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# Explaining Drinking Patterns and Heavy Drinking Among Racial and Ethnic Subgroups in the United States

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Explaining Drinking Patterns and Heavy Drinking  
Among Racial and Ethnic Subgroups in the United States

by

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A thesis submitted in partial fulfillment  
of the requirements for the degree of  
Master of Arts  
Department of Criminology  
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Subgroups in the United States

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**ABSTRACT**

The study of racial differences in the consumption of alcohol and the prevalence of alcohol-related problems has clearly matured in recent years. Researchers have moved away from single-factor explanations and are beginning to develop and test theories focusing on the complex interplay of psychological, historical, cultural, and social factors that describe and explain alcohol use among racial and ethnic subgroups in the United States. The current study continues this maturation process by further examining the complex interaction effects of predictor variables that have established their utility in explaining racial/ethnic subgroup differences in alcohol consumption and alcohol-related problems. This study analyzes data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative sample of people 18 and older (n = 43,093), using OLS regression with the inclusion of interaction terms. The NESARC is a representative sample which provides ample coverage of the relevant subgroups (e.g. citizens and noncitizens). This study also looks at the impact of social and economic stressors on alcohol use.

## **Chapter 1**

### **Introduction**

Patterns of alcohol use and alcohol-related consequences vary widely among minority groups. Studies have found evidence suggesting that prevention and treatment efforts may be more effective when based on an understanding of the ethnic context of drinking behaviors and their development (Botvin et al., 1995; Kumpfer, 1998). Alcohol use and abuse has a wide range of potential costs, including social, medical, and financial consequences (see National Institute on Alcohol Abuse and Alcoholism, 2002 for an overview).

Research on alcohol's health effects on minority populations has typically focused on rates of liver disease and cirrhosis. Findings indicate that African-Americans may be as much as 10 times more likely than whites to die from cirrhosis of the liver, and that Hispanic cirrhosis mortality rates are approximately twice that of whites (Blot & Fraumeni, 1987; National Institute of Alcohol Abuse and Alcoholism, 1982; Singh & Hoyert, 2000). Hispanic males have the highest cirrhosis mortality rates of any group (National Institute on Alcohol Abuse and Alcoholism, 2002).

The social consequences include higher rates of mental hospital admissions observed for some minorities, as well as increased rates of arrest for drunk driving, drunken driving deaths, and other alcohol related offenses (Locke & Duvall, 1964; Stinson et al., 1998; Zax et al., 1964). Research on minority alcohol use behavior and the

related consequences is vital. Identifying subpopulations at the greatest risk for particular alcohol-related problems can help public health professionals target their prevention strategies in order to intervene before the problem is fully developed (National Institute on Alcohol Abuse and Alcoholism, 2006).

Many researchers have examined racial and ethnic differences in alcohol use behaviors in the United States. There is a significant body of extant literature concerning patterns and trends of alcohol consumption in the United States (Caetano & Clark, 1998a; Caetano & Kaskutas, 1995; Midanik & Clark, 1994; Williams et al., 1997; Steffens et al., 1988). Other research has explored alcohol-related health disparities across subgroups, differential rates of heavy drinking and alcohol-related problems, and the race specific causes of alcohol use behaviors. Overall, research on alcohol use behaviors among racial and ethnic subgroups in the United States has illustrated that drinking behaviors and their causes differ across race and ethnicity (Barr et al., 1993; Caetano & Clark, 1998a, 1998b; Caetano et al., 1998; Dawson et al., 1995; Galvan & Caetano, 2003; Grant, 1997; Herd, 1994; Herd & Caetano, 1987; Jones-Webb et al., 1995; Jones-Webb, 1998; Nielsen, 2000). In addition to racial differences, social scientists have examined the influence of social stressors, socioeconomic status, educational attainment, employment status, marital status, and immigration on differential drinking behaviors.

A number of factors that influence alcohol use behaviors among racial and ethnic subgroups have been consistently established across the extant literature. These factors have shown at least marginal utility in explaining observable disparities in alcohol use behaviors. However, much of the existing literature is only able to attain partial explanations of these disparities leading to the suggestion that the alcohol use behaviors



of ethnic subgroups result from a complex interplay of social, psychological, historical, and cultural factors (Caetano et al., 1998). The current study examines the interactions between demographics, and draws some conclusions about the role that social and economic factors play in shaping drinking behaviors across race.

This study analyzes data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), in order to attain a better classification of differential alcohol use behaviors across racial and ethnic subgroups within the United States. NESARC, which is the largest survey of this type conducted to date, contains an extensive battery of questions about present and past alcohol consumption, alcohol use disorders, and the use of alcohol treatment services (National Institute on Alcohol Abuse and Alcoholism, 2006). The current study uses this contemporary, rich and unparalleled data source to examine the relationships between the interactive effects of established predictors of alcohol use behaviors and outcome variables that represent the frequency of heavy drinking and the average level of alcohol consumption.

The importance of conducting alcohol research among minorities is underscored by the disparate findings concerning levels of heavy drinking and alcohol-related problems (Caetano et al., 1998). The continued study of similarities and differences in alcohol consumption patterns across these subgroups within the U.S. can help guide societal changes, such as the implementation of treatment programs, the creation of ethnic specific prevention programs, and an overall better understanding of the motivations of alcohol use and abuse.

## Chapter 2

### Literature Review

#### Early Research

Much of the early research examining racial differences in alcohol consumption came in response to the appearance of disproportionate rates of alcohol-related problems among African-Americans (Herd, 1990; 1994). Several social and health indicators suggest that rates of alcohol-related problems are considerably higher among black males than among white males (Herd, 1994). Studies have shown that blacks are as much as 10 times more likely than whites to die from liver cirrhosis, and at higher risk for esophageal cancer than whites (National Institute of Alcohol Abuse and Alcoholism, 1982; Blot & Fraumeni, 1987). More recent research has shown that Hispanics are about twice as likely as whites to die from cirrhosis of the liver and other liver diseases (Singh & Hoyert, 2000). Black men were also overrepresented in mental hospital admissions for alcohol-related diagnoses and in arrest statistics for public drunkenness (Gorowitz et al., 1970; Locke & Duvall, 1964; Zax et al., 1964).

Herd (1990; 1994) notes contrasting findings throughout the extant literature concerning black drinking patterns; some studies report that rates of heavier drinking and alcohol-related problems are lower for black men than for white men (Caetano, 1984; Clark and Midanik, 1982; Rappaport et al., 1975). In contrast, other studies have described considerably higher rates of heavy alcohol consumption and related social,

legal and health consequences for black males compared to white males (Cahalan, 1970; Cahalan & Room, 1974; Robins et al., 1968). Herd (1994) attributes these contrasting findings to sampling and regional differences, noting that most of the studies used small or geographically limited groups of black respondents.

In 1984, the first major national survey of drinking patterns in the U.S. black population was conducted (Herd, 1990). Studies began to examine subgroup differences in drinking patterns at a national level in terms of demographics, socioeconomic status, and more. Despite the fact that black and white men exhibit very similar drinking patterns on the aggregate level, major black-white differences occur when the relationship between drinking rates and major social characteristics is considered (Herd, 1990; 1994). Herd (1990) examines subgroup differences between white and black males in terms of the effects of age, income, and region on heavier drinking behaviors. Her results indicate that frequent heavier drinking among whites is associated with youthfulness, high-income status, and residing in areas with high concentrations of outlets for alcohol purchase, whereas among blacks these patterns are reversed or absent. When blacks and whites were examined together, race emerged as an independent predictor of heavier drinking. Among blacks, income and age emerged as significant predictors of heavy drinking, and the influence of age differed by race (Herd, 1990). Herd suggests that there may be important differences in the cultural environments surrounding drinking behaviors of black and white men.

In addition to age, income, and region, Herd's 1994 analyses look at marital status, education, employment status, and religious preference as possible predictors of racial differences in problem drinking. She finds that while black men experience higher

rates of alcohol-related problems than white men, the two groups do not differ significantly on major risk factors for negative drinking consequences, such as heavier drinking, drunkenness or liberalism of drinking norms. They do however differ considerably in terms of social characteristics which may also affect the amount of problems they experience related to the consumption of alcohol. Herd finds that as the frequency of heavier drinking increases, rates of drinking problems rise faster among black men than white men. She notes that black men are more likely to be impoverished, undereducated, and unemployed, which might make them more vulnerable to social and health consequences of heavier drinking. This lower socioeconomic status may limit access to health care resulting in increased health problems, and residing in lower class neighborhoods may increase the likelihood of contact with police and subsequent alcohol-related arrests. Even when controlling for social and demographic characteristics Herd finds that higher rates of drinking problems persist among black men. She concludes that racial differences in the prevalence of drinking problems are likely related to differences in the sociocultural context of drinking and in the conditions in which black and white men live. The relationship between socioeconomic status, education, and employment with alcohol use behaviors is later addressed beyond main effect analyses.

