolescents. *J Am Acad Child Adolesc Psychiatry, 30*(4), 563-568.

Weber, M. D., Graham, J. W., Hansen, W. B., Flay, B. R., & Johnson, C. A. (1989). Evidence for two paths of alcohol use onset in adolescents. *Addict Behav, 14*(4), 399-408.

White, H. R., Johnson, V., & Buyske, S. (2000). Parental modeling and parenting behavior effects on offspring alcohol and cigarette use. A growth curve analysis. *J Subst Abuse, 12*(3), 287-310.

Zhang, L., Welte, J. W., & Wieczorek, W. F. (1997). Peer and parental influences on male adolescent drinking. *Subst Use Misuse, 32*(14), 2121-2136.

Zhang, L., Welte, J. W., & Wieczorek, W. F. (1999). The influence of parental drinking and closeness on adolescent drinking. *J Stud Alcohol, 60*(2), 245-251.

Chapter III

Longitudinal study of the relationships between alcohol use behavior, acculturation and psychosocial factors from adolescence to young adulthood among Asian American adolescents

Introduction

This chapter reports the results of the second paper, which focuses on the relationships between acculturation and psychosocial factors and trajectories of alcohol use behavior among Asian American adolescents.

In the last few decades, the Asian American population has been increasing among American race groups. According to the U.S. Bureau of the Census (2002), the number of Asian Americans in the United States rose from 6,908,638 to 11,213,133 between 1990 and 2002. It is predicted that the population of Asian Americans will increase from four percent (year 2000) to 11 % (year 2050) as a total of the American population (U.S. Bureau of the Census, 2001).

Although the Asian American population is increasing, there is limited research related to the health of Asian Americans (Ghosh, 2003; Price, Risk, Wong, & Klingle, 2002). Asian Americans adolescents usually are less likely to drink alcohol, smoke, or

use marijuana than White, Black, or Hispanic adolescents (Bachman et al., 1991; Grunbaum, Lowry, Kann, & Pateman, 2000; Price et al., 2002; Wiecha, 1996). In the 1999-2000 NHSDA (National Household Survey on Drug Abuse) report, alcohol use by Asian Americans was 9.9%, a rate lower than that of other races between the ages of 12 and 17. However, Klingle and Miller (1998) pointed out that Asian American adolescents in some locations (Native Hawaiian middle school) reported higher rates of alcohol use than White adolescents. Further, Wong and colleagues (2004) found that Pacific Islander/Native Hawaiian adolescents showed the highest rate of substance use compared to White and other Asian American subgroups. The next highest use rate was that of Whites, then Filipinos, Japanese, and Chinese Americans. Chinese American adolescents showed the lowest substance use among AAPI adolescents. These differences are attributable to regional differences, social acceptance and availability of substances among adolescents in California and Hawaii (Thridandam, Fong, Jang, Louie, & Forst, 1998; M. M. Wong, Klingle, & Price, 2004).

Research on alcohol use among Asian American adolescents demonstrated that the prevalence rates of alcohol use were relatively lower than other races (Bachman et al., 1991). Although alcohol use by Asian Americans may not be considered as a problem, assumptions of lower alcohol related problems have been questionable. Even if various surveys of alcohol use differ in their results, alcohol use is increasing among Asian American adolescents (James et al., 2000). In addition, exposure of Asian American adolescents to Western alcohol use culture leads to the development of risky alcohol related behaviors (James et al.). According to investigations of ethnic identity and alcohol use, Asian American adolescents demonstrated that their cultural identity and family

management styles lead to lower rates of alcohol use (James & Kim, 1997). However, Asian American's acculturation to Western culture may disrupt the influences of ethnic identity, self-identity, interdependence with family, and a hierarchical family structure (James & Moore, 1994).

Several risk factors for adolescent alcohol use among Asian Americans have been identified, including acculturation (Hahm, Lahiff, Guterman et al., 2003; Kaplan et al., 2003) and psychological factors such as depressive symptoms (Nakashima & Wong, 2000), low self-esteem (P. L. Ellickson, Tucker, & Klein, 2001; Otsuki, 2003), and lack of religiosity among diverse race groups including White and Asian Americans (4%) (Wallace, Brown, Bachman, & LaVeist, 2003). Levels of acculturation are significantly and positively associated with alcohol use among Asian American adolescents (Hahm et al., 2003). Depressive symptoms are significantly related to alcohol use in Asian American adolescents (Nakashima & Wong, 2000; Otsuki, 2003). In ethnically diverse adolescent groups (Dolcini & Adler, 1994) and African American female adolescents (Belgrave, 2002), those with higher self-esteem drank less than those with lower self-esteem. Higher religious involvement is correlated with drinking less in predominantly Mexican American samples of adolescents (Marsiglia, Kulis, Nieri, & Parsai, 2005).

The increase in the Asian American population in the U.S gives rise to the need to understand the relationship between health behaviors, specifically alcohol use, on the one hand, and acculturation and psychosocial factors on the other. These latter factors include religiosity, depressive symptoms and self-esteem in Asian American adolescents.

The purpose of the current study was to determine the relationships of acculturation and psychosocial factors to alcohol use trajectories in Asian American

77

adolescents from grades 7 through 12 and into young adulthood. The purpose of this study was to determine the effects of predictors including acculturation and psychosocial factors (e.g., religiosity, depressive symptoms, and self-esteem) on the development of alcohol use trajectories within the context of age and gender.

Conceptual Framework

The conceptual framework for the study reported here was derived from two theories, the Social Development Model (SDM) (Hawkins & Weis, 1985) and acculturation theory (Berry et al, 1987). While the SDM (Hawkins & Weis) is an integrated model including personal and social factors, acculturation theory (Berry et al.) refers to the cultural feature of adaptation for adolescents who have immigrant parents.

The SDM (Hawkins & Weis) is an integrated theoretical approach incorporating social cognitive theory (Bandura, 1977), social control theory (Hirschi, 1969; Elliot, 1985) and differential association theory (Sutherland, 1973). The SDM is an appropriate theoretical model to examine the etiology and developmental processes that influence alcohol use, because the SDM incorporates the process of socialization and the influences of risk, as well as protective factors on alcohol use. The SDM also includes exogenous constructs such as individual constitutional factors including depression and beliefs, which influence the socialization process. Thus, this theory specifies psychosocial factors and normative beliefs, which predict adolescent alcohol use. Biological, psychological, and social factors may increase prosocial involvement and interaction or contribute in some degrees to the development of risky health behaviors such as alcohol use.

From a developmental perspective, adolescence is a time of many physical, mental, emotional, and social changes. During early adolescence, adolescents are more focused on themselves and concerned with their body images. Further, they experience moodiness and anxiety from challenging school work, and report sometimes feeling sad or depressed. During middle adolescence, adolescents are more developed in their identities and opinions (Berger & Thompson, 1995). Moreover, this is an important time for adolescents to prepare for independence and responsibility. These emotional and social developments, including depressive symptoms and self-esteem issues, may predict adolescent alcohol use (Otsuki, 2003; Belgrave, 2002).

Furthermore, adolescents are concerned about their future education and work plans after high school (Fuligni, 1998). In this developmental period, depression was more likely to be associated with greater alcohol consumption among African American and White adolescents (Crum, Brown, Liang, & Eaton, 2001). The intense self-consciousness and self-evaluation may contribute to low self-esteem among White adolescents (D'Amico, Metrik, McCarthy, Appelbaum, & Frissel, 2001). During late adolescence, negative affect and depressive feelings, and low self-esteem may result not only from hormonal changes, but also from stressful environments and events such as school, transitions into high school or college, high expectation of academic achievement, and the transition to work and employment (Brown et al., 2008).

In the current study, individual factors are examined that may influence alcohol, including depressive symptoms, self-esteem, and religiosity. Because the SDM incorporates individual and social constructs related to alcohol use, this model offers a framework to investigate predictors of alcohol use across developmental periods among

Asian American adolescents. The SDM does not take cultural adaptation into account, so acculturation theory (Berry et al, 1987) was used to investigate the cultural influences on alcohol use.

Acculturation Theory (Berry et al, 1987) provides a framework for understanding how cultural adaptation affects alcohol use in Asian American adolescents. This theory accounts for various forms of adaptation as an outcome of the acculturation process: assimilation, separation, integration or biculturalism, and marginalization which include the intersection of ethnic identity affirmation and orientation. In the process of acculturation, Asian American adolescents may balance both American and their Asian cultures (e.g., integration), exclusively follow American culture (e.g., assimilation), narrowly follow Asian culture (e.g., separation), or not follow either culture (e.g., marginalization). Berry suggests that integration has been reported as the most successful adaptation, and both assimilation and separation are considered as moderate and marginalization as the least successful adaptation (Berry, 1997).

The result of moving to a new cultural environment may affect the adoption of risky health behavior such as alcohol use (Gutmann, 1999; Hahm, Lahiff, & Guterman, 2003). Acculturation theory provides direction for understanding diverse adaptation processes and how health behaviors such as alcohol use are adopted among Asian American adolescents.

The conceptual framework for the current study is illustrated in Figure 3.1. Socio-demographic factors as control variables consisted of age, gender and socioeconomic status. The dependent variable was alcohol consumption, and independent variables included acculturation, religiosity, depressive symptoms, and self-esteem (Figure 3.1).
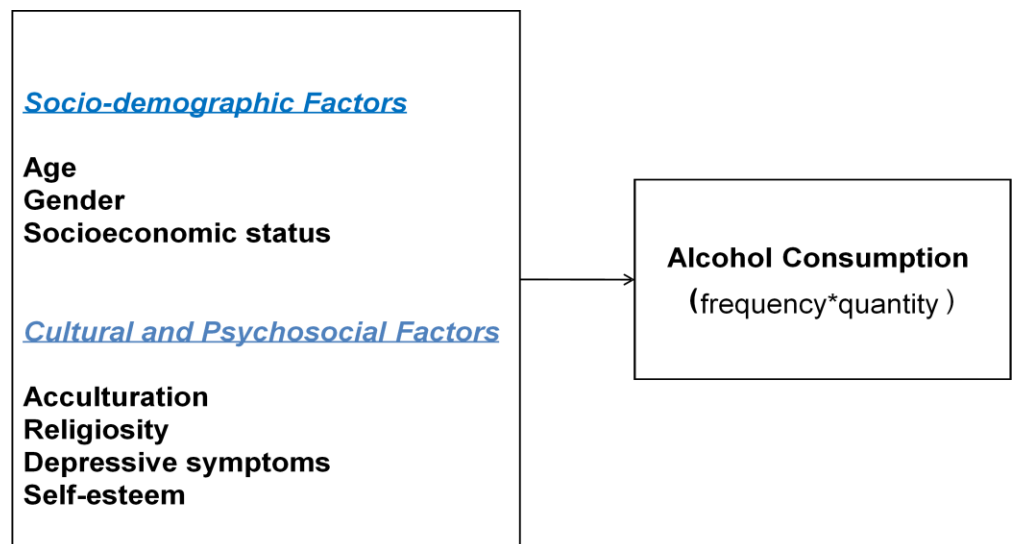
Figure 3.1. Conceptual Framework

Background and Significance

Alcohol Use and Acculturation

Acculturation is the cumulative social learning process in which immigrants assimilate to the values and culture of a new country (Oetting & Beauvais, 1990). Second generation Americans (U.S.-born children of U.S.-born parents) are more likely to acculturate than first generation Americans (U.S.-born adolescents with foreign-born parents), including Latino immigrants (Eitle, Wahl, & Aranda, 2009; Torres Stone & Meyler, 2007), Korean Americans (Kim, 1995), and Chinese Americans (Rosenthal & Feldman, 1990). This generation gap may lead to stressful family conflicts related to risky health behaviors and acculturation-related family conflict has been shown to be

associated with substance use in younger generations of immigrants (Blake, Ledsky, Goodenow, & O'Donnell, 2001; P. L. Ellickson & Morton, 1999; Gfroerer & Tan, 2003; Hahn, Teutsch, Franks, Chang, & Lloyd, 1998; Yu, Huang, Schwalberg, Overpeck, & Kogan, 2003). Acculturation has been a critical factor in adolescents' successful adaptation to their environments. Adoption of health behaviors, and acceptance of risky behaviors of peers among Cuban-American, African-American, and White non-Hispanic students is part of this process (Vega, Zimmerman, Gil, Warheit, & Apospori, 1993).

As a minority group becomes more highly assimilated into mainstream American values and customs, health–related attitudes and behaviors may also change. The pattern of drinking behavior in minority groups may also shift toward that of the majority group (Blake et al., 2001). In a study of 2635 Massachusetts 8th and 10th graders consisting of White, African American, Hispanic, Asian American, and American Indian adolescents, immigrant adolescents who had lived six years or less in the United States, showed lower levels of alcohol use than non-immigrant adolescents (Blake et al.). Recently immigrated adolescents who were born outside of the United States and moved to the United States with their parents, experience more peer pressure to engage in alcohol use than non-immigrant adolescents (Blake et al.; Gillmore et al., 1990), and have less parental support and less self-confidence in their ability to protect themselves from risk behaviors than non-immigrant adolescents (Blake et al.; Resnick et al., 1997). Adolescents in immigrant families are more likely to be poor, uninsured, have fewer sources of health care, and live in crowded housing than native born adolescents (Blake et al.).

In addition, higher levels of acculturation have been shown to be associated with increased alcohol use and use of other substances among Hispanics (Black & Markides,

1993; Markides, Krause, & Mendes de Leon, 1988; Zemore, 2005), and among Asian Americans (Hahm, Lahiff, Guterman et al., 2003). This might be the result of the process of coping with the new cultural environment and the adoption of more liberal attitudes and more favorable norms toward drinking (Caetano, 1987; Cervantes, Gilbert, Salgado de Snyder, & Padilla, 1990). However, the influence of acculturation on adolescent alcohol use varies across studies and the specific relationship is not clearly understood. The positive relationship between acculturation and increased alcohol use is more apparent in females than males among Hispanics (Alaniz, Treno, & Saltz, 1999; Black & Markides, 1993; Markides, Ray, Stroup-Benham, & Trevino, 1990). Among Hispanic males, acculturation was positively associated with increased alcohol use (Hines & Caetano, 1998), whereas another study reported opposite findings in the sample of White, Hispanics, and African American adolescents (Neff & Hoppe, 1992). The relationship between acculturation and alcohol use was more inconsistent among males than females. Furthermore, in a Hispanic sample, the association between acculturation and alcohol use was stronger in the younger generation than the older generation (Markides et al., 1988). To date, the majority of studies related to acculturation and health behaviors focus on the Hispanic population, whereas the Asian American population has had less attention. Recently, Hahm and colleagues (2003) reported that higher levels of acculturation among Asian American youth were found to be significantly associated with higher alcohol use and earlier initiation of alcohol use. Thus, paying more attention to the Asian American population is necessary to identify the relationship between acculturation and health behaviors, like alcohol use, because few studies have been conducted on Asian American adolescents.

Alcohol Use and Psychosocial Factors

In a longitudinal cohort of White adolescents, psychosocial risk factors were found to have a strong relationship with both early and subsequent alcohol use (Scheier, Botvin, & Baker, 1997), although parent and peer factors may differ in their influences on adolescent alcohol use at different stages of development (i.e., parent alcohol use influences early alcohol use, and peer alcohol use affects later alcohol use in adolescents) (Brook, Brook, Gordon, Whiteman, & Cohen, 1990).

In cross-sectional studies, adolescents have been found to drink more alcohol when they are depressed among Asian American high school students (Otsuki, 2003); have low self-esteem among African American girls (Belgrave, 2002) and multi-ethnic school students (Dolcini & Adler, 1994); possess low self–efficacy (Epstein, Botvin, Diaz, Toth, & Schinke, 1995; Kumpfer & Turner, 1990; Myers & Brown, 1990); and hold positive attitudes towards alcohol consumption (Barkin, Smith, & DuRant, 2002; Griffin, Botvin, Epstein, Doyle, & Diaz, 2000; Hawkins, Catalano, & Miller, 1992; Wilks, Callan, & Austin, 1989).

In longitudinal studies, risky psychological factors related to alcohol use consist of the lack of behavioral self-control (Griffin et al., 2000; Scheier et al., 1997; Wills & Stoolmiller, 2002); lower level of religiosity (Wills, Yaeger, & Sandy, 2003); and low self-esteem (Andrews & Duncan, 1997; S. L. Ellickson, Tucker, Klein, & McGuigan, 2001; Ennett et al., 1994; Hill, Shen, Lowers, & Locke, 2000; Hoffmann & Cerbone, 2002; Scheier et al., 1997).

Religiosity has been proposed to consist of three dimensions (Marsiglia et al.,

2005) including a behavioral dimension (e.g., involvement in church activities), religious observance (e.g., prayer and efforts to live up to a religious standard) and an attitudinal dimension (e.g., the extent of sincerity toward religion). Religiosity in the current study included the above three dimensions. Religiosity often is considered a protective factor against alcohol use (Barthwell, 1995; Resnick et al., 1997; Wallace, Brown et al., 2003; Wills, Gibbons, Gerrard, Murry, & Brody, 2003). Regular attendance at religious services among Filipino Americans (Lubben, Chi, & Kitano, 1988), the importance of religion among African American adolescents (Wills, Gibbons et al., 2003), and prayer and participation in religious activities among multiracial adolescents (Bahr, Marcos, & Maughan, 1995) were consistently associated with decreased alcohol use. Adolescents who attended church services and who felt religion was important were less likely to drink than those who did not among White and African American adolescents (Wallace, Brown et al., 2003; Miller, 1998).

Depressive symptoms are also positively associated with levels of alcohol use among adolescents in eight general population longitudinal studies (Hartka et al., 1991). In particular, depressive symptoms are significantly associated with alcohol use and problem drinking among African American and White adolescents (Crum, Brown, Liang, & Eaton, 2001). In a longitudinal study of seventh grade students (N=4200) and follow-up at twelfth grade, low self-esteem appeared to be one of the predictors of alcohol use in White adolescents (S. L. Ellickson et al., 2001), indicating it as one of the risk factors of initiation and maintenance of alcohol use in adolescents. According to Nakashima and Wong (2000), White adolescents might be influenced by psychological factors such as depression and self-esteem, while Korean American adolescents might be influenced by

social variables such as social relationships with friends and parents. This might suggest that alcohol use among Korean American adolescents may more influenced by relationships with their parents and friends than psychological factors.

Studies regarding adolescent depression show gender differences. Females had higher levels of depressive symptoms than males among African American adolescents, White adolescents and adolescents from other racial groups (Simantov, Schoen, & Klein, 2000; Crum et la., 2001), suggesting that gender differences should be considered when examining the relationship between alcohol use and depressive symptoms. Among Asian Americans in California, higher levels of depressive symptoms were more likely to be related to higher levels of alcohol use in females than males (Otsuki, 2003). Further, in a longitudinal study, depressive symptoms predicted subsequent heavy alcohol drinking over three years (odds ratio = 3.04) and four years (odds ratio = 2.42) for females; this relationship did not hold for males in the African American adolescent sample (Moscato et al., 1997). In addition, the higher level of depression predicted heavier alcohol use in females, but not males in a predominantly White sample (female 87.4%, male 79.2%) (Schutte, Hearst, & Moos, 1997) and Canadian populations (Wang & Patten, 2001). This finding suggests that depressive symptoms might have a greater impact on alcohol use for females than males.

Purpose

The purposes of the current study were to examine the relationship of acculturation with the trajectory of alcohol use from early adolescence to young adulthood among Asian American adolescents; and to determine how psychosocial

factors including religiosity, depressive symptoms, and self-esteem, are associated with the trajectory in alcohol use among Asian American adolescents.

Hypotheses

These hypotheses were tested for Asian American adolescents across three waves of Add Health data:

1) The alcohol use trajectories of adolescents who were more acculturated would reflect increased alcohol use relative to those of less acculturated adolescents.

2) The alcohol use trajectories of adolescents who were less religious would reflect increased alcohol use relative to those of more religious adolescents.

3) The alcohol use trajectories of adolescents who were more depressed would reflect increased alcohol use relative to those who were less depressed adolescents.

4) The alcohol use trajectories of adolescents who had lower self-esteem would reflect increased alcohol use compared to those who had higher self-esteem.

Methods

Sample and Design

The present study is a secondary analysis of the National Longitudinal Study of Adolescent Health (Add Health) data. The Add Health data are from a nationally representative longitudinal survey that collected data in three waves from 1994 to 2002 (Wave I to Wave III) (Udry, 2003). Respondents were drawn from a nationally

representative, stratified clustered sample of adolescents and their outcomes were followed into young adulthood.

Wave I consisted of a school sample and an in-home sample. The students who participated in the school sample were included in the core in-home sample in Wave I. The in-home sample comprised a core sample from each community. Subsequent Waves only conducted in-home sampling. In Wave I, 20,745 respondents participated in the in-home interview and 14,738 in Wave II interviews. Interviews with 15,197 original respondents were completed at Wave III. The response rate of the in-home interview was 75% in Wave I, 77% in Wave II, and 76% in Wave III. The overall interview participation rate was 76%.

The face-to-face interviews were conducted in the participants' homes, and for confidential and sensitive questions, a laptop computer using both a computer-assisted personal interview (CAPI) and an audio computer-assisted self interview (ACASI) was used. The average interview length was about two hours and the laptop interview took approximately 90 minutes. Informed consent was obtained from parents or legal guardians and informed assent from the adolescents. These data were collected by the University of North Carolina (UNC), School of Public Health, and the UNC Institutional Review Board approved the procedures for the Add Health Study.

The current study used three waves of data from Add Health. The participants were Asian American adolescents who participated in at least one of three interviews; Wave I, II, and III. The cross-sectional sample of Asian Americans included were 1582 in Wave I, 1088 in Wave II, and 1268 adolescents in Wave III. The mean age of the Wave I sample was 16.01 years ranging from 12 to 20 years. The number of males was

824 (52.08%) and females was 758 (47.92%). In Wave II, the mean age of the sample

was 16.58 years (range 13-22). The number of males was 556 (51%) and females was

533 (49%). The mean age of participants in Wave III was 22.27 years (range 18-27) and

the number of males was 657 (52%) and females was 613 (48%) (unweighted number).

In the weighted data, the sample sizes of Asian Americans were 1,480 in Wave I, 1010 in

Wave II and 876 in Wave III. The weighted samples were used in the data analyses

(Table 3.1).

Table 3.1

The sample of the current study

	Wave I		Wave II		Wave III	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Total	1582	1480	1088	1010	1268	876
Male	824 (52.08%)	773 (52.23%)	556 (51.10%)	519 (51.39%)	656 (51.73%)	449 (51.26%)
Female	758 (47.92%)	707 (47.77%)	532 (48.89%)	491 (48.61%)	612 (48.27%)	427 (48.74%)
Mean age	16.01	15.58	16.68	16.24	22.27	21.11

Measures

The dependent variable, alcohol consumption, was measured by multiplying

frequency by quantity of alcohol use. The frequency and quantity of alcohol use were

measured using a single item for each. The frequency of alcohol use was assessed by the

question "During the past 12 months, on how many days did you drink alcohol?"

Responses included: "every day or almost every day" (1); "3 to 5 days a week" (2); "1 or

2 days a week' (3); "2 or 3 days a month" (4); 'once a month or less (3-12 times in the

past 12 months)" (5); "1 or 2 days in the past 12 months" (6); and "never" (7). This item

was reverse coded, so higher scores indicated higher levels of alcohol use. The quantity

of alcohol use was assessed by the question "Think of all the times you have had a drink

during the past 12 months, how many drinks did you usually have each time?" The

original responses to this question ranged from 0 to 90 reported drinks. The responses

were categorized into four levels of drinking: "0"= 0 (no drinks), "1-2 drinks" = 1, "3-5

drinks" = 2 and "6 or more drinks per occasion"= 3 (Donovan, 1993). Alcohol use was

converted by a log transformation after examining skewness and a residual plot. The

skewness of alcohol consumption was 1.248, and after applying a log transformation, the

skewness was 0.104. Additionally, to test the differences between drinkers and non-

drinkers, a dichotomous indicator (drinkers=1 and non-drinkers=0) was used.

Independent variables included acculturation, religiosity, depressive symptoms

and self-esteem. Acculturation was measured using two variables of English usage and

U.S. nativity: "the use of English at home" (English at home= 1, no English at home= 0)

and "the place of the adolescent's birth" (U.S. born= 1, foreign-born= 0). Respondents

were categorized into four different groups: Group 1, no English at home and foreign-

born; Group 2, no English at home and U.S.-born; Group 3, English at home and foreign-

born; and Group 4, English at home and U.S.-born.

Religiosity consisted of four items: 1) "In the past 12 months, how often did you

attend religious services?' 2) "How important is religion to you?" 3) "How often do you

pray?" 4) "Many churches, synagogues, and other places of worship have special

activities for teenagers - such as youth groups, Bible classes, or choir. In the past 12

months, how often did you attend such youth activities?" These items have different

scales, so standardization was employed. For each of the variables, a Z score with a mean

of zero and a standard deviation of one was calculated. Religiosity was then calculated by

the mean Z score, with increasing scores representing a higher level of religiosity.

Cronbach's alpha for this study was 0.76 in Waves I and II, and 0.82 in Wave III.

Depressive symptoms were measured using the Center for Epidemiologic Studies

Depression Scale (CES-D) (Radloff, 1977), which is a self-report scale intended for the

general population. Examples of questions include; "How do you feel emotionally?" and

"How did you feel in general during the past week?"

The original CES-D scale included twenty items, but nine items were selected for

the depression scale in the current study because Wave I and II had nineteen items but

Wave III had only nine so the nine items that were asked at all three waves were used.

The scale items included responses of how often each of the following was true during

the last week: 1) "You were bothered by things that usually don't bother you"; 2) "You

felt that you could not shake off the blues, even with help from your family and your

friends"; 3) "You felt that you were just as good as other people"; 4) "You had trouble

keeping your mind on what you were doing"; 5) "You felt depressed"; 6) "You felt that

you were too tired to do things"; 7) 'You enjoyed life"; 8) "You felt sad"; 9) "You felt

that people disliked you." The 4-point response scale for the items was 0=never or rarely,

1= sometimes, 2=a lot of the time, and 3=most of the time or all the time. Spearman-

Brown, split half reliability for the scale was 0.85 for the general population and 0.90 for

the patient sample (Radloff, 1977). In Chung's study for low income Asian and Latino people, Cronbachs' alpha was 0.89 (Chung et al., 2003). Depressive symptoms were represented by a mean value with higher scores indicating more depressive symptoms. Cronbach's alpha for current study was 0.80 in Waves I and II, and 0.81 in Wave III.

The self-esteem scale was composed of the four items that were asked in all three waves (Wave I and II had ten items, but Wave III had only four items). Rosenberg's (1965) self-esteem scale consisting of ten items represents a positive or negative self-worth. Blascovich and Tomaka (1993) reported that Cronbach's alpha for various samples ranged from 0.77 to 0.88. Bartlett and colleagues (2006) used the same four items as this study and had a Cronbach's alpha ranging from 0.79 to 0.88 (they did not specify the exact value). The four items were "You have a lot of good qualities"; "You have a lot to be proud of"; "You like yourself just the way you are"; "You feel like you are doing everything just about right." The scale items were assessed using a five-point Likert scale: 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, and 5 = strongly disagree, and a mean score was used for the scale. Reverse coding was applied, so the higher scores of the mean value represented higher levels of self-esteem. Cronbach's alpha for the current study was 0.81for all three waves.

Socio-demographic variables: age, gender, socioeconomic status

Age was calculated as a continuous variable using the interview completion date and participant's date of birth at Wave I. Date of birth used 15 as the day of birth to calculate age because only the month and year of birth are available (age = int ((interview date-birth date)/365.25). Gender was coded as males (1) and females (2). Socioeconomic

status was measured using parental education. The information in the Add Health household roster at Wave 1 was used for mother's and father's education. The scale of education consists of ten items: 1 for eighth grade or less; 2 for more than eighth grade, but did not graduate from high school; 3 for went to a business, trade, or vocational school instead of high school; 4 for high school graduate; 5 for completed a GED; 6 for went to a business, trade, or vocational school after high school; 7 for went to college, but did not graduate; 8 for graduated from a college or university; 9 for professional training beyond a four-year college or university; and 10 for never went to school. In the current study, 10 for "never went to school" was recoded as 0, so that a higher score reflected a higher level of education. The higher education level between father and mother was selected to measure parental education level in this study (Hussong & Hicks, 2003; Jones, Hussong, Manning, & Sterrett, 2008).

Data analysis

This study involved secondary data analysis of the Add Health data. Add Health data were collected using a stratified cluster sampling design. In a longitudinal study, item non-response and attrition frequently occur. There are three types of missing data mechanisms; missing completely at random (MCAR), missing at random (MAR) and not missing at random (NMAR). The test for a missing completely at random MCAR mechanism was conducted and the data for this study were not MCAR. The test for missing at random (MAR) was not performed; however, multiple imputation was conducted on the assumption that the data were MAR using IVEware (Rubin, 1976; Little & Rubin, 2002). Multiple imputation using IVEware (Raghunathan, Lepkowski,

VanHoewyk, & Solenberger, 2001) produced five complete imputed replicates. The analyses were performed on each of the five replicates and combined as described by Little and Rubin (2002). Secondly, descriptive statistics were calculated using IVEware in conjunction with SAS 9.1 to adjust for the complex sampling design and weights. Frequency and percentage were calculated and the significance test between drinkers and non-drinkers was performed using t-tests and χ^2 tests. Thirdly, Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) was used to examine predictors of the trajectory of alcohol use over time. HLM can incorporate the clustered design structure, producing unbiased point estimates and variances, and appropriately combines multiple imputed data replicates to generate combined parameter estimates. This statistical method can better assess estimates and their standard errors, accommodating the clustered sample design. Given sampling weights from the Add Health data, HLM computes robust standard errors to account for additional variation that may be introduced by the complex sampling design. Ignoring weights or the design structure can result in incorrect point estimates and variances.

The dependent variable (alcohol use) was measured repeatedly at Wave I (1995), Wave II (1996) and Wave III (2001-2002). For inferential statistical analyses, first HLM models were used to estimate trajectories of alcohol use and test predictor effects, including time varying predictors to explain variation in the growth curves at Level 1 (intra-individual level or growth level, or occasion level). Also, subject-level variables (e.g., gender) were added to the models at Level-2 (inter-individual level) to explain between individual variations in trajectories of alcohol use.

94

At Level 1, time-varying variables included adolescent alcohol use, acculturation, religiosity, depressive symptoms and self-esteem. As Level 2 (inter-individual level), time-invariant variables included age, gender, and socioeconomic status. Level 2 variables were factors associated with different rates of growth in alcohol use, acculturation, religiosity, depressive symptoms, and self-esteem. Regarding the age variable, linear and quadratic effects of age were used. All continuous variables were centered by grand means to decrease collinearity among the variables (Hox, 2002; Kreft & de Leeuw, 1998). Level 1 estimated the growth trajectory of each adolescent's alcohol use, acculturation, religiosity, depressive symptoms and self-esteem across time. Finally, multiple regression analysis was established to find predictors of alcohol use over time. The weights were applied to all analyses, so the results are nationally representative.