Jones-Webb and colleagues (1995) examine the relationship between socioeconomic status and problem drinking among black and white men. Unemployed or lower income black males are significantly more likely than their white counterparts to report drinking consequences (Barr et al., 1993; Herd, 1994). Jones-Webb and colleagues examine this relationship further, predicting a two-way interaction of social

class with race/ethnicity and with drinking consequences and alcohol dependence symptoms. They find that less affluent black males reported greater number of drinking consequences and total drinking problems than less affluent white males. They also find that affluent black males reported fewer number of drinking consequences and total drinking problems than affluent white males. Lower class status seems to have a greater effect on drinking problems for black males than white males (Jones-Webb et al., 1995). Black men in lower classes may be more likely than white men in lower classes to experience overt forms of discrimination, and also may be more likely to live in communities where there is a greater police presence and fewer health and social resources (Jones-Webb et al., 1995; Gelberg et al., 1988; Herd, 1989; Morris, 1990). The work of Jones-Webb and colleagues is most like the current study, as it examines interactive effects of predictor variables on alcohol use behaviors and alcohol-related problems. The current study explores more interactions of predictor variables and their conditional influence on differential alcohol use behaviors among racial and ethnic subgroups in the United States.

The early research reviewed here begins to establish a relationship between certain predictor variables, such as socioeconomic status, age, employment, marital status, and religiosity and racial differences in alcohol consumption and alcohol-related problems (Herd, 1990; 1994; Jones-Webb et al., 1995). Some interactive effects of these predictors are also examined (Barr et al., 1993; Herd, 1994; Jones-Webb et al., 1995). This research focuses mainly on single factor predictor variables and a limited number of interactions, which limits its capacity to explain racial differences in alcohol use behaviors and alcohol related problems. Herd (1994) notes in her discussion, that the

meaning of these subgroup differences is unable to be fully explained by these types of analyses, indicating a need for more advanced modeling strategies.

### **Differential Trends in Alcohol Use**

Previous research has often examined overall trends between subgroups. This literature is reviewed because of the influence it has on more contemporary research. The differential rates of abstention and heavy drinking prompted a closer look by researchers into the relationship between social predictors and alcohol use behaviors.

Midanik and Clark (1994) examine trends in alcohol consumption patterns that reveal a per capita decline in the United States. Their analyses indicate that between 1984 and 1990, there were reductions in the rates of current drinkers, weekly drinkers, and drinkers who reported having five or more drinks on occasion at least once weekly. Multivariate analyses reveal that these trends were present among whites only, not among blacks or Hispanics (Midanik & Clark, 1994). Similarly, Caetano and Kaskutas (1995) find that heavy drinking decreased only among white men (from 19% to 12%) between 1984 and 1992. Among men, the incidence of heavy drinking was 7% among whites, 10% among blacks, and 17% among Hispanics. The stability of heavy drinking was greater among blacks (51%) and among Hispanic men (43%) than among white men (32%) (Caetano & Kaskutas, 1995). They find that the strongest predictor of drinking in 1992 is drinking in 1984. Reductions in heavy drinking observed among whites were not observed among blacks and Hispanics. Caetano and Kaskutas conclude that the greater stability of heavy drinking in blacks and Hispanics helps to explain higher rates of alcohol-related problems reported in the existing literature for these two groups.

Examining nationally representative survey data, Caetano and Clark (1998a; 1998b) continue the inquiry into the issue of racial differences in declining per capita consumption rates in the U.S. Their findings, in correspondence with previous research, indicate that between 1984 and 1995 frequent heavy drinking decreased among white men, but remained stable for black men, and increased slightly for Hispanic men. They find similar patterns in female drinking. Caetano and Clark (1998b) find stability in alcohol-related problem prevalence for both white and black men, but a sharp increase in problems among Hispanic men. The prevalence of alcohol-related problems is shown to be stable and relatively low for women in all three ethnic groups. Age and drinking volume were significant predictors of drinking problems across ethnicity and gender. For both white males and females, those who were divorced or who never married were more likely to report alcohol-related problems. In the male Hispanic group, unemployment and poverty increase the likelihood of reporting three or more alcohol-related problems. Hispanic men in the 1995 sample were also three times more likely to report alcohol-related problems than those in the 1984 sample (Caetano & Clark, 1998b). Caetano and Clark (1998a; 1998b) conclude that the reduction in per capita alcohol consumption in the U.S. between 1984 and 1995 differentially influenced individuals of white, black, and Hispanic ethnicity, and that rates of alcohol-related problems remain high among men in the United States, despite decreases in frequent heavy drinking among white men and increases in abstention among white, black, and Hispanic men.

These trend analyses which indicate that drinking behaviors and alcohol-related problems vary disproportionately by race illustrate a continuing need for research on this subject. Social scientists have sought more complete explanations of racial and ethnic

differences in alcohol use behaviors. The traditional predictors of subgroup differences in alcohol use behaviors remain important, but an analytic approach that better models the fit between these predictors and reality is required to gain proper understanding of differential drinking behaviors across racial groups.

### **Ethnicity and Alcohol Use**

The following sections review the literature concerning the drinking behaviors of the three ethnic minorities that are the focus of the current study.

#### ***Hispanic Alcohol Use***

According to Caetano and colleagues (1998), alcohol research among Hispanics in the United States exemplifies the difficulties in studying a heterogeneous minority population. They note that most analyses have treated Hispanics as a single group and have typically focused on male drinking patterns. Studies of Hispanic drinking patterns typically refer to “standard” Hispanic cultural norms that promote male alcohol consumption and female abstention (Caetano et al., 1998). More recent research has demonstrated that drinking patterns and rates of drinking-related problems differ among Hispanic subgroups. These findings indicate that Mexican-American and Puerto Rican men have higher rates of heavy drinking than do Cuban-American men (Aguirre-Molina & Caetano, 1994; Nielsen, 2000). According to Aguirre-Molina & Caetano (1994), Mexican-American women have higher rates of both abstention and frequent heavy drinking than Puerto Rican and Cuban-American women. Mexican-Americans have also been shown to exhibit more alcohol related problems than Cuban-Americans or Puerto Ricans (Caetano, 1988; Nielsen, 2000).



In general, findings on acculturation and drinking among Hispanics suggest that the drinking patterns of Hispanics who are more acculturated to U.S. society more closely resemble the drinking patterns of the general U.S. population than less acculturated Hispanics (Caetano, 1987; Vega et al., 1998). Vega and colleagues (1998) find that U.S.-born Latinos with low levels of acculturation have the highest rate of substance use problems of all Latinos in their study. Drinking behaviors related to acculturation among Hispanics may also be influenced by the country of origin, the region of the U.S. where they settle, and the personal characteristics and social status of the individual (Caetano, 1987; Dawson, 1998; Vega et al., 1998).

Caetano and colleagues (1998) conclude their discussion of drinking patterns and causes among Hispanics by urging social scientists to take into account social, economic, cultural, and historic aspects of Hispanic life in the United States when looking at alcohol consumption patterns. The current study takes this approach to exploring the issue of subgroup differences in alcohol use behaviors; examining complex interactions of a wide range of predictor variables.

### ***African-American Alcohol Use***

Much of the discussion of alcohol consumption patterns among African-Americans have focused on comparisons between blacks and whites, and have emphasized the prevalence of heavy drinking and ignored patterns of abstention and lighter drinking (Caetano et al., 1998; Jones-Webb, 1998). These studies review the relevant literature on drinking patterns and underlying causes among blacks which indicate that blacks have higher rates of abstention and lower rates of light drinking than whites, but the two groups report similar levels of frequent heavy drinking and blacks

often experience more alcohol-related problems than whites (Caetano & Clark, 1998a, 1998b; Caetano & Kaskutas, 1995; Dawson et al., 1995; Grant, 1997; Herd, 1994; Herd & Caetano, 1987).

Caetano and colleagues (1998) suggest that African-American drinking patterns and alcohol-related problems most likely result from “a complex interplay of individual attributes, environmental characteristics, and historical and cultural factors that shape the life history of blacks in the United States” (Caetano et al., 1998, 235). The literature stresses the influence of socioeconomic status on African-American drinking behaviors (Herd, 1990; 1994; Jones-Webb et al., 1995). Herd (1994) holds that the sociocultural context of drinking and the situations in which African-Americans live likely influences their increased rates of alcohol-related problems.

#### *Asian-American Alcohol Use*

In contrast to Hispanics and blacks, Asian-Americans have typically been considered a “model minority,” with high rates of abstention and low rates of frequent heavy alcohol use (Caetano et al., 1998). Caetano and colleagues (1998) hold that this image likely results from the fact that few Asian-Americans enter alcohol treatment and from the lack of research on alcohol consumption patterns of at risk Asian-Americans. They also note that, like Hispanics, there is substantial variability between different Asian subgroups. The highest proportions of heavy drinkers are found among Japanese-Americans, followed by Filipino-Americans, Korean-Americans, and Chinese-Americans (Sasao, 1991). Overall, the lifetime alcohol use among all Asian subgroups is lower than the national average (Caetano et al., 1998).

Researchers have developed several theories to explain the stereotyped drinking patterns of low rates of alcohol consumption among Asian-Americans (Caetano et al., 1998). A popular explanation is the flushing response that many Asians experience. This response is an adverse physiological reaction to alcohol ingestion that includes flushing of the skin, especially in the face and torso, and an increase in skin temperature. Various researchers have considered this negative physiological sensitivity to alcohol ingestion a protective factor against excessive alcohol use (Caetano et al., 1998; Ewing et al., 1974; Johnson, 1989; Zeiner et al., 1979).

Other researchers have argued that low alcohol consumption levels among Asians are related to cultural values, such as the influence of ancient Confucian and Taoist philosophies that emphasize conformity and harmony (Singer 1974; Sue et al., 1985). Researchers suggest that cultural emphasis on responsibility, interdependence, restraint, and group achievement along with the fact that drinking in most Asian cultures takes place in prescribed social situations may contribute to limited abuse of alcohol (Hsu, 1981; Kitano et al., 1985).