Results

Descriptive Statistics and Bivariate Analysis Results between Drinkers and Non-drinkers

Descriptive statistics are presented in Tables 3.2 through 3.7 and the results of bivariate analyses are shown in Tables 3.8 and 3.9. The number of respondents was different at each Wave: 1480 in Wave I (unweighted N=1,582), 1010 in Wave II (unweighted N=1,088), and 876 in Wave III (unweighted N=1,268). The mean age of participants increased in each successive Wave: 15.58 years in Wave I, 16.24 in Wave II and 21.11 in Wave III. Older adolescents drank more than younger adolescents and this was significant in Waves I ($p<0.001$) and II ($p=0.001$), but not in Wave III. Among

drinkers, the mean value of parental education was higher compared with that of non-drinkers in Wave I (drinkers: 6.65, non-drinkers: 6.22) and II (drinkers: 6.60, non-drinkers; 6.23), but not significantly so.

Regarding the psychosocial factors, drinkers and non-drinkers showed differences in each variable. For instance, across all three waves, the mean value of religiosity decreased for both drinkers and non-drinkers. Drinkers had a lower level of religiosity than non-drinkers in any given wave but this was not statistically significant. For depressive symptoms, there was a statistically significant difference between drinkers (M= 074, SE=0.03) and non-drinkers (M=0.59, SE=0.03) in Wave I (p<.001), with the drinkers having more depressive symptoms. However, this was not significant in Wave II and III. Self-esteem was statistically significantly different between drinkers (M= 3.86, SE=0.03) and non-drinkers (M= 4.02, SE=0.03) in Wave I (p<.001), with the drinkers having lower self-esteem, but not significant in Waves II or III.

Drinkers were more acculturated than non-drinkers across all three waves (p<.001 in Wave I and II, p<.01 in Wave III). Overall, the more acculturated groups were more likely to drink alcohol than the less acculturated groups.

Alcohol consumption ranged from 1 to 18 for drinkers. Drinkers comprise 38.18% of the total population in Wave I, 34.83% in Wave II, and 67.47% in Wave III. To identify alcohol consumption of different groups, gender and acculturation groups were included. Male adolescents drank more alcohol than female adolescents in Wave I, II and III. Gender was statistically significantly associated with alcohol use in Wave III (p=0.001), but not in Waves I or II. The respondents were categorized into four groups on

the acculturation variable. Group 1 was the least acculturated group and Group 4 was the most acculturated group (Table 3.2- 3.7).

Table 3.2

Descriptive Statistics and comparative analysis of drinkers *vs* non-drinkers among Asian American adolescents in Wave I

(weighted N=1480)

	Wave I									Drinkers vs Non-drinkers	
	All respondents			Drinkers			Non-drinkers				
Characteristics	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	Coefficient	Pr > F
Age	1480	15.58(0.24)	12-20	565(38.18)	16.10(0.20)	12-20	915 (61.82)	15.29 (0.28)	12-20	19.73****	<0.001
Level of education of parent	1374	6.38(0.19)	0-9	542 (39.45)	6.65(0.24)	0-9	832 (60.55)	6.22(0.21)	0-9	3.10	0.082
Mean Religiosity[a]	1263	1.27(0.06)	-1.08 – 2.65	483(38.24)	1.18(0.05)	-0.94 - 2.23	780 (61.76)	1.32 (0.08)	-1.08 - 2.65	3.21	0.078
Mean Depressive symptoms	1477	0.65(0.02)	0-2.68	565(38.25)	0.74(0.03)	0-2.11	912(61.75)	0.59(0.03)	0-2.68	16.16****	<0.001
Mean Self-esteem	1474	3.96(0.02)	1.8-5.0	565(38.33)	3.86(0.03)	2-5	909 (61.67)	4.02 (0.03)	1.8-5	14.22***	<0.001
Acculturation	1480	2.77(0.15)	1-3	565 (38.18)	3.12(0.13)	1-4	915 (61.82)	2.57 (0.18)	1-4	18.13****	<0.001

a: standardized index, SE: standard error; * p <0.05 ** p <0.01 **** p <0.001

Table 3.3

Alcohol use and comparative analysis of drinkers *vs* non-drinkers among Asian American adolescents in Wave I

(weighted N=1480)

	All respondents			Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
Characteristics	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Coefficient	Pr > F
Alcohol Use	1480	1.49(0.17)	0-18	565(38.18)	4.12(0.33)	1-18	915 (61.82)	0	-		
Gender Male	773 (52.23)	1.57(0.20)	0-15	298(38.55)	4.30(0.38)	1-15	475 (61.45)	0	-	0.47	0.493
Female	707 (47.77)	1.40 (0.22)	0-18	267(37.77)	3.93(0.42)	1-18	440 (62.23)	0	-		
Acculturation Groups	1480	1.49(0.17)	0-18	565(38.18)	4.12(0.33)	1-18	915 (61.82)	0	-	16.81****	<0.001
Group1 Not English use at home & Not U.S.-born	362 (24.46)	0.52 (0.11)	0-15	104(28.73)	2.38 (0.28)	1- 15	258 (71.27)	0	-		
Group2 Not English use at home & U.S.-born	149(10.07)	0.94(0.31)	0-12	40(26.85)	3.28 (0.85)	1-12	109 (73.15)	0	-		

	N (%)	Mean (SE)	Range	N (%)	Mean (SE)	Range	N (%)		
Group3 English use at home & Not U.S.-born	276 (18.65)	1.70(0.31)	0-15	111(40.22)	4.16 (0.60)	1- 15	165 (59.78)	0	-
Group4 English use at home & U.S.-born	693(46.82)	2.15(0.21)	0-18	310 (44.73)	4.78 (0.38)	1-18	383 (55.27)	0	-

SE: standard error, * *p* <0.05 ** *p* <0.01 *** *p* <0.001

Table 3.4

Descriptive Statistics and comparative analysis of drinkers vs non-drinkers among Asian American adolescents in Wave II

(weighted N=1010)

| | Wave II | | | | | | | | | | |
| Demographic factors | All respondents | | | Drinkers | | | Non-Drinkers | | | Drinkers vs Non-drinkers | |
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Coefficient	Pr > F
Age	1010	16.24(0.27)	13-20	357 (35.35)	16.64(0.30)	13-22	653 (64.65)	16.05(0.26)	13-20	11.61****	<0.001
Level of education of parents	943	6.35(0.21)	0-9	337(35.74)	6.60(0.29)	0-9	606 (63.64)	6.23 (0.24)	0-9	1.32	0.254
Mean Religiosity[a]	858	1.11(0.06)	-0.97- 2.09	316(36.83)	1.04(0.09)	-0.97- 2.10	542 (63.17)	1.15 (0.08)	-0.97 -2.10	0.85	0.359
Mean Depressive symptoms	1009	0.65(0.03)	0- 2.21	356(35.28)	0.70(0.04)	0- 2.21	653 (64.72)	0.63 (0.03)	0 -2	3.16	0.079
Mean Self-esteem	1009	4.03(0.02)	2.0- 5.0	356 (35.28)	3.97(0.03)	2-5	653(64.72)	4.06 (0.03)	2- 5	3.81	0.054
Acculturation	1009	2.82(0.16)	1-4	356 (35.28)	3.03(0.16)	1-4	653 (64.72)	2.70 (0.16)	1- 4	7.74***	0.007

a: standardized index, SE: standard error, * p<0.05 *** p<0.01 **** p<0.001

Table 3.5

Alcohol use and comparative analysis of drinkers vs non-drinkers among Asian American adolescents in Wave II

(weighted N=1010)

Characteristics	All respondents			Wave II Drinkers			Non-Drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	Coefficient	Pr > F
Alcohol use	1010	1.35 (0.19)	0-18	357 (35.35)	4.15(0.46)	1-18	653 (64.65)	0	-		
Gender male	519 (51.39)	1.43 (0.24)	0-18	172 (33.14)	4.9 (0.65)	1-18	347 (66.86)	0	-	0.45	0.505
Female	491 (48.61)	1.25 (0.22)	0-18	185 (37.68)	3.49(0.46)	1-18	306 (62.32)	0	-		
Acculturation Groups	1009	1.35 (0.19)	0-18	356 (35.28)	4.15(0.46)	1-18	653 (64.72)	0	-	7.79****	<0.001
Group1 Not English use at home & Not U.S.-born	215 (21.31)	0.61 (0.12)	0-15	62 (28.84)	2.47 (0.24)	1-15	153 (71.16)	0	-		
Group2 Not English use	110 (10.90)	1.02 (0.39)	0-18	24 (21.82)	4.05 (1.24)	1-18	86 (78.18)	0	-		

at home & U.S.-born								
Group3 English use	215 (21.31)	1.69 (0.46)	0-18	80 (37.21)	5.21 (1.13)	1-18	135 (62.79)	0	-
at home & Not U.S.-born								
Group4 English use	469 (46.48)	1.68 (0.20)	0-18	190 (40.51)	4.31 (0.50)	1-18	279(59.49)	0	-
at home & U.S.-born								

SE: standard error , * $p < 0.05$ *** $p < 0.01$ **** $p < 0.001$

Table 3.6

Descriptive Statistics and comparative analysis of drinkers vs non-drinkers among Asian American adolescents in Wave III

(weighted N=876)

Characteristics	All respondents			Wave III Drinkers			Non-Drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean(SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Coefficient	Pr > F
Age	876	21.11 (0.27)	18-25	591 (67.47)	21.10(0.30)	18-25	285(32.53)	21.11 (0.29)	18-25	0.00	0.945
Mean Religiosity[a]	873	-0.04 (0.07)	-1.72 – 2.11	589 (67.47)	-0.07(0.07)	-1.72 2.11	284 (32.53)	-0.0 (0.11)	-1.15 - 2.11	0.34	0.561
Mean Depressive symptoms	876	0.59 (0.03)	0-2.44	591 (67.47)	0.58(0.03)	0-2.44	285 (32.53)	0.62 (0.06)	0-2.33	0.29	0.589
Mean Self-esteem	876	4.17 (0.03)	1.0-5.0	591 (67.47)	4.12(0.04)	1-5	285 (32.53)	4.24 (0.05)	1 - 5	3.76	0.056
Acculturation	876	2.87 (0.13)	1-4	591 (67.47)	3.05(0.14)	1-4	285 (32.53)	2.57 (0.16)	1 - 4	9.41***	0.003

SE: standard error * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

104

Table 3.7

Alcohol use and comparative analysis of drinkers vs non-drinkers among Asian American adolescents in Wave III

(weighted N=876)

Characteristics	All respondents			Wave III Drinkers			Non-Drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Coefficient	Pr > F
Alcohol use	876	3.26 (0.29)	0-18	591 (67.47)	5.25 (0.32)	1-18	285 (32.53)	0	-		
Gender Male	449 (51.26)	4.15 (0.40)	0-18	315 (70.16)	6.16 (0.46)	1-18	134 (29.84)	0	-	19.52****	<0.001
Female	427 (48.74)	2.28 (0.29)	0-18	276 (64.64)	4.05 (0.34)	1-18	151 (35.36)	0	-		
Acculturation Groups	876	3.26 (0.29)	0-18	591 (67.47)	5.25 (0.32)	1-18	285 (32.53)	0	-	8.12****	<0.001
Group1 Not English use at home & Not U.S.-born	176 (20.57)	1.73 (0.37)	0-15	110 (62.50)	3.68 (0.39)	1-15	66 (37.50)	0	-		
Group2 Not English use at home & U.S. -born	122 (13.55)	2.65 (0.52)	0-15	76 (62.30)	4.74 (0.69)	1-15	46 (37.70)	0	-		

Group3 English use at home & Not U.S.-born	168 (18.44)	3.30 (0.46)	0-15	112 (66.67)	5.06 (0.48)	1-15	56 (33.33)	0	-
Group4 English use at home & U.S. -born	410 (47.44)	4.20 (0.42)	0-18	293 (71.46)	5.99 (0.52)	1-18	117 (28.54)	0	-

$* p <0.05$ $*** p <0.01$ $**** p < 0.001$

Bivariate and Multivariate Analysis Results: Effect of Acculturation and Psychological Factors on Alcohol use over time

As previously described, there were four hypotheses for this study. To investigate the independent effect of acculturation and psychosocial factors on alcohol consumption over time, linear regression analysis using Hierarchical Linear Modeling was employed (Raudenbush & Bryk, 2002). Table 3.14 shows the results of multivariate analyses.

The simple associations in bivariate analysis can change when the model is adjusted for other variables in multivariate analysis. In order to better understand the multivariate results, bivariate analyses were first conducted to provide a comparison. Higher parental education ($p=0.005$) was positively and significantly associated with adolescent alcohol use over time, but multivariate output did not show significant relationship, and a similar pattern is evident for male adolescents ($p<0.04$). Related to acculturation, bivariate analysis showed that acculturation group 1 and 4 were significantly and positively associated with alcohol consumption, but not in acculturation groups 2 and 3. In multivariate analysis, however, acculturation groups 2, 3 and 4 (reference group: group1) showed a significant association with alcohol consumption over time (Table 3.8).

In multivariate analysis, the linear and quadratic age terms were included in the model. The linear age term was positively associated with alcohol consumption in adolescents ($p<0.001$), while the quadratic age term was negatively associated and also significant ($p<0.01$). As shown in Figure 3.2, this means that alcohol consumption

increased with age but that the escalation rate of alcohol consumption decreased with increasing age.

The slope of linear age on alcohol consumption for females compared to males was 0.12. The slope for males relative to females was 0.07 higher, which means that the net slope for males was $0.12 + 0.07 = 0.19$. For females, a one-unit increase in age resulted in a 0.12 unit change in expected alcohol consumption whereas for males, a one-unit increase in age resulted in a 0.19 unit change in expected alcohol consumption. Finally, a one year increase in age for females was related to a 13% increase in alcohol consumption (i.e., exp $(0.12) = 1.13$, $p<0.001$) and a one year increase in age in males increased the expected alcohol consumption by 21% (i.e., exp $(0.19) = 1.21$, $p<0.001$), controlling for other variables in the model. Parental education was significantly associated with alcohol consumption. A one-level of education increment was associated with a 3% increase in average alcohol consumption ($p<0.01$), controlling for other covariates.

Regarding psychosocial factors, depressive symptoms and self-esteem were not significant predictors of adolescent alcohol consumption. However, religiosity was a significant predictor of adolescent alcohol consumption ($p<0.01$). A one-unit increment in religiosity was associated with an 8% decrease in average alcohol consumption ($p<0.01$), controlling for other variables in the model.

Acculturation divides adolescents into four categories, depending on whether they speak English at home and whether they are born in the United States. Group 1 (not use English at home, not in the U.S.-born) was the reference group. Adolescents in acculturation group 2 (not using English at home, born in the U.S.) were estimated to

have 32% more (or 1.32 times greater, $p<0.01$) alcohol consumption on average than those in group 1, controlling for other covariates in the model. The adolescents in group 3 (English at home, not born in the U.S.) and group 4 (English at home, born in the U.S.), on average, used 26% (or 1.26 times greater, $p<0.05$) and 50% (or 1.50 times greater, $p<0.001$) more alcohol than those in group 1. These findings suggest that the most acculturated adolescents tended to drink more alcohol than adolescents who were the least acculturated on average (Table 3.8).

Table 3.8

Acculturation and Psychological Factors' Effects on Alcohol use over time (weighted)

	Multivariate Anti-log transformation coefficient	Coefficie-nts	Standard error	t	df	Multivari-ate P-value	Bivariate anti-log coefficients	Bivariate P-value
Effect of parental education	1.03**	0.03	0.01	2.63	848	0.009	1.03**	0.005
Effect of male	0.75**	-0.29	0.09	-3.06	848	0.003	1.14*	0.040
Effect of age (linear)	1.13***	0.12	0.03	4.22	2535	<0.001	1.10***	<0.001
Effect of male on effect of age	1.07***	0.07	0.01	4.42	2535	<0.001	1.10***	<0.001
Effect of age (quadratic)	0.99**	-0.01	0.00	-2.71	2535	0.007	1.01***	<0.001
Effect of religiosity [a]	0.92**	-0.08	0.03	-2.62	2535	0.009	0.77***	<0.001
Effect of depressive symptoms [a]	1.16	0.15	0.08	1.85	2535	0.064	1.15	0.059
Effect of self-esteem [a]	0.93	-0.07	0.06	-1.07	2535	0.287	0.97	0.586
Effect of acculturation (Gr1: Not use English at home, Not U.S.-born) [a]	Reference group						0.73***	<0.001
Effect of acculturation (Gr2: Not use English at home, U.S.-born) [a]	1.32**	0.27	0.08	3.27	2535	0.001	0.92	0.285
Effect of acculturation (Gr3: Use English at home, Not U.S.-born) [a]	1.26*	0.23	0.09	2.50	2535	0.013	1.09	0.286
Effect of acculturation (Gr4: Use English at home, U.S.-born) [a]	1.50***	0.41	0.07	5.94	2535	<0.001	1.28***	<0.001

[a] grand mean-centered
* $p<0.05$ ** $p<0.01$ *** $p<0.001$
 Reference group in acculturation: Gr1 (Not use English at home and Not U.S.- born)
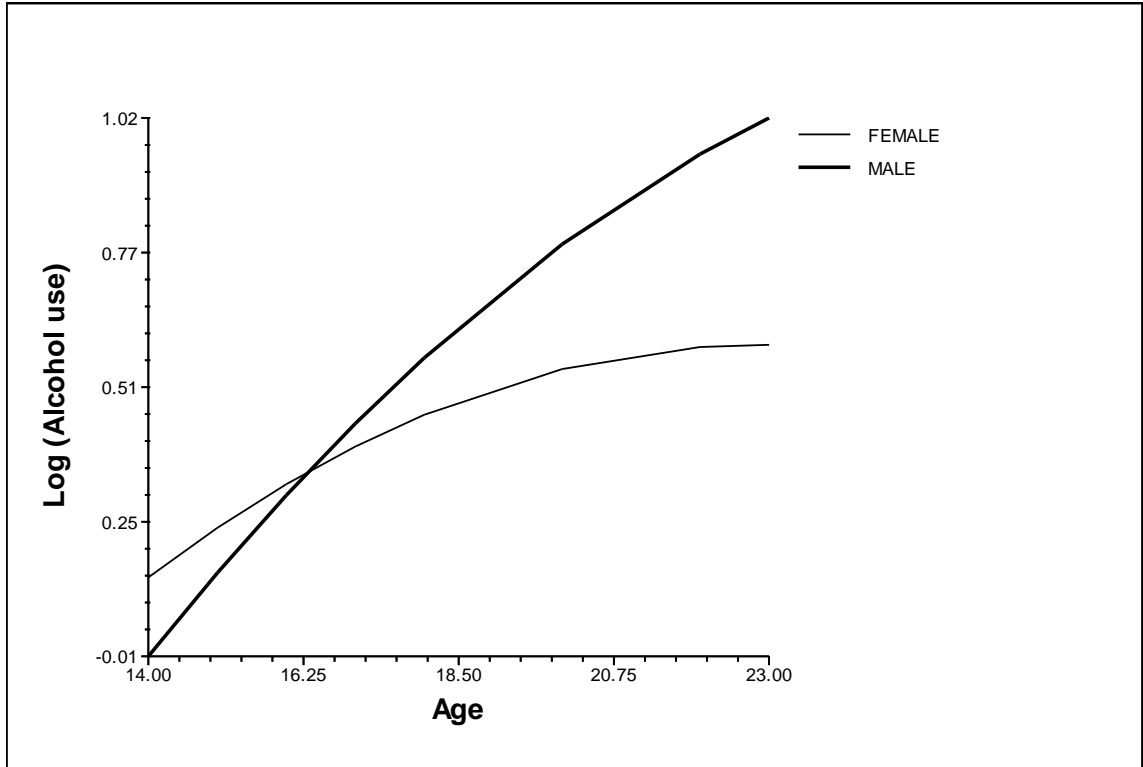
Figure 3.2. Alcohol consumption (quantity and frequency) over time for males and females

Figure 3.2 displays the gender differences in alcohol usage as age increases. Males and females' drinking increased with age. The gap in alcohol consumption increased between age 16 and 17 and females drank alcohol more than males between age 16 and age 17 on average, while male alcohol consumption was higher than that of females after age 17. The escalation rates of adolescent alcohol consumption decreased with greater age.
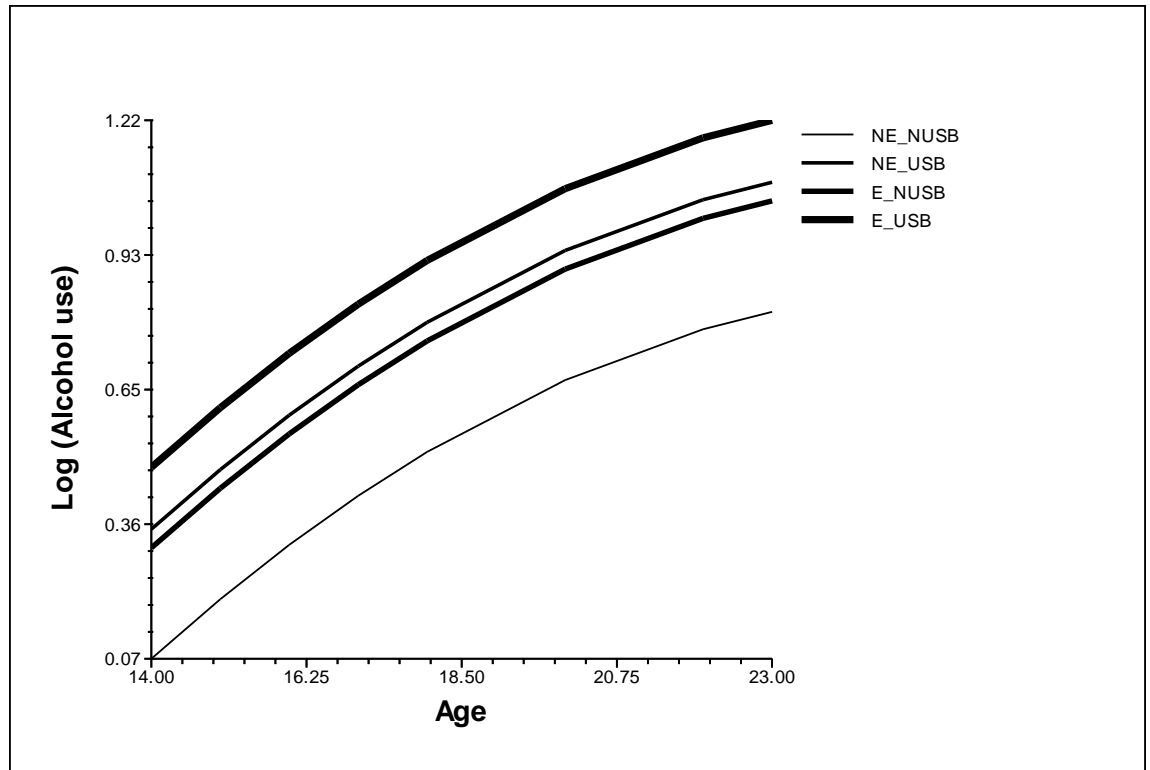
Figure 3.3. Alcohol consumption over time by acculturation groups

  * Group1 (NE_NUSB) Not English use at home & Not U.S.-born

  Group2 (NE_USB) Not English use at home & U.S.-born

  Group3 (E_NUSB) English use at home & Not U.S.-born

  Group4 (E_USB) English use at home & U.S.-born

Figure 3.3 shows the differences of alcohol consumption among the four acculturation groups. Group 4 (English use at home & U.S.-born) was the most acculturated group and drank more alcohol than those of other groups on average. Group 1, the least acculturated group (Not English use at home & not U.S.-born), consumed the least amount of alcohol on average. In general, the more acculturated adolescents were, the more alcohol they drank.

Discussion and Conclusions

This chapter focused on trajectories of alcohol consumption of Asian American adolescents from grades 7 through 12 and into young adulthood with gender, acculturation and psychosocial factors including religiosity, depressive symptoms and self-esteem as predictors.

Alcohol Use and Socio-demographic and Psychosocial Factors

In this study, 39% of male adolescents and 38% of female adolescents drank alcohol in Wave I. When these adolescents were young adults in Wave III, 68% of them (males: 70%, females: 65%) engaged in alcohol consumption. The higher rates of alcohol consumption in males than females were similar to another study for Asian American adolescents (Tosh & Simmons, 2007) and this finding was also similar to other races (Cheng, Gau, Chen, Chang, & Chang, 2004; Edwards, Thurman, & Beauvais, 1995; Maney, Higham-Gardill, & Mahoney, 2002; Schiff, Rahav, & Teichman, 2005). In the current study, gender differences in alcohol consumption were apparent as adolescents grew older (Wave III, p<0.001), with a higher level of alcohol consumption among males.

The findings of the current study are consistent with other studies of the general adolescent population which have consistently shown positive increasing associations between age and alcohol consumption among White adolescents (91%) in New York (Griffin et al., 2000) and multiple race groups (Edwards et al., 1995). In the current longitudinal study, age was a significant and consistent predictor of alcohol consumption

for males and females. This is also a consistent finding in the literature among various race groups (Hartka et al., 1991) and among Taiwanese (Cheng et al., 2004).

With regard to psychosocial factors, results of the current study indicated that depressive symptoms and self-esteem were not significantly associated with alcohol consumption over time among Asian American adolescents. However, in the current study, higher levels of religiosity were negatively associated with adolescent alcohol consumption ($p<0.01$). Religiosity appears to have a buffering effect against alcohol consumption over time among White and other race groups (Wallace, Bachman et al., 2003) and African American, Hispanic, Asian American, White, and other races (Yaeger et al., 2003). The influence of religiosity on alcohol consumption might be different among subgroups among Asian Americans. For instance, the attendance at religious services was significantly related to lower heavy alcohol use in Korean Americans, but was not associated with alcohol consumption in Chinese Americans. However, Chinese Americans practicing Western religions engaged in less heavy episodic drinking than those of Oriental religions (Luczak, Corbett, Oh, Carr, & Wall, 2003). In the past, Japanese Americans were influenced by Buddhist and Chinese philosophies, which encouraged moderation and conservative alcohol consumption; today, however, drinking patterns are influenced by a business-oriented and urban lifestyle with its increased alcohol consumption (McNeece & DiNitto, 1998). To develop effective alcohol prevention programs, future research should investigate the relationship between religiosity and alcohol consumption based on ethnic cultures and type of religion.

Alcohol consumption and Acculturation

The strongest predictor of alcohol use in the current study was acculturation. In the current study, on average, adolescents who were more acculturated were more likely to drink alcohol over time than adolescents who were less acculturated. This finding indicated that as adolescents become more acculturated to the U.S. culture, they may encounter situations in which they are exposed to alcohol. In particular, the Asian American adolescents in the highest acculturated group (English used at home and born in the U.S.) drank 50% more alcohol than those in the least acculturated group (English not used at home and not born in the U.S.) based on three waves from 1996 to 2002. Acculturation experience among Asian Americans contributes to an increase in alcohol consumption, abuse, and addiction (Alaniz, Treno, & Saltz, 1999). The pressure of acculturation turns Asian Americans to acculturate to the dominant culture of the United States, and then their drinking patterns are more likely to approximate the general U.S. drinking norm (Kitano, Hatanaka, Yeung, and Chai, 1984). When Chinese Americans have experienced stress related to alterations in family structures and roots associated with acculturation, they are more likely to drink alcohol (Cheng & Chen, 1995; Chin, Lai, & Rouse, 1990).

Furthermore, adolescents who did not use English at home and were born in the U.S., drank alcohol more than those who used English at home and were born in a foreign country. According to Phinney (1990), adolescents who use English at home and were born in the U.S. were the most acculturated group. Phinney argued that language is a more accurate tool to assess acculturation than the place of birth. Contrary to this assertion, the current study's findings showed that adolescents born in the U.S. who did

not use English at home drank more alcohol than those who were not born in the U.S. and used English at home. Thus, the current study suggested that being born in the United States may be more influential on acculturation than English use at home among Asian American adolescents.

Acculturation to the U.S. culture was associated with increased risk of alcohol consumption among Hispanics (Black & Markides, 1993; Zemore, 2005) and Asian American adolescents (Hahm, Lahiff, & Guterman, 2003). The process of acculturation includes adaptation to new environments and culture, less support from the traditional system among Asian Americans (Berry, 2004; Nagata, 1994) and greater exposure to groups with high levels of alcohol consumption among Mexican Americans (Bonnheim & Korman, 1985), White, Black and other race groups (Unger et al., 2004), which might lead Asian American adolescents to increase their alcohol consumption. The less-acculturated Asian American adolescents are, the lower their levels of alcohol consumption. However, their risk taking behavior with alcohol increases as they become more acculturated (Cheng et al., 2004; Fosados et al., 2007; Nieri, Kulis, Keith, & Hurdle, 2005; O'Hare & Van Tran, 1998; So, Wong, & DeLeon, 2005; Tosh & Simmons, 2007). Asian American adolescents who are more acculturated, were associated with increased alcohol use in both genders, but especially among males (Tosh & Simmons, 2007). This finding, however, is not applicable to Latino populations. Specifically, acculturated Mexican females were significantly more likely to increase their alcohol use (Alaniz et al., 1999), while with acculturated Mexican males such an increase was not evident (Markides et al., 1990; Neff & Hoppe, 1992).

Furthermore, acculturation was associated with a lower prevalence of alcohol abuse among Hispanic males, whereas Hispanic females developed more heavy episodic drinking and alcohol-related problems as they acculturated (Caetano, 1987; Caetano, Ramisetty-Mikler, Wallisch, McGrath, & Spence, 2008). When Hispanic females immigrated in the United States, they started to work and the economic independence placed more emphasis on individualism and adopting new gender roles in American culture. Hispanic females tend to change from passive and docile roles at home to more active and independent roles in the workplace. This might be due to more liberal norms of female alcohol use in the United States than Hispanic countries such as Mexico (Caetano et al., 2008). Therefore, acculturation had different effects on alcohol use depending on gender and race. Acculturation among Asian Americans was positively associated with alcohol use in both genders. In Hispanics, however, females were more susceptible of acculturation to alcohol use than males.

In the current study, there were no gender differences in the association between acculturation and alcohol consumption. Thus, differences in gender-related drinking patterns between the Latino population and Asian Americans may be due to cultural differences. Future studies should consider gender differences and acculturation to predict alcohol consumption based on different races and ethnicities.

Hahm and his colleagues (2003) reported that Asian American adolescents with the highest levels of acculturation drank alcohol three times more than the least acculturated groups. Furthermore, Asian Americans who were born in the U.S. reported significantly more alcohol consumption than people who were foreign born (F. Y. Wong et al., 2007). This may suggest that more acculturated adolescents who were born in the

U.S., drank more alcohol than less acculturated adolescents who were foreign born.

These findings are in accordance with the current study's findings. The measurement of

alcohol consumption is different from Hahm's study. Hahm and his colleagues (2003)

considered only the number of days' of alcohol use whereas the current study measured

alcohol consumption by multiplying frequency by quantity. Additionally, the current

study used longitudinal data across three Waves, but Hahm and associates' study

employed only data from Wave I and II of Add Health. In addition, in Wong and

colleagues' study (2007), the alcohol use variable in Southeast Asian Americans was

measured by the number of days the respondents' used alcohol during the prior 30-day

period. Thus, one should be cautious in comparing the measurement of alcohol

consumption, because measurement differences, the type of study (i.e., cross-sectional

and longitudinal study), and the study periods may be different. Although the

measurements of alcohol consumption and time periods for analysis among studies were

different, acculturation was a consistent predictor of increased alcohol consumption

among Asian American adolescents.

Asian Americans in the United States consist of several race groups. The Asian

Americans are composed of a variety of ethnicities with diverse cultures and backgrounds.

The level of acculturation varies significantly among various Asian American subgroups

and these diverse backgrounds may be differentially related to alcohol consumption

(Makimoto, 1998). Among Asian Americans, Japanese and Filipino Asian Americans

showed the highest substance use rates (Tsunoda et al., 1992). Chinese Americans have

the lowest rates of heavy drinking, whereas Vietnamese in the United States were found

to be at high risk for heavy drinking (Makimoto, 1998; Price et al., 2002; M. M. Wong et

al., 2004). Although Asian American adolescents engage in fewer risk-taking behaviors compared with other races in the Unites States, if they engaged in risk behaviors once, the risks are at the same or greater level than those of other ethnicities (Tosh & Simmons, 2007). In the current study, the population of each subgroup among Asian American adolescents was not explored. However, further studies should consider examining the differences of alcohol use behavior among Asian American subpopulations.

Regarding alcohol prevention and treatment programs, the barriers to prevention and treatment of alcohol consumption among Asian American adolescents are associated with cultural factors such as shame and denial of alcohol use problems. The denial is often generated not only by the individuals who drink alcohol, but also by their family because substance abuse is considered a serious breach of acceptable behavior. Denial of alcohol use was the primary barrier to seeking help or decrease of drinking among Asian Americans. Consequently, Asian American alcohol users may lose the opportunity to have their alcohol problems treated (Ja & Aoki, 1993). Furthermore, other barriers in tackling their problems include language problems, a lack of understanding of Asian American cultural differences, and a dearth of outreach services (McNeece &DiNitto, 1998). As these adolescents may face limited opportunities for resolving alcohol related problems, relevant services such as linguistically appropriate programs, geographically accessible programs, and culturally appropriate programs should be considered to increase these adolescents' limited opportunities to help themselves.

In sum, findings of the current study highlight the importance of examining longitudinal alcohol consumption in terms of the factors of psychosocial factors and acculturation. Depressive symptoms and self-esteem were not significantly associated

119

with alcohol consumption over time; however, higher levels of religiosity were negatively associated with adolescent alcohol consumption among Asian American adolescents. The most acculturated adolescents were more likely to drink alcohol than the least acculturated adolescents. This finding suggests that acculturated adolescents may have risky behavior, so Asian American adolescents need to enhance healthy behaviors as they become acculturated into the American culture. This implies that health professionals need to consider acculturation when addressing alcohol use in this group. In addition, it is important to develop culturally sensitive prevention and education programs against alcohol consumption. Further, because Asian American adolescents have different cultural backgrounds, research methods including both qualitative and quantitative elements may be valuable to define specific cultural differences and influencing factors of alcohol consumption.

Contribution

This study contributes to understanding the relation of acculturation and psychosocial factors with alcohol consumption over time in Asian American adolescents. To date, a limited number of studies have addressed substance use among Asian American adolescents, even though the population of Asian Americans is gradually increasing. In addition, there is a paucity of studies using longitudinal data for Asian Americans, so the current study using longitudinal data provides evidence of an association between alcohol consumption, acculturation and psychosocial factors among Asian American adolescents and young adults.

Limitations

There are some limitations to the current study. First, the data were obtained from self-reports which might reflect dishonest reports of alcohol consumption and other variables. The validity of data may have been influenced by biased responses.

Second, the test for a missing at random (MAR) was not conducted, before the multiple imputation, but the data were imputed assuming they were MAR.

Third, acculturation is a multidimensional concept implicating culture; English language usage, birth place, attitudes and behaviors, and staying periods since arriving in the U.S. (Oetting & Beauvais, 1990). The measure of acculturation used in this study may not cover the multidimensional concept because acculturation in the current study involved English language usage and birth place.

Fourth, this study did not examine alcohol consumption in subgroups of Asian American adolescents. Further research needs to include Asian American subgroups, because each subgroup may have different cultural backgrounds.

Future implications

This study examined alcohol consumption as measured by frequency multiplied by quantity as a dependent variable. Future studies also should explore heavy drinking and binge drinking to define the associations between alcohol consumption and risk or protective factors among Asian American adolescents using longitudinal data.

In addition, research on patterns of trajectories should be investigated for understandings of alcohol consumption having different antecedent factors and influencing conditions (Schulenberg et al., 1996). The consideration of different

development types can give more detailed inter-individual information to predict changes over time in alcohol consumption (Schulenberg et al.). In addition, these approaches, including multiple trajectories, offer a method to define risk factors or influencing factors in certain types of individuals based on initial and subsequent levels of alcohol consumption (Muthen & Muthen, 2000). Thus, these different trajectories may help us understand the normative developmental trends and wide diversity of patterns of change in alcohol drinking over time (Bates & Labouvie, 1997; Guo, Collins, Hill, & Hawkins, 2000; Muthen & Muthen, 2000).

Finally, since Asian American adolescents have different levels of acculturation and cultural backgrounds, the intervention and education programs for the prevention of alcohol consumption should consider cultural backgrounds among subpopulations and the acculturation levels of Asian American adolescents.

References

Alaniz, M. L., Treno, A. J., & Saltz, R. F. (1999). Gender, acculturation, and alcohol consumption among Mexican Americans. *Subst Use Misuse, 34*(10), 1407-1426.

Andrews, J. A., & Duncan, S. C. (1997). Examining the reciprocal relation between academic motivation and substance use: effects of family relationships, self-esteem, and general deviance. *J Behav Med, 20*(6), 523-549.

Bachman, J. G., Wallace, J. M., Jr., O'Malley, P. M., Johnston, L. D., Kurth, C. L., & Neighbors, H. W. (1991). Racial/Ethnic differences in smoking, drinking, and illicit drug use among American high school seniors, 1976-89. *Am J Public Health, 81*(3), 372-377.

Bahr, S. J., Marcos, A. C., & Maughan, S. L. (1995). Family, educational and peer influences on the alcohol use of female and male adolescents. *J Stud Alcohol, 56*(4), 457-469.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev, 84*(2), 191-215.

Barkin, S. L., Smith, K. S., & DuRant, R. H. (2002). Social skills and attitudes associated with substance use behaviors among young adolescents. *J Adolesc Health, 30*(6), 448-454.

Barthwell, A. G. (1995). Alcoholism in the family. A multicultural exploration. *Recent Dev Alcohol, 12*, 387-407.

Bates, M. E., & Labouvie, E. W. (1997). Adolescent risk factors and the prediction of persistent alcohol and drug use into adulthood. *Alcohol Clin Exp Res, 21*(5), 944-950.

Belgrave, F. Z. (2002). Relational theory and cultural enhancement interventions for African American adolescent girls. *Public Health Rep, 117 Suppl 1*, S76-81.

Berger, K.S. & Thompson, R.A. (1995). The developing person: Through childhood and adolescence. New York: Worth Publishers. Feek, W. (Ed). (1990). On-Line: Thedrugs learning package. London, The Commonwealth Secretariat.

Berry, J. W. (2004). Psychology of group relations: cultural and social dimensions. *Aviat Space Environ Med, 75*(7 Suppl), C52-57.

Berry. J.W. (1997). Immigration, acculturation, and adaptation. *Applied Psychology, An Internationational Review*, 46(1), 5-68.

Berry, J. W., Kim, U., Minde, T. & Mok, D. (1987). Comparative studies of acculturative stress. *International Migration Review*, 21, 491-511.

Beyers, J. M., Loeber, R., Wikstrom, P. O., & Stouthamer-Loeber, M. (2001). What predicts adolescent violence in better-off neighborhoods? *J Abnorm Child Psychol, 29*(5), 369-381.

Black, S. A., & Markides, K. S. (1993). Acculturation and alcohol consumption in Puerto Rican, Cuban-American, and Mexican-American women in the United States. *Am J Public Health, 83*(6), 890-893.

Blake, S. M., Ledsky, R., Goodenow, C., & O'Donnell, L. (2001). Recency of immigration, substance use, and sexual behavior among Massachusetts adolescents. *Am J Public Health, 91*(5), 794-798.

Bonnheim, M. L., & Korman, M. (1985). Family interaction and acculturation in Mexican-American inhalant users. *J Psychoactive Drugs, 17*(1), 25-33.

Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: a family interactional approach. *Genet Soc Gen Psychol Monogr, 116*(2), 111-267.

Brown, S. A., McGue, M., Maggs, J., Schulenberg, J., Hingson, R., Swartzwelder, S., et al. (2008). A developmental perspective on alcohol and youths 16 to 20 years of age. *Pediatrics, 121 Suppl 4*, S290-310.

Caetano, R. (1987). Acculturation and attitudes toward appropriate drinking among U.S. Hispanics. *Alcohol Alcohol, 22*(4), 427-433.

Caetano, R., Ramisetty-Mikler, S., Wallisch, L. S., McGrath, C., & Spence, R. T. (2008). Acculturation, drinking, and alcohol abuse and dependence among Hispanics in the Texas-Mexico border. *Alcohol Clin Exp Res, 32*(2), 314-321.

Cervantes, R. C., Gilbert, M. J., Salgado de Snyder, N., & Padilla, A. M. (1990). Psychosocial and cognitive correlates of alcohol use in younger adult immigrant and U.S.-born Hispanics. *Int J Addict, 25*(5A-6A), 687-708.

Cheng, A. T., & Chen, W. J. (1995). Alcoholism among four aboriginal groups in Taiwan: high prevalences and their implications. *Alcohol Clin Exp Res, 19*(1), 81-91.

Cheng, A. T., Gau, S. F., Chen, T. H., Chang, J. C., & Chang, Y. T. (2004). A 4-year longitudinal study on risk factors for alcoholism. *Arch Gen Psychiatry, 61*(2), 184-191.

Chin, K. L., Lai, T. F., & Rouse, M. (1990). Social adjustment and alcoholism among Chinese immigrants in New York City. *Int J Addict, 25*(5A-6A), 709-730.

Chung, H., Teresi, J., Guarnaccia, P., Meyers, B. S., Holmes, D., Bobrowitz, T., et al. (2003). Depressive symptoms and psychiatric distress in low income Asian and Latino primary care patients: prevalence and recognition. *Community Ment Health J, 39*(1), 33-46.

Crum, R. M., Brown, C., Liang, K. Y., & Eaton, W. W. (2001). The association of depression and problem drinking: analyses from the Baltimore ECA follow-up study. Epidemiologic Catchment Area. *Addict Behav, 26*(5), 765-773.

D'Amico E.J, Metrik J, McCarthy D.M, Appelbaum M, Frissell K.C, (2001). Brown SA. Progression into and out of binge drinking among high school students. *Psychol Addict Behav.* 15(4): 341–349.

Dolcini, M. M., & Adler, N. E. (1994). Perceived competencies, peer group affiliation, and risk behavior among early adolescents. *Health Psychol, 13*(6), 496-506.

Donovan, J. E. (1993). Young adult drinking-driving: behavioral and psychosocial correlates. *J Stud Alcohol, 54*(5), 600-613.

Edwards, R. W., Thurman, P. J., & Beauvais, F. (1995). Patterns of alcohol use among ethnic minority adolescent women. *Recent Dev Alcohol, 12*, 369-386.

Eitle, T. M., Wahl, A. M., & Aranda, E. (2009). Immigrant generation, selective acculturation, and alcohol use among Latina/o adolescents. *Soc Sci Res, 38*(3), 732-742.

Elliot, K.S, Huizinga, D., & Ageton, S.S. (1985). *Explaining delinquency and drug use*. Beverly Hills, CA;Sage.

Ellickson, P. L., & Morton, S. C. (1999). Identifying adolescents at risk for hard drug use: racial/ethnic variations. *J Adolesc Health, 25*(6), 382-395.

Ellickson, P. L., Tucker, J. S., & Klein, D. J. (2001). High-risk behaviors associated with early smoking: results from a 5-year follow-up. *J Adolesc Health, 28*(6), 465-473.

Ellickson, S. L., Tucker, J. S., Klein, D. J., & McGuigan, K. A. (2001). Prospective risk factors for alcohol misuse in late adolescence. *J Stud Alcohol, 62*(6), 773-782.

Ennett, S. T., Rosenbaum, D. P., Flewelling, R. L., Bieler, G. S., Ringwalt, C. L., & Bailey, S. L. (1994). Long-term evaluation of drug abuse resistance education. *Addict Behav, 19*(2), 113-125.

Epstein, J. A., Botvin, G. J., Diaz, T., Toth, V., & Schinke, S. P. (1995). Social and personal factors in marijuana use and intentions to use drugs among inner city minority youth. *J Dev Behav Pediatr, 16*(1), 14-20.

Fosados, R., McClain, A., Ritt-Olson, A., Sussman, S., Soto, D., Baezconde-Garbanati, L., et al. (2007). The influence of acculturation on drug and alcohol use in a sample of adolescents. *Addict Behav*.

Fuligni A.J. (1998). Parental authority, adolescent autonomy, and parent-adolescent relationships: a study of adolescents from Mexican, Chinese, Filipino, and European backgrounds. *DevPsychol.* 34(4):782–792

Gfroerer, J. C., & Tan, L. L. (2003). Substance use among foreign-born youths in the United States: does the length of residence matter? *Am J Public Health, 93*(11), 1892-1895.

Ghosh, C. (2003). Healthy People 2010 and Asian Americans/Pacific Islanders: defining a baseline of information. *Am J Public Health, 93*(12), 2093-2098.

Gillmore, M. R., Catalano, R. F., Morrison, D. M., Wells, E. A., Iritani, B., & Hawkins, J. D. (1990). Racial differences in acceptability and availability of drugs and early initiation of substance use. *Am J Drug Alcohol Abuse, 16*(3-4), 185-206.

Griffin, K. W., Botvin, G. J., Epstein, J. A., Doyle, M. M., & Diaz, T. (2000). Psychosocial and behavioral factors in early adolescence as predictors of heavy drinking among high school seniors. *J Stud Alcohol, 61*(4), 603-606.

Grunbaum, J. A., Lowry, R., Kann, L., & Pateman, B. (2000). Prevalence of health risk behaviors among Asian American/Pacific Islander high school students. *J Adolesc Health, 27*(5), 322-330.

Guo, J., Collins, L. M., Hill, K. G., & Hawkins, J. D. (2000). Developmental pathways to alcohol abuse and dependence in young adulthood. *J Stud Alcohol, 61*(6), 799-808.

Gutmann, M. C. (1999). Ethnicity, alcohol, and acculturation. *Soc Sci Med, 48*(2), 173-184.

Hahm, H. C., Lahiff, M., & Guterman, N. B. (2003). Acculturation and parental attachment in Asian-American adolescents' alcohol use. *J Adolesc Health, 33*(2), 119-129.

Hahn, R. A., Teutsch, S. M., Franks, A. L., Chang, M. H., & Lloyd, E. E. (1998). The prevalence of risk factors among women in the United States by race and age, 1992-1994: opportunities for primary and secondary prevention. *J Am Med Womens Assoc, 53*(2), 96-104, 107.

Hartka, E., Johnstone, B., Leino, E. V., Motoyoshi, M., Temple, M. T., & Fillmore, K. M. (1991). A meta-analysis of depressive symptomatology and alcohol consumption over time. *Br J Addict, 86*(10), 1283-1298.

Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. *Psychol Bull, 112*(1), 64-105.

Hawkins, J.D., and Weis, J.G., (1985). The social development model: An integrated

approach to delinquency prevention. *Journal of Primary Prevention*, 6, 73-97.

Hill, S. Y., Shen, S., Lowers, L., & Locke, J. (2000). Factors predicting the onset of adolescent drinking in families at high risk for developing alcoholism. *Biol Psychiatry, 48*(4), 265-275.

Hines, A. M., & Caetano, R. (1998). Alcohol and AIDS-related sexual behavior among Hispanics: acculturation and gender differences. *AIDS Educ Prev, 10*(6), 533-547.

Hirschi, T. (1969) *Causes of Delinquency*, Berkeley, CA: Univ. of California Press, 1969.

Hoffmann, J. P., & Cerbone, F. G. (2002). Parental substance use disorder and the risk of adolescent drug abuse: an event history analysis. *Drug Alcohol Depend, 66*(3), 255-264.

Hox, J. (2002). *Multilevel analysis: Techniques and applications.* Lawrence Erlbaum; Mahwah, NJ.

Hussong, A. M., & Hicks, R. E. (2003). Affect and peer context interactively impact adolescent substance use. *J Abnorm Child Psychol, 31*(4), 413-426.

Ja,D. Y., & Aoki, B. (1993). Substance abuse treatment: Cultural barriers in the Asian-American community. Journal of Psychoactive Drugs, 25(1), 61-71.James, W. H.,

Jaeger, M. (2006). *On testing the missing at random assumption*, Springer, Berlin, Heidelberg.

James W., and Kim G., (1997), Examining Background and Lifestyle Factors among Asian American Adolescents Using Drugs, *Drugs, Education, Prevention and Policy, 4*:1, 39-51.

James W., and Moore D., (1994). The Adolescent Substance Battery: Clinical Diagnoses and Student Assistance Program Case Management for Adolescents Using Drugs, *Journalof Child and Adolescent Substance Abuse, 3*:2, pp. 45-57.

Jones, D. J., Hussong, A. M., Manning, J., & Sterrett, E. (2008). Adolescent alcohol use in context: The role of parents and peers among African American and European American youth. *Cultur Divers Ethnic Minor Psychol, 14*(3), 266-273.

Kandel, D. B., Yamaguchi, K., & Chen, K. (1992). Stages of progression in drug involvement from adolescence to adulthood: further evidence for the gateway theory. *J Stud Alcohol, 53*(5), 447-457.

Kaplan, C. P., Zabkiewicz, D., McPhee, S. J., Nguyen, T., Gregorich, S. E., Disogra, C., et al. (2003). Health-compromising behaviors among Vietnamese adolescents: the role of education and extracurricular activities. *J Adolesc Health, 32*(5), 374-383.

Kim, G. K., & Armijo, E. (2000). The influence of ethnic identity on drug use among ethnic minority adolescents. *J Drug Educ, 30*(3), 265-280.

Kim, M. T. (1995). Cultural influences on depression in Korean Americans. *J Psychosoc Nurs Ment Health Serv, 33*(2), 13-18.

Kintano, H., & Daniels, R. (1988). Asian Americans: Emerging minorities. Englewood Cliffs, NJ: Prentice-Hall.

Klingle RS, Miller MD. (1998) Hawaii student alcohol and drug use study (1991-1998). Hawaii adolescent treatment needs assessment. Kapolei (HI): Hawaii Dept. of Health, Alcohol and Drug Abuse Division; 1999.

Kreft, I., De Leeuw, J. (1998). *Introducing multilevel modeling.* Sage; Thousand OaksCA.

Kumpfer, K. L., & Turner, C. W. (1990). The social ecology model of adolescent substance abuse: implications for prevention. *Int J Addict, 25*(4A), 435-463.

Lowry, R., Kann, L., Collins, J. L., & Kolbe, L. J. (1996). The effect of socioeconomic status on chronic disease risk behaviors among US adolescents. *Jama, 276*(10), 792-797.

Lubben, J. E., Chi, I., & Kitano, H. H. (1988). Exploring Filipino American drinking behavior. *J Stud Alcohol, 49*(1), 26-29.

Luczak, S. E., Corbett, K., Oh, C., Carr, L. G., & Wall, T. L. (2003). Religious influences on heavy episodic drinking in Chinese-American and Korean-American college students. *J Stud Alcohol, 64*(4), 467-471.

Makimoto, K. (1998). Drinking patterns and drinking problems among Asian-Americans and Pacific Islanders. *Alcohol Health Res World, 22*(4), 270-275.

Maney, D. W., Higham-Gardill, D. A., & Mahoney, B. S. (2002). The alcohol-related psychosocial and behavioral risks of a nationally representative sample of adolescents. *J Sch Health, 72*(4), 157-163.

Markides, K. S., Krause, N., & Mendes de Leon, C. F. (1988). Acculturation and alcohol consumption among Mexican Americans: a three-generation study. *Am J Public Health, 78*(9), 1178-1181.

Markides, K. S., Ray, L. A., Stroup-Benham, C. A., & Trevino, F. (1990). Acculturation and alcohol consumption in the Mexican American population of the southwestern United States: findings from HHANES 1982-84. *Am J Public Health, 80 Suppl*, 42-46.

Marsiglia, F. F., Kulis, S., Hecht, M. L., & Sills, S. (2004). Ethnicity and ethnic identity as predictors of drug norms and drug use among preadolescents in the US Southwest. *Subst Use Misuse, 39*(7), 1061-1094.

Marsiglia, F. F., Kulis, S., Nieri, T., & Parsai, M. (2005). God forbid! Substance use among religious and non-religious youth. *Am J Orthopsychiatry, 75*(4), 585-598.

McNeece,C.A., & DiNitto,D.M.(1998). Chemical dependency: A systems approach (2nd ed.). Englewood Cliffs,NJ: Prentice Hall.

Miller, W. R. (1998). Researching the spiritual dimensions of alcohol and other drug problems. *Addiction, 93*(7), 979-990.

Moscato, B. S., Russell, M., Zielezny, M., Bromet, E., Egri, G., Mudar, P., et al. (1997). Gender differences in the relation between depressive symptoms and alcohol problems: a longitudinal perspective. *Am J Epidemiol, 146*(11), 966-974.

Muthen, B. O., & Muthen, L. K. (2000). The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *J Stud Alcohol, 61*(2), 290-300.

Myers, M. G., & Brown, S. A. (1990). Coping responses and relapse among adolescent substance abusers. *J Subst Abuse, 2*(2), 177-189.

Nagata, D. K. (1994). Asian American and Pacific Islanders Mental Health Issues%colon; A Historical Perspective. *Asian Am Pac Isl J Health, 2*(2), 108-124.

Nakashima, J., & Wong, M. M. (2000). Characteristics of alcohol consumption, correlates of alcohol misuse among Korean American adolescents. *J Drug Educ, 30*(3), 343-359.

Neff, J. A., & Hoppe, S. K. (1992). Acculturation and drinking patterns among U.S. Anglos, blacks, and Mexican Americans. *Alcohol Alcohol, 27*(3), 293-308.

Nieri, T., Kulis, S., Keith, V. M., & Hurdle, D. (2005). Body image, acculturation, and substance abuse among boys and girls in the Southwest. *Am J Drug Alcohol Abuse, 31*(4), 617-639.

O'Hare, T., & Van Tran, T. (1998). Substance abuse among Southeast Asians in the U.S.: implications for practice and research. *Soc Work Health Care, 26*(3), 69-80.

Oetting, E. R., & Beauvais, F. (1990). Orthogonal cultural identification theory: the cultural identification of minority adolescents. *Int J Addict, 25*(5A-6A), 655-685.

Otsuki, T. A. (2003). Substance use, self-esteem, and depression among Asian American adolescents. *J Drug Educ, 33*(4), 369-390.

Phinney, J. S. (1990). Ethnic identity in adolescents and adults: review of research. *Psychol Bull, 108*(3), 499-514.

Price, R. K., Risk, N. K., Wong, M. M., & Klingle, R. S. (2002). Substance use and abuse by Asian Americans and Pacific Islanders: preliminary results from four national epidemiologic studies. *Public Health Rep, 117 Suppl 1*, S39-50.

Radloff, L.S. 1977. "The CES-D Scale: A Self-Report Depression Scale for Research in the GeneralPublic," *Applied Psychological Measurement* 1(3):385-401.

Raghunathan T. E., Lepkowski J., VanHoewyk J., and Solenerger P.,(2001). A multivariate technique for multiply imputing missing values using a sequence of regression models. *Survey Methodology*, 27 (1), 85-95.

Raudenbush, S.W. & Bryk, A.S. (2002). Hierarchical Linear Models: Applications and Data Analysis Methods. Advanced Quantitative Techniques in the Social Sciences, Sage Publications, Thousand Oaks, CA.

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *Jama, 278*(10), 823-832.

Rosenthal, D. A., & Feldman, S. S. (1990). The acculturation of Chinese immigrants: perceived effects on family functioning of length of residence in two cultural contexts. *J Genet Psychol, 151*(4), 495-514.

Scheier, L. M., Botvin, G. J., & Baker, E. (1997). Risk and protective factors as predictors of adolescent alcohol involvement and transitions in alcohol use: a prospective analysis. *J Stud Alcohol, 58*(6), 652-667.

Schiff, M., Rahav, G., & Teichman, M. (2005). Israel 2000: immigration and gender differences in alcohol consumption. *Am J Addict, 14*(3), 234-247.

Schutte, K. K., Hearst, J., & Moos, R. H. (1997). Gender differences in the relations between depressive symptoms and drinking behavior among problem drinkers: a three-wave study. *J Consult Clin Psychol, 65*(3), 392-404.

Simantov, E., Schoen, C., & Klein, J. D. (2000). Health-compromising behaviors: why do adolescents smoke or drink?: identifying underlying risk and protective factors. *Arch Pediatr Adolesc Med, 154*(10), 1025-1033.

So, D. W., Wong, F. Y., & DeLeon, J. M. (2005). Sex, HIV risks, and substance use among Asian American college students. *AIDS Educ Prev, 17*(5), 457-468.

Sutherland E.H. (1973) *Development of the theory*. In: SCHUESSLER, K. (Ed.) Edwin Sutherland on Analyzing Crime, Chicago, IL: Univ. of Chicago Press, pp. 13-29.

Schulenberg, J., O'Malley, P. M., Bachman, J. G., Wadsworth, K. N., & Johnston, L. D. (1996). Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *J Stud Alcohol, 57*(3), 289-304.

Thridandam, M., Fong, W., Jang, M., Louie, L., & Forst, M. (1998). A tobacco and alcohol use profile of San Francisco's Chinese community. *J Drug Educ, 28*(4), 377-393.

Torres Stone, R. A., & Meyler, D. (2007). Identifying potential risk and protective factors among non-metropolitan Latino youth: cultural implications for substance use research. *J Immigr Minor Health, 9*(2), 95-107.

Tosh, A. K., & Simmons, P. S. (2007). Sexual activity and other risk-taking behaviors among Asian-American adolescents. *J Pediatr Adolesc Gynecol, 20*(1), 29-34.

Tsunoda, T., Parrish, K. M., Higuchi, S., Stinson, F. S., Kono, H., Ogata, M., et al. (1992). The effect of acculturation on drinking attitudes among Japanese in Japan and Japanese Americans in Hawaii and California. *J Stud Alcohol, 53*(4), 369-377.

Udry J.R. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.

Unger, J. B., Baezconde-Garbanati, L., Shakib, S., Palmer, P. H., Nezami, E., & Mora, J. (2004). A cultural psychology approach to "drug abuse" prevention. *Subst Use Misuse, 39*(10-12), 1779-1820.

U.S. Census Bureau. Census 2000 redistricting data. Washington (DC); 2001. Release dateJuly 7, 2001. Available from: URL: http://www.census.gov/clo/www/redistricting.html

U.S. Census Bureau, (2002). Table QT-02: Profile of Selected Social Characteristics: 2000. Census 2000 Supplementary Summary Tables. , U.S. Census Bureau, Washington, DC.

Vega, W. A., Zimmerman, R., Gil, A., Warheit, G. J., & Apospori, E. (1993). Acculturation strain theory: its application in explaining drug use behavior among Cuban and other Hispanic youth. *NIDA Res Monogr, 130*, 144-166.

Wallace, J. M., Jr., Bachman, J. G., O'Malley, P. M., Schulenberg, J. E., Cooper, S. M., & Johnston, L. D. (2003). Gender and ethnic differences in smoking, drinking and illicit drug use among American 8th, 10th and 12th grade students, 1976-2000. *Addiction, 98*(2), 225-234.

Wallace, J. M., Jr., Brown, T. N., Bachman, J. G., & LaVeist, T. A. (2003). The influence of race and religion on abstinence from alcohol, cigarettes and marijuana among adolescents. *J Stud Alcohol, 64*(6), 843-848.

Wang, J., & Patten, S. B. (2001). A prospective study of sex-specific effects of major depression on alcohol consumption. *Can J Psychiatry, 46*(5), 422-425.

Wiecha, J. M. (1996). Differences in patterns of tobacco use in Vietnamese, African-American, Hispanic, and Caucasian adolescents in Worcester, Massachusetts. *Am J Prev Med, 12*(1), 29-37.

Wilks, J., Callan, V. J., & Austin, D. A. (1989). Parent, peer and personal determinants of adolescent drinking. *Br J Addict, 84*(6), 619-630.

Wills, T. A., Gibbons, F. X., Gerrard, M., Murry, V. M., & Brody, G. H. (2003). Family communication and religiosity related to substance use and sexual behavior in early adolescence: a test for pathways through self-control and prototype perceptions. *Psychol Addict Behav, 17*(4), 312-323.

Wills, T. A., & Stoolmiller, M. (2002). The role of self-control in early escalation of substance use: a time-varying analysis. *J Consult Clin Psychol, 70*(4), 986-997.

Wills, T. A., Yaeger, A. M., & Sandy, J. M. (2003). Buffering effect of religiosity for adolescent substance use. *Psychol Addict Behav, 17*(1), 24-31.

Wong, F. Y., Huang, Z. J., Thompson, E. E., De Leon, J. M., Shah, M. S., Park, R. J., et al. (2007). Substance use among a sample of foreign- and U.S.-born southeast Asians in an urban setting. *J Ethn Subst Abuse, 6*(1), 45-66.

Wong, M. M., Klingle, R. S., & Price, R. K. (2004). Alcohol, tobacco, and other drug use among Asian American and Pacific Islander Adolescents in California and Hawaii. *Addict Behav, 29*(1), 127-141.

Yu, S. M., Huang, Z. J., Schwalberg, R. H., Overpeck, M., & Kogan, M. D. (2003). Acculturation and the health and well-being of U.S. immigrant adolescents. *J Adolesc Health, 33*(6), 479-488.

Zemore, S. E. (2005). Re-examining whether and why acculturation relates to drinking outcomes in a rigorous, national survey of Latinos. *Alcohol Clin Exp Res, 29*(12), 2144-2153.

Chapter IV

Alcohol use trajectories during adolescence among Asian Americans: Multilevel analysis of parent, peer, school, and neighborhood factors

Introduction

This chapter constitutes the third paper of this dissertation and focuses on identifying parent, peer, school, and neighborhood factors that are associated with trajectories of alcohol use among Asian American adolescents.