Caetano and colleagues (1998) predict that acculturation to mainstream American culture should result in Asian adoption of white drinking patterns. Some studies have shown that later generations of immigrants tend to perceive more relaxed Asian cultural norms and drink more than their parents (Li & Rosenblood, 1994). Asians born in the United States have higher rates of alcohol use and lower rates of abstention than Asians born in their ancestral homelands (Johnson et al., 1987; Makimoto, 1998). Higuchi and colleagues (1994) find that the drinking behaviors of Japanese-Americans more closely resemble the drinking behaviors of whites in the United States than Japanese males of

similar age. Japanese-American men, like whites, experience higher risk for drinking problems when they are young, unlike Japanese men who are at higher risk for drinking problems during middle age (Higuchi et al., 1994). Other studies, however, did not confirm these cultural explanations (Akutsu et al., 1989; Chin et al., 1991).

Caetano and colleagues (1998) conclude their discussion of drinking patterns and underlying causes among Asian-Americans suggesting that future research must address the differences among various Asian-American ethnic groups and identify the interactive effects of physiological, cultural, and social factors that influence Asian-American drinking patterns.

### **Emergent Themes**

Several themes emerge in the existing literature concerning racial differences in alcohol consumption and alcohol-related problems. Early research primarily focuses on examining trends between samples and between racial and ethnic subpopulations. Going beyond trend data, other studies focus on the relationships between single-factor predictor variables and outcomes of drinking behaviors and heavy drinking. Many of these predictor variables have been examined across numerous studies and have established their utility in explaining racial differences in alcohol consumption and heavier drinking. As outlined in the previous pages, the predictors that dominate the early research include: gender, age, income/socioeconomic status, educational attainment, employment status, marital status, and religion (Barr et al., 1993; Caetano & Clark, 1998a, 1998b; Caetano et al., 1998; Dawson et al., 1995; Galvan & Caetano, 2003; Grant, 1997; Herd, 1994; Herd & Caetano, 1987; Jones-Webb et al., 1995; Jones-Webb, 1998; Nielsen, 2000).

A number of these early studies find significant interaction effects between some of these predictor variables and race (Barr et al., 1993; Herd, 1994; Jones-Webb et al., 1995). These studies primarily examine the relationship between socioeconomic status and employment status with racial differences in consumption levels and alcohol-related problems.

As social scientists continue to look beyond racial differences between blacks and whites only, a key predictor variable that is the focus of much of the more recent literature on comparative rates of alcohol consumption and alcohol-related problems among ethnic minorities is the level of acculturation to mainstream United States culture (Al-Issa, 1997; Caetano, 1987; Caetano et al., 1998; Galvan & Caetano, 2003; Higuchi et al., 1994; Makimoto, 1998; De La Rosa, 2002). Studies examining acculturation find significant relationships between levels of acculturation and differences in alcohol consumption patterns (Caetano, 1987; Caetano et al., 1998; Dawson, 1998; Galvan & Caetano, 2003; Higuchi et al., 1994; Johnson et al., 1987; Li & Rosenblood, 1994; Makimoto, 1998; De La Rosa, 2002).

Overall, previous research has identified gender, age, socioeconomic status, education, employment, marital status, and religion as important demographic characteristics in drinking behaviors. Male gender is consistently one of the strongest predictors of higher alcohol consumption. In terms of race, studies of the subgroups that are relevant in the current analysis continually find drinking to be most frequent for whites and Hispanics.

## **Chapter 3**

### **The Current Study**

The study of racial differences in the consumption of alcohol and alcohol-related problems has clearly matured in recent years. As noted by Caetano and colleagues (1998) “researchers in the field are moving away from single-factor explanations of drinking and are beginning to develop and test theories focusing on the complex interplay of psychological, historical, cultural, and social factors that describe and explain alcohol use among minority groups” (Caetano et al., 1998, 237). In general, the early studies addressing this topic come to similar conclusions; that racial and ethnic differences in drinking behavior are a complex issue. Most commonly social scientists have concluded that some combination of social, cultural, psychological, historical, and environmental factors interact to shape the drinking behaviors of racial groups.

The current study is designed to continue the maturation process of the existing literature by further examining the interactive effects of predictor variables that have established their utility in explaining racial differences in alcohol consumption and heavy drinking. This methodology is designed to command a better understanding of how the drinking behaviors of racial and ethnic groups within the United States are shaped.

Based on the literature that has been reviewed here, the current study looks to answer the following research questions designed to further what is known about racial and ethnic differences in alcohol use behaviors:

- How do the single-factor predictor variables of gender, age, nativity, poverty, education, employment, and marital status interact to shape the drinking behaviors of ethnic groups in the United States.?
- Do rates of heavy drinking differ between native-born U.S. citizens and immigrants? Are there racial/ethnic differences in this relationship?
- How do social and economic stressors differentially influence levels of consumption and rates of heavy drinking across racial subgroups?

The current study predicts that the influence of social and economic stressors will differentially affect patterns of heavy alcohol use across racial and ethnic groups. The current study also predicts that native-born United States citizens will have higher rates of heavy alcohol use than immigrants, but that the interactive effects of certain predictors will be more influential to immigrants. Consistent with previous research in the area of heavy alcohol use, it is predicted that male gender and lower age will demonstrate the most robust relationships with both heavy drinking and average consumption, and that whites and Hispanics will demonstrate higher levels of alcohol consumption than the other subgroups included in the analyses.

## **Chapter 4**

### **Methodology**

#### **Sample**

The 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is a representative sample of the United States sponsored by the National Institute of Alcohol Abuse and Alcoholism (NIAAA), an agency of the National Institute of Health (Grant et al., 2003; 2004). The NESARC was designed to be a longitudinal survey, with its first wave fielded in 2001-2002 and its second wave in 2004-2005 using the same respondents (Grant et al., 2003). The current study focuses on the data from Wave 1 of the NESARC.

The NESARC is a representative sample, including citizens and noncitizens. The target population of the NESARC is the civilian noninstitutionalized population, 18 years and older, residing in the United States and the District of Columbia, Alaska, and Hawaii (Grant et al., 2003). The sample includes persons living in households, and the following noninstitutional group quarters: boarding houses, rooming houses, nontransient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes (Grant et al., 2003). The overall survey response rate for Wave 1 of the NESARC was 81 percent.

The sampling frame of housing units for NESARC is the Census Supplementary Survey (C2SS) conducted by the Bureau of the Census, which included 2,000 primary



sampling units (PSU's) consisting of all 3,142 counties and county equivalents in the United States. The NESARC also included a group quarters (GQ) frame selected from the Census 2000 Group Quarters Inventory (Grant et al. 2003; 2004). A stratified multistage cluster design was used to obtain the desired representative sample with adequate representation of racial/ethnic minorities and young people.

The final NESARC sample resulted in 43,093 completed interviews (Grant et al., 2003). Oversampling of Blacks and Hispanics was accomplished at the design phase of the survey. Oversampling increased the proportion of Hispanic and Black households from roughly 12 percent to approximately 20 percent each of the total sample. Young adults were also oversampled, at a rate of 2.25: 1.00 (Grant et al., 2003; 2004). White non-Hispanics represent about 55 percent of the total sample and Asians represent about 3 percent of the total sample. The NESARC respondents are 43 percent male and 57 percent female. About 62 percent (26,946) of the NESARC respondents considered themselves current drinkers.

Two of the major purposes of the NESARC are “to determine the magnitude of alcohol use disorders and their associated disabilities in the general population” and “to estimate the magnitude of health disparities and identify their determinants among subgroups of the population defined by gender, race/ethnicity, disability, age, low income, and socioeconomic status” (Grant et al., 2003, 1). This makes the NESARC an ideal data source to answer the research questions of this study. The oversampling of Hispanics and non-Hispanic Blacks is important in providing accurate and precise estimates of major survey variables, adequate numbers for reliable statistical analysis, and appropriate representation of each major race/ethnic subgroup in the U.S. population

(Grant et al., 2003). The focus on alcohol-related health disparities, especially in terms race/ethnicity, age, and income status corresponds very well with the motivations of the current study, which looks to help explain heavy drinking patterns across race/ethnicity and the effects of heavy drinking on alcohol-related problems.

### **Data Collection**

NESARC data were collected in face-to-face, computer-assisted personal interviews conducted in respondents' homes (Grant & Dawson, 2006). Experienced lay interviewers from the U.S. Census Bureau administered the interviews. On average, the 1,800 interviewers had 5 years experience working on Census and other health-related surveys. The survey instrument was computerized, with software that included built-in skip, logic, and consistency checks. Interviewers completed a rigorous 5 day self-study at home as well as a 5 day in-class training session. Training supervisors also completed the home study and were required to attend centralized training sessions where they were trained by NIAAA sponsors and Census Field and Demographics Surveys Division Headquarters Staff (Grant et al., 2004).

### **Measures**

#### ***Dependent Variables***

*Heavy Drinking* – This variable is a recode of the NESARC survey variable that asks respondents “How often they drank five or more drinks of any alcohol in the last 12 months”. Originally this was a categorical variable with coding ranging from “1” everyday to “11” never. The heavy drinking variable used in this study, is the original NESARC variable reverse coded so that a “0” response represents never and a “10” represents everyday. This adjustment is made so that the variable can be interpreted as

roughly continuous; as the value of heavy drinking increases, so does the frequency with which the respondent consumed 5 or more alcoholic beverages in the preceding 12 months.