The increased probability of risk behavior in adolescents may be related to the influences of diverse environments such as home, school, and neighborhood (Dryfoos, 1990; Jessor, 1993; Robins, 1995). During adolescence, a critical developmental stage, adolescents confront physical, psychological, and social changes, and need to adapt to new roles and environments. In particular, parental and peer relationships, as well as school and neighborhood environments may be considered significant factors related to substance use among Asian Americans (Kim & McCarthy, 2006), White and African American adolescents (Simons-Morton, Haynie, Crump, Eitel, & Saylor, 2001), and Mexican American adolescents (Yabiku et al., 2007)

131

Adolescent development, including development of attitudes, beliefs and risk behaviors such as alcohol use, is affected by parental and peer factors (Casswell, Pledger, & Pratap, 2002; Ennett, Flewelling, Lindrooth, & Norton, 1997; White, Johnson, & Buyske, 2000; White et al., 2006). In studies of white samples, risk factors for alcohol use included parental alcohol use and parent-adolescent relationships (Simons-Morton et al., 2001), and peer alcohol use, which becomes stronger in late adolescence (Ary, Tildesley, Hops, & Andrews, 1993). Adolescents with more friends who drink alcohol have been found among African American and White adolescents to be more likely to use alcohol over time than are adolescents whose peers do not drink (Urberg, Degirmencioglu, & Pilgrim, 1997). In contrast to peer influence, studies of multi-race samples have indicated that parents' influences are stronger in early adolescence (Griffin, Botvin, Scheier, Diaz, & Miller, 2000).

School is the primary context for social interaction and adaptation for adolescents. Adolescents spend more time in school; therefore the school environment is important in the formation of adolescent health behavior, and has been shown to be related to adolescent substance use (Aveyard, Markham, & Cheng, 2004; Evans-Whippet al., 2004). Adolescents with low academic achievement (Bahr, Marcos, & Maughan, 1995), and lower levels of school bonding are more likely to use alcohol (Kumpfer & Turner, 1990), and among Vietnamese adolescents more school absence is related to greater risk of using alcohol (Kaplan et al., 2003).

Researchers have also identified neighborhood characteristics as possible risk factors for adolescent substance use, including economic deprivation, decreased social cohesion, and low collective efficacy (Brook, Nomura, & Cohen, 1989; Hawkins,

Catalano, & Miller, 1992; Lambert, Brown, Phillips, & Ialongo, 2004). Adolescents who

report less social cohesion in their neighborhoods demonstrated greater substance use

than adolescents having more social cohesion (Brook et al., 1989). In an African

American sample, neighborhood constructs such as community social organizations are

associated with lower levels of adolescent substance use, and may act as a form of social

control (Lambert et al., 2004). Given that adolescents interact frequently with their

parents and peers, and also spend a lot of time in school, it is not surprising that these

factors and contexts, as well as the neighborhood environments they live in have

important influences on developmental outcomes. Thus parent factors, peer factors, and

perceived and aggregated school and neighborhood constructs should be considered as

potential risk factors for alcohol use among adolescents.

The Asian American population has been increasing in the U.S. According to the

U.S. Bureau of the Census (2002), in the year 2000, Asian Americans made up 4% of the

U.S. population, but the proportion is projected to be 11% of the total U.S. population by

the year 2050 (U.S. Bureau of the Census, 2001). In spite of their growth in this

population, health problems among Asian Americans remain under-researched (Ghosh,

2003; Price, Risk, Wong, & Klingle, 2002). Specifically, research on alcohol use

behavior among Asian Americans using longitudinal data is rare; thereby increasing the

importance of taking advantage of opportunities to investigate prospectively the

predictors of alcohol use among Asian American adolescents.

The purpose of the study reported here was to examine the association between

parental, peer, school, and neighborhood factors experienced by adolescents and

characteristics of the adolescent's schools-and neighborhoods with alcohol consumption

trajectories among Asian American adolescents from grades 7 to 12.

Conceptual Framework

The current study used the Social Developmental Model (SDM) (Hawkins &

Weis, 1985). The SDM is a general theory of human behavior and identifies the

mechanism by which predictors are interrelated in the etiology of behavior. This model is

a synthesis of cognitive theory (Bandura, 1977), social control theory (Hirschi, 1969;

Elliot, 1985) and differential association theory (Sutherland, 1973). The SDM is an

appropriate theoretical model to examine alcohol use because it incorporates both risk

and protective factors related to adolescent alcohol use. Also, this model accounts for

reciprocal relationships between predictors and alcohol use during adolescence and

supports hypotheses concerning the possible developmental processes leading to

prosocial or antisocial behavior. The SDM proposes that adolescents may learn alcohol

use behavior from socialization with parents, peers, schools, and neighborhoods.

The social development model assumes that interactions with some social groups

and environments during adolescent development may affect health behaviors through

social bonds to peers or parents who drink alcohol. The social groups may enhance

powerful bonds within group members and also may influence social standards and

reinforce health behaviors. During early adolescence (12-14 years of age) relationships

with family, peers, and school and social contexts are important socializing forces.

Adolescents in this period experience cognitive development, reproductive maturation,

moodiness, anxiety from challenging school work, friendship development, and increased autonomy (Smetana, 1988). During middle adolescence (from 15-17 years of age), a personal identity takes shape, which influences their opinions, independence, dating, friendships and future plans. When they transition to young adulthood, adolescents are expected to be advancing their educations, and they may consider marriage, having children and the challenges of dealing with family and work responsibilities (Berger & Thompson, 1995).

In the beginning of early adolescence, with increased independence from parents and increased individual responsibility, adolescents gradually start to spend less time with their parents and more time with their friends. This tendency may continue through middle and late adolescence (Larson & Richards, 1991). Despite an increased focus on peers during adolescence, families remain an important influence. Stressors such as school transitions, high expectation of academic achievement, transition to work, as well as the contexts and neighborhoods in which they live can influence adolescent development and health behaviors negatively (Brown et al., 2008).

The current study included socializing agents related to adolescent alcohol consumption, including: parents, peers, school and neighborhoods. Parent alcohol use and parent-adolescent relationships were included for their major influences on adolescent alcohol consumption during this developmental period. Because peer influences play an increasing role as adolescence progresses, peer alcohol use and peer-adolescent relationships were also included as predictors of adolescent alcohol consumption. The SDM suggests that adolescents who bond with others who drink alcohol will be more likely to initiate or escalate alcohol consumption. Furthermore,

parents or peers may directly influence adolescent alcohol consumption, by asking them to stop or by encouraging alcohol use. Other individual-level variables include school attendance, school performance and school bonding. External factors influencing alcohol use, include school context and community-level constructs (e.g., school type, urbanicity, and policies and programs against alcohol use), and neighborhood factors such as social cohesion, safety, and happiness living in their neighborhoods.

The Social Development Model provides a conceptual framework to examine predictors of alcohol consumption during adolescence. Based on the SDM, the dependent variable was alcohol consumption, and the independent variables were individual-level and contextual variables at the school and neighborhood levels. The community level variables are directly associated with both the individual-level variables and alcohol consumption, and the individual level variables are directly associated with alcohol consumption (Figure 4.1).

Individual-Level Factors

Socio-demographic Factors
Age
Gender
Socioeconomic status

Parental Factors
Parental alcohol use
Parent-adolescent relationship

Peer Factors
Peer alcohol use
Peer-adolescent relationship

School Factors
School absence without excuse
School bonding
Academic achievement

Neighborhood Factors
Perceived social cohesion in neighborhood
Perceived safety in neighborhood
Perceived happiness living in neighborhood

Community-Level Factors

School type
Metropolitan regions of school
School education against alcohol use
Policy against alcohol use

Alcohol Consumptioin

(frequency*quantity)
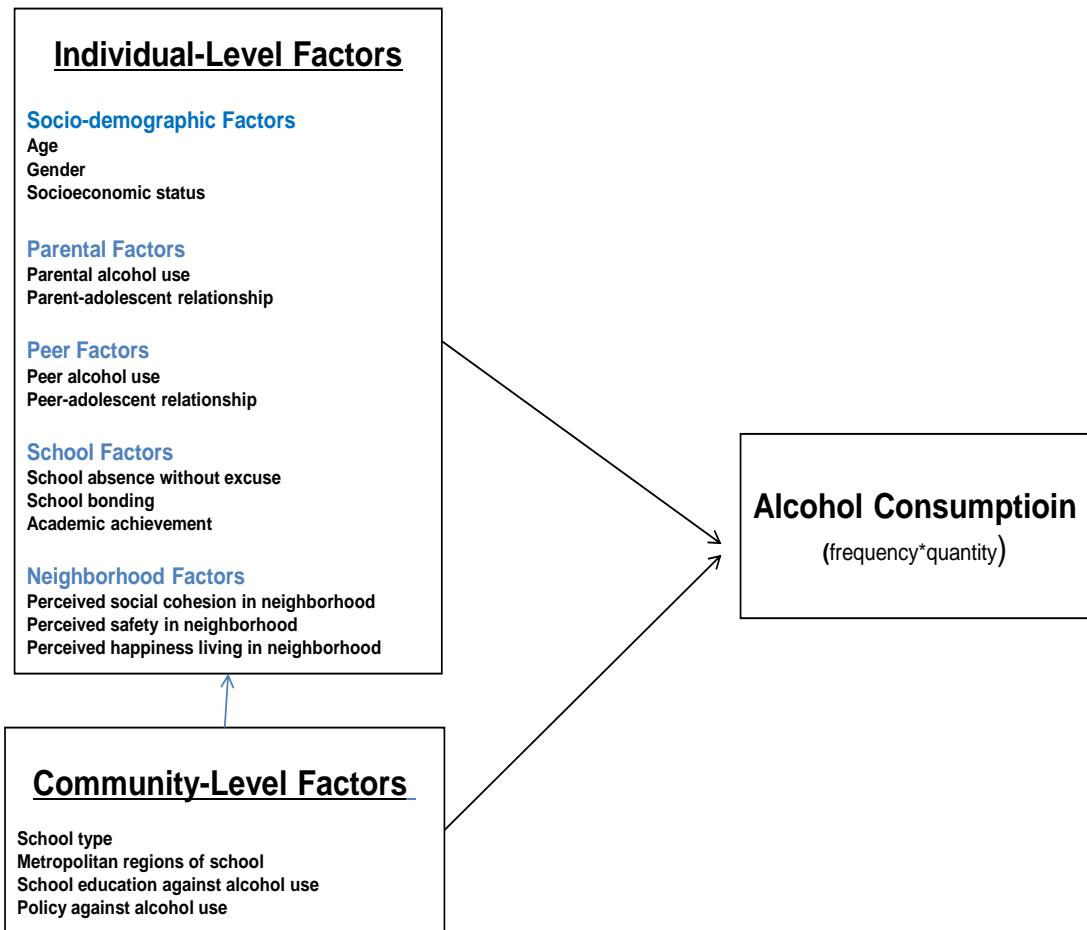
Figure 4.1. Conceptual Framework

Background and significance

Individual-Level Variables

Parental Factors

There are many studies that examine the relationship between parental factors and adolescent drinking. The majority of these studies find that adolescents who have parents who drink are more likely to drink alcohol than those whose parents do not drink. (Ary et

al., 1993; Hawkins et al., 1992; Jackson, 1997; Jackson, Henriksen, & Dickinson, 1999; Jackson, Henriksen, Dickinson, & Levine, 1997; Johnson & Pandina, 1991; Ritchey, Reid, & Hasse, 2001; Webster, Hunter, & Keats, 1994; White et al., 2000; Wilks, Callan, & Austin, 1989; Wills & Cleary, 1996).

Adolescents whose families or friends use alcohol, or have alcohol-related problems, have a greater tendency to drink alcohol (Bahr, Marcos, & Maughan, 1995; Epstein, Botvin, Baker, & Diaz, 1999). They also tend to initiate alcohol use at an earlier age (Hill, Shen, Lowers, & Locke, 2000). Specifically, in a sample of White and African American adolescents, those adolescents whose parents consumed alcohol were more than twice as likely to drink alcohol (O.R.=2.13) than those whose parents did not drink (Jackson, 2002). In longitudinal studies, parental drinking has been shown to be the strongest predictor of adolescent drinking in a variety of racial groups (Costello, Erkanli, Federman, & Angold, 1999; Jackson et al., 1997). Muthen and Muthen (2000) found that heavy parental alcohol use was significantly associated with heavy alcohol use among African American and Hispanic adolescents. Casswell and associates (2002) found similar results among adolescents in New Zealand. Heavy parental alcohol use significantly associated with early adolescent alcohol misuse and heavy alcohol use among White, African American, and other racial groups (Weinberg, Dielman, Mandell, & Shope, 1994). Moreover, adolescents with alcoholic fathers have been shown to have a greater increase in alcohol and other substance use over time among Hispanic and White adolescents (Chassin, Curran, Hussong, & Colder, 1996). These findings indicate that adolescents who have been exposed to alcohol use by family or friends are more likely to use alcohol themselves than those who were not exposed.

Conversely, a positive parent-adolescent relationship may reduce the influence of peer drug use as a risk factor for adolescent alcohol use behavior, and enhance protective factors (Brook, Brook, Gordon, Whiteman, & Cohen, 1990; Grunbaum, Tortolero, Weller, & Gingiss, 2000; Resnick et al., 1997; Simons-Morton et al., 2001). In longitudinal studies, close relationships with parents were related to lower likelihood of adolescent drug use (Brook et al., 1990), and delayed initiation of alcohol use (T. E. Duncan, Duncan, & Hops, 1994). These findings among White and African American adolescents suggest that adolescents' relationships with their parents may play an important protective role against alcohol use, even in the context of negative peer affiliation (Simons-Morton et al., 2001). Because parents are a central influence on adolescent alcohol use, enhancing positive interactions between parents and adolescents could help prevent or reduce adolescent alcohol use.

Peer Factors

From early through late adolescence there is a shift in socializing influences from parents or family to peer groups and schools. During the transition into adolescence, less time is spent with parents and more time alone or with friends (Brooks et al., 1990). Adolescents who have friends that drink alcohol are at greater risk of using alcohol than adolescents without drinking peers (Wilks et al., 1989; Hawkins et al, 1992; Ary et al, 1993; Webster et al., 1994; Wills et al., 1995; Bahr et al., 1995; Jackson, 1997; Rose, 1999; Griffin, Botvin, Epstein, Doyle, & Diaz, 2000). In two rural high schools, the strongest influences on alcohol use were found to be peers who engage in alcohol and marijuana use, followed by peer pressure (Ritchey et al., 2001). Among non-Hispanic

White adolescents, the strongest influences were peer and parental attitudes toward substance use, and low self-control (Botvin, Malgady, Griffin, Scheier, & Epstein, 1998). Furthermore, in a longitudinal study, the initial level of peer alcohol use among White and Hispanic adolescents (Curran, Stice, & Chassin, 1997) and peer encouragement to drink were found to be predictors of later maintenance and elevated levels of alcohol use among White, Native American, Hispanic, African American and Asian American adolescents (Ary, Duncan, Duncan, & Hops, 1999; Ary et al., 1993).

During adolescence, peer relationships are more strongly associated with alcohol use than family and parental relationships (Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Brook et al., 1990; T. E. Duncan et al., 1994; Petraitis, Flay, & Miller, 1995; Zhang, Welte, & Wieczorek, 1997). Adolescent interests shift from family to friends during adolescence (Brooks et al., 1990; Larson & Richards, 1991), and peers play an important role in engaging in problem behaviors, including alcohol use among African American, Hispanic, White, Asian American, and other race groups (Wills et al., 1995; Zhang, Welte, & Wieczorek, 1997). In particular, among African Americans, peer relationships have been found to explain 18.8% of the variation in substance use, while family problems explained only 5.1% (Friedman & Glassman, 2000).

Asian American adolescents are less likely to drink alcohol than White Americans. This may be due to lower exposure to environments that encourage alcohol use, family involvement, fewer offers of alcohol, and less peer influence encouraging alcohol use (Au & Donaldson, 2000). Lower peer influence among Asian American adolescents may result from having fewer friends, and spending less time with friends, than White adolescents (Au & Donaldson, 2000).

School and Neighborhood Factors at the Individual-Level

School factors include school bonding, school absence, and academic achievement. As a protective factor against substance use, school bonding has been negatively associated with alcohol use (Henry & Slater, 2007; Kumpfer & Turner, 1990). Among White and African American adolescents, those with strong school bonds have been found to be less likely to use alcohol, have less intention to drink alcohol, and have fewer peers drinking alcohol at school, (Henry & Slater, 2007). Furthermore, greater school bonding predicted less binge drinking among White adolescents (McBride et al., 1995).

Thus, in school programs, the enhancement of school bonding could reduce substance use and might help students achieve their academic goals (Henry, Swaim, & Slater, 2005). To reduce adolescent alcohol use, efforts to increase involvement in extracurricular activities, school attachment, and commitment to pro-social norms have been recommended (McBride et al., 1995).

In addition, greater academic achievement is associated with less frequent and heavy drinking among adolescents (Bahr et al., 1995; Casswell et al., 2002; Hawkins et al., 1992; Jackson, 1997; Muthen & Muthen, 2000; van Oers, Bongers, van de Goor, & Garretsen, 1999). Among diverse ethnic groups, adolescents with lower educational commitment (Bahr et al., 1995), lower educational goals (Wood, Sher, & McGowan, 2000), or a higher rate of academic failure (Hawkins et al., 1992; Rose, 1999) tend to drink more frequently, and consume larger amounts per drinking occasion. Additionally, poor academic performance and early initiation of alcohol use among 7th grade

adolescents predicted more alcohol misuse five years later among White and minority group adolescents (Ellickson, Tucker, Klein, & McGuigan, 2001). In a longitudinal study, White, African American, and Asian American adolescents with low grade point averages (Kumpfer & Turner, 1990) and academic failure (S. C. Duncan, Duncan, Biglan, & Ary, 1998) had higher levels of alcohol use. In other studies this association is also true. Adolescent receiving good grades reported less frequent alcohol use over time than those who got poorer grades (Schulenberg, Bachman, O'Malley, & Johnston, 1994). Kaplan et al. (2003) found that Vietnamese adolescents who were at educational risk, skipping school and being sent out of the classroom were more likely to engage in alcohol use. Additionally, being in the top quartile of school absences or below the median GPA was associated with more frequent engagement in alcohol and other drug use in high schools in San Antonio, Texas, and San Francisco, California (Hallfors, Cho, Brodish, Flewelling, & Khatapoush, 2006).

Community-Level Variables and Alcohol consumption

Ennett and colleagues (1997) note that neighborhood and school factors are statistically significantly associated with lifetime alcohol use. Neighborhood factors are associated with alcohol use both directly and indirectly through school characteristics (Ennett et al., 1997). Further, characteristics of neighborhoods, such as physical location and socioeconomic status, might impact health-related problem behaviors and violence. The neighborhood collective efficacy that represents mutual trust based on social cohesion and social control in neighborhoods (i.e., networks, trust, shared expectations and mutual engagement by residents in local social control) was negatively associated

with violence in Chicago sample (Sampson, 2003; Sampson et al., 1999; Sampson, Raudenbush, & Earls, 1997). Disadvantaged neighborhoods tend to have less social cohesion and control that could influence adolescent alcohol use (Duncan et al., 2002). In addition, a lower level of perceived social cohesion has been associated with increased alcohol use among urban African American adolescents (Lambert et al., 2004). However, higher lifetime alcohol use has been found in neighborhoods with greater social advantage, and where there was lower neighborhood population density and mobility (Ennett et al., 1997). Thus, neighborhood effects, including individual perception and aggregated outcomes of disorder and neighborhood crime may influence adolescent alcohol use, but this is still unclear.

With regard to school types, adolescents attending private school have been found to be 30% more likely to drink alcohol than those attending public school. In addition, private schools have shown higher rates of alcohol prevalence (O'Malley et al., 1988). Adolescent substance use in rural or small towns has been found to be higher than in urban areas in California (Skager & Fisher, 1989). State, local, and school alcohol policies can also minimize opportunities for adolescent alcohol use. Such policies have reduced consumption and alcohol-related problems among college students in Minnesota and Wisconsin (Nelson, et al., 2005). Most colleges prohibit beer kegs and ban advertisements for alcohol in school newspapers (Mitchell, Toomey, & Erickson, 2005). Stricter enforcement of policies by campus security limited underage drinking and was associated with lower rates of heavy drinking in non-Hispanic and White students (Knight et al., 2003). However, Evans-Whipp and associates (2004) point out that there is much less known about school drug and alcohol policy than college policy, with studies

143

of school policy related to alcohol use being much less prevalent than those related to tobacco use.

The role of these factors in relation to Asian American adolescents is still particularly under-investigated. This study aimed to contribute to knowledge about the association between parental and peer alcohol use, adolescent relationships with parents and friends, and school and neighborhood factors and alcohol use among Asian Americans.

Hypotheses

The following hypotheses were tested using two waves of Add Health data for an Asian American sample of adolescents:

1) The alcohol consumption trajectories of adolescents with parents (father or mother) who drink alcohol will be increased compared to adolescents with parents who do not drink alcohol.

2) The alcohol consumption trajectories of adolescents who have a negative relationship with their parents (father or mother) will be increased compared to adolescents who have positive relationships with parents.

3) The alcohol consumption trajectories of adolescents with peers who drink alcohol will be increased compared to adolescents with peers who do not drink alcohol.

4) The alcohol consumption trajectories of adolescents who have a positive relationship with peers will be increased compared to adolescents with negative relationships with peers.

5) The alcohol consumption trajectories of adolescents with negative school outcomes, including higher rates of school absences, a lower level of school bonding, and

144

lower GPAs, will be increased compared to adolescents who have more positive school outcomes.

6) The alcohol consumption trajectories of adolescents living in neighborhood environments characterized by lower neighborhood social cohesion, lower personal safety, and lower personal happiness with the neighborhood, will be increased compared adolescents living in neighborhoods characterized by higher perceived social cohesion, higher personal safety, and higher personal happiness living in the neighborhood.

7) The alcohol consumption trajectories of adolescents who study in private or Catholic schools, or live in rural or suburban areas, reflect increased alcohol consumption compared to those who study in public schools, or live in urban areas.

8) The alcohol consumption trajectories of adolescents in schools without policies and programs against alcohol use reflect increased alcohol use compared to those in schools with policies and programs against alcohol use.

Methods

Design and Sample of Add Health Data

The current study used data that were abstracted from a subsample of the National Longitudinal Study of Adolescent Health (Add Health) (Udry, 2003). These data consist of three data sets: Wave I (1994-1995), Wave II (1995-1996), and Wave III (2001-2002). The Add Health data are from a nationally representative longitudinal survey of grade 7-12 students from throughout the United States (Udry, 2003). Wave I consisted of the school sample and an in-home sample. The in-home sample consisting of core samples

from the community. African American adolescents with well-educated families, Chinese, Cubans and Puerto Rican adolescents were over-sampled. The Add health data used a stratified cluster sampling design. Weights were estimated to adjust for non-response within clusters, differential sampling probability, and distributions within the populations. At Wave I, 20,745 adolescents participated in the in-home interview, and 14,738 in Wave II interviews. The response rate for the in-home interviews was 75% in Wave I, and 77% in Wave II. The overall interview participation rate was 76%.

For home data collection, a laptop computer was used for confidentiality, sensitive questionnaire content, and to decrease reporting bias. Written informed consent was obtained from parents or legal guardians and informed assent was obtained from the adolescents.

The current study used Waves I and II from the Add Health data because school data were only available in Waves I and II. In addition, the current study focused on parent, peer, school and neighborhood factors. Based on unweighted data, there were 1,582 Asian American respondents in Wave I, and 1,088 in Wave II. The mean age was 16.01 in Wave I and 16.68 in Wave II, and in Wave I, there were 824 (52.08%) males and 758 (47.92%) females, and in Wave II, 556 (51%) males and 533 (49%) females. Based on weighted data, there were 1,480 Asian American respondents in Wave I, and 1010 in Wave II. The mean age was 15.58 in Wave I and 16.24 in Wave II, and the percentages were 52.23% and 47.77% in Wave I and 51.39% and 48.61% in Wave II for males and females, respectively (Table 4.1).

Table 4.1 The sample of the current study

	Wave I		Wave II	
	Unweighted	Weighted	Unweighted	Weighted
Total	1582	1480	1088	1010
Male	824	773	556	519
	(52.08%)	(52.23%)	(51.10%)	(51.39%)
Female	758	707	532	491
	(47.92%)	(47.77%)	(48.89%)	(48.61%)
Mean age	16.01	15.58	16.68	16.24

Measures

Individual-level variables

Measures for the study assessed variables at the individual-, school-, and neighborhood-levels. Because Wave III data did not include school and neighborhood variables, only Waves I and II were included for this study.

At the individual-level, alcohol consumption was measured by the frequency and quantity of alcohol use. The frequency of alcohol use was measured by the question "During the past 12 months, on how many days did you drink alcohol?" Responses consisted of : "every day or almost every day" = 1, "3 to 5 days a week"= 2, "1 or 2 days a week"= 3, "2 or 3 days a month"= 4, "once a month or less (3-12 times in the past 12 months)"= 5, "1 or 2 days in the past 12 months"= 6, and "never"= 7. The frequency variable was reverse coded so that higher scores reflected higher levels of alcohol use.

147

The quantity of alcohol consumed was assessed with the question "Think of all the times you have had a drink during the past 12 months. How many drinks did you usually have each time?" The quantity of alcohol consumed ranged from 0 to 90. In the current study, the quantity of alcohol use was measured as: "0"= 0 (no drink), "1-2 drinks" = 1, "3-5 drinks" = 2 and "6 more drinks per occasion"= 3 (Donovan, 1993). The final measure of alcohol use was the product of the frequency response times the quantity response and ranged from 0 to 18. The alcohol consumption variable was log transformed after examining skewness and a residual plot. The skewness of quantity-frequency of alcohol consumption before and after transformation was 1.25, and 0.10. In addition, a dichotomous indicator (drinkers=1 and non-drinkers=0) was used to test the differences between drinkers and non-drinkers in bivariate analyses.

Parental Factors

Parental factors included four variables: paternal alcohol use, maternal alcohol use, adolescent-father relationship and adolescent-mother relationship. Paternal alcohol use and maternal alcohol use were measured by one item obtained from each parent: "How often do you drink alcohol?" This item was scaled from "never" (1), "once a month or less" (2), "two or three days a month" (3), "once or twice a week" (4), "three to five days a week" (5), "to nearly every day" (6). The higher scores designated higher levels of alcohol use.

Adolescents' relationships with their mothers and fathers were measured by five items: 1) "How close do you feel to your mother (father)?" 2) "How much do you think she (he) cares about you?" 3) "Most of the time, your mother (father) is warm and loving

toward you" 4) "You are satisfied with the way your mother (father) and you communicate with each other" and 5) "Overall, you are satisfied with your relationship with your mother (father)." The first two items were scaled as 1 = "not at all", 2 = "very little", 3 = "somewhat", 4 = "quite a bit", and 5 = "very much." The latter three items were scaled as 1 = "strongly agree", 2 = "agree", 3 = "neither agree nor disagree", 4 = "disagree", and 5 = "strongly disagree." These latter three items were reverse coded. The mean value of the five items was used for adolescent-mother (father) relationships, so that higher scores indicated a better adolescent-parent relationship. Cronbach's alpha for the adolescent-mother relationship measure was 0.85 in Wave I, and 0.84 in Wave II. Cronbach's alpha for the adolescent-father relationship measure was 0.88 in Wave I, and 0.86 in Wave II.

Peer Factors

Two peer-related factors were assessed: peer alcohol use and peer-adolescent relationships. These variables were included as potential predictors of adolescent alcohol consumption. Peer alcohol use was assessed by a single item: "Of your 3 best friends, how many drink alcohol at least once a month?" Responses ranged from "no friends" (0) to "three friends" (3). Higher scores indicated having more friends who drank alcohol and represented peers' influence on adolescents' socialization (Kandel & Andrews, 1987) and the influence of peers' on adolescent alcohol consumption (Bahr et al., 1995; Jackson, 1997; Rose, 1999; Griffin, Botvin, Epstein, Doyle, & Diaz, 2000; Rose, 1999). Peer-adolescent relationships were measured by a single item: "How much do you feel that

your friends care about you?" Responses ranged from "not at all" (0) to "very much" (5).
A higher score represented a closer relationship with friends.

School factors

School factors included school absenteeism, school suspension, school bonding, and academic achievement. School absenteeism was measured by a single item: "During this school year how many times have you skipped school for a full day without an excuse?" Responses ranged from 0 to 99 times, with higher scores indicating more frequent school absenteeism.

The school bonding scale included six items: 1) You feel close to people at your school; 2) You feel like you are part of your school; 3) Students at your school are prejudiced; 4) You are happy to be at your school; 5) The teachers at your school treat students fairly; and 6) You feel safe in your school. Responses were measured on a 5 point Likert scale; strongly agree = 1, agree= 2, neither agree nor disagree = 3, disagree = 4 and strongly disagree = 5. Except for the third, the items were reverse coded. The mean value of the five items was used to measure school bonding with higher scores representing a stronger school bond. Cronbach's alpha for school bonding was 0.71 in Wave I, and 0.72 in Wave II.

Academic achievement was assessed by the mean value of grades including English or language arts, mathematics, history or social studies, and science. Responses ranged from A to D. Responses for each grade are A = 1, B = 2, C = 3 and D = 4. The item was reverse coded so that higher scores indicated better grades. The mean value of

the four items was used to assess academic achievement. Cronbach's alpha was 0.79 in Wave I, and 0.76 in Wave II.

Neighborhood factors

Three neighborhood factors were measured at the individual-level: neighborhood social cohesion, feeling of safety in the neighborhood, and happiness with living in the neighborhood. Neighborhood social cohesion was measured by 3 items: "You know most of the people in your neighborhood"; "In the past month, you have stopped on the street to talk with someone who lives in your neighborhood; "People in this neighborhood look out for each other". Responses were coded 1 for true and 2 for false, but this scale was reverse coded. Social cohesion was measured by a mean value of the three items, so that higher scores represented higher levels of social cohesion. Cronbach's alpha was 0.62 in Wave I, and 0.63 in Wave II. Adolescents' perceptions of their own personal safety in their neighborhood were measured by a single item: "Do you usually feel safe in your neighborhood?" Responses were no=0 and yes=1. Adolescents' perceptions of their happiness with living in their neighborhood were measured by a single item: "On the whole, how happy are you with living in your neighborhood?" measured on a 5-point Likert scale ranging from not at all (1) to very much (5).

Community-Level Variables

For the community-level variables, all adolescents in the same school were assigned the same values. The community-level variables were from data in Wave I. At the school level, the types of school included private, Catholic and public schools. The

types of school were coded; 1=private school, 2=Catholic school, 3=public school. When the school type was used in Hierarchical Linear Modeling (HLM) analyses, it was coded as a dummy variable with public school as the reference. The metropolitan location of schools consisted of urban, suburban, and rural. The metropolitan location was coded as 1=urban, 2=suburban, and 3=rural. This item was dummy-coded, and urban was a reference group. The school health policies and programs (School Health Policies and Programs Study, 1995) included both the schools' educational programs on alcohol and the state policy on alcohol use. Alcohol education at school was assessed by a single item: State does not require "alcohol and other drug use prevention" topic to be offered in any level of schooling. Responses were 1=yes and 2=no. The state policy on alcohol was measured by one item: The State recommends that schools or school districts include rules against alcohol and drug use by students in their alcohol and drug use policies. Responses were 1=yes and 2=no.

Socio-demographic variables: age, gender and socioeconomic status

The socio-demographic factors included in this study were age, gender, and socioeconomic status. Age was measured by the interview completion date, and participants' date of birth at Wave I. As only the month and year of birth were available, the 15th of each month was considered the day of birth for calculating age. Gender was coded as males=1 and females=2. Socioeconomic status was measured by parental education, using the level of the parent with the most education (Hussong & Hicks, 2003; Jones, Hussong, Manning, & Sterrett, 2008). The level of education reached by parents was obtained from the Add Health household roster in Wave I. The scale of education

level ranged from 0="never went to school" to 9="for professional training beyond a four-year college or university".

Data analysis

The current study conducted a secondary analysis of Wave I and II Add Health data. The Add Health data were collected from a sample of individuals in the United States with a stratified cluster sampling design. Data sets arising using complex sampling designs need to be analyzed differently from simple random samples. In order to reflect the clustering and stratification, standard errors and confidence intervals were estimated differently than for simple random samples. In addition, sampling weights reflected the probability of selection into the sample, needed to be included in the analyses. If weights had not been applied in the analysis, the model would not be correctly specified. In order to generate representative point estimates of statistical parameters, the HML software was used for all growth curve analyses, as it allowed for the calculation of robust standard errors and weighted statistical estimates. The survey analysis procedures in SAS (version 9.1) were also used for descriptive analyses to handle design effects. IVEware in conjunction with SAS 9.1 was used to conduct descriptive analysis for frequency and percentages, and to perform t-tests and χ^2 tests comparing drinkers and non-drinkers. This statistical method can adjust the standard error and confidence intervals as needed for a complex sample design.

In this study, missing data were addressed using multiple imputation. Before the missing data were imputed, the data were tested to determine if they were missing completely at random (MCAR). The results showed that the data for this study were not

MCAR. The test for MAR was not conducted, but the missing data were imputed assuming that they were MAR. Multiple imputation was conducted using IVEware (Raghunathan, Lepkowski, VanHoewyk, & Solenerger, 2001), resulting in five replicates of imputed data. Data analyses were performed in a manner that generated estimates on each imputed data set and then combined them into overall estimates (Little & Rubin, 2002).

Inferential statistical analyses were conducted using Hierarchical Linear Modeling (HLM) to estimate individual growth trajectories. HLM was developed by Raudenbush and Bryk (2002), and allows one to estimate models for both the individual and group level. This study used a three-level linear regression.

As time-varying variables, Level 1 estimated the growth trajectory of alcohol consumption, which was predicted by adolescent age, parental factors (paternal and maternal alcohol use, and each parent's relationship with the adolescents), peer factors (peer alcohol use and peer adolescent relationships), school factors (school absence, school bonding, and academic achievement), and neighborhood factors (perceived social cohesion, safety and happiness in neighborhood). As time-invariant variables, Level 2 (inter-individual level) had socio-demographic factors such as gender. For the community-level variables, Level 3 covariates included school type, urbanicity, school policies and education in the schools against alcohol use. Public schools were used as the reference group. For school location, urban was used as the reference group. The linear rate of change over age was estimated for alcohol use. To decrease the collinearity among variables, continuous variables were centered on the grand mean (Hox, 2002; Kreft & de Leeuw, 1998). In the model fitting process, gender did not interact significantly with age,

154

peer alcohol use, adolescent-parent relationship, or alcohol use of parents. Non-significant interaction terms were not included in the final model.

Results

Socio-demographic background of Drinkers and Non-drinkers

The descriptive statistics are displayed in Table 4.1 and Table 4.2 for Waves I and II. The range of alcohol consumption was from 0 to 18. The cross-sectional samples of respondents were different in size at each Wave, and were used to calculate descriptive statistics, but the inferential analyses included only the longitudinal subset that was surveyed at both waves.

The percentages of drinkers was lower in Wave II than Wave I (Wave I: 38.2%, Wave II: 35.4 %), while the mean level of alcohol consumption among drinkers increased in Wave II (4.12 in Wave I, 4.15 in Wave II). Males drank more alcohol than females in Wave I (males: 39%, females: 38%), but in Wave II, females drank more than males (males: 33%, females: 38%), but these differences were not significant. However, the level of alcohol consumption was higher among males than females in both waves (Wave I: males 4.30, females 3.93, Wave II: males 4.90, females 3.49).

There was a significant age difference between drinkers and non-drinkers in both waves with drinkers being slightly older (drinkers: Wave I: 16.10, Wave II: 16.64, non-drinkers: Wave I: 15.29, Wave II: 16.05) (p<0.001). The level of parental education was nominally, but not significantly higher for drinkers than non-drinkers (Wave I: drinkers 6.65, non-drinkers 6.22, Wave II: drinkers 6.60, non-drinkers 6.23).

155

Paternal and maternal alcohol use were significantly higher among drinkers (Paternal: in Wave I 2.42, Wave II 2.15) (Maternal: Wave I 1.66, Wave II 1.41) than non-drinkers (Paternal: Wave I 1.87, Wave II 1.94) (Maternal: Wave I 1.58, Wave II 1.45) at Wave I, but not at Wave II.

Peer alcohol use showed significant differences between drinkers and non-drinkers. Specifically the number of peers who drank alcohol was higher among drinkers (Wave I: 1.63, Wave II: 1.46) than non-drinkers (Wave I: 0.45, Wave II: 0.49) ($p<0.001$).

Only a few differences in relationships with parents and peers were found between drinkers and non-drinkers. Drinkers reported less positive adolescent-father relationships than non-drinkers ($p<0.001$ in Wave I, $p<0.05$ in Wave II). Neither adolescent-mother nor adolescent-friend relationships were significantly different between drinkers and non-drinkers.

Among the individual level school factors, reports of school absence were significantly different between drinkers and non-drinkers ($p<0.01$ in Wave I and II), with drinkers reporting more school absence. School bonding was significantly lower for drinkers than non-drinkers in Wave I ($p<0.001$), but there were no significant differences at Wave II. Grade point average was significantly different between drinkers and non-drinkers in both waves ($p<0.001$ in Wave I and II), with drinkers having lower grades. No significant differences were found between drinkers and non-drinkers on any of the individual level neighborhood factors.

At the school and neighborhood level, the total number of schools was 73, with more public schools (90.4%) than Catholic (6.84%) or private schools (2.74%). In the distribution of metropolitan regions (urbanicity), 56.2% of adolescents reported living in

suburban areas, 37% in urban areas and 6.8% in rural areas. Fifty-four schools (74.0%)

offered alcohol and drug prevention programs, and 64 schools (87.7%) had rules and

policies against alcohol and drug use in schools or school districts (Table 4.2 and Table

4.3).

Table 4.2

Descriptive Statistics and comparative analysis of drinkers vs. non-drinkers among Asian American adolescents in Wave I

(weighted N=1480)

Characteristics	All respondents			Wave I Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	Range	coefficient	Pr > F
Individual level											
alcohol use and gender											
Alcohol consumption	1480	1.49(0.17)	0-18	565(38.18)	4.12(0.33)	1-18	915 (61.82)	0	-	19.73 ****	<0.001
Gender Male	773 (52.23)	1.57(0.20)	0-18	298(38.55)	4.30(0.38)	1-15	475(61.45)	0	-	0.47	0.493
Female	707 (47.77)	1.40(0.22)	0-18	267(37.77)	3.93(0.42)	1-18	440(62.23)	0	-		
Individual level: intra & interpersonal factors											
Age	1480	15.58(0.24)	12-20	565(38.18)	16.10(0.20)	12-20	915(61.82)	15.29(0.28)	12-20	19.73 ****	<0.001
Level of education of parents	1374	6.38(0.19)	0-9	542(39.45)	6.65(0.24)	0-9	832(60.55)	6.22(0.21)	0-9	3.10	0.082
Less high school graduation	113 (8.22)	1.53(0.09)	0-3	32(28.32)	1.74(0.10)	0-3	81(71.68)	1.46(0.12)	0-3		
High school graduation	510 (37.12)	5.16(0.12)	4-7	213(41.76)	5.21(0.16)	4-7	297(58.24)	5.13 (0.14)	4-7		
College graduation	751 (54.66)	8.38(0.04)	8-9	297(39.55)	8.40(0.06)	8-9	454(58.24)	8.37 (0.05)	8-9		
Paternal alcohol use	802	2.06(0.17)	1-6	308 (38.40)	2.42(0.21)	1-6	494 (61.60)	1.87(0.16)	1-6	13.48****	0.004
Maternal alcohol use	937	1.50(0.08)	1-6	366 (39.06)	1.66(0.11)	1-6	571 (60.94)	1.41(0.07)	1-6	7.37***	0.008
Peer alcohol use	1450	0.88(0.07)	0-3	558 (38.48)	1.63(0.10)	0-3	892 (61.52)	0.45(0.05)	0-3	148.25****	<0.001
Adolescent-father relationship	1234	4.18(0.04)	1.2-	458 (37.12)	3.40(0.06)	1.2-	776 (62.88)	4.39(0.04)	1.4-	16.32****	<0.001

	N	Mean(SD)	Range	N (%)	Mean(SD)	Range	N (%)	Mean(SD)	Range	Test	p
Adolescent-mother relationship	1384	4.35(0.03)	5.0 1.4-5.0 1-5	537 (38.40)	4.28(0.05)	5.0 1.6-5.0 1-5	847 (61.20)	4.40(0.04)	5.0 1.4-5.0 1-5	3.78	0.055
Adolescent-friend relationship	1466	4.22(0.81)	1-5	564 (38.47)	4.29(0.04)	1-5	902 (61.53)	4.15(0.06)	1-5	3.39	0.069
Individual level: school factors											
School absence	1451	2.29(0.64)	0-99	552 (38.04)	4.15(1.21)	0-99	899 (61.96)	1.25(0.35)	0-95	9.06***	0.003
School bonding	1454	3.66(0.03)	11.5-5	553 (38.03)	3.50(0.06)	1.5-5	901 (61.97)	3.75(0.03)	1.5-5	21.49****	<0.001
GPA(grade point average)	1443	3.05(0.05)	1-4	551 (38.18)	2.85(0.07)	1-4	892 (61.82)	3.16(0.05)	1-4	21.71****	<0.001
Individual level: neighborhood factors											
Social cohesion	1472	1.61(0.02)	1-2	565 (38.38)	1.61(0.03)	1-2	907 (61.62)	1.61(0.03)	1-2	0.01	0.922
Perceived safety in neighborhood	1469	0.87(0.02)	0-1	564 (38.39)	0.86(0.03)	0-1	905 (61.61)	0.88(0.02)	0-1	0.70	0.405
Happiness living in neighborhood	1472	3.61(0.05)	1-5	565 (38.38)	3.59(0.06)	1-5	907 (61.62)	3.63(0.06)	1-5	0.26	0.613
School & Neighborhood level	73										
School types											
Public school	66 (90.41)	0.904(0.41)	0-1								
Catholic school	5 (6.84)	0.069(0.25)	0-1								
Private school	2 (2.74)	0.027(0.16)	0-1								
Metropolitan regions											
Urban	27 (37)	0.20(0.40)	0-1								
Suburban	41 (56.2)	0.77(0.41)	0-1								
Rural	5 (6.8)	0.02(0.15)	0-1								
School education & State policy											
Required school to offer alcohol & drug prevention	No: 17 (23.3) Yes: 54 (74.0)	0.44(0.49)	0-1								
Required policy & rules against alcohol use	No: 9 (12.3) Yes:64(87.7)	0.96(0.19)	0-1								

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 4.3

Descriptive Statistics and comparative analysis of drinkers vs non-drinkers among Asian American adolescents in Wave II

(weighted N=1010)

Characteristics	All respondents			Wave II Drinkers			Non-drinkers			Drinkers vs Non-drinkers	
	Numbers (%)	Mean (SE)	Range	Numbers (row %)	Mean (SE)	Range	Numbers (row %)	Mean(SE)	range	coefficient	Pr > F
Individual level											
alcohol use and gender											
Alcohol consumption	1010	1.35(0.19)	0-18	357 (35.35)	4.15(0.46)	1-18	653 (64.65)	0	-		
Gender Male	519 (51.39)	1.43(0.24)	0-18	172 (33.14)	4.90(0.65)	1-18	347 (66.86)	0	-	0.45	0.505
Female	491 (48.61)	1.25(0.22)	0-18	185 (37.68)	3.49(0.46)	1-18	306 (62.32)	0	-		
Individual level: intra & interpersonal factors											
Age	1010	16.24(0.27)	13-20	357 (35.35)	16.64(0.30)	13-20	653 (64.55)	16.05(0.26)	13-20	11.61***	<0.001
Level of education of parents	943	6.35(0.21)	0-9	337 (35.74)	6.60(0.29)	0-9	606 (64.26)	6.23 (0.24)	0-9	1.32	0.254
Less high school graduation	81 (8.59)	1.49(0.11)	0-3	21 (25.93)	1.52(0.20)	0-2	60 (74.07)	1.49 (0.13)	0-3		
High school graduation	336 (35.63)	5.15(0.13)	4-7	123 (36.61)	5.12(0.19)	4-7	213 (63.39)	5.17 (0.16)	4-7		
College graduation	526 (55.78)	8.35(0.04)	8-9	193 (36.69)	8.32(0.06)	8-9	333 (63.31)	8.37 (0.04)	8-9		
Paternal alcohol use	568	2.00(0.17)	1-6	201 (35.39)	2.15(0.20)	1-6	367 (64.61)	1.94(0.18)	1-6	1.32	0.255
Maternal alcohol use	655	1.49(0.09)	1-6	239 (36.49)	1.58(0.13)	1-6	416 (63.51)	1.45(0.09)	1-6	1.27	0.264
Peer alcohol use	997	0.81(0.07)	0-3	356 (35.71)	1.46(0.11)	0-3	641 (64.29)	0.49(0.05)	0-3	87.32****	<0.001
Adolescent-father relationship	821	4.10(0.04)	1.2-5	275 (33.50)	3.92(0.10)	1.4-5	546 (66.50)	4.18(0.05)	1.2-5	4.74*	0.033

160

	N	Mean(SD)	Range	N (%)	Mean(SD)	Range	N (%)	Mean(SD)	Range		p
Adolescent-mother relationship	934	4.23(0.04)	1.4-5	328 (35.12)	4.24(0.08)	1.8-5	606 (64.88)	4.22(0.04)	1.4-5	0.02	0.881
Adolescent-friend relationship	1005	4.33(0.04)	1-5	357 (35.52)	4.43(0.06)	1-5	648 (64.48)	4.28(0.05)	1-5	2.85	0.095
Individual level: school factors											
School absence	948	1.65(0.33)	0-100	334 (35.23)	3.13(0.81)	0-100	614 (64.77)	0.96(0.23)	0-70	7.13***	0.009
School bonding	948	3.64(0.04)	1.3-5.0	334 (35.23)	3.57(0.07)	1.33-5	614 (64.77)	3.67(0.04)	1.5-5	1.93	0.169
GPA (grade point average)	937	3.06(0.05)	1-4	330 (35.23)	2.85(0.08)	1-4	607 (64.48)	3.17(0.05)	1-4	18.25****	<0.001
Individual level: neighborhood factors											
Social cohesion	1008	1.61(0.02)	1-2	357 (35.42)	1.60(0.04)	1-2	651 (64.58)	1.61(0.03)	1-2	0.11	0.737
Perceived safety in neighborhood	1007	0.87(0.02)	0-1	357 (35.42)	0.88(0.05)	0-1	650 (64.55)	0.87(0.02)	0-1	0.05	0.821
Happiness living in neighborhood	1008	3.61(0.05)	1-5	357 (35.42)	3.54(0.10)	1-5	651 (64.58)	3.64(0.06)	1-5	0.70	0.407
School & Neighborhood-level	73										
School types Public school	66 (90.41)	0.904(0.41)	0-1								
Catholic school	5 (6.84)	0.069(0.25)	0-1								
Private school	2 (2.74)	0.027(0.16)	0-1								
Metropolitan regions urban	27 (37)	0.20(0.40)	0-1								
Suburban	41 (56.2)	0.77(0.41)	0-1								
Rural	5 (6.8)	0.02(0.15)	0-1								
School education & State policy											
Required school to offer alcohol & drug prevention	No: 17 (23.3) Yes: 54(74.0)	0.44(0.49)	0-1								
Required policy & rules against alcohol use	No: 9 (12.3) Yes:64(87.7)	0.96(0.19)	0-1								

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

161

Bivariate and Multivariate Analysis Results: The Effect of Peer, Parental, School, and Neighborhood Factors on alcohol consumption over time

<u>Bivariate analysis</u>

The simple bivariate association of age with alcohol consumption showed that a one year increment in age was associated with a 2.9% increase in alcohol consumption (p<0.001). A one unit increase in adolescent-father relationships was associated with a 13% decrease in the alcohol consumption of adolescents (p=0.014). At the community-level, private school attendance was positively associated with alcohol consumption over time (p=0.001) (Table 4.4).

<u>Fixed Effects on Alcohol consumption</u>

At the individual level, parental education was positively associated with alcohol consumption (p<0.05). Adolescents with a one-unit higher level of parental education drank 1.2 % more alcohol than those reporting lower levels of parental education.

Paternal alcohol use was strongly and positively associated with adolescents' alcohol consumption (p<0.01) (Figures 4.2 and 4.3). Adolescents with fathers who are frequent consumers of alcohol drank 7.5% more on average than their counterparts whose fathers did not drink alcohol, controlling for other variables. Adolescents with mothers who are frequent consumers of alcohol drank 5.6% more than their counterparts whose mothers did not drink alcohol, controlling for the other variables in the model. There was as strong significant association between peer and adolescent alcohol consumption, with a one person increase in the number of best friends who drank alcohol at least once a

month associated with a 35.5% increase in average alcohol consumption by adolescents

($p<0.001$), controlling for other variables (Figures 4.2 and 4.3).

In Figure 4.2, the differences in alcohol consumption among adolescents by paternal alcohol use are shown. Paternal alcohol use was positively associated with alcohol consumption in Asian American adolescents. Adolescents with fathers who drank more alcohol (father's alcohol use= 0.182) showed a greater increase in alcohol consumption over time than adolescents with fathers who drank alcohol less (paternal alcohol use= -0.818). Figure 4.2 shows values of the 25th and 75th percentiles for comparison.
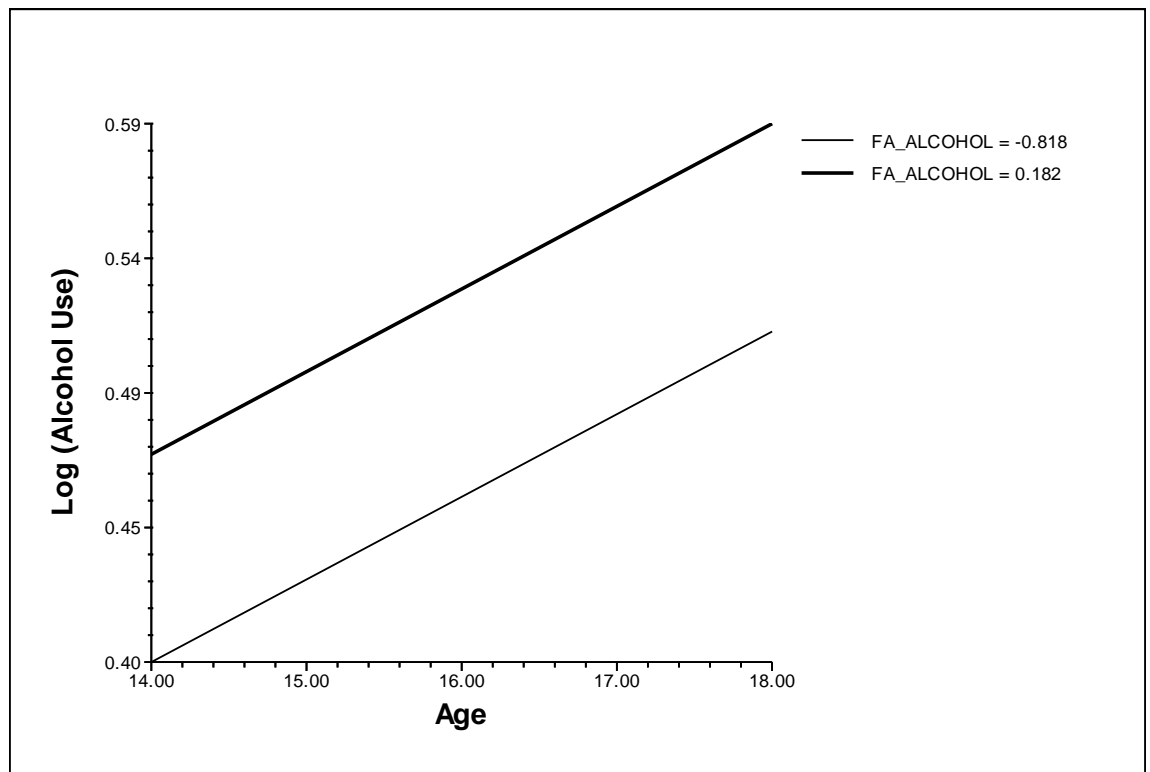

Figure 4.2. Alcohol consumption (quantity and frequency) over time by paternal alcohol use

* FA_ALCOHOL: father's alcohol use (25th and 75th percentiles were used)
  FA_ALCOHOL = -0.818: 25th percentile value
  FA_ALCOHOL = 0.182: 75th percentile value

Figure 4.3 displays the differences of alcohol consumption across ages by peer alcohol use. Adolescents with three peers who drink alcohol (FR_ALC=3) drank more alcohol than those with no friends who drink alcohol (FR_ALC=0).
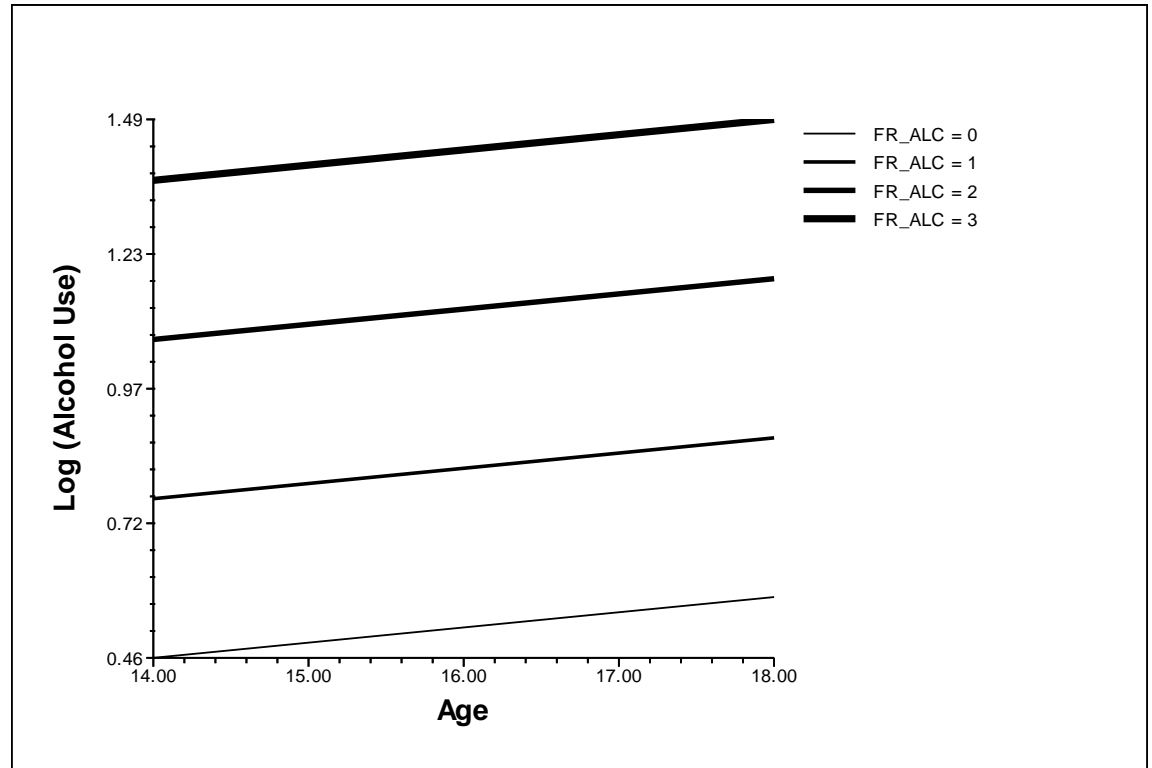

Figure 4.3. Alcohol consumption (quantity and frequency) over time by peer alcohol use

*FR_ALC: a number of peer who drinks alcohol use
FR_ALC=0: adolescent has no peers who drink alcohol use
FR_ALC=1: adolescent has one peer who drinks alcohol use
FR_ALC=2: adolescent has two peers who drink alcohol use
FR_ALC=3: adolescent has three peers who drink alcohol use

Regarding relationships with others, a one-unit increase in adolescent-father relationships was associated with a 7% decrease in the alcohol consumption of adolescents (p<0.014), controlling for other covariates in the model. The adolescent-mother relationship and friends' level of caring about the adolescent measures did not have significant associations with adolescent alcohol consumption.

A one day increment in school absences was associated with a 1.3% increase in alcohol consumption (p<0.001), while a one unit increase in school bonding was associated with an 11.6% decrease in alcohol consumption (p<0.01). A one-unit increase in GPA was associated with an 8.0% decrease in alcohol consumption (p<0.05).

Figure 4.4 shows the differences in alcohol consumption among adolescents across ages by adolescent school bonding. Adolescents with higher levels of school bonding (0.42) drank less alcohol than those with lower levels of school bonding (-0.41). The graph used the values of the 25th and 75th percentiles for comparison.
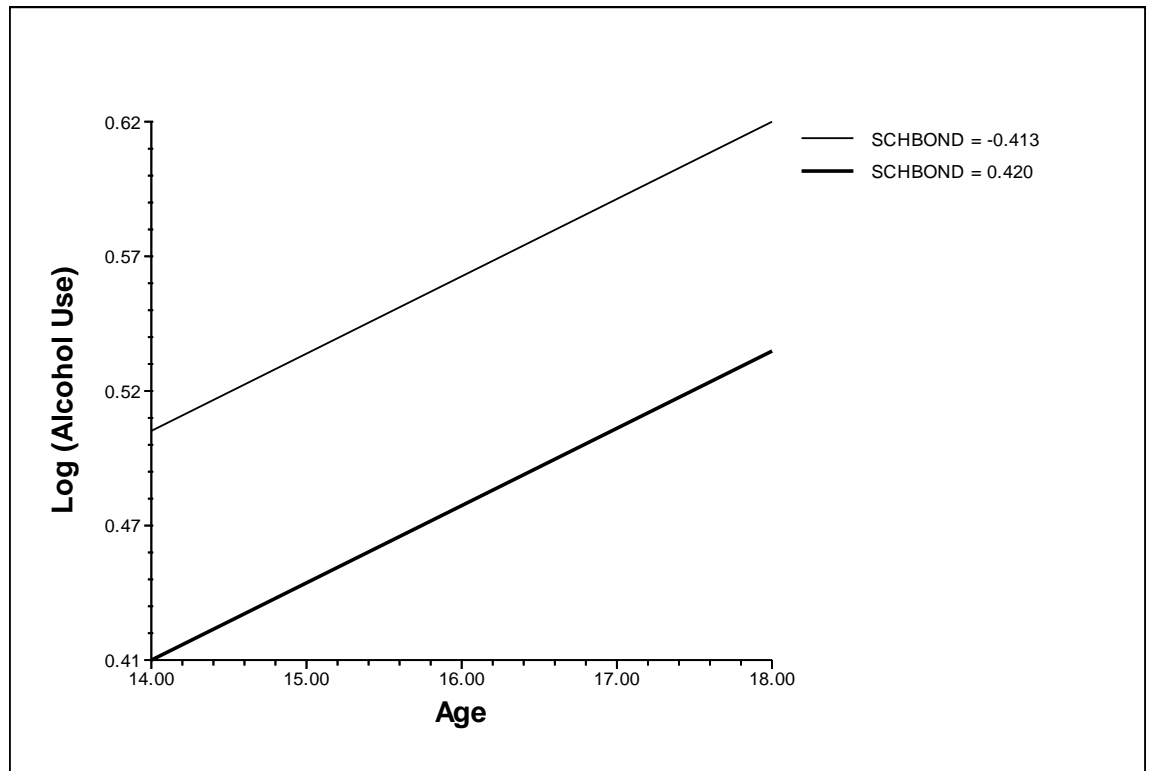

Figure 4.4. Alcohol consumption (quantity and frequency) over time by school bonding

* SCHBOND: school bonding (25th and 75th percentiles were used)
  SCHBOND= -0.413: 25th percentile value
  SCHBOND= 0.420: 75th percentile value

Perceived neighborhood factors, social cohesion, perceived safety in the neighborhood and happiness living in the neighborhood were not significantly associated with alcohol consumption, controlling for other variables. None of the community level covariates were significantly associated with alcohol consumption (Table 4.4).

Random effect

The variance components are shown in Table 4.4. The reliability of the Level 1 (adolescent Level) random effects was 0.46. The estimated variance in Level 1 random errors was 0.31. The variation in alcohol consumption across individuals (Level 2) as well as schools (Level 3) was statistically significant. That is, the estimated variance of the random intercepts for individual adolescents was roughly 0.23 ($p < 0.001$), indicating a large amount of unexplained variation in alcohol consumption. The Level-3 variance components showed evidence of unexplained variation between schools. Additionally, school-level variables may explain the variance of alcohol consumption between schools when all of the covariates are equal to zero (Table 4.4).