*Average Consumption* – This measure is a recode of the NESARC prompt which asks respondents to indicate the number of drinks of any alcohol that they usually consumed on days when they drank alcohol in the prior 12 months. The original variable was continuous, with values ranging from 1 drink to 98. The average consumption measure used in these analyses is recoded so that “0” represents non drinkers, 1 - 12 drinks remains continuous, and the remaining data are grouped in a “13 or more drinks” category. Only .5% of the data is at or above the 13 drink cutoff.

Two dependent measures are included in the current analysis. These measures are reflective of previous studies, which have suggested that the “five or more” heavy drinking measure may not be optimal for examining some key concepts (see Dawson, 1998). For this reason, both outcome measures are included in the current analyses, and the findings are compared across both outcomes.

### ***Predictor Variables***

*Gender* – Females are coded “0” and Males are “1”

*Age* – The respondents’ ages range continuously from 18 to 98 plus.

*Race/Ethnicity* – The NESARC includes two indicators of race/ethnicity, both of which will be utilized as measures in these analyses. The first NESARC race/ethnicity indicator is a self-reported, multirace measure. Respondents are given the option of selecting multiple races. The race/ethnicity categories that are central to the current analyses are “Hispanic or Latino origin” (n = 8,308), “Asian” (n = 1,334), “Black or

African-American” (n = 8,600), and “White” (n = 32,789). The self-report, multirace measure is used in the bivariate analyses to look at race-specific relationships, as well as in the multivariate models for comparisons between groups.. The second race/ethnicity indicator is a categorical race measure. Some of the race/ethnicity was imputed from other NESARC questions. The breakdown of the recoded categorical race measure is “Hispanic or Latino” (n = 8,308), “Asian/Native Hawaiian/Pacific Islander” (n = 1,332), “Black” (n = 8,245), “White” (n = 24,507). The categorical race/ethnicity measure is utilized in situations where mean comparisons and other like analyses are required.

*Family Poverty* – The family poverty variable utilized in these analyses is a computation that includes two NESARC variables. The NESARC includes an indicator of the past year total household income as well as an indicator of number of related individuals residing in a dwelling. These two measures were combined to create a dichotomous family poverty variable. The family poverty variable is based on the 2007 Household Poverty Thresholds compiled by the U.S. Census Bureau. Based on the number of related persons residing in a dwelling, the poverty thresholds indicate a poverty line. The family poverty measure indicates responding households which are below the poverty line based on the number of related persons residing in that dwelling.

*Education* – The level of educational attainment measure is a recode of a NESARC question which asks respondents to indicate the highest level of school that they completed. The education measure used in the current analyses is identical to the NESARC measure other than the fact that some of the original categories have been collapsed. The education measure categories are as follows: no formal schooling, less than 9<sup>th</sup> grade, some high school, completed high school, earned a GED, some college,

completed 2-year college degree, completed college (bachelor's degree), some graduate studies, completed graduate studies (master's or higher).

*Employment Status* – Multiple measures of employment status are applied in the NESARC. The measure of employment in the current analysis is a recode of the multiple NESARC variables into a dichotomy in which “0” represents unemployed/retired, and “1” represents employed/student.

*Marital Status* – The marital status measure is a dichotomy created from the NESARC survey's original 6-category measure. For the measure in this study “0” represents not married and “1” represents married. Included in the not married category are individuals who are widowed, divorced, separated, in a domestic partnership, or never married.

*Nativity* – A measure of U.S. nativity is derived directly from the NESARC survey, which asks respondents to indicate whether or not they were born in the United States. 83% of the NESARC respondents are native-born, 17% are immigrants. Previous studies suggest that the alcohol use behaviors of immigrant populations differ significantly from those of native born citizens (Higuchi et al., 1994; Vega et al., 1998). Dawson (1998) suggests that recent immigrants show the greatest variation and deviation from majority group drinking patterns.

### **Analytic Plan**

The current study is designed to examine the relationship between social stressors and differential alcohol use behaviors among race/ethnicity subgroups within the United States. This study is particularly interested in the influence of the interaction effects of demographic predictor variables on heavy alcohol use.

The relationships in these analyses are first examined at a basic descriptive level. The two dependent variables and all predictor measures are examined in terms of distribution and basic descriptive statistics.

After descriptive relationships are assessed, the current study examines the bivariate relationships between individual predictor measures and the dependent variables. First, the dependent variables are examined in terms of race. These analyses are accomplished using race specific models, which allow a comparison to be made between each race in terms of the bivariate relationship being explored. After bivariate relationships are assessed, the current study conducts multivariate analyses of the relationship between demographic predictors and the heavy drinking and average consumption outcome variables.

Since the outcome measures are influenced by more than one predictor, it is necessary to use multiple regression in the analyses of heavy drinking and average consumption. Multiple regression is particularly appropriate when the predictor variables are intercorrelated (McClendon, 1994). Using ordinary least squares (OLS) regression, the two dependent variables are regressed onto the main effects predictors. After the main effects relationships have been examined, the current study explores the interaction effects of the predictor variables in order to assess their conditional effects on the outcome variables. These interaction effects represent the moderated causal relationship between three variables (i.e., two predictors and the outcome) (Jaccard & Turissi, 2003). Once the interaction effects have been calculated and assessed, they will be added to the regression model individually. The statistical significance of each block will be determined by the F-change statistic, which represents a significant  $R^2$  change. The final

models of the current analysis are made up of each outcome variable regressed onto the main effects of the predictors, plus additional blocks in the regression which represent the inclusion of each of the significant interaction effects.

## Chapter 5

### Results

The following sections discuss the results of the procedures detailed in the analytic plan. First, univariate findings are discussed and presented visually in Table 1. After the descriptive analyses have been addressed, bivariate relationships are analyzed and the findings are discussed and visually represented. Finally, multivariate results are presented for each model of the analysis.

#### Descriptive Analysis

Table 1 displays the distribution of both dependent variables, and the main effects predictor variables. The number of cases and percent of the distribution is denoted for each variable. Means and standard deviations are indicated for continuous variables. Visual inspection of Table 1 provides some insight into the NESARC sample. 81.6% of respondents claim to have never engaged in heavy drinking, as defined by the consumption of five or more alcoholic beverages in a single day, within the past year. The mean value of .83 (s.d.=2.10) indicates that the average respondent engaged in heavy drinking less than 1-2 times in the past year. However, 11.1% of the sample engaged in frequent heavy drinking, as defined as the consumption of five or more alcohol beverages in a single day, at least once a month (see Stinson et al., 1998).

The average consumption variable, measured in drinks, indicates that the average NESARC respondent drinks between one and two alcoholic beverages per drinking



occurrence. Five percent of the sample averaged six drinks or more on days when they drank.

The remaining distributions describe the predictor variables. The majority of the NESARC sample is white 57.8% and female 57%. Native born citizens represent 83% of the sample, and 81.5% of the respondents live above the family poverty threshold. 63.7% are employed and 51.8% are not married. 81.8% of respondents have at least a high school education. The average age of respondents is 46.4 (s.d.=18.18).

Table 1: Frequency Distribution of Key Variables					
Variable	n	%	Variable	n	%
<b>Heavy Drinking</b> (mean = .83, SD=2.10)					
Never	35039	81.6	<b>Gender</b>		
1-2 times	1333	3.1	Female	24,575	57.0
3-6 times	1169	2.7	Male	18,518	43.0
7-11 times	619	1.4	<b>Nativity</b>		
Once a month	854	2.0	Immigrant	7,320	17.0
2-3 times a month	929	2.2	U.S. born	35,622	83.0
Once a week	950	2.2	<b>Poverty</b>		
2 times a week	787	1.8	Above Poverty	35,103	81.5
3-4 times a week	605	1.4	Below Poverty	7,990	18.5
Nearly Everyday	288	.7	<b>Employment</b>		
Everyday	356	.8	Unemployed	15,299	36.4
<b>Average Consumption</b> (mean =1.54, SD=2.01)			Employed/Student	26,704	63.6
Non Drinker	16,147	37.7	<b>Marital Status</b>		
One	10,350	24.2	Not Married	22,324	51.8
Two	7,880	18.4	Married	20,769	48.2
Three	3,678	8.6	<b>Education</b> (mean =5.57, SD=2.28)		
Four	1,724	4.0	No Formal School	218	.5
Five	759	1.8	< 9 <sup>th</sup> Grade	3,113	7.2
Six	1,247	2.9	Some High School	4,518	10.5
Seven	189	.4	Graduated H.S.	10,935	25.4
Eight	275	.6	GED	1,612	3.7
Nine	45	.1	Some College	8,891	20.6
Ten	163	.4	2-year Degree	3,772	8.8
Eleven	7	.0	Bachelor's Degree	5,251	12.2
Twelve	246	.6	Some Grad. School	1,526	3.5
Thirteen +	145	.3	Master's Degree +	3,257	7.6
<b>Race</b>			<b>Age</b>		
Hispanic	8,308	19.6	Range = 18 to 98+ (mean =46.40, SD=18.18)		
Asian	1,332	3.1			
African-American	8,245	19.4			
White	24,507	57.8			

## Bivariate Analysis

The results of the bivariate analyses of the dependent variables and main effects predictors are described here. Bivariate tests are conducted in order to achieve a better understanding of the basic relationships between the demographic predictors, which have established utility based on past research, and the dependent measures of heavy drinking and average consumption.