Table 4.4

Three-Level Hierarchical Linear Model of individual-level and community-level factors

on alcohol consumption over time

Fixed effects	Multivariate Anti-log transformation coefficient	Coeffic-ients	Standard error	t	df	Multivari-ate P-value	Bivariate anti-log coefficients	Bivariate P-value
Individual Level								
Level of alcohol use Intercept	1.52	0.41	0.07	6.23	59	<0.001		
Effect of parental education	1.02*	0.02	0.01	2.07	931	0.039	1.02	0.319
Effect of male	0.96	-0.04	0.05	-0.81	931	0.417	1.04	9.468
Effect of age	1.03	0.03	0.01	1.94	1843	0.052	1.10***	<0.001
Effect of paternal alcohol use [a]	1.08 **	0.07	0.02	3.20	931	0.002	1.09**	0.005
Effect of maternal alcohol use [a]	1.06 *	0.05	0.03	1.10	931	0.046	1.13**	0.004
Effect of peer alcohol use [a]	1.36***	0.30	0.02	12.49	1843	0.000	1.14***	<0.001
Effect of adolescent-father's relationship [a]	0.93	-0.07	0.037	-1.949	529	0.052	0.87*	0.014
Effect of adolescent-mother's relationship [a]	1.0	0.03	0.03	0.94	781	0.347	1.01	0.832
Effect of friends care about you [a]	1.05	0.05	0.07	1.77	1843	0.076	1.06	0.135
Effect of school absence [a]	1.01 ***	0.01	0.00	4.21	1843	0.000	1.02***	<0.001
Effect of school bonding [a]	0.89**	-0.12	0.04	-3.11	1843	0.002	0.85***	<0.001
Effect of GPA [a]	0.92*	-0.08	0.03	-2.50	422	0.013	0.82***	<0.001

Effect of social cohesion [a]	0.97	-0.03	0.05	-0.65	1843	0.515	0.99	0.895
Effect of perceived safety in neighborhood [a]	0.96	-0.04	0.07	-0.60	345	0.549	0.94	0.326
Effect of happiness living in neighborhood [a]	1.00	0.00	0.04	0.01	1843	0.993	0.98	0.661
Community level								
Effect of Public school (reference) [a]							0.89	0.326
Effect of Catholic school [a]	1.17	0.15	0.09	1.75	59	0.084	1.06	0.612
Effect of Private school [a]	1.15	0.14	0.09	1.50	59	0.139	1.48**	<0.001
Effect of Urban (reference) [a]							0.92	0.499
Effect of Suburban [a]	0.95	-0.05	0.07	-0.70	59	0.489	1.02	0.854
Effect of Rural [a]	1.19	0.17	0.15	1.15	59	0.255	1.44	0.135
Effect of Required education [1]	0.96	-0.04	0.07	-0.51	59	0.610	0.98	0.866
Effect of Required rules [2]	0.99	-0.00	0.09	-0.01	59	0.996	0.98	0.854

Random effects	Variance component	Standard deviation	df[f]	X^2	p-value
Individual (Level1)	0.31	0.09			
Intercept (Level2)	0.23	0.09	866	1589.723***	<0.001
Intercept (Level3)	0.02	0.12	59	137.834***	<0.001

[a] grand mean-centered
[b] centered on age 11
* P<0.05   ** p<0.01   *** p<0.001
1) required programs: Schools are Required to Offer "Alcohol and Drug Use prevention"- State
2) required rules: State Recommends that Schools or School Districts Include Rules against Alcohol and Drug

Discussion and Conclusions

The current study examined individual-and community-level variables to identify predictors of alcohol consumption among Asian American adolescents. To understand how individual and contextual variables relate to alcohol consumption, multilevel analyses, which included both individual-level and community-level variables, were tested using longitudinal data at the one-year follow up.

Parental Alcohol Use, Adolescent-Parent Relationship and Adolescent Alcohol Use

The findings of the current study show that paternal and maternal alcohol use were significant predictors of increased alcohol consumption among Asian American adolescents. The current study differentiated fathers' and mothers' alcohol use, suggesting that their use of alcohol have different degrees of influence on adolescent alcohol consumption. Specifically, adolescents whose fathers drank alcohol consumed 7.5% more than adolescents with fathers who did not drink, while having a mother who drank alcohol was associated with a 5.5% increase in alcohol use. Thus, among Asian American adolescents, paternal alcohol use had a larger effect than maternal alcohol use on adolescent alcohol consumption. These findings may be ascribed to variations in adolescent development attributable to race diversity. In Asian American and Hispanic families, strong paternal authority is dominant, with unusually high maternal warmth. This leads children to be compliant to family values, and especially to paternal will. In support of this view, studies have found that Chinese-American parents place a greater

importance on obedience and respect from their adolescents than White parents (Itai & McRae, 1994; Sue & Sue, 1999).

The findings of the current study are in accordance with previous research (Ary et al., 1993; Hawkins, Catalano, & Miller, 1992; Johnson & Pandina, 1991; Ritchey et al., 2001). However, the aforementioned research did not take into consideration the impact of each parent's alcohol use separately on adolescent alcohol use. Because the current study made a distinction between the father's and the mother's alcohol use, a better understanding may be had of which parent's alcohol use is more strongly associated with adolescent alcohol use.

Regarding each parent's impact on adolescent alcohol use, other research has indicated that paternal alcohol use positively influenced adolescent alcohol use among diverse ethnic groups (Chassin et al., 1996), while among White and Non-White adolescents, maternal alcohol use did not (Zhang, Welte, & Wieczorek, 1999). Adolescent perception of maternal substance use (i.e. alcohol and drugs, except tobacco) has been found to be a significant predictor of adolescent substance use, but paternal alcohol use was not found to be a predictor among White students in high school (Stephenson, Henry, & Robinson, 1996). The difference in findings between the current study and Stephenson and associate's results could be due to several factors. First, there could be ethnic and cultural differences between White and Asian American adolescents. Second, Stephenson et al.'s sample consisted of high school students, whereas this current study's sample consisted of middle and high school students. Finally, Stephenson and associates (1996) measured adolescents' perceived parental alcohol use, whereas the current study collected alcohol use information from parents themselves. A plausible

explanation lies in the unusually strong relationships that Asian Americans have to their nuclear family, with identities being based on the family model. The welfare of the family is believed to be more important than that of individuals. In Asian culture, such family structure revolves around the father's power (Bhattacharya, 1998). In general, age is a dominant factor in the family hierarchy, as is gender. Men are highly valued and authoritative within the family, while women are expected to play a passive role (Rosenthal & Feldman, 1990). This may explain the greater influence of a father's alcohol use on adolescent alcohol use. Therefore, the design of alcohol prevention programs should consider social hierarchy and cultural roles (Itai & McRae, 1994; Sue & Sue, 1999).

In support of this argument, the current study found that Asian American adolescents who had better relationships with their fathers drank 7% less alcohol than those who had poorer relationships with their fathers. On the other hand, adolescent-mother relationships were not associated with alcohol consumption among Asian American adolescents. Other studies showed that although they did not show the relationships with each parent, close parent-adolescent relationships protected against alcohol use and decreased adolescent alcohol use among Hispanic, White, and African American adolescents (Ennet, et al., 2001; Simons-Morton, et al., 2001). In the longitudinal study for this dissertation, close father-adolescent relationships were a protective factor related to decreased adolescent alcohol use, and might be capable of counteracting the influence of peers' substance use at a later time (Brook et al., 1990). This may support the current study's findings that Asian American adolescents across ages who had better relationships with their fathers drank less than those with poorer

relationships with their fathers. Thus, future research should continue to examine the differences between father-adolescent relationships and mother-adolescent relationships, and their impact on adolescent alcohol consumption. The findings concerning parent-adolescent relationships may contribute to programs to prevent or decrease alcohol use among Asian American adolescents. In the light of this, parents must be made aware that parental alcohol use and father-adolescent relationships might have great influences on their children's alcohol use. Intervention programs often focus primarily on adolescents and peers, however interventions with parents should be included (Loveland-Cherry, Leech, Laetz, & Dielman, 1996). Family involved intervention approaches showed the effectiveness of decreased adolescent alcohol misuse (Loveland-Cherry, Ross, & Kaufman, 1999; Petrie, Bunn, & Byrne, 2007). Specifically, active parental involvement, developing skills in social competence, self-regulation and parenting skills appeared to be effective intervention approaches (Petrie, Bunn, & Byrne, 2007). Furthermore, decrease of parents' alcohol use and behavioral parent training programs including enhancing skills and self-efficacy in coping with relapse, family management practices and improvement of family communication, supported reduced adolescent alcohol use (Catalano, Gainey, Fleming, Haggerty, & Johnson, 1999; Ruma,Burke & Thompson, 1996; Serketich & Duman, 1996). Family can play a major role in preventing substance use and later misuse among adolescents (Velleman et al., 2005). Furthermore, parent training alone may not be strongly effective in yielding substantial and lasting behavioral changes in both parent and adolescents (Serketich & Duman, 1996), so involvement of both parents and adolescents in prevention programs might be recommended.

Peer Alcohol Use, Adolescent Relationships with Peers, and Adolescent Alcohol Use

The findings of the current study demonstrate that the number of peers who drank alcohol was the strongest predictor of adolescent alcohol consumption. The period of early and middle adolescence is characterized by great changes, both physically and socially. During adolescence, the amount of time spent with parents declines, and this decline may occur gradually over a number of years (Fuligni, 1993). At the same time, adolescents are increasingly exposed to peers, and their relationships with peers become relatively more important. As a result, more time is spent with peers than with the family. Peer influences were shown to increase during early adolescence, and peak during the middle school period in a sample of White adolescents in the United States (Steinberg, 1986). Adolescents also have been found to be more influenced by the increase and continuity of peer alcohol use during early and middle adolescence (Dielman, 1994). In addition, Baer and Carney (1993) found that adolescents have a tendency to overestimate the prevalence of their peers' alcohol use, and overvalue drinking norms, leading to increased alcohol use among White students.

Specifically, an increase in the number of best friends who drank alcohol increased adolescent alcohol consumption on average by 35.5% in this study. This finding was consistent with other studies showing that adolescents whose friends drank alcohol were more likely to use alcohol (Epstein, 1990; Hawkins et al, 1992; Ary et al, 1993; Wills et al., 1994; Griffin et al., 2000). In particular, best friends' alcohol use has been strongly associated with both the initiation and level of substance use among African Americans (mean age = 10.5 years) (Wills et al., 2000). In this study for this dissertation, adolescents who used alcohol were more likely to have best friends who also

174

drank (O.R: 2.12). This is similar to another study of White and African American adolescents that found adolescents whose best friends did not drink were less likely to use alcohol (Jackson, 2002). Additionally, among White and African American adolescents, those with one friend who drank alcohol were found to not be significantly more likely to drink, but those with two or more friends who drank were 4.52 times as likely to drink than adolescents with no drinking friends (Simons-Morton et al., 2001). Thus, having fewer friends who drink alcohol has been suggested as a factor that reduces exposure to alcohol use among adolescents (White et al., 2006) and only close peer alcohol use has been found to be one of the main predictors in adolescent alcohol use over time among African American and White adolescents (Urberg et al., 1997). Peer alcohol use and the number of peers who drink alcohol might increase adolescent alcohol consumption. Skill based interventions might be helpful to improve adolescent's skills in resisting peer pressure, improve decision-making skills, and build realistic perceptions of peer alcohol use for delay or decrease of adolescent alcohol use (Loveland-Cherry, Leech, Laetz, & Dielman, 1996; Faggiano et al., 2008). Further, Botvin and Griffin (2007) emphasized programs to increase the effectiveness of interventions that encourage adolescents to acquire the skills to be able to refuse drug offers from peers. They also emphasized improving social and personal competence skills to decrease adolescent alcohol use.

The Shift of Primary Influence from Parents to Peers

The current study provides longitudinal evidence suggesting that paternal and maternal alcohol use, peer alcohol use, and poor adolescent-father relationships could lead to a higher level and greater increase in alcohol use over time among Asian

175

American adolescents. According to extant research, adolescents tend to be more influenced by their parents and family in childhood, whereas they are more susceptible to the influence of their friends during adolescence (Brooks et al., 1990). Furthermore, older students spent half as much time with their families than younger students (Larson & Richards, 1991). Some research has found that African American adolescents with good relationships with their parents have a tendency to choose friends who do not use drugs (Bahr et al., 1995; Brook, 1993). In a study of White and African American boys, poor parent-child relationships in early childhood were related to more antisocial behavior in middle childhood (Ingoldsby et al., 2006).

Moreover, intergenerational conflict may influence parent-adolescent relationships and may lead to weakened family attachment and increased peer bonding with others who drink alcohol (Oetting & Donnermeyer, 1998). Weakened parental relationships and lack of communication alienate adolescents from their parents. In turn, adolescents seek support from peers, who may engage in alcohol use. Thus, poor parent-adolescent relationships may moderate the influence the drinking behavior of peers has on adolescents (Kandel & Andrews, 1987; Oetting & Donnermeyer, 1998). This is supported by findings that peer influences are more strongly associated with adolescent alcohol use when adolescents have poor relationships with their parents (Bahr et al., 1995). It has been suggested that among Hispanics in the United States, this situation leads adolescents to drink alcohol as one way of coping with conflict with their parents (Rogler, Cortes, & Malgady, 1991). In the current study, peer alcohol use was also the strongest predictor of alcohol consumption among Asian American adolescents.

Therefore, good relationships between adolescents and parents may be an important

protective factor in protecting adolescents from the influences of peers who drink.

School and Neighborhood factors and Alcohol Consumption

There is evidence that school factors such as school bonding, academic

achievement and school absences play an important role in whether adolescents choose to

use alcohol and other substances (Henry & Slater, 2007; Najaka, Gottfredson, & Wilson,

2001; Schulenberg, Bachman, O'Malley, & Johnston, 1994). The findings of the current

study demonstrate that school factors at the individual level were more important

predictors of alcohol consumption than perceived neighborhood factors. Among school

factors, school bonding and high grade point average (GPA) were negatively associated

with alcohol consumption, while school absences were positively associated with alcohol

consumption. Within school factors, school bonding was a stronger factor than GPA, or

unexcused school absences. In particular, higher levels of school bonding were found to

be associated with an 11% lower level of alcohol consumption by adolescents. This

finding is in accordance with studies of African American and White adolescents (Henry

& Slater, 2007; McBride et al., 1995), and high school students, generally (Kumpfer &

Turner, 1990). In this dissertation, a higher grade point average (GPA) predicted 8% less

alcohol consumption compared with a lower grade point average. Furthermore,

adolescents who had school absences were 1.3% more likely to have engaged in alcohol

consumption than their counterparts. Thus, among school factors, school bonding appears

to be strongly associated with alcohol consumption, and lower GPAs, more strongly than

with unexcused school absences.

On the other hand, while perceived neighborhood social cohesion, safety and happiness living in the neighborhood were examined, none of these factors were significantly associated with alcohol consumption. Based on these findings, the school factors at the individual-level had a stronger association with adolescent alcohol consumption than neighborhood factors. This may reflect a more central role of individual school-related variables in adolescent alcohol consumption than factors at the neighborhood level (Ennett et al., 1997). In the current study, school- and neighborhood-level variables, including state policies and rules regarding schools and alcohol, urbanicity, alcohol prevention programs and education were examined to predict alcohol consumption. However, none of these variables were significantly associated with adolescent alcohol consumption among Asian American adolescents.

Alcohol interventions have attempted to increase adolescents' knowledge of alcohol (Clayton, Cattarello, & Johnstone, 1996; Shope, Kloska, Dielman, & Maharg, 1994), and influence the formation of attitudes and beliefs about alcohol, tobacco, or other drugs using social skills training (Botvin, Baker, Dusenbury, Botvin, & Diaz, 1995) and social resistance skills training (Clayton et al., 1996; Shope et al., 1994). Social skills training programs include teaching broad strategies for social interaction, and fostering social problem solving strategies. This training may be effective in enhancing prosocial skills, promoting desired social behavior and facilitating integrated behavior in an adaptive manner (Ladd & Aher, 1985; Bierman & Montminy, 1993).

The results of this study suggest that alcohol prevention strategies need to focus on peer and parental alcohol use, as well as on parent-adolescent relationships. Programs need to include effective communication, maintenance of good relationships with fathers

and peers, and relationship-building skills with fathers. Moreover, social interaction strategies such as refusal skill training may reduce the influence of peers on adolescents' use of alcohol. Prevention programs need to combine a variety of social and personal skills (Botvin, 2000), rather than solely implementing refusal skills training (Epstein, Griffin, & Botvin, 2001). Further, parents should be involved in intervention programs, in order to learn how to provide emotional support and encourage their youths to delay or decrease alcohol use. Parents involved in alcohol prevention intervention programs reported a significantly greater reduction in the alcohol use of their adolescents compared to parents who were not involved in the programs (Spoth, Redmond, & Shin, 2001; Pentz, Johnson, & Dwyer et al., 1989). When the 'Drug use Abuse Resistance Education '(DARE) program and DARE with an additional parenting program involving homework (DARE Plus) were compared, the DARE Plus group showed statistically significantly lower substance use scores than the DARE comparison group (Perry, Komro, & Veblen-Mortenson et al., 2003). Furthermore, a program that involved both parents and adolescents (Life Skills Training: LST with Strengthening Families Programme: SFP) showed higher reductions in alcohol, tobacco and marijuana use than an adolescent-only intervention (LST) (Spoth, Redmond, & Trudeau et al., 2002). In particular, prevention programs that included families in activities and promoting the maintenance of good relationships within family have been found to be more effective than those that focused exclusively on alcohol or substance use issues, or adolescent-only interventions (Park, Kosterman, & Hawkins et al., 2000; Spoth, Redmond, & Shin, 2001; Spoth, Redmond, & Trudeau et al., 2002). Active parental involvement, such as direct communication with parents, was found to be an important element of successful interventions. In contrast,

179

interventions involving mailed information to parents showed no significant differences between intervention and control groups (Williams, Grechanaia, & Romanova et al., 2001). Therefore, interventions with active parental involvement are likely to be more effective in the reduction of alcohol and other substance use than adolescent-only interventions.

In the current study, individual-level variables included socio-psychological factors (e.g., parent/peer-adolescent relationships, parent/peer alcohol use and perception of neighborhood etc.), and community-level variables (e.g., school type, school education or State policy against alcohol use) represented organizational characteristic of the environment. In the current study, alcohol consumption did not have any significant association with factors in community-levels, however, this should be examined further in future studies.

Contributions

This study contributes to the understanding of parent, peer, and school factors related to alcohol consumption over time in Asian American adolescents. To date, although the population of Asian Americans is gradually increasing, substance use has been under-researched in this racial group, especially using longitudinal data. Thus, the two year span of longitudinal data used in the current study provides much needed preliminary information about relationships between alcohol consumption and parental, peer, and school factors among Asian American adolescents. This in itself contributes to understanding Asian American adolescents' alcohol consumption behaviors.

Furthermore, many studies have only examined the general effects of parental alcohol use on adolescents or focused their analysis exclusively on paternal alcohol use. This study, however, examined maternal and paternal alcohol use separately to identify predictors of adolescent alcohol consumption, contributing greater understanding of the association between the two parents' alcohol use and adolescent alcohol consumption.

Limitations

One of the limitations of this study is that data were obtained from self-reports. This might influence the validity of the data due to biased responses, because adolescents under-report on sensitive issues. Although self-report measures may be susceptible to social desirability biases, previous work has supported the validity of substance use and related problem behavior self-reports (Smith, McCarthy, & Goldman, 1995; Williams et al., 1995). In addition, the lack of a standardized measurement of parent-adolescent relationships makes it difficult to compare findings with other studies.

Multiple imputation was conducted in the absence of evidence that the data were MAR, and instead the data were only assumed to be MAR. As a result, if this assumption was false, the results will be biased.

Furthermore, school and neighborhood contexts were measured at only one time point in Wave I. The effects of changes in school and neighborhood factors on the trajectory of alcohol consumption over time were not investigated. Moreover, Asian American adolescents have been treated as a single homogenous group in this study, even though the Asian American population is made up of many ethnicities. Thus, the findings of this study may not reflect sub-group characteristics.

Future implications

In the current study, alcohol consumption as a dependent variable was measured by frequency multiplied by quantity. It would be helpful to investigate heavy drinking and binge drinking to further define the associations between alcohol consumption and risk or protective factors among Asian American adolescents using longitudinal data. In addition, research on multiple trajectories should be investigated to determine what different developmental types of alcohol use might exist and to investigate diversity in patterns of drinking over time (Muthen & Muthen, 2000).

Future research should consider including more indicators of parent–adolescent relationships such as quality of support, frequency of contact, and geographic distance between parents and adolescents to explore in more detail the quality of these relationships (Turner, Larimer, & Sarason, 2000). Moreover, adolescent-father relationships and father and peer alcohol use were significant predictors of increased adolescent alcohol consumption, so these predictors should be addressed in prevention programs. Furthermore, peer pressure resistance training and social skill training may lead to delayed initiation and decreased alcohol consumption among Asian American adolescents.

Given that little research on school policies related to alcohol use has been conducted, more studies related to school based alcohol policy are needed. Because school based policy and prevention programs may be important in preventing alcohol use during adolescence, more research should attempt to evaluate the effects of

alcohol control policies and rules, and those related problems among adolescents
(Nutbeam, Smith, Moore, & Bauman, 1993).

Finally, future research should consider the relationship between individual-level
and community-level variables that might predict adolescent alcohol use. More
specifically, the same questionnaire could be distributed to individual adolescents and
their local administrators in school and neighborhood. This approach could reveal blind
spots where new interventions strategies could be aimed while also revealing the degree
of subjectivity in both sides' perspectives. The results of such a study may be able to
identify the differences between the individual's perceptions and the actual environments.
This would ensure that the programs of the schools and states meet the needs of
individual adolescents. The findings may be helpful to form new policies or rules and to
develop programs against alcohol use.

References

Ary, D. V., Duncan, T. E., Duncan, S. C., & Hops, H. (1999). Adolescent problem behavior: the influence of parents and peers. *Behav Res Ther, 37*(3), 217-230.

Ary, D. V., Tildesley, E., Hops, H., & Andrews, J. (1993). The influence of parent, sibling, and peer modeling and attitudes on adolescent use of alcohol. *Int J Addict, 28*(9), 853-880.

Au, J. G., & Donaldson, S. I. (2000). Social influences as explanations for substance use differences among Asian-American and European-American adolescents. *J Psychoactive Drugs, 32*(1), 15-23.

Aveyard, P., Markham, W. A., & Cheng, K. K. (2004). A methodological and substantive review of the evidence that schools cause pupils to smoke. *Soc Sci Med, 58*(11), 2253-2265.

Baer, J. S. & Carney, M.M. (1993). Biases in the perception of the consequences of alcohol use among college students. *J. Stud. Alcohol* 54:54-60.

Bahr, S. J., Marcos, A. C., & Maughan, S. L. (1995). Family, educational and peer influences on the alcohol use of female and male adolescents. *J Stud Alcohol, 56*(4), 457-469.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev, 84*(2), 191-215.

Berger, K.S. & Thompson, R.A. (1995). The developing person: Through childhood and adolescence. New York: Worth Publishers. Feek, W. (Ed). (1990). On-Line: The drugs learning package. London, The Commonwealth Secretariat.

Bhattacharya, G. (1998). Drug use among Asian-Indian adolescents: identifying protective/risk factors. *Adolescence, 33*(129), 169-184.

Bierman, K.L., Montminy, H.P. (1993). Developmental issues in social-skills assessment and intervention with children and adolescents, *Behavior Modification*, 17, 229.

Bogenschneider, K., Wu, M. Y., Raffaelli, M., & Tsay, J. C. (1998). Parent influences on adolescent peer orientation and substance use: the interface of parenting practices and values. *Child Dev, 69*(6), 1672-1688.

Botvin, G. J. (2000). Preventing drug abuse in schools: social and competence enhancement approaches targeting individual-level etiologic factors. *Addict Behav, 25*(6), 887-897.

Botvin, G. J., Baker, E., Dusenbury, L., Botvin, E. M., & Diaz, T. (1995). Long-term follow-up results of a randomized drug abuse prevention trial in a white middle-class population. *Jama, 273*(14), 1106-1112.

Botvin, G. J., & Griffin, K. W. (2007). School-based programmes to prevent alcohol, tobacco and other drug use. *Int Rev Psychiatry, 19*(6), 607-615.

Botvin, G. J., Malgady, R. G., Griffin, K. W., Scheier, L. M., & Epstein, J. A. (1998). Alcohol and marijuana use among rural youth: interaction of social and intrapersonal influences. *Addict Behav, 23*(3), 379-387.

Brook, J. S. (1993). Interactional theory: its utility in explaining drug use behavior among African-American and Puerto Rican youth. *NIDA Res Monogr, 130*, 79-101.

Brook, J. S., Brook, D. W., Gordon, A. S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: a family interactional approach. *Genet Soc Gen Psychol Monogr, 116*(2), 111-267.

Brook, J. S., Nomura, C., & Cohen, P. (1989). A network of influences on adolescent drug involvement: neighborhood, school, peer, and family. *Genet Soc Gen Psychol Monogr, 115*(1), 123-145.

Brook, J.S., Brook, D.W., Gordon, A.S., Whiteman, M., & Cohen, P. (1990). The psychosocial etiology of adolescent drug use: A family interactional approach. *Genetic, Social, and General Psychology Monographs*, 116, 11-267.

Brown, S. A., McGue, M., Maggs, J., Schulenberg, J., Hingson, R., Swartzwelder, S., et al. (2008). A developmental perspective on alcohol and youths 16 to 20 years of age. *Pediatrics, 121 Suppl 4*, S290-310.

Burstein, L. (1980) The analysis of multilevel data in education research and evaluation.*, Rev Res Educ*, 8:158–233.

Catalano, R. F., Gainey, R. R., Fleming, C. B., Haggerty, K. P., & Johnson, N. O. (1999). An experimental intervention with families of substance abusers: one-year follow-up of the focus on families project. *Addiction, 94*(2), 241-254.

Chassin, L., Curran, P. J., Hussong, A. M., & Colder, C. R. (1996). The relation of parent alcoholism to adolescent substance use: a longitudinal follow-up study. *J Abnorm Psychol, 105*(1), 70-80.

Clayton, R. R., Cattarello, A. M., & Johnstone, B. M. (1996). The effectiveness of Drug Abuse Resistance Education (project DARE): 5-year follow-up results. *Prev Med, 25*(3), 307-318.

Costello, E. J., Erkanli, A., Federman, E., & Angold, A. (1999). Development of psychiatric comorbidity with substance abuse in adolescents: effects of timing and sex. *J Clin Child Psychol, 28*(3), 298-311.

Curran, P. J., Stice, E., & Chassin, L. (1997). The relation between adolescent alcohol use and peer alcohol use: a longitudinal random coefficients model. *J Consult Clin Psychol, 65*(1), 130-140.

Dielman, T.E. (1994).School-based research on prevention of adolescent alcohol use and misuse: Methodological and advances. *J. Res. Adolesc*.4, 271-293.

Donovan, J. E. (1993). Young adult drinking-driving: behavioral and psychosocial correlates. *J Stud Alcohol, 54*(5), 600-613.

Dryfoos, J. G. (1998). School-based health centers in the context of education reform. *J Sch Health, 68*(10), 404-408.

Duncan, S. C., Duncan, T. E., Biglan, A., & Ary, D. (1998). Contributions of the social context to the development of adolescent substance use: a multivariate latent growth modeling approach. *Drug Alcohol Depend, 50*(1), 57-71.

Duncan, S. C., Duncan, T. E., & Strycker, L. A. (2002). A multilevel analysis of neighborhood context and youth alcohol and drug problems. *Prev Sci, 3*(2), 125-133.

Duncan, T. E., Duncan, S. C., & Hops, H. (1994). The effects of family cohesiveness and peer encouragement on the development of adolescent alcohol use: a cohort-sequential approach to the analysis of longitudinal data. *J Stud Alcohol, 55*(5), 588-599.

Ellickson, S. L., Tucker, J. S., Klein, D. J., & McGuigan, K. A. (2001). Prospective risk factors for alcohol misuse in late adolescence. *J Stud Alcohol, 62*(6), 773-782.

Elliot, K.S, Huizinga, D., & Ageton, S.S. (1985). *Explaining delinquency and drug use* Beverly Hills, CA; Sage.

Ennett, S. T., Flewelling, R. L., Lindrooth, R. C., & Norton, E. C. (1997). School and neighborhood characteristics associated with school rates of alcohol, cigarette, and marijuana use. *J Health Soc Behav, 38*(1), 55-71.

Ennett Susan T., Bauman, K.E., Pemberton M., Foshee V.A., Chuang Y.C., King T.S.,Koch G.G.,(2001), Mediation in a Family-Directed Program for Prevention of Adolescent Tobacco and Alcohol Use, *Preventive Medicine*, 33, 333-346.

Epstein, J. A., Botvin, G. J., Baker, E., & Diaz, T. (1999). Impact of social influences and problem behavior on alcohol use among inner-city Hispanic and black adolescents. *J Stud Alcohol, 60*(5), 595-604.

Epstein, J. A., Griffin, K. W., & Botvin, G. J. (2001). Risk taking and refusal assertiveness in a longitudinal model of alcohol use among inner-city adolescents. *Prev Sci, 2*(3), 193-200.

Evans-Whipp, T., Beyers, J. M., Lloyd, S., Lafazia, A. N., Toumbourou, J. W., Arthur, M. W., et al. (2004). A review of school drug policies and their impact on youth substance use. *Health Promot Int, 19*(2), 227-234.

Faggiano, F., Vigna-Taglianti, F. D., Versino, E., Zambon, A., Borraccino, A., & Lemma, P. (2008).School-based prevention for illicit drugs use: a systematic review. *Prev Med, 46*(5), 385-396.

Friedman, A. S., & Glassman, K. (2000). Family risk factors versus peer risk factors for drug abuse. A longitudinal study of an African American urban community sample. *J Subst Abuse Treat, 18*(3), 267-275.

Fuligni A.J, Eccles J.E.(1993). Perceived parent-child relationships and early-adolescents' orientation towards peers. *Dev Psychol.*29(4), 622–632

Ghosh, C. (2003). Healthy People 2010 and Asian Americans/Pacific Islanders: defining a baseline of information. *Am J Public Health, 93*(12), 2093-2098.

Griffin, K. W., Botvin, G. J., Scheier, L. M., Diaz, T., & Miller, N. L. (2000). Parenting practices as predictors of substance use, delinquency, and aggression among urban minority youth: moderating effects of family structure and gender. *Psychol Addict Behav, 14*(2), 174-184.

Grunbaum, J. A., Tortolero, S., Weller, N., & Gingiss, P. (2000). Cultural, social, and intrapersonal factors associated with substance use among alternative high school students. *Addict Behav, 25*(1), 145-151.

Hallfors, D., Cho, H., Brodish, P. H., Flewelling, R., & Khatapoush, S. (2006). Identifying high school students "at risk" for substance use and other behavioral problems: implications for prevention. *Subst Use Misuse, 41*(1), 1-15.

Hawkins, J. D., Catalano, R. F., & Miller, J. Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance abuse prevention. *Psychol Bull, 112*(1), 64-105.

Henry, K. L., & Slater, M. D. (2007). The contextual effect of school attachment on young adolescents' alcohol use. *J Sch Health, 77*(2), 67-74.

Henry, K. L., Swaim, R. C., & Slater, M. D. (2005). Intraindividual variability of school bonding and adolescents' beliefs about the effect of substance use on future aspirations. *Prev Sci, 6*(2), 101-112.

Hill, S. Y., Shen, S., Lowers, L., & Locke, J. (2000). Factors predicting the onset of adolescent drinking in families at high risk for developing alcoholism. *Biol Psychiatry, 48*(4), 265-275.

Hirschi, T.(1969) *Causes of Delinquency*, Berkeley, CA: Univ. of California Press. Hox, J. (2002). *Multilevel analysis: Techniques and applications.* Lawrence Erlbaum; Mahwah, NJ.

Hussong, A. M., & Hicks, R. E. (2003). Affect and peer context interactively impact adolescent substance use. *J Abnorm Child Psychol, 31*(4), 413-426.