Table 2 displays the results of the cross tabulation representing the relationship between heavy drinking and race. Displayed are the percentages of each category of heavy drinking across the race-specific models. The relationship between heavy drinking and each racial subgroup is statistically significant; ( $\chi^2 = 86.772$ ,  $p < .001$ ) for Hispanics, ( $\chi^2 = 55.068$ ,  $p < .001$ ) for Asians, ( $\chi^2 = 448.835$ ,  $p < .001$ ) for African-Americans, and ( $\chi^2 = 476.344$ ,  $p < .001$ ) for whites. These  $\chi^2$  values represent the difference between individuals who select each race and all other individuals in the sample. All four races show significant differences. Some distinguishable differences between racial subgroups can be seen in Table 2. Hispanics and whites are shown to be about 10% more likely than Asians and African-Americans to have engaged in heavy drinking in the past year. Hispanics and whites illustrate extremely similar relationships with the heavy drinking variable. In fact their mean value of frequency of heavy drinking is identical (mean = .91). Asians and African-Americans are also shown to be similar in their frequency of heavy drinking. However, African-Americans display a higher percentage in the most frequent heavy drinking categories, in comparison to Asians. Hispanics (12.8%) and whites (12.1%) display the highest rates of frequent heavy drinking, as defined as five or

more drinks in a day at least once a month, while the rates for Asians (6.2%) and African-Americans (7.5%) are considerably lower.

<b>Table 2: Crosstabulation of Heavy Drinking by Race</b>				
	Hispanic (n=8,276)	Asian (n=1,333)	Black (n=8,573)	White (n=32,656)
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
<b>Heavy Drinking (past year)</b>				
Never	79.7	89.0	89.1	79.4
1-2 times	3.2	1.7	1.6	3.6
3-6 times	2.8	2.0	1.3	3.1
7-11 times	1.5	1.3	.6	1.7
Once a month	2.4	1.2	1.1	2.2
2-3 times a month	2.7	1.2	1.1	2.5
Once a week	3.2	1.6	1.4	2.4
2 times a week	1.9	.9	1.4	2.0
3-4 times a week	1.3	.8	1.1	1.5
Nearly Everyday	.7	.1	.5	.7
Everyday	.6	.4	.9	.8
$\chi^2$	86.772***	55.068***	448.835***	476.344***
Mean ^	.910	.510	.550	.910
Phi	.045	.036	.102	.105

\*\*\* p < .001; ^ F = 76.520, p<.001

Table 3 displays the results of the cross tabulation between average consumption and the four race variables. The table displays the percentage of each racial group that fall within each level of consumption. Hispanic ( $\chi^2 = 287.652$ , p<.001), Asian ( $\chi^2 = 135.068$ , p<.001), African-American ( $\chi^2 = 652.122$ , p<.001), and white ( $\chi^2 = 841.169$ , p<.001) race are all significantly related to the average consumption variable. Again, these  $\chi^2$  values represent the difference between individuals who select each race and all other individuals in the sample. All four races show significant differences. Bivariate results reveal that whites (34%) are least likely to be non drinkers, followed by Hispanics (41%), African-Americans (49%), and Asians (50%). Consistent with the findings for heavy drinking, whites and Hispanics are shown to have higher rates of consumption than African-Americans and Asians. An average of six or more drinks is observed for 7.6

percent of Hispanics followed by 5.9 percent of whites, 3.3 percent of African-Americans, and 3.2 percent of Asians. Bivariate findings are consistent across both models. Hispanics display the highest levels of alcohol consumption and heavy drinking followed closely by whites. Asians and African-Americans are considerably less likely to engage in heavy drinking, and consume less on average than Hispanics and whites.

	<b>Hispanic</b> (n=8,252)	<b>Asian</b> (n=1,331)	<b>Black</b> (n=8,555)	<b>White</b> (n=32,600)
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
<b>Average Consumption (in drinks)</b>				
Non Drinker	40.7	50.3	49.1	34.0
One	19.6	25.6	20.7	25.2
Two	15.9	12.6	15.0	19.6
Three	9.2	4.9	8.0	8.9
Four	4.6	2.5	3.0	4.3
Five	2.3	1.1	1.0	2.0
Six	4.0	1.9	2.0	3.2
Seven	.6	.2	.2	.5
Eight	.8	.5	.4	.7
Nine	.1	--	.1	.1
Ten	.5	.2	.2	.4
Eleven	--	--	--	--
Twelve	1.1	.1	.2	.7
Thirteen or more	.5	.3	.2	.3
$\chi^2$	287.652***	135.068***	652.122***	841.169***
Mean ^	1.70	1.03	1.14	1.63
Phi	.082	.056	.123	.140

\*\*\* p < .001; ^ F = 174.638, p < .001

Bivariate analysis of the relationships between the frequency of heavy drinking and the remaining predictor variables reveal some additional patterns. Table 4 displays the results of the cross tabulation between heavy drinking and gender, nativity, poverty, employment, and marital status. Results indicate that gender ( $\chi^2 = 2904.637$ , p < .001), nativity ( $\chi^2 = 166.275$ , p < .001), poverty ( $\chi^2 = 96.900$ , p < .001), employment ( $\chi^2 = 1564.692$ , p < .001), and marital status ( $\chi^2 = 343.636$ , p < .001) are all significantly related to heavy drinking. These findings illustrate higher frequency of heavy drinking among

individuals who are male, native born, non poor, employed, and not married. Gender shows the strongest relationship with heavy drinking, although it is moderate ( $\phi=.260$ ), and males are shown to have the highest frequency of heavy drinking relative to females. Employment shows the next strongest relationship with heavy drinking ( $\phi=.193$ ), followed by marital status ( $\phi=.089$ ), nativity ( $\phi=.062$ ), and poverty ( $\phi=.048$ ). Within the poverty category, the frequency of heavy drinking is similar for poor and non poor individuals. Less frequent heavy drinking is higher among the non poor, but as the frequency of heavy drinking increases the prevalence for poor and non poor individuals becomes almost identical. The measure of frequent heavy drinking discussed earlier indicates that 11.2 percent of non poor individuals engage in frequent heavy drinking compared to 10.9 percent of those who are below poverty, which suggests that there is very little difference between poor and non-poor individuals in terms heavy drinking, despite the significance of the bivariate relationship.

Table 5 displays the results of the cross tabulations of the average consumption variable by the remaining predictors. Like heavy drinking, average consumption is significantly related to gender ( $\chi^2 = 2719.273, p<.001$ ), nativity ( $\chi^2 = 389.667, p<.001$ ), poverty ( $\chi^2 = 1308.296, p<.001$ ), employment ( $\chi^2 = 2852.761, p<.001$ ), and marital status ( $\chi^2 = 616.814, p<.001$ ). Gender ( $\phi=.252$ ) and employment ( $\phi=.261$ ) show the strongest relationships with the average consumption variable, followed by poverty ( $\phi=.175$ ), marital status ( $\phi=.120$ ), and nativity ( $\phi=.096$ ). The highest levels of average consumption are observed for males, individuals who are employed, individuals who are not married, and those who live below the poverty line. Poverty appears to lead to less frequent light drinking, but a higher prevalence of frequent heavy drinking. The

fact that poverty appears to be related to heavier drinking is supportive of the predicted relationship between economic stress and increased drinking. Individuals living below the minimum standard of sustenance are subject to increased social, economic, and psychological stress, and are shown here to be more likely than non impoverished people to engage in higher levels of drinking.

Bivariate analysis of the continuous predictors reveals a significant negative correlation between age and heavy drinking ( $r = -.210, p < .01$ ), and between age and average consumption ( $r = -.276, p < .01$ ), signifying that as age increases the frequency of heavy drinking decreases and the average level of consumption decreases. The magnitude of the relationships between age and the dependent variables are moderate. Education is shown to be significantly and negatively related to the frequency of heavy drinking ( $r = -.018, p < .01$ ), and average consumption ( $r = -.027, p < .01$ ), signifying that increased education leads to less heavy drinking and lower average consumption. The magnitude of the relationships is quite weak.

These findings suggest racial differences in heavy alcohol use. Whites and Hispanics have the highest prevalence of heavy drinking, and the highest average consumption. Lower drinking levels are observed for Asians and African-Americans across both outcome measures. As predicted, male gender and age display the strongest relationships with the dependent variables. The bivariate patterns observed for poverty support the stress hypothesis, and reveal that in terms of prevalence of frequent heavy drinking there is little difference between poor and non poor individuals. These and other patterns are further addressed in the multivariate analyses.

**Table 4: Crosstabulations of the Frequency of Past Year Heavy Drinking by Predictor Variables**

	<u>Gender</u>		<u>Nativity</u>		<u>Poverty</u>		<u>Employment</u>		<u>Marital Status</u>	
	<u>Female</u> (n=24,517)	<u>Male</u> (n=18,412)	<u>Immigrant</u> (n=7,302)	<u>U.S. born</u> (n=35,483)	<u>Above Pov.</u> (n=34,954)	<u>Below Pov.</u> (n=7,975)	<u>Unemployed</u> (n=15,254)	<u>Employed</u> (n=26,589)	<u>Not Married</u> (n=22,227)	<u>Married</u> (n=20,702)
<b>Heavy Drinking</b>										
Never	90.1	70.4	86.3	80.6	81.0	84.2	91.3	76.0	79.0	84.4
1-2 times	2.2	4.3	2.5	3.2	3.3	2.2	1.5	4.1	3.1	3.1
3-6 times	1.8	3.9	2.1	2.9	3.0	1.7	1.2	3.6	2.7	2.7
7-11 times	.9	2.1	1.1	1.5	1.5	1.1	.5	2.0	1.6	1.3
Once a month	1.2	3.1	1.6	2.1	2.1	1.7	.8	2.6	2.2	1.7
2-3 times a month	1.2	3.5	1.8	2.2	2.2	1.9	1.0	2.9	2.6	1.7
Once a week	1.0	3.9	2.2	2.2	2.2	2.3	1.0	2.9	2.6	1.8
2 times a week	.8	3.3	1.1	2.0	1.9	1.6	.7	2.5	2.3	1.3
3-4 times a week	.5	2.6	.8	1.5	1.4	1.6	.8	1.7	1.9	.9
Nearly Everyday	.2	1.3	.3	.8	.6	.9	.4	.8	.9	.4
Everyday	.3	1.6	.4	.9	.8	.9	.7	.9	1.0	.6
$\chi^2$	2904.637***		166.275***		96.900***		1564.692***		343.636***	
Phi	.260		.062		.048		.193		.089	



**Table 5: Crosstabulations of the Average Number of Drinks Consumed by Predictor Variables**

Average Consumption	<u>Gender</u>		<u>Nativity</u>		<u>Poverty</u>		<u>Employment</u>		<u>Marital Status</u>	
	<u>Female</u> (n=24,494)	<u>Male</u> (n=18,361)	<u>Immigrant</u> (n=7,286)	<u>U.S. born</u> (n=35,423)	<u>Above Pov.</u> (n=34,897)	<u>Below Pov.</u> (n=7,958)	<u>Unemployed</u> (n=15,232)	<u>Employed</u> (n=26,537)	<u>Not Married</u> (n=22,173)	<u>Married</u> (n=20,682)
Non Drinker	43.7	29.7	47.3	35.5	34.0	53.8	52.1	29.0	39.1	36.2
One	27.1	20.2	22.1	24.6	26.0	16.1	24.5	24.2	20.8	27.7
Two	16.9	20.3	14.5	19.2	20.0	11.5	13.0	21.7	17.2	19.7
Three	6.3	11.6	7.1	8.9	9.0	6.7	4.9	10.8	9.0	8.1
Four	2.8	5.6	3.0	4.2	4.2	3.4	2.1	5.2	4.6	3.4
Five	1.0	2.8	1.4	1.9	1.8	1.6	.8	2.3	2.2	1.3
Six	1.2	5.1	2.4	3.0	2.8	3.2	1.4	3.8	3.6	2.1
Seven	.2	.8	.3	.5	.4	.5	.2	.6	.6	.2
Eight	.2	1.2	.4	.7	.6	.9	.3	.8	.9	.4
Nine	--	.2	.1	.1	.1	.2	.1	.1	.1	.1
Ten	.2	.7	.4	.4	.4	.5	.2	.5	.5	.2
Eleven	--	--	--	--	--	--	--	--	--	--
Twelve	.2	1.1	.6	.6	.5	.8	.3	.7	.7	.4
Thirteen +	.1	.7	.3	.3	.3	.7	.3	.4	.5	.2
$\chi^2$	2719.273***		389.667***		1308.296***		2852.761***		616.814***	
Phi	.252		.096		.175		.261		.120	

\*\*\* p < .001

## **Multivariate Analysis**

The relationships observed in the bivariate analysis warrant further investigation. Multivariate OLS regression is used to examine the main effects of the predictor variables on the dependent variables, while controlling for other relevant covariates. In addition to the main effects analysis, the interaction effects of the predictors will be included in subsequent regressions in order to examine the conditional effects of these predictors on the outcome variables.

The initial multivariate models consist of the frequency of heavy drinking and the average level of consumption regressed onto the main effects of the ten predictor variables. Table 6 displays the results of these analyses. Overall both model 1 ( $F=596.52$ ,  $p<.001$ ) and model 2 ( $F=773.06$ ,  $p<.001$ ) are statistically significant. When the race dummy variables are added in a separate block, the models account for roughly 12 and 15 percent of the variance in the dependent variables respectively.

**Table 6: Heavy Drinking and Average Consumption Regressed onto Main Effects Predictors**

Variable	Model 1 (n=41,702)			Model 2 (n=41,626)		
	<u>Heavy Drinking</u>		$\beta$	<u>Average Consumption</u>		$\beta$
	b	s.e.		b	s.e.	
Gender	1.016***	.020	.240	.900***	.019	.222
Age	-.023***	.011	-.203	-.028***	.001	-.256
Nativity	.411***	.031	.074	.457***	.029	.085
Poverty	.012	.027	.002	-.074**	.025	-.014
Education	-.054***	.005	-.059	-.025***	.004	-.028
Employment	.096***	.025	.022	.184***	.023	.044
Marital Status	-.413***	.020	-.099	-.344***	.019	-.086
			R <sup>2</sup> adj. = .118			R <sup>2</sup> adj. = .144
<b>Race †</b>						
Hispanic ^	-.058***	.029	-.011	.046***	.028	.009
Asian ^	-.271***	.060	-.022	-.464***	.056	-.040
Black ^	-.455***	.025	-.087	-.550***	.024	-.109
			R <sup>2</sup> adj. = .125, F = 596.52***			R <sup>2</sup> adj. = .156, F = 773.06***

\* p < .05, \*\* p < .01, \*\*\* p < .001; ^ White as reference group

† Statistical significance judged by the F-change statistic

### *Heavy Drinking*

In model 1 all predictors are significantly related to the frequency of heavy drinking, except for poverty. Gender (b=1.016, p<.001), nativity (b=.411, p<.001), and employment (b=.096, p<.001) are all positively related to frequency of heavy drinking. Male gender, U.S. nativity, and employment are associated with higher levels of frequency of heavy drinking. Males are shown to engage in heavy drinking more frequently than females, as are native born U.S. citizens relative to immigrants, and employed individuals relative to the unemployed. The standardized coefficients indicate that the relationship between gender and the frequency of heavy drinking is moderate ( $\beta = .240$ ), while the relationships between nativity ( $\beta = .074$ ) and employment ( $\beta = .025$ ) with heavy drinking are relatively weak.

Age ( $b=-.023$ ,  $p<.001$ ), education ( $b=-.054$ ,  $p<.001$ ), and marital status ( $b=-.413$ ,  $p<.001$ ) are significant and negatively related to the frequency of heavy drinking when controlling for other predictors and race. A unit increase in age or level of education significantly reduces the mean frequency of heavy drinking. Being married, relative to not married, leads to a lower mean frequency of heavy drinking as well. The relationship between age and heavy drinking is moderate ( $\beta=-.203$ ), while education ( $\beta=-.059$ ) and marital status ( $\beta=-.099$ ) show fairly weak relationships with frequency of heavy drinking.

The race dummy variables are integrated into the model in a separate block. Their addition is statistically significant ( $F \text{ change}=113.398$ ,  $p<.001$ ), and associated with an  $R^2$  change of .007. The three minority groups, Hispanics ( $b=-.058$ ,  $p<.05$ ), Asians ( $b=-.271$ ,  $p<.001$ ), and African-Americans ( $b=-.455$ ,  $p<.001$ ) all show significant negative relationships with the dependent variable, using whites as a reference group. This indicates that the mean frequency of heavy drinking for all three minority groups is lesser than for whites. Individuals from these minority groups are less frequently prone to participate in heavy drinking than white individuals, when controlling for other main effects relationships. The magnitude of the relationships between the minority groups and frequency of heavy drinking are relatively weak, as indicated by the standardized coefficients for Hispanics ( $\beta=-.011$ ), Asians ( $\beta=-.022$ ), and African-Americans ( $\beta=-.087$ ).

Overall, model 1 supports what has been established in the existing literature on racial differences in alcohol use behaviors. All but one of the single-factor predictors tested are shown to be significantly related to the frequency of heavy drinking. As previously noted, these predictor variables have been selected based on the fact that they

have previously established utility in explaining drinking patterns across racial and ethnic subgroups in the United States.

### *Average Consumption*

Model 2 consists of the average level of consumption dependent variable regressed onto the ten predictor variables. The race dummy variables are added in a subsequent block, and statistical significance and change in variance are assessed. The findings from these analyses are displayed in Table 6 as well.

Regression results indicate that gender ( $b=.900$ ,  $p<.001$ ), nativity ( $b=.457$ ,  $p<.001$ ), and employment ( $b=.184$ ,  $p<.001$ ) have a significant positive relationship on the average number of drinks consumed. Consistent with the findings from model 1, being male, being born in the United States and being employed are all significantly and positively related to level of drinking. Males, native born U.S. citizens, and employed individuals are shown to consume more alcohol on average than females, U.S. immigrants, and the unemployed, when controlling for the other main effects in the equation. The standardized coefficients indicate that the relationship between gender and the average alcohol consumption is moderate ( $\beta =.222$ ), while the relationships between nativity ( $\beta=.085$ ) and employment ( $\beta=.044$ ) and average consumption are relatively weak.