Ingoldsby, E. M., Shaw, D. S., Winslow, E., Schonberg, M., Gilliom, M., & Criss, M. M. (2006). Neighborhood disadvantage, parent-child conflict, neighborhood peer relationships, and early antisocial behavior problem trajectories. *J Abnorm Child Psychol, 34*(3), 303-319.

Itai, G, & McRae, C. (1994). Counseling Older Japanese American clients: An overview and observations. Journal of Counseling & Development, 72(4), 373-377.

Jackson, C. (2002). Perceived legitimacy of parental authority and tobacco and alcohol use during early adolescence. *J Adolesc Health, 31*(5), 425-432.

Jackson, C., Henriksen, L., & Dickinson, D. (1999). Alcohol-specific socialization, parenting behaviors and alcohol use by children. *J Stud Alcohol, 60*(3), 362-367.

Jackson, C., Henriksen, L., Dickinson, D., & Levine, D. W. (1997). The early use of alcohol and tobacco: its relation to children's competence and parents' behavior. *Am J Public Health, 87*(3), 359-364.

Jaeger, M. (2006). *On testing the missing at random assumption*, Springer, Berlin, Heidelberg.

Jessor, R. (1993). Successful adolescent development among youth in high-risk settings. *Am Psychol, 48*(2), 117-126.

Johnson, V., & Pandina, R. J. (1991). Familial and personal drinking histories and measures of competence in youth. *Addict Behav, 16*(6), 453-465.

Jones, D. J., Hussong, A. M., Manning, J., & Sterrett, E. (2008). Adolescent alcohol use in context: The role of parents and peers among African American and European American youth. *Cultur Divers Ethnic Minor Psychol, 14*(3), 266-273.

Kandel, D. B., & Andrews, K. (1987). Processes of adolescent socialization by parents and peers. *Int J Addict, 22*(4), 319-342.

Kaplan, C. P., Zabkiewicz, D., McPhee, S. J., Nguyen, T., Gregorich, S. E., Disogra, C., et al. (2003). Health-compromising behaviors among Vietnamese adolescents: the role of education and extracurricular activities. *J Adolesc Health, 32*(5), 374-383.

Kim, J., & McCarthy, W. J. (2006). School-level contextual influences on smoking and drinking among Asian and Pacific Islander adolescents. *Drug Alcohol Depend, 84*(1), 56-68.

Knight, J. R., Harris, S. K., Sherritt, L., Kelley, K., Van Hook, S., & Wechsler, H. (2003). Heavy drinking and alcohol policy enforcement in a statewide public college system. *J Stud Alcohol, 64*(5), 696-703.

Kreft, I., De Leeuw, J. (1998). *Introducing multilevel modeling.* Sage; Thousand Oaks, CA.

Kumpfer, K. L., & Turner, C. W. (1990). The social ecology model of adolescent substance abuse: implications for prevention. *Int J Addict, 25*(4A), 435-463.

Ladd, G.W. & Asher S.R. (1985). Social skills training and children's peer relations: current issues in research and practice. In LL. L' Abate & M.Milan (Eds). Handbook of social skill training, p219-233, New York, Wiley.

Lambert, S. F., Brown, T. L., Phillips, C. M., & Ialongo, N. S. (2004). The relationship between perceptions of neighborhood characteristics and substance use among urban African American adolescents. *Am J Community Psychol, 34*(3-4), 205-218.

Larson, R., & Richards, M. H. (1991). Daily companionship in late childhood and early adolescence: changing developmental contexts. *Child Dev, 62*(2), 284-300.

Little, R. J. A., & Rubin, D. B. (2002). Statistical analysis with missing data. New York: John Wiley & Sons.

Loveland-Cherry, C. J., Leech, S., Laetz, V. B., & Dielman, T. E. (1996). Correlates of alcohol use and misuse in fourth-grade children: psychosocial, peer, parental, and family factors. *Health Educ Q, 23*(4), 497-511.

Loveland-Cherry, C. J., Ross, L. T., & Kaufman, S. R. (1999). Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol Suppl, 13*, 94-102.

McBride, C. M., Curry, S. J., Cheadle, A., Anderman, C., Wagner, E. H., Diehr, P., et al. (1995). School-level application of a social bonding model to adolescent risk-taking behavior. *J Sch Health, 65*(2), 63-68.

Mitchell, R. J., Toomey, T. L., & Erickson, D. (2005). Alcohol policies on college campuses. *J Am Coll Health, 53*(4), 149-157.

Muthen, B. O., & Muthen, L. K. (2000). The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *J Stud Alcohol, 61*(2), 290-300.

Najaka, S. S., Gottfredson, D. C., & Wilson, D. B. (2001). A meta-analytic inquiry into the relationship between selected risk factors and problem behavior. *Prev Sci, 2*(4), 257-271.

Nelson, T. F., Naimi, T. S., Brewer, R. D., & Wechsler, H. (2005). The state sets the rate: the relationship among state-specific college binge drinking, state binge drinking rates, and selected state alcohol control policies. *Am J Public Health, 95*(3), 441-446.

Nutbeam, D., Smith, C., Moore, L., & Bauman, A. (1993). Warning! Schools can damage your health: alienation from school and its impact on health behaviour. *J Paediatr Child Health, 29 Suppl 1*, S25-30.

O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (1988). Period, age, and cohort effects on substance use among young Americans: a decade of change, 1976-86. *Am J Public Health, 78*(10), 1315-1321.

Oetting, E. R., & Donnermeyer, J. F. (1998). Primary socialization theory: the etiology of drug use and deviance. I. *Subst Use Misuse, 33*(4), 995-1026.

Perry, C, Komro, K, Veblen-Mortenson S et al.(2003). A randomized controlled trial of the middle and junior high school DARE and DARE PLUS programs. Arch *Pediatr Adolesc Med,* 157, 178–84.

Pentz, M.A., Johnson, A, Dwyer, J.H. et al. (1989). A comprehensive community

approach to adolescent drug abuse prevention: effects on cardiovascular disease risk behaviors. *Ann Med*,21, 219–22.

Petraitis, J., Flay, B. R., & Miller, T. Q. (1995). Reviewing theories of adolescent substance use: organizing pieces in the puzzle. *Psychol Bull, 117*(1), 67-86.

Petrie, J., Bunn, F., & Byrne, G. (2007). Parenting programmes for preventing tobacco, alcohol or drugs misuse in children <18: a systematic review. *Health Educ Res, 22*(2), 177-191.

Price, R. K., Risk, N. K., Wong, M. M., & Klingle, R. S. (2002). Substance use and abuse by Asian Americans and Pacific Islanders: preliminary results from four national epidemiologic studies. *Public Health Rep, 117 Suppl 1*, S39-50.

Raghunathan T. E., Lepkowski J., VanHoewyk J., and Solenerger P.,(2001). A multivariate technique for multiply imputing missing values using a sequence of regression models. *Survey Methodology*, 27 (1), 85-95.

Raudenbush, S.W. & Bryk, A.S. (2002). Hierarchical Linear Models: Applications and Data Analysis Methods. Advanced Quantitative Techniques in the Social Sciences, Sage Publications, Thousand Oaks, CA.

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *Jama, 278*(10), 823-832.

Ritchey, P. N., Reid, G. S., & Hasse, L. A. (2001). The relative influence of smoking on drinking and drinking on smoking among high school students in a rural tobacco-growing county. *J Adolesc Health, 29*(6), 386-394.

Robins, L. N. (1995). The natural history of substance use as a guide to setting drug policy. *Am J Public Health, 85*(1), 12-13.

Rogler, L. H., Cortes, D. E., & Malgady, R. G. (1991). Acculturation and mental health status among Hispanics. Convergence and new directions for research. *Am Psychol, 46*(6), 585-597.

Rose, C. D. (1999). Peer cluster theory and adolescent alcohol use: an explanation of alcohol use and a comparative analysis between two causal models. *J Drug Educ, 29*(3), 205-215.

Ruma, P.R., Burke, r.V. &Thompason, R.W. (1996). Group parent training: is it effective for childdren of all ages? Behavior Therapy, 27, 159-169.

Sampson, R. J. (2003). The neighborhood context of well-being. *Perspect Biol Med, 46*(3 Suppl), S53-64.

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science, 277*(5328), 918-924.

Sampson, Robert J. Jeffrey Morenoff, and Felton Earls. (1999). Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children. *American Sociological Review*, 64, 633-660.

Schulenberg, J., Bachman, J. G., O'Malley, P. M., & Johnston, L. D. (1994). High school educational success and subsequent substance use: a panel analysis following adolescents into young adulthood. *J Health Soc Behav, 35*(1), 45-62.

School Health Policies and Programs Study: A Summary Report (1995), *Journal of School Health,* October, 65(1), No. 8.

Shope, J. T., Kloska, D. D., Dielman, T. E., & Maharg, R. (1994). Longitudinal

evaluation of an enhanced alcohol misuse prevention study (AMPS) curriculum for grades six-eight. *J Sch Health, 64*(4), 160-166.

Simons-Morton, B., Haynie, D. L., Crump, A. D., Eitel, S. P., & Saylor, K. E. (2001). Peer and parent influences on smoking and drinking among early adolescents. *Health Educ Behav, 28*(1), 95-107.

Serketich, W.J.& Duman, J.E. (1996). The effectiveness of behavioral parent training to modify antisocial behavioral in children: a met-analysis, Behavior Therapy, 27, 171-186.

Skager, R., & Fisher, D. G. (1989). Substance use among high school students in relation to school characteristics. *Addict Behav, 14*(2), 129-138.

Smetana, J. (1988). Adolescents' and parents' conceptions of parental authority. *Child Dev.*59(2):321–335.

Spoth R, Redmond C, Shin C.(2001). Randomized trial of brief family interventions for general populations: adolescent substance use outcomes 4 years following baseline.*J Consult Clin Psychol*, 69, 627–42.

Spoth R, Redmond C, Trudeau L et al.(2002). Longitudinal substance initiation outcomes for a universal Preventive intervention combining family and school programs. *PsycholAddict Behav,* 16, 129–34.

Steinberg, L., Silverberg S.B.(1986). The vicissitudes of autonomy in early adolescence. *Child Dev.* 57(4), 841–851.

Stephenson, A. L., Henry, C. S., & Robinson, L. C. (1996). Family characteristics and adolescent substance use. *Adolescence, 31*(121), 59-77.

Sue, D.W. & Sue, D. (1999). Counseling the culturally different (3rd ed).New York: John Wiley & Sons.

Smith, G. T., McCarthy, D. M., & Goldman, M. S. (1995). Self-reported drinking and alcohol-related problems among early adolescents: Dimensionality and validity over 24 months. *Journal of Studies on Alcohol, 36,*383–394.

Sutherland, E.H. (1973) *Development of the theory*. In: SCHUESSLER, K. (Ed.) Edwin Sutherland on Analyzing Crime, Chicago, IL: Univ. of Chicago Press, pp. 13-29.

Turner, A. P., Larimer, M. E., & Sarason, I. G. (2000). Family risk factors for alcohol-related consequences and poor adjustment in fraternity and sorority members: exploring the role of parent-child conflict. *J Stud Alcohol, 61*(6), 818-826.

Urberg, K. A., Degirmencioglu, S. M., & Pilgrim, C. (1997). Close friend and group influence on adolescent cigarette smoking and alcohol use. *Dev Psychol, 33*(5), 834-844.

U.S. Census Bureau. Census 2000 redistricting data. Washington (DC); 2001. Releas date July 7, 2001. Available from: URL: http://www.census.gov/clo/www/redistricting.html

U.S. Census Bureau, (2002). Table QT-02: Profile of Selected Social Characteristics: 2000. Census 2000 Supplementary Summary Tables. , U.S. Census Bureau, Washington, DC.

Udry J.R. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.

van Oers, J. A., Bongers, I. M., van de Goor, L. A., & Garretsen, H. F. (1999). Alcohol consumption, alcohol-related problems, problem drinking, and socioeconomic status. *Alcohol Alcohol, 34*(1), 78-88.

Velleman, R. D., Templeton, L. J., & Copello, A. G. (2005). The role of the family in preventing and intervening with substance use and misuse: a comprehensive review of family interventions, with a focus on young people. *Drug Alcohol Rev, 24*(2), 93-109.

Webster, R. A., Hunter, M., & Keats, J. A. (1994). Peer and parental influences on adolescents' substance use: a path analysis. *Int J Addict, 29*(5), 647-657.

Weinberg, N. Z., Dielman, T. E., Mandell, W., & Shope, J. T. (1994). Parental drinking and gender factors in the prediction of early adolescent alcohol use. *Int J Addict, 29*(1), 89-104.

White, H. R., Johnson, V., & Buyske, S. (2000). Parental modeling and parenting behavior effects on offspring alcohol and cigarette use. A growth curve analysis. *J Subst Abuse, 12*(3), 287-310.

White, H. R., McMorris, B. J., Catalano, R. F., Fleming, C. B., Haggerty, K. P., & Abbott, R. D. (2006). Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *J Stud Alcohol, 67*(6), 810-822.

Wilks, J., Callan, V. J., & Austin, D. A. (1989). Parent, peer and personal determinants of adolescent drinking. *Br J Addict, 84*(6), 619-630.

Williams, C. L., Perry, C. L., Dudovitz, B., Veblen-Mortenson, S., Anstine, P. S., Komro, K. A., & Toomey, T. L. (1995). A home-based prevention program for sixth-grade alcohol use: Results from Project Northland. *Journal of Primary Prevention, 16,* 125–147.

Wills, T. A., McNamara, G., & Vaccaro, D. (1995). Parental education related to adolescent stress-coping and substance use: development of a mediational model. *Health Psychol, 14*(5), 464-478.

Wills, T. A., & Cleary, S. D. (1996). How are social support effects mediated? A test with parental support and adolescent substance use. *J Pers Soc Psychol, 71*(5), 937-952.

Wills, T. A., Schreibman, D., Benson, G., & Vaccaro, D. (1994). Impact of parental substance use on adolescents: a test of a mediational model. *J Pediatr Psychol, 19*(5), 537-555.

Wills, T. A., Gibbons, F. X., Gerrard, M., & Brody, G. H. (2000). Protection and vulnerability processes relevant for early onset of substance use: a test among African American children. *Health Psychol, 19*(3), 253-263.

Williams C, Grechanaia T, Romanova O et al. (2001). Russian-American partners for prevention. Adaptation of a schoolbased parent-child programme for alcohol use prevention. Eur J Public Health, 11, 314–21.

Wood, M. D., Sher, K. J., & McGowan, A. K. (2000). Collegiate alcohol involvement and role attainment in early adulthood: findings from a prospective high-risk study. *J Stud Alcohol, 61*(2), 278-289.

Yabiku, S., Kulis, S., Marsiglia, F. F., Lewin, B., Nieri, T., & Hussaini, S. (2007). Neighborhood effects on the efficacy of a program to prevent youth alcohol use. *Subst Use Misuse, 42*(1), 65-87.

Zhang, L., Welte, J. W., & Wieczorek, W. F. (1997). Peer and parental influences on male adolescent drinking. *Subst Use Misuse, 32*(14), 2121-2136.

Zhang, L., Welte, J. W., & Wieczorek, W. F. (1999). The influence of parental drinking and closeness on adolescent drinking. *J Stud Alcohol, 60*(2), 245-251.

Chapter V

Conclusions

The purpose of this dissertation was to describe how individual and contextual factors are related to age of alcohol use onset and alcohol use trajectories among Asian American adolescents. The dissertation research was a secondary analysis using three waves of the Add Health data, and was organized into: an introductory chapter, three paper chapters, and a concluding chapter. Chapter I provided an overview of the dissertation including the introduction, background, significance of the study, and the conceptual framework. Chapter II, the first paper, investigated correlates of age at alcohol use onset, using data from Asian American adolescents. The second paper, reported in Chapter III, used three waves of longitudinal data, to explore the relationships between alcohol use behavior and acculturation and psychosocial factors from adolescence to young adulthood among Asian Americans. Chapter IV, the third paper, used multilevel modeling techniques to examine the relationships among alcohol use trajectories of Asian American adolescents and parental, peer, school, and neighborhood factors. Finally, the current and concluding chapter, discussed the findings, presented conclusions, and suggested implications for future research and practice.

The conceptual framework for the current study was derived from two theories, the Social Development Model (SDM) (Hawkins & Weis, 1985) and Acculturation Theory (Berry et al, 1987). The SDM (Hawkins & Weis) is an integrated model including personal and social factors. Acculturation Theory (Berry et al.) refers to the cultural feature of adaptation for adolescents who have immigrant parents, which may have an effect on the adoption of risky health behavior, such as alcohol use. The Social Development Model and Acculturation Theory offered a useful conceptual framework with which to investigate predictors of alcohol use from adolescence to young adulthood among Asian American adolescents.

The three papers were based on a secondary analysis of data (Wave I-III) from the National Longitudinal Study of Adolescent Health (Add Health data), a longitudinal and nationally representative survey of adolescents in grades 7-12 (Udry, 2003). The sample of the current study consisted of the subsample of the total Asian American adolescents, (i.e., the weighted sample of participants) and the analyses used three waves of data, and involved both cross-sectional and longitudinal analyses of Add Health data.

An Integrated Summary of Findings

The results of analyses to address correlates of alcohol use at different ages of onset were reported. The hypotheses were supported, with results indicating more paternal, maternal, and peer alcohol use as predictors of an earlier age of alcohol use onset in younger adolescents. As found in other studies, greater parental and peer alcohol use were identified as risk factors in earlier age of alcohol use onset (Coffelt, Forehand, Olson, Jones, Gaffney, & Zens, 2006; Jackson, Henriksen, Dickinson, & Levine, 1997; (D'Amico

194

& McCarthy, 2006). For adolescents under the age of 12, maternal and peer alcohol use were associated with an early age of alcohol use onset. For adolescents aged 12-14 and 15-18, paternal and peer alcohol use were related to the age of alcohol use onset. However, peer alcohol use was more strongly related to age of alcohol use onset in the 12-14 age group than in the 15-18 age group. Peer influence on adolescent alcohol use appears to peak in the middle school period (Bush, Weinfurt, Iannotti, 1994). This might be due to pressure to fit in, or conform to observed peer behavior. Further, the age of onset differed by gender, with males tending to initiate alcohol use earlier than females. Males were more likely to start alcohol use in middle school, whereas females initiated alcohol use more often in high school. Thus, programs tailored to different adolescent age groups should take into account these sex differences in studies of Asian American adolescents.

Acculturation was associated with escalating alcohol use in both males and females. The results of the longitudinal data showed that for Asian Americans, acculturation was positively linked to alcohol use over time. While the findings revealed that depressive symptoms and self-esteem did not predict changes in alcohol use, religiosity did predict decreased alcohol use over time.

The results support Social Developmental Theory, which emphasizes the influence of peer and parental alcohol use, peer-adolescent relationships, parent-adolescent relationships, and school constructs on alcohol use. Adolescents with peers who drink alcohol were more likely to increase their alcohol use over time than adolescents without peers who drank. The results also showed that parental alcohol use and negative father-adolescent relationships predicted increased alcohol use over time, as did a low level of school bonding, low GPA, and frequent school absenteeism. These

results support hypotheses and replicate results in other samples indicating that negative

school outcomes are related to alcohol use. However, neighborhood factors at both the

individual and institutional-levels were not related to alcohol use over time. Results of the

current study suggest that peer and parental alcohol use, adolescent-parent relationships,

and individual-level school variables were more likely to be associated with Asian

American adolescents' alcohol use than neighborhood factors at the individual or

community-levels.

Age of Alcohol Use Onset among Asian American Adolescents

Alcohol use is an important public health problem in the United States

(USDHHS, 2000). Early onset of alcohol use among adolescents is of particular concern.

Alcohol use at an early age has been associated with risky health behavior including

unwanted pregnancy and violence among college students (Perkins, 1992; Wechsler,

Davenport, Dowdall, Moeykens, & Castillo, 1994). In particular, early age of onset of

drinking was found to predict lifetime alcohol abuse and dependence in a longitudinal

cohort of ages 15 to 35 (Kandel, Yamaguchi, & Chen, 1992) and in a longitudinal study

with a White sample (Scheier, Botvin, & Baker, 1997). As an alcohol prevention strategy,

delaying the age of onset of drinking has been prioritized, so it is crucial to understand

the predictors of early age of alcohol use onset among adolescents. Thus, the current

study aimed to identify factors related to age of alcohol use onset from early adolescence

to young adulthood among Asian Americans, which have not been studied closely.

The findings of the current study supported the hypotheses that higher levels of

paternal, maternal, and peer alcohol use were related to an earlier age of alcohol use onset.

Furthermore, each age group of initiation of alcohol use had different correlates of age of onset. Specifically, maternal alcohol use was a risk factor for onset among youths who initiated drinking under the age of twelve. Asian American adolescents were less likely to listen to their parents, especially their fathers, when compared to White adolescents (Rhee, Chang, & Rhee, 2003). Chinese adolescents were more likely to listen to their mothers, followed by their best friends, their fathers and their ordinary friends (Gao, 1998). This may indicate that adolescents in this age group are more receptive of their mother's influence, which might be due to more time being spent with their mothers than with their fathers. Results indicate that peers' and fathers' alcohol use might be risk factors in the earlier onset of alcohol use for both middle and high school adolescents. Because a father-centered family structure and paternal authority are central in Asian American culture, paternal alcohol use might be a significant risk factor for earlier onset of alcohol use for Asian American adolescents (Triandis, 2001; Heine et al., 1999; Kim, 2001; Bhattacharya, 1998).

Interventions to delay adolescent alcohol use initiation and reduce adolescent alcohol consumption have yielded favorable results (Spoth, Redmond & Shin, 2001; Spoth, Redmond, Shin & Azevedo, 2004). The Preparing for the Drug Free Years (PDFY) program is an intervention that includes a family competency training program to enhance protective parent-child interactions, and reduce children's risk of initiating substance use early (Spoth, Redmond, & Shin, 1998).The Strengthening Families Program (ISFP) for parents and adolescents aged 10-14 trains skills-building, including family management and communication for parents and adolescents (Spoth, Redmond, & Shin, 1998). PDFY programs have shown weaker effects on delaying the initiation of

alcohol use, whereas ISFP has yielded positive results on family factors (e.g., increase

family cohesiveness and positive involvement of the adolescent in the family) associated

with delayed alcohol initiation and progression. ISFP is relatively more intensive than

PDFY, in that it provides two additional sessions and adolescents attend all intervention

sessions, whereas PDFY focuses primarily on parents (Spoth, Redmond, & Shin). These

intervention results demonstrated that interventions involving both parents and

adolescents may be more effective in delaying alcohol initiation than parents-only or

adolescents-only intervention programs.

Given the influence of parental alcohol use on the timing of the initiation of

adolescent alcohol use, parents are an important target for interventions. Parents' problem

drinking needs to be reduced, and alcoholic parents should be encouraged to seek

treatment to help decrease adolescents' exposure to drinking at home. Further, training of

effective parenting practices and the provision of counseling to reduce domestic conflict

may be effective in managing parents' problem drinking or alcoholism (Zucker, Donovan,

Masten, Mattson, & Moss, 2008).

Peer alcohol use might be a greater risk factor for adolescents who initiate

alcohol use in middle school rather than high school. Alcohol use prevention programs

should begin before middle school in order to effectively prevent or delay onset of

alcohol use among Asian American adolescents. Therefore, the delivery of the

interventions needs to be established prior to the point in adolescents' development at

which participants begin to experience alcohol use, but before the adoption of frequent

alcohol use (Spoth, Redmond, Shin, & Azevedo, 2004). Meanwhile, Loveland-Cherry

and her colleague (1999) reported that early drinking in elementary school was related to

higher rates of alcohol use and misuse in middle adolescence. In addition, students who began drinking alcohol before fourth or fifth grade were engaged in alcohol drinking and alcohol related problems in elementary school and in adolescence (Donovan et al., 2004). Further, home-based family intervention for adolescents (grade 4) who were not using alcohol was an effective universal prevention program for decreasing initiation of alcohol use and subsequent misuse (Loveland-Cherry, Ross, & Kaufman, 1999). Although there may be reluctance to recognize children's alcohol use, it is important to determine risk factors and the prevalence of elementary school students' drinking for successful prevention in elementary school (Donovan et al.). Because alcohol drinking is an ongoing process and because earlier onset of alcohol use may predict alcohol problems in adolescence and alcohol abuse or dependence in adulthood (Hawkins et al., 1997; Pedersen & Skrondal, 1998), early intervention programs need to be considered to prevent or delay the onset of alcohol use. Furthermore, interventions aiming to decrease alcohol-related peer pressure need to include peer refusal skills to help delay the onset of alcohol use, or decrease the level of use. Because each increase in the number of best friends drinking alcohol was associated with age of alcohol use onset among adolescents, intervention programs involving deviant peers and promoting prosocial peer involvement need to be provided (Zucker et al., 2008).

As the results of this study indicate, correlates vary at different ages of onset of alcohol use. This suggests that preventive efforts targeted to delay of alcohol use onset might need to include different components depending on the age of the non-drinking adolescent being targeted with an alcohol use prevention. Alcohol use prevention programs tailored to different age groups should be considered for Asian American

adolescents. In addition, the effects of interventions may differ across individuals. For example, improved parental monitoring may be an effective approach for younger adolescents, whereas enhanced peer refusal skills or increased school bonding might be helpful for older adolescents (R. Spoth, Trudeau, Guyll, Shin, & Redmond, 2009).

Furthermore, early initiation of alcohol use is correlated with greater use of alcohol, illicit drugs, unintentional injuries, physical fights, motor vehicle crashes and unprotected sex (Hingson, Heeren, Jamanka, & Howland, 2000; Hingson, Heeren, & Zakocs, 2001; Hingson, Heeren, Levenson, Jamanka, & Voas, 2002; Hingson, Heeren, Zakocs, Winter, & Wechsler, 2003; Hingson, Heeren, Winter, & Wechsler, 2003). Delaying onset may be more likely to reduce later alcohol dependence (Hingson, Heeren, & Winter, 2006) and negative outcomes like unintentional injury and motor vehicle crashes after drinking (Hingson & Zha, 2009). Specifically, adolescents who began alcohol use before age 14 were more likely to experience alcohol dependence and multiple dependence episodes than adolescents who began drinking at 21 years or older (Hingson, Heeren, & Winter). Furthermore, adolescents usually begin alcohol use or cigarette smoking as their first substance. Those adolescents who begin using a more serious substance have usually used a less serious substance previously (Johnson, Boles, & Kleber, 2000). Marijuana is a common first illicit substance (Lessem et al., 2006; Vaughn, Wallace, Perron, Copeland, & Howard, 2008). Further along the pathway, most of those who use cocaine have previously used marijuana, and before that alcohol and/or tobacco (Kandel, 2003).In a twin design study, early regular drinking was significantly correlated with marijuana use, other drugs use, and alcohol dependence (Grant et al., 2006). Thus, understanding the age of alcohol use onset and delaying drinking onset may

help prevent potential drinkers from more serious substance uses and unintentional injury or other drinking related problems.

Acculturation and Alcohol Use

The findings of the current study show that greater acculturation is strongly associated with a higher probability of drinking. Research conducted to date demonstrates that acculturation is related with increased risk of alcohol use among Asian American adolescents (Hahm et al., 2003; Tosh & Simmons, 2007) and Hispanic populations (Black & Markides, 1993; Zemore, 2005). However, with regard to acculturation, studies have also shown a different association between acculturation and alcohol use, depending on gender and race. While both male and female acculturated Asian American adolescents tended to show increased alcohol use, males drank more than females (Hahm et al., 2003; Hendershot, MacPherson, Myers, Carr, & Wall, 2005). However, among acculturated Hispanics, more acculturated females drank more frequently and consumed greater amounts of alcohol per occasion than those who were less acculturated Hispanic females, while with acculturated Hispanic males such an increase was not evident (Black & Markides, 1993; Caetano, 1987a; Caetano, Ramisetty-Mikler, & Rodriguez, 2008; Zemore, Mulia, Yu, Borges, & Greenfield, 2008). Furthermore, acculturation has been associated with increased alcohol-related problem behaviors. Among both Asian Americans (Izuno et al., 1992; Yeh & Inose, 2002) and Hispanics (Caetano & Mora, 1988; Zemore et al., 2008; Caetano, Ramisetty-Mikler, & McGrath , 2004; Caetano, Ramisetty-Mikler, Wallisch, McGrath, & Spence, 2008; Wahl & Eitle, 2008), highly acculturated individuals reported more alcohol-related health behaviors.

A potential explanation for the association between acculturation and alcohol use is that as immigrants acculturate, they typically adopt more behaviors and attitudes common in mainstream U.S. culture, which may be more permissive toward the use of alcohol, and hold more positive expectations of alcohol use

Although greater acculturation is generally related to increased alcohol use among Asian American adolescents, the processes by which acculturation leads to increased alcohol use are not clear (Beauvais, 1998). However, the acculturation process may involve cultural adaptations to new environments like social norms, attitudes to alcohol use, and expectancies of alcohol use among Hispanics (Caetano & Mora, 1988; Caetano, Ramisetty-Mikler, Wallisch et al., 2008). Furthermore, weak social networks and lower social support (Kaskutas, Bond, & Humphreys, 2002; Nagata, 1994; Berry, 2004), and exposure to alcohol use norms of Hispanics (Bonnheim & Korman, 1985; Caetano, 1987b) may also contribute to increased alcohol use and alcohol-related problems. The social context related to alcohol use also varies by acculturation level; more acculturated individuals are more likely to visit bars or parties than those who are less acculturated, among Hispanics (Caetano, 1987b).

The empirical research on the health of Asian American adolescents is very limited at this point, and there is also a dearth of evaluation studies on the effectiveness of interventions (Harachi, Catalano, Kim, & Choi, 2001). There are limited information resources to use in the development and implementation programs for alcohol prevention among Asian American adolescents. For Asian American adolescents who have a strong family orientation and a sense of collectivism, strategies might need to emphasize such values. Because family oriented culture is important to Asian Americans, Hispanics and

African Americans, an emphasis on family might be appropriate for these ethnic groups, as well (Santisteban, Muir-Malcolm,& Mitrani, et al., 2002). Because these ethnic groups are more oriented to the family and the respect of elders, family-based approaches might be more effective than individual approaches (Szapocznik & Kurtines, 1993). The family plays a very important role in Asian culture, with family relationships characterized by a strong sense of loyalty and reciprocity. For this reason, alcohol prevention programs for Asian Americans may be improved by increasing family involvement (Hawkins et al., 1999). As a way of increasing family involvement, parent training might be desirable for promoting adolescent behavior management skills. In particular, parents of Asian American adolescents should consider parenting education or workshops run by professional ethnic staff that could help to build their skills in preventing or reducing their adolescent's alcohol use and other risky behaviors (Hawkins et al., 1999).