The remaining variables of age ( $b=-.028$ ,  $p<.001$ ), poverty ( $b=-.074$ ,  $p<.01$ ), education ( $b=-.025$ ,  $p<.001$ ), and marital status ( $b=-.344$ ,  $p<.001$ ) all have a statistically significant and negative relationship with the average consumption dependent variable. A unit increase in age or level of education is related to a decrease in the average number of drinks consumed. Younger and less educated individuals are shown to consume more

alcohol on average. The negative coefficients observed for poverty and marital status indicate that the mean level of alcohol consumption is lower for individuals who are married and those who live below the family poverty line, relative to non-married and non-poor individuals. The standardized coefficients suggest that age is moderately related to the average consumption dependent variable ( $\beta = -.256$ ), while poverty ( $\beta = -.014$ ), education ( $\beta = -.028$ ), and marital status ( $\beta = -.086$ ) are shown to be weakly related to average consumption.

The addition of the race dummy variables is statistically significant ( $F$  change=214.107,  $p < .001$ ), and an  $R^2$  change of .013 is observed for the block. The coefficients for Asians ( $b = -.464$ ), and African-Americans ( $b = -.550$ ) suggest a negative relationship with the average number of drinks consumed, using whites as the reference group. Their negative coefficients indicate that the mean level of consumption is lower for Asians and African-Americans than for whites, demonstrating that Asians and African-Americans consume less alcohol on average relative to whites. The positive coefficient observed for Hispanics ( $b = .046$ ) suggests that the mean number of drinks consumed is slightly larger for Hispanics relative to whites, while controlling for the other main effects. The strength of the relationships between the minority subgroups and the dependent variable are relatively weak ( $\beta = .009$ ) for Hispanics, ( $\beta = -.040$ ) for Asians, and ( $\beta = -.109$ ) for African-Americans.

Overall model 2 also supports what has been found in previous studies of racial differences in alcohol use behaviors. The main effects of all of the single factor predictors are significantly related to the average level of alcohol consumption. Across models 1 and 2, gender and age are shown to have the most robust relationships with

drinking behaviors. As previously noted, the predictors in this study are included because of their established utility for explaining differential alcohol use across racial and ethnic subgroups. Their utility is assessed further in the next section, as their conditional effects are assessed using two-way interactions between predictors.

### *Interaction Effects*

The next step in the analysis involves the addition of the interaction terms to the main effects models in order to assess the conditional effects of the predictor variables on the frequency of heavy drinking and the average level of consumption. Each interaction is blocked into the base regression model individually, and significance is interpreted based on the F change statistic, which reflects the change in the  $R^2$  value. The interactive effects of most of the independent variables are assessed for each dependent variable. The choice of the interactive effects that are modeled is based on the findings of previous studies and the predictions of the current study. Because of the large number of interactions included in the model, the following section discusses only those relationships which achieve statistically significant relationships with the dependent variables, based on each block's F change statistic (see appendix for results containing all interactions). The interactions that contribute significantly to the model are included in the final set of analyses presented in this chapter.

### *Heavy Drinking Models*

A number of interaction terms are significantly related to the frequency of heavy drinking. Of particular interest in the current study are the interactions between the race dummies and other predictors. For interpretation purposes, note that the heavy drinking

outcome measure is coded roughly continuous, with values ranging from never “0” to everyday “10”.

The addition of the interaction between age and poverty to the model is statistically significant (F change=8.622,  $p<.01$ ). The interaction term coefficient is significant and positive ( $b=.004$ ,  $p<.001$ ), indicating that as age increases one unit, the mean of frequency of heavy drinking for individuals below poverty is slightly greater than for non-poor ( $\beta=.02$ ). The addition of the interaction term between education and poverty is also positive and statistically significant (F change=10.066,  $p<.01$ ). The positive coefficient ( $b=.040$ ) for the interaction term reveals that the effect of education on heavy drinking is slightly stronger among poor individuals relative to non-poor ( $\beta=.02$ ). The addition of the interaction between employment and nativity is statistically significant and positive (F change=8.230,  $p<.01$ ). In this case, the positive coefficient ( $b=.156$ ,  $p<.01$ ) indicates that being employed increases the difference in the mean frequency of heavy drinking between native born U.S citizens and immigrants ( $\beta=.04$ ).

The inclusion of the interaction term between age and nativity is also significant (F change=81.033,  $p<.001$ ). Its effects are negative, however; the estimate ( $b=-.014$ ,  $p<.001$ ) indicates that with a unit increase in age, the difference in the mean frequency of heavy drinking between U.S. citizens and immigrants lessens ( $\beta=-.11$ ).

Interactions between race and other predictors are blocked into the models as three dummy variables, representing each racial minority in the analysis, using whites as a reference group. The interaction between race and age is significantly related to the frequency of heavy drinking (F change=60.808,  $p<.001$ ). The positive coefficients for Hispanics ( $b=.011$ ), Asians ( $b=.016$ ), and African-Americans ( $b=.016$ ) indicate that an



increase in age is slightly more strongly related to frequency of heavy drinking for minority groups relative to an increase in age for whites. As age increases minorities have higher levels of heavy drinking relative to whites.

The interaction of race and marital status is also significant ( $F$  change=25.445,  $p<.001$ ). The positive coefficients for Hispanics ( $b=.280$ ), Asians ( $b=.293$ ), and African-Americans ( $b=.382$ ) indicate that the difference in the mean of frequency of heavy drinking is slightly greater among married minority group members compared to married whites. Simply stated, married whites drink heavily slightly less frequently than married Hispanics ( $\beta=.04$ ), Asians ( $\beta=.02$ ), and African-Americans ( $\beta=.05$ ).

The interaction between race and employment is also significant when added to the model ( $F$  change=19.927,  $p<.001$ ). The coefficients differ in direction between the minority groups. The negative coefficients observed for Asians ( $b=-.416$ ), and African-Americans ( $b=-.361$ ) indicate that for members of these groups, employment is associated with a lower mean of heavy drinking relative to working whites. The positive coefficient observed for Hispanics ( $b=.008$ ) indicates that the effect of employment on the mean of heavy drinking is slightly greater for Hispanics relative to whites, but the magnitude of the mean difference is extremely weak ( $\beta=.001$ ), therefore the frequency of heavy drinking is virtually identical for employed Hispanics and employed whites.

The interaction between race and gender is also significant ( $F$  change=20.052,  $p<.001$ ). Again, the coefficients differ in direction. The negative coefficients observed for Asians ( $b=-.528$ ) and African-Americans ( $b=-.191$ ) indicate that the effects of male gender on the mean frequency of heavy drinking are weaker for these two groups compared to whites. Simply stated, white males engage in heavy drinking more often

than Asian or African-American males. The inverse is seen with Hispanics ( $b=.206$ ), indicating that the effect of male gender on mean frequency of heavy drinking is greater for Hispanics relative to whites.

#### *Average Consumption Models*

The results for the average consumption dependent variable are similar to those in the heavy drinking model. Many of the same interactions have significant relationships in both models. In addition, some interactions that are not significant predictors of an increase in the frequency of heavy drinking are significantly related to the average number of alcoholic beverages consumed. The average consumption dependent variable is continuous, ranging from 0 to 13 or more alcoholic beverages consumed on average in a day when drinking occurred.

The addition of the interaction between education and poverty to the base model is statistically significant ( $F \text{ change}=11.988, p<.01$ ). The positive coefficient ( $b=.042$ ) observed for this interaction indicates that as education increases, the difference in mean number of drinks consumed by individuals below poverty is greater than for individuals not below poverty. This relatively weak ( $\beta=.02$ ) association indicates that as education increases poor individuals are shown to consume slightly more alcohol than non-poor individuals on average.

The introduction of the interaction of employment and poverty was also significant ( $F \text{ change}=5.513, p<.05$ ). In this interaction, the coding of the predictor variables is set so that the interactive effects represent the conditional effects of poverty and unemployment on alcohol consumption. The negative coefficient observed ( $b=-.113$ ) indicates that poverty decreases the mean number of drinks consumed by unemployed

individuals relative to employed persons. Simply put, unemployed poor individuals consume less alcohol on average than employed poor individuals.

Keeping the research questions in mind, the interaction between poverty and nativity is coded to represent the conditional effects of poverty and immigration on average alcohol consumption. The addition of this interaction is significant (F change=6.368,  $p<.05$ ). The negative coefficient ( $b=-.145$ ) demonstrates that poverty decreases the difference in mean number of drinks consumed for immigrants compared to native born U.S. citizens. In other words, poor immigrants consume less alcohol on average than poor native born citizens.

The interactions between age and nativity (F change=85.758,  $p<.001$ ) and education and nativity (F change=3.963,  $p<.05$ ) are both statistically significant and negative. The negative coefficients observed for the age interaction ( $b=-.013$ ), and the education interaction ( $b=-.020$ ) indicate that as both age and education increase, the mean number of drinks consumed by native born U.S. citizens is lesser than that by immigrants. As age and education increase, immigrants consume more alcohol on average than native born individuals. The relationship is stronger between age and nativity ( $\beta=-.11$ ) than between education and nativity ( $\beta=-.02$ ).

The addition of the interaction between race and poverty is also significant (F change=2.857,  $p<.05$ ) when added to the base model. The negative coefficients observed for Hispanics ( $b=-.151$ ) and Asians ( $b=-.009$ ), indicate that for members of these minority groups, the effects of poverty on the mean number of drinks consumed are less than they are for whites. Hispanics who are below poverty average less drinks consumed relative to whites ( $\beta=-.02$ ), while Asians are virtually identical to whites in terms of the

relationship between poverty and consumption ( $\beta=.000$ ). Conversely, the positive coefficient observed for African-Americans ( $b=.023$ ) indicates that the effect of poverty on the mean number of drinks consumed is greater for African-Americans than whites. This relationship is extremely weak as well ( $\beta=.003$ ).