Intervention and Education Efforts on the Prevention of Adolescent Alcohol Use

The developmental framework for this study can also help guide interventions for adolescents when they experience the transitions from early adolescence to late adolescence, and into young adulthood. During this transition period, their physical development and the changes in their social and cultural contexts can create obstacles to the discovery of appropriate intervention programs and efforts to prevent and decrease alcohol use and alcohol related problems. During adolescence, social, cognitive, behavioral and biological changes, and stressful life situations may develop and contribute to increased alcohol use (Windle et al., 2008). From a psychosocial perspective, increased autonomy, new social roles, stressful situations, less parental

attention and greater importance of peer relationships may be related to increased risk of problematic alcohol use, and problematic drinking during adolescence may lead to increased alcohol use disorders in young adulthood (D'Amico, et al., 2001). Intervention programs based on a developmental perspective (Donaldson et al., 1996) that incorporate environmental and social factors (Jansen et al., 1996), are more likely to be effective. For example, intervention methods for college students need to be different from high school student preventions. Effective preventions should take into account how college student think about drinking problems. They suggest alternatives to alcohol use for socializing, romantic encounters, and stressful situations (Schulenberg & Maggs, 2002), dormitory curfew rules for freshmen, and encouraging social responsibility through community work (Youniss & Yates, 1997).

Alcohol use decisions result from cognitive evaluation and emotional states, which depend on motivations to engage in alcohol use and social contexts (e.g., peer drinking) (Sobell, Sobell, Toneatto, and Leo, 1993; Klingemann, 1991). Some studies have reported that motivations may be very important for adolescents who voluntarily participate in alcohol prevention interventions with motivational enhancement principles (Brown, Anderson, Schulte, Sintov, and Frissell, 2005). Motivation may help reduce or stop alcohol use. However, appropriate environmental scaffolding should be provided, or positive outcomes will be limited (D'Amico, et al., 2001). Motivational principles against alcohol use should highlight training for improving self-efficacy and cognitive behavioral skills. To succeed in the prevention of adolescent alcohol use and abuse, tailored intervention based on the cognitive and social contexts of adolescence should be considered.

Helping adolescents learn social skills and interpersonal problem solving skills using cognitive approaches may also be effective against risky behavior like alcohol use. Cognitive social skills may lead adolescents to think through, and make use of, alternative solutions to problems like alcohol use with peers. Adolescents can develop these skills by participating in cooperative learning groups and social activities that do not involve problem behaviors. These cognitive social skills may develop adolescents' abilities to recognize and resist social pressures to engage in alcohol use and could help create positive alternatives to socializing with friends who drink. In addition, problem-solving skills are effective against alcohol use through the improvement of coping skills, enhancement of communication, decision making, negotiation and conflict resolution skills (Kadden, 2001; Hawkins et al., 1999). In particular, social adjustment skills are crucial to prevent continuity of alcohol use through the enhancement of successful coping skills that result in enhanced self-esteem (D'Amico, et al., 2001). Effective prevention priorities include stress reduction and decision making for broader skill acquisitions, and resistance skills training. Further, building resilience skills and strengthening the capacity to rebound from adversity are critical to prevent and decrease alcohol use (Bukstein, 1995; NIDA, 1997, 2003).Therefore, alcohol prevention programs should incorporate skills-focused programs, including improving self-efficacy against alcohol use, and developing decision making, social, and peer-pressure resistance skills. Adolescents may also learn attitudes and behavior related to alcohol use from peer or sibling alcohol use or parental behavior and attitudes (in the process of social modeling) (Donaldson, Graham, Piccinin, & Hansen, 1995). Skills training programs are popular for both the prevention of alcohol use, and the ability to resist pressure to use alcohol (Perry et al., 1993; Williams et al.,

1999). The most effective interventions are interactively conducted, enhance skills for refusing drug offers, and improve social competency skills (Botvin, Griffin, Diaz & Ifill-Williams, 2001; Botvin, 2000). In prevention programs, knowledge, affection and skills are important elements. In particular, skills-focused programs for behavior change are more effective than affect-focused programs for attitude change or knowledge change (Tobler & Stratton, 1997; Faggiano et al., 2008; Brown et al., 2005).

Furthermore, school based alcohol prevention programs often lack continuous support for adolescents to maintain abstinence and decrease alcohol use (Zunz, Ferguson, and Senter, 2005). Developmentally tailored interventions, however, may increase the likelihood of successful outcomes (D'Amico, Metrik, McCarthy, Appelbaum, and Frissell, 2001). In the current study, school factors at the individual level including school bonding, school absenteeism, and low school achievement were significantly associated with increased alcohol use, but there was no significant association with school-level factors . School-related individual-level studies have overwhelmingly found that school bonding (O'Donnell, Hawkins, & Abbott, 1995) and teacher support (McNeely & Falci, 2004) were significantly associated with decreased alcohol use, whereas absenteeism and truancy from school were positively associated with increased alcohol use (Kaplan et al., 2003; (Hallfors, Cho, Brodish, Flewelling, & Khatapoush, 2006). As a result, alcohol use might be associated with low school bonding where students have fewer opportunities to be involved in school activities or less support from schools or teachers. At the school-level, participation in extracurricular activities might enhance school bonding, which in turn is protective against alcohol use (McNeely, & Falci, 2004; Darling, 2005). Thus, interventions should be developed to improve students' interactions with schools, to train

teachers to nurture stronger relationships with students, and to build positive school environments (Flay, Graumlich, & Segawa, et al., 2004; Bond, Patton, & Glover, et al., 2004).

In sum, programs based on knowledge and attitudes alone are unlikely to be effective. A combination of skill-based approaches that provide knowledge, but also enhance adolescents' ability to resist peer pressure and discourage use of other substances is more desirable (Ellickson, McCaffrey, Ghosh-Dastidar, & Longshore, 2003; Botvin, Griffin, & Diaz, et al., 2001). Further, because alcohol use is related to both the onset and escalation of use of other substances, including marijuana and other illicit drug use (D'Amico & McCarthy, 2006), multifaceted prevention approaches targeting the use of more than one substance might prove effective. However, Tobler (1992) found in a meta analysis that an alcohol prevention program was more successful than a multi-drug prevention program. This was especially true for students older than twelve, although younger adolescents may also benefit from receiving multiple drug education (Tobler et al., 1999). Thus, future research needs to investigate the effectiveness of multi-drug and single-drug prevention programs.

Single dimensional prevention strategies have been shown to be ineffective in achieving successful long term changes (Jansen, Glynn, & Howard, 1996). Multi-component approaches tend to be the more successful by incorporating various channels such as individuals, families, peers, schools, communities, the media, and the workplace. The use of media is an important part of appropriate prevention strategies in terms of educating communities, the enhancement of public awareness, the development of community support, and the maintenance of established prevention efforts.

The appropriate intensity and duration of prevention efforts should carefully be considered. According to Hawkins and associates (1999), a group that received an intervention over the full period of elementary school demonstrated better school bonding and academic achievement. However, a group that had been part of intervention in grades 5 and 6 only did not experience significantly lessened risk behaviors, such as heavy drinking and violent behaviors during adolescence. Early and sustained interventions are more likely to lead to positive health outcomes and to have longer durations of effectiveness. Further, booster sessions through adolescence may be necessary to maintain social norms and standards for positive health behaviors, and also promote less health compromising behavior (Resnick et al., 1997).

In efforts to modify behaviors towards substance use, effective primary prevention programs might be initiated before substance use begins. Secondary or tertiary prevention programs might be appropriate in the provision of programs to decrease substance use or it's outcomes (McBride et al., 2003).

Contributions and Limitations

The results of this study contribute to a better understanding of alcohol use behavior among Asian American adolescents. Because longitudinal studies of alcohol use in Asian American adolescents are limited in number, the results of this study provide important information on the predictors of alcohol use in this population. Furthermore, the sample was weighted and analyses employed multilevel models. As a result, this longitudinal study can be generalized nationally.

The identification of growth curve trajectories of alcohol use provide insight into socio-demographic factors, acculturation and psychosocial factors, peer and parent factors, and school and neighborhood factors related to alcohol use over time. Furthermore, the investigation of the relationship between age of alcohol use onset and the parental and peer alcohol use among Asian American adolescents were important in understanding the predictors and age of each onset group.

The strongest aspect of this study is the framework using multilevel analyses, which includes both individual-level and school-and neighborhood-level variables. The findings of the multilevel analyses using longitudinal data can help in the development of comprehensive prevention programs against alcohol use. In addition, information about the predictors of the age onset of alcohol use based on developmental stages provides important information for the development of prevention and education programs for Asian American adolescents. Longitudinal data can provide evidence of relationships between alcohol use and acculturation, psychosocial factors, parent, peer, school, and neighborhood factors among Asian American adolescents and young adults.

Although this study offers a base from which to extend research on alcohol use among Asian American adolescents, there are some limitations. The secondary data analyses allowed this study to use only existing variables, so variable selection was restricted. The data were collected by self-report, which might result in under or over-reporting. The validity of the data may therefore be compromised due to biased responses. In addition, this study did not consider the heterogeneity of Asian American adolescents. Further, the variables at the school- and neighborhood-level were measured at only one time point, in Wave I. Changes within the school and neighborhood, therefore were not

209

reflected in the trajectory of alcohol use over time. Analysis of this study using time

varying variables demonstrated that the parents, peers, acculturation, psychosocial factors,

school and neighborhood factors to alcohol use averaged across all ages investigated.

However, this study did not examine differences at each age in the relationship between

variables and alcohol use. Additionally, this study did not examine the reciprocity between

alcohol use and factors that were examined in this study. Furthermore, the test for a

missing at random (MAR) was not conducted. However, data for the current study were

assumed to follow a MAR mechanism and multiple imputation was performed.

Future Implications

This study focused on Asian American adolescents using longitudinal data.

However, this study did not distinguish among subgroups of Asian American adolescents.

Thus, it does not reflect the specific cultural and economic backgrounds of the Asian

American subpopulations. Further research needs to include Asian American subgroups

to explore their group-specific predictors of alcohol use. In addition, this study used

alcohol consumption as the dependent variable, but binge drinking, other substance use

and alcohol-related problems need to be investigated.

The current study used a variable centered approach, but research on patterns of

trajectories needs to be carried out to further understanding of alcohol use as having

different antecedent factors (Schulenberg et al, 1996). Multiple trajectories offer a

method to define risk factors or influencing factors in certain types of adolescents based

on initial and subsequent levels of alcohol use (Muthen & Muthen, 2000). Thus, these

different trajectories may help to understand the normative developmental trends and

wide diversity of trajectories of change in alcohol use over time. The investigation of multiple trajectories can help the development of prevention programs according to different developmental patterns of alcohol use.

Asian American adolescents have different levels of acculturation and cultural backgrounds, so the intervention and education programs for the prevention of alcohol use should consider these differences. There is a paucity of longitudinal studies of Asian American adolescents, so more research using longitudinal data needs to be conducted on this group to promote health and reduce risky behaviors.

Finally, because alcohol use is associated with negative health outcomes, the prevention of alcohol use should be addressed in primary preventions to delay age of onset and prevent adolescent alcohol use. Intervention programs need to identify, educate and intervene in alcohol use with the goal of decreasing alcohol use before progression to the use of other illicit substances. Thus, these results may contribute to the creation of prevention programs concerning alcohol use and be of benefit to those who work in adolescent health.

References

Beauvais, F. (1998). Cultural identification and substance use in North America: An annotated bibliography. *Subst. Use Misuse*, 33, 1315-1336.

Berry, J. W., Kim, U., Minde, T. & Mok, D. (1987). Comparative studies of acculturative stress. *International Migration Review*, 21, 491-511.

Berry, J. W. (2004). Psychology of group relations: cultural and social dimensions. *Aviat Space Environ Med, 75*(7 Suppl), C52-57.

Bhattacharya, G. (1998). Drug use among Asian-Indian adolescents: identifying protective/risk factors. *Adolescence, 33*(129), 169-184.

Black, S. A., & Markides, K. S. (1993). Acculturation and alcohol consumption in Puerto Rican, Cuban-American, and Mexican-American women in the United States. *Am J Public Health, 83*(6), 890-893.

Bond, L., Patton, G., Glover, S., et al. (2004).The Gatehouse Project: can a multi-level school intervention affect emotional well-being and health risk behaviours? *J Epidemiol Community Health*, 58, 997–1003.

Bonnheim, M. L., & Korman, M. (1985). Family interaction and acculturation in Mexican-American inhalant users. *J Psychoactive Drugs, 17*(1), 25-33.

Botvin, G.J., Griffin, K.W., Diaz, T., et al. (2001). Drug abuse prevention among Minority adolescents: posttest and one-year follow-up of a school based preventive intervention. *Prev Sci*, 2, 1–13.

Botvin, G.J.(2000). Preventing drug abuse in schools: social and competence enhancement approaches targeting individual-level etiological factors. *Addict Behav*. 25(6),887-897.

Botvin, G.J., Schinke, S.P., Epstein, J.E., et al. (1994). The effectiveness of culturally focused and generic skills training approaches to alcohol and drug abuse prevention among minority youth. *Psychol Addict Behav*. 8,116-127.

Brown, S.A, Anderson K.G, Schulte M.T, Sintov N.D, Frissell K.C.(2005). Facilitating youth self-change through school-based intervention. *Addict Behav,* 30(9), 1797–1810.

Bukstein, O. G.(1995). Influences on the risk and course of substance use and abuse in adolescents. Current Opinion in psychiatry, 8, 218-221.

Bush, P.J., Weinfurt K.P., Iannotti R.J. (1994). Families versus peers: developmental influences on drug use from Grade 4–5 to Grade 7–8. *J Appl Dev Psychol,* 15, 437–56.

Caetano, R. (1987a). Acculturation and attitudes toward appropriate drinking among U.S. Hispanics. *Alcohol Alcohol, 22*(4), 427-433.

Caetano, R. (1987b). Acculturation, drinking and social settings among U.S. Hispanics. *Drug Alcohol Depend, 19*(3), 215-226.

Caetano, R., & Mora, M. E. (1988). Acculturation and drinking among people of Mexican descent in Mexico and the United States. *J Stud Alcohol, 49*(5), 462-471.

Caetano, R., Ramisetty-Mikler, S., McGrath, C. (2004). Acculturation, drinking, and intimate partner violence among Hispanic couples in the United States: a longitudinal study. *Hisp J Behav Sci*, 26:60–78

Caetano, R., Ramisetty-Mikler, S., & Rodriguez, L. A. (2008). The Hispanic Americans baseline alcohol survey (HABLAS): DUI rates, birthplace, and acculturation across Hispanic national groups. *J Stud Alcohol Drugs, 69*(2), 259-265.

Caetano, R., Ramisetty-Mikler, S., Wallisch, L. S., McGrath, C., & Spence, R. T. (2008). Acculturation, drinking, and alcohol abuse and dependence among Hispanics in the Texas-Mexico border. *Alcohol Clin Exp Res, 32*(2), 314-321.

Coffelt, N. L., Forehand, R., Olson, A. L., Jones, D. J., Gaffney, C. A., & Zens, M. S. (2006). A longitudinal examination of the link between parent alcohol problems and youth drinking: the moderating roles of parent and child gender. *Addict Behav, 31*(4), 593-605.

D'Amico, E.J. and McCarthy, D.M. (2006). Escalation and Initiation of Younger Adolescents' Substance Use: The Impact of Perceived Peer Use, *Journal of Adolescent Health,* 39, 481–487.

D'Amico, E.J, Metrik J, McCarthy D.M, Appelbaum M, Frissell K.C, (2001). Brown SA. Progression into and out of binge drinking among high school students. *Psychol Addict Behav.* 15(4): 341–349

Darling, N.(2005). Participation in extracurricular activities and adolescent adjustment: cross-sectional and longitudinal findings. *J Youth Adolesc*, 34, 493–505.

Donaldson, S. I., Graham, J. W., Piccinin, A. M., & Hansen, W. B. (1995). Resistance-skills training and onset of alcohol use: evidence for beneficial and potentially harmful effects in public schools and in private Catholic schools. *Health Psychol, 14*(4), 291-300.

Donaldson, S.I., Sussman, S., Mackinnon, D. P., Severson, H. H., Glynn, T., Murray, D. M., & Stone, E. J. (1996). Drug abuse prevention programming. American Behavioral Scientist, 39, 868-883.

Donovan, J. E., Leech, S. L., Zucker, R. A., Loveland-Cherry, C. J., Jester, J. M., Fitzgerald, H. E., et al. (2004). Really underage drinkers: alcohol use among elementary students. *Alcohol Clin Exp Res, 28*(2), 341-349.

Ellickson, P.L., Faggiano, F., Galanti, M. R., Bohrn, K., Burkhart, G., Vigna-Taglianti, F., Cuomo, L., et al. (2008). The effectiveness of a school-based substance abuse prevention program: EU-Dap cluster randomised controlled trial. *Prev Med, 47*(5), 537-543.

Flay, B., Graumlich, S., Segawa, E,. et al. (2004). Effects of 2 prevention programs on high-risk behaviors among African American youth. A randomized trial. *Arch Paediatr Adolesc Med*, 158, 377– 84.

Grant, J. D., Scherrer, J. F., Lynskey, M. T., Lyons, M. J., Eisen, S. A., Tsuang, M. T., et al. (2006). Adolescent alcohol use is a risk factor for adult alcohol and drug dependence: evidence from a twin design. *Psychol Med, 36*(1), 109-118.

Harachi, T. W., Catalano, R. F., Kim, S., & Choi, Y. (2001). Etiology and prevention of substance use among Asian American youth. *Prev Sci, 2*(1), 57-65.

Hawkins, J. D., Graham, J. W., Maguin, E., Abbott, R., Hill, K. G., & Catalano, R. F. (1997). Exploring the effects of age of alcohol use initiation and psychosocial risk factors on subsequent alcohol misuse. *J Stud Alcohol, 58*(3), 280-290.

Hawkins, J. D., Catalano, R. F., Kosterman, R., Abbott, R., & Hill, K. G. (1999). Preventing adolescent health-risk behaviors by strengthening protection during childhood. *Arch Pediatr Adolesc Med, 153*(3), 226-234.

Hawkins, J.D., & Weis, J.G. (1985). The social development model: An integrated approach to delinquency prevention. *Journal of Primary Prevention*, 6, 73-97.

Hallfors, D., Cho, H., Brodish, P. H., Flewelling, R., & Khatapoush, S. (2006). Identifying high school students "at risk" for substance use and other behavioral problems: implications for prevention. *Subst Use Misuse, 41*(1), 1-15.

Hendershot, C. S., MacPherson, L., Myers, M. G., Carr, L. G., & Wall, T. L. (2005). Psychosocial, cultural and genetic influences on alcohol use in Asian American youth. *J Stud Alcohol, 66*(2), 185-195.

Hines, A. M., & Caetano, R. (1998). Alcohol and AIDS-related sexual behavior among Hispanics: acculturation and gender differences. *AIDS Educ Prev, 10*(6), 533-547.

Hingson, R., Heeren, T., Levenson, S., Jamanka, A., & Voas, R. (2002). Age of drinking onset, driving after drinking, and involvement in alcohol related motor-vehicle crashes. *Accid Anal Prev, 34*(1), 85-92.

Hingson, R., Heeren, T., Winter, M. R., & Wechsler, H. (2003). Early age of first drunkenness as a factor in college students' unplanned and unprotected sex attributable to drinking. *Pediatrics, 111*(1), 34-41.

Hingson, R., Heeren, T., & Zakocs, R. (2001). Age of drinking onset and involvement in physical fights after drinking. *Pediatrics, 108*(4), 872-877.

Hingson, R., Heeren, T., Zakocs, R., Winter, M., & Wechsler, H. (2003). Age of first intoxication, heavy drinking, driving after drinking and risk of unintentional injury among U.S. college students. *J Stud Alcohol, 64*(1), 23-31.

Hingson, R. W., Heeren, T., Jamanka, A., & Howland, J. (2000). Age of drinking onset and unintentional injury involvement after drinking. *Jama, 284*(12), 1527-1533.

Hingson, R. W., Heeren, T., & Winter, M. R. (2006). Age at drinking onset and alcohol dependence: age at onset, duration, and severity. *Arch Pediatr Adolesc Med, 160*(7), 739-746.

Hingson, R. W., & Zha, W. (2009). Age of drinking onset, alcohol use disorders, frequent heavy drinking, and unintentionally injuring oneself and others after drinking. *Pediatrics, 123*(6), 1477-1484.

Izuno, T., Miyakawa, M., Tsunoda, T., Parrish, K. M., Kono, H., Ogata, M., et al. (1992). Alcohol-related problems encountered by Japanese, Caucasians, and Japanese-Americans. *Int J Addict, 27*(12), 1389-1400.

Jackson, C., Henriksen, L., Dickinson, D., & Levine, D. W. (1997). The early use of alcohol and tobacco: its relation to children's competence and parents' behavior. *Am J Public Health, 87*(3), 359-364.

Jansen, M. A., Glynn, T., & Howard, J. (1996). Prevention of alcohol, tobacco, and other drug Abuse, *American Behavioral Scientist*, 39, 790-807.

Johnson, P. B., Boles, S. M., & Kleber, H. D. (2000). The relationship between adolescent smoking and drinking and likelihood estimates of illicit drug use. *J Addict Dis, 19*(2), 75-81.

Kandel, D. B. (2003). Does marijuana use cause the use of other drugs? JAMA 289:4 82–483.

Kaplan, C. P., Zabkiewicz, D., McPhee, S. J., Nguyen, T., Gregorich, S. E., Disogra, C., et al. (2003). Health-compromising behaviors among Vietnamese adolescents: the role of education and extracurricular activities. *J Adolesc Health, 32*(5), 374-383

Kaskutas, L.A., Bond, J., Humphreys, K. (2002) Social networks as mediators of

the effect of alcoholics anonymous. *Addiction* 97:891–900.

Klingemann H.K. (1991).The motivation for change from problem alcohol and heroin use. *Br J Addict.* 86(6), 727–744.

Lessem, J. M., Hopfer, C. J., Haberstick, B. C., Timberlake, D., Ehringer, M. A., Smolen, A., et al. (2006). Relationship between adolescent marijuana use and young adult illicit drug use. *Behav Genet, 36*(4), 498-506.

Loveland-Cherry, C. J., Ross, L. T., & Kaufman, S. R. (1999). Effects of a home-based family intervention on adolescent alcohol use and misuse. *J Stud Alcohol Suppl, 13*, 94-102.

McCaffrey, D.F., Ghosh-Dastidar, B., Longshore, D. L. (2003). New inroads in preventing adolescent drug use: results from a large scale trial of project ALERT in middle schools. *Am J Public Health*, 93,1830–6.

McBride, N., Farringdon, F., & Midford, R. (2000). What harms do young Australians experience in alcohol-use situations? *Aust N Z J Public Health, 24*(1), 54-59.

McBride, N., Farringdon, F., Midford, R., Meuleners, L., & Phillips, M. (2003). Early unsupervised drinking--reducing the risks. The School Health and Alcohol Harm Reduction Project. *Drug Alcohol Rev, 22*(3), 263-276.

McNeely, C., & Falci, C. (2004). School connectedness and the transition into and out of health-risk behavior among adolescents: a comparison of social belonging and teacher support. *J Sch Health, 74*(7), 284-292.

Muthen, B. O., & Muthen, L. K. (2000). The development of heavy drinking and alcohol-related problems from ages 18 to 37 in a U.S. national sample. *J Stud Alcohol, 61*(2), 290-300.

Nagata, D. K. (1994). Asian American and Pacific Islanders Mental Health Issues%colon; A Historical Perspective. *Asian Am Pac Isl J Health, 2*(2), 108-124.

National Institute on Drug Abuse. (1997). *Preventing drug use among children and adolescents: A research-based guide* (NIH publication No. 97-4212). Washington, DC: U.S. Government printing Office.

National Institute on Drug Abuse. (2003). *Preventing drug use among children and adolescents: A research-based guide for parent, educators, and community leaders* (2nd ed) (NIH publication No. 04-4212B).

O'Donnell J, Hawkins JD, Abbott RD.(1995). Predicting serious delinquency and substance use among aggressive boys. J Consult Clin Psychol, 63, 529 –37.

Pedersen, W., & Skrondal, A. (1998). Alcohol consumption debut: predictors and consequences. *J Stud Alcohol, 59*(1), 32-42.

Perkins, H. W. (1992). Gender patterns in consequences of collegiate alcohol abuse: a 10-year study of trends in an undergraduate population. *J Stud Alcohol, 53*(5), 458-462.

Perry, C. L., Williams, C. L., Forster, J. L., Wolfson, M., Wagenaar, A. C., Finnegan, J. R., et al. (1993). Background, conceptualization and design of a community-wide research program on adolescent alcohol use, Project Northland. *Health Educ Res, 8*(1), 125-136.

Perry, C. L., & Staufacker, M. J.(1996). *Tobacco use*. In R. J. DiClemente, W. B. Hanson, & L. E. Ponton(Eds.) , Handbook of adolescent health risk behavior (pp.53-81). New York: Plenum Press.

Resnick, M. D., Bearman, P. S., Blum, R. W., Bauman, K. E., Harris, K. M., Jones, J., et al. (1997). Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. *Jama, 278*(10), 823-832.

Santisteban D.A., Muir-Malcolm J.A., Mitrani V.B., et al. (2002). Integrating the study of ethnic culture and family psychology intervention science. In: Liddle HA, Santisteban DA, editors. Family psychology: science based interventions. Washington, DC7 American Psychological Association. p. 331– 51.

Scheier, L. M., Botvin, G. J., & Baker, E. (1997). Risk and protective factors as predictors of adolescent alcohol involvement and transitions in alcohol use: a prospective analysis. *J Stud Alcohol, 58*(6), 652-667.

Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *J Stud Alcohol Suppl*(14), 54-70.

Schulenberg, J., Maggs, J. L., Steinman, K. and Zucker, R.A. (2001) *Development matters: Taking the long view on substance abuse etiology and intervention during adolescence.* In: Monti,P.M., Colby, S.M. and O'leary, T.A. (Eds.). Adolescents Alcohol, and Substance Abuse:Reaching Teens through Brief Intervention, New York: Guilford Press, 19-57.

Schulenberg, J., O'Malley, P. M., Bachman, J. G., Wadsworth, K. N., & Johnston, L. D. (1996). Getting drunk and growing up: trajectories of frequent binge drinking during the transition to young adulthood. *J Stud Alcohol, 57*(3), 289-304.

Sobell L.C, Sobell M.B, Toneatto T, Leo G.I. (1993). What triggers the resolution of alcohol problems without treatment. *Alcohol Clin Exp Res.* 17(2):217–224

Spoth, R., Redmond, C., & Shin, C. (1998). Direct and indirect latent variable parenting outcomes of two universal family-focused preventive interventions: Extending a public health-oriented research base. *Journal of Consulting and Clinical Psychology, 66,* 385–399.

Spoth, R., Redmond, C., Shin, C., & Azevedo, K. (2004). Brief family intervention effects on adolescent substance initiation: school-level growth curve analyses 6 years following baseline. *J Consult Clin Psychol, 72*(3), 535-542.

Spoth, R. L., Redmond, C., & Shin, C. (2001). Randomized trial of brief family interventions for general populations: adolescent substance use outcomes 4 years following baseline. *J Consult Clin Psychol, 69*(4), 627-642.

Spoth, R., Trudeau, L., Guyll, M., Shin, C., & Redmond, C. (2009). Universal intervention effects on substance use among young adults mediated by delayed adolescent substance initiation. *J Consult Clin Psychol, 77*(4), 620-632.

Szapocznik J, Kurtines W.M. (1993). Family psychology and cultural diversity: Opportunities for theory, research and application. *American Psychologist*, 48, 400–407.

Szapocznik J., Santisteban D., Kurtines W.M., Perez-Vidal A., Hervis O.E.(1984). Bicultural effectiveness training:A treatment intervention for enhancing intercultural adjustment. *Hispanic Journal of Behavioral Sciences*, 6, 317–344.

Szapocznik J, Santisteban D., Rio A., Perez Vidal A., Kurtines W.M., Hervis O.E. (1986). Bicultural effectiveness training (BET): An intervention modality for families experiencing intergenerational/intercultural conflict. *Hispanic Journal of Behavioral Sciences*, 6, 303–330.

Tobler, N. (1992) Drug prevention programs can work: research findings. *Journal of Addictive Diseases*, 11, 1–28

Tobler, N., Lessard, T., Marshall, D., Ochshorn, P. and Roona, M. (1999) Effectiveness of school-based drug prevention programs for marijuana use. *School Psychology International*, 20, 105–137.

Tobler, N. and Stratton, H. (1997) Effectiveness of school based drug prevention programs: a meta-analysis of the research. *Journal of Primary Prevention*, 18, 71–128.

Tosh, A. K., & Simmons, P. S. (2007). Sexual activity and other risk-taking behaviors among Asian-American adolescents. *J Pediatr Adolesc Gynecol, 20*(1), 29-34.

Triandis, H. C. (2001). Individualism-collectivism and personality. *J Pers, 69*(6), 907-924.

Udry, J.R. (2003). Add Health data. Chapel Hill, North Carolina; Carolina Population Center.

US Department of Health and Human Services, *Healthy People 2010*: Understanding and Improving Health, 2nd ed. Washington, DC: US.Government Printing Office, November 2000.

Vaughn, M., Wallace, J., Perron, B., Copeland, V., & Howard, M. (2008). Does marijuana use serve as a gateway to cigarette use for high-risk African-American youth? *Am J Drug Alcohol Abuse, 34*(6), 782-791.

Wahl, A. M., & Eitle, T. M. (2008). Gender, Acculturation and Alcohol Use among Latina/o Adolescents: A Multi-Ethnic Comparison. *J Immigr Minor Health*.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college. A national survey of students at 140 campuses. *Jama, 272*(21), 1672-1677.

Williams, C. L., Perry, C. L., Farbakhsh, K., & Veblen-Mortenson, S. (1999). Project Northland: comprehensive alcohol use prevention for young adolescents, their parents, schools, peers and communities. *J Stud Alcohol Suppl, 13*, 112-124.

Windle, M., Spear, L. P., Fuligni, A. J., Angold, A., Brown, J. D., Pine, D., et al. (2008). Transitions into underage and problem drinking: developmental processes and mechanisms between 10 and 15 years of age. *Pediatrics, 121 Suppl 4*, S273-289.

Yeh, C., & Inose, M. (2002). Difficulties and coping strategies of Chinese, Japanese, and Korean immigrant students. *Adolescence, 37*(145), 69-82.

Youniss, J. and Yates, M. (1997). Community Service and social Responsibility in Youth, Chicago, II: Univ. of Chicago Press.

Zemore, S. E. (2005). Re-examining whether and why acculturation relates to drinking outcomes in a rigorous, national survey of Latinos. *Alcohol Clin Exp Res, 29*(12), 2144-2153.

Zemore, S. E., Mulia, N., Yu, Y., Borges, G., & Greenfield, T. K. (2008). Gender, acculturation, and other barriers to alcohol treatment utilization among Latinos in three National Alcohol Surveys. *J Subst Abuse Treat*.

Zucker, R. A., Donovan, J. E., Masten, A. S., Mattson, M. E., & Moss, H. B. (2008). Early developmental processes and the continuity of risk for underage drinking and problem drinking. *Pediatrics, 121 Suppl 4*, S252-272.

Zunz S.J, Ferguson N.L, Senter M. (2005). Post-identification support for substance

dependent students in school-based programs: the weakest link. *J Child Adolesc Subst Abuse.* 14(4):77–92.