The addition of the interaction between race and age to the base model of average consumption is statistically significant ( $F \text{ change}=37.046, p<.001$ ). The positive coefficients observed for Hispanics ( $b=.008$ ), Asians ( $b=.012$ ), and African-Americans ( $b=.012$ ) indicate that as age increases by one unit the mean consumption level for all three minority groups is slightly higher than for whites. The interaction between race and marital status is also significant when added to the main effects model ( $F \text{ change}=9.711, p<.001$ ). The positive coefficients observed for Hispanics ( $b=.171$ ), Asians ( $b=.116$ ), and African-Americans ( $b=.222$ ) indicate that for married minority group members the mean number of drinks consumed is greater than for married whites. Married minority groups members are shown to consume slightly more alcohol on average than married whites.

The introduction of the interaction between race and employment is statistically significant ( $F \text{ change}=14.841, p<.001$ ). The coefficients differ in direction between the minorities. The negative coefficients observed for Asians ( $b=-.260$ ), and African-Americans ( $b=-.218$ ) indicate that for members of these groups, employment is associated with a lesser mean number of drinks consumed relative to employed whites. The positive coefficient observed for Hispanics ( $b=.176$ ) indicates that the effect of employment leads to a slightly increased mean consumption level for Hispanics relative to whites.

The interaction between race and gender is also significant ( $F$  change=39.025,  $p < .001$ ). Again, the coefficients differ in direction. The negative coefficients observed for Asians ( $b = -.195$ ) and African-Americans ( $b = -.005$ ) indicate that the effect of male gender on the mean number of drinks consumed is weaker for these two groups compared to whites. Simply stated, white males engage in heavy drinking more often than Asian or African-American males, however the beta coefficient for the African-American gender interaction of  $-.001$  indicates that the average consumption by African-Americans males is virtually the same as that of white males. The converse is seen with Hispanics ( $b = .488$ ), indicating that the effect of male gender on the mean level of consumption is greater for Hispanic males relative to white males.

#### ***Final Multivariate Models***

The final models in these analyses consist of both dependent variables regressed onto the main effects predictors and interactions. First, a block including the race dummy variables is added to the other main effects. This represents the base model, which has an adjusted  $R^2$  of .125 for the heavy drinking model and .156 for the average consumption model. In addition to the base model, the final regressions include all interactions that achieve statistically significant relationships with the dependent variables when blocked separately into the models. Each interaction or set of interactions is added separately in order to assess the change in variance explained associated with each interaction and to avoid potential multicollinearity problems in assessing statistical significance. Statistical significance is assessed based on the  $F$  change statistics for each additional block.  $R^2$  changes and individual coefficients are interpreted as well. The results of these analyses are displayed in Tables 7 and 8.

### *Heavy Drinking*

The main effects of some predictors change with the addition of the significant interactions. The most notable difference observed is the loss of significance of employment in the model. Poverty remains not significant, and the remaining relationships vary only slightly in magnitude.

The addition of the interaction of age and poverty is statistically significant (F change=8.622,  $p < .01$ ). The interaction term coefficient is significant and positive ( $b = .001$ ), indicating that as age increases, the mean frequency of heavy drinking by individuals below poverty is slightly greater than for non-poor ( $\beta = .006$ ). This signifies that as age increases, a slightly higher frequency of heavy drinking can be expected for individuals living below poverty, but this effect size is quite small. A statistically significant  $R^2$  change is observed; however it is less than .000 indicating virtually no change in variance when the age-poverty interaction is added.

The interaction between education and poverty, is statistically significant (F change=14.899,  $p < .001$ ). The positive coefficient ( $b = .047$ ) indicates that the effect of a one unit increase in education on the mean frequency of heavy drinking is greater for individuals who live below poverty than those who are not poor. As education increases, poverty stricken individuals drink slightly more than non-poor individuals. This suggests a relationship between stress and increased frequency of heavy drinking. As education level increases, continued impoverishment may lead to increased stress, and therefore more frequent heavy drinking. Virtually no  $R^2$  change is observed for this block.

The introduction of the interaction between age and nativity into the heavy drinking model is also statistically significant (F change=76.851,  $p < .001$ ). The negative

interaction ( $b=-.011$ ) indicates that as age increases one unit, the difference in mean frequency of heavy drinking between native born individuals and immigrants is reduced. As age increases, native born citizens engage in heavy drinking less often than immigrants ( $\beta=-.09$ ). This suggests that more frequent heavy drinking is associated with youthfulness in native born citizens. An  $R^2$  change of .002 is observed for this block. The interaction between employment and nativity is not significant when added to the regression model.

The interactions between the race dummy variables and employment are statistically significant ( $F$  change=19.896,  $p<.001$ ). The coefficients differ in direction between the minority groups. The negative coefficient observed for African-Americans ( $b=-.079$ ) indicates that for African-Americans, employment is associated with a lower mean frequency of heavy drinking relative to whites. In other words, employed African-Americans participate in heavy drinking less frequently than employed whites. The positive coefficients observed for Hispanics ( $b=.193$ ), and Asians ( $b=.015$ ) indicate that the effect of employment on the mean frequency of heavy drinking is greater for Hispanics and Asians relative to whites. Employed Hispanics and Asians have higher levels of heavy drinking relative to employed whites. The interaction between Asian race and employment has an extremely small effect on frequency of heavy drinking ( $\beta=.001$ ). A significant  $R^2$  change of .001 is observed for this block.

The addition of the interactions between the race dummy variables and age is statistically significant ( $F$  change=34.032,  $p<.001$ ). The positive coefficients for Hispanics ( $b=.008$ ), Asians ( $b=.007$ ), and African-Americans ( $b=.015$ ) indicate that a unit increase in age increases the difference in the mean frequency of heavy drinking for

minority groups relative to whites. As age increases minority group members demonstrate higher mean levels of heavy drinking relative to whites. This suggests that increased frequency of heavy drinking is associated with youthfulness for whites. An  $R^2$  change of .002 is observed for this block. The addition of the interaction results in slight, but significant increase in variance explained in the frequency of heavy drinking.

The introduction of the interaction between race and marital status to the regression model is statistically significant ( $F$  change=21.545,  $p<.001$ ). The positive coefficients observed for Hispanics ( $b=.255$ ), Asians ( $b=.247$ ), and African-Americans ( $b=.382$ ) indicate that the difference in mean frequency of heavy drinking is greater among married minority group members than among married whites. Simply put, married minority group members are shown to engage in heavy drinking more often than married whites. This relationship is fairly weak; marriage, however, may be more of a protective factor against heavy drinking for whites than for minority group members. A slight, but significant  $R^2$  change of .001 is observed with the addition of this interaction.

The final block in the heavy drinking model consists of the interaction between race and gender. The race-gender interaction is statistically significant ( $F$  change=18.001,  $p<.001$ ). The coefficients differ in direction between minority groups. The negative coefficients observed for Asians ( $b=-.485$ ) and African-Americans ( $b=-.214$ ) signify that the difference in the mean frequency of heavy drinking is less for males from these two groups relative to whites. The positive coefficient observed for Hispanics ( $b=.184$ ) suggests that the difference in the mean frequency of heavy drinking is greater for Hispanic males than whites. These findings indicate that Asian and African-American males engage in heavy drinking less frequently than white males, while



Hispanic males drink heavily more often than males from any other subgroup in the model. A slight, but significant  $R^2$  change of .001 is observed for this interaction.

The complete results of the final heavy drinking regression model are displayed in Table 7. Inspection of the beta coefficients suggests that the relationships between the interactions and frequency of heavy drinking are quite weak; however significant interactions can be difficult to find. The strongest predictors are the main effects of gender ( $\beta=.244$ ), age ( $\beta=-.163$ ), and marital status ( $\beta=-.128$ ). The strongest relationship between any interaction and the heavy drinking dependent variable is observed for the age-nativity interaction ( $\beta=-.090$ ). In summary, the results show significant interactions between age and poverty, education and poverty, age and nativity, race and employment, race and age, race and marital status, and race and gender. As age and education increase, the effect of poverty on heavy drinking increases. Also, as age increases, native born citizens drink less than immigrants. Racial differences are observed between minority subgroups and whites in terms of the effects of employment, age, marital status, and gender on frequency of heavy drinking.

**Table 7: OLS Regression Results of Heavy Drinking Regressed onto Interaction Effects**

	<b>Heavy Drinking</b> (n=41,702)		
	b	s.e.	$\beta$
<b>Main Effects</b>			
Gender	1.034***	.025	.244
Age ♦	-.019***	.002	-.163
Nativity	.410***	.041	.061
Poverty	.053	.031	.010
Education ♦	-.059***	.005	-.065
Employment	.022	.077	.005
Marital Status	-.537***	.025	-.128
<b>Race</b>			
Hispanic ^ †	-.375***	.060	-.070
Asian ^ †	-.170***	.136	-.014
Black ^ †	-.466***	.050	-.089
<b>Interaction Terms †</b>			
Age x Poverty	.001**	.001	.006
Education x Poverty	.047***	.013	.021
Age x Nativity	-.011***	.002	-.090
Employment x Nativity	.071	.074	.017
<b>Race x Employment</b>			
Hispanic x Employment	.193***	.071	.031
Asian x Employment	.015***	.149	.001
Black x Employment	-.079***	.060	-.013
<b>Race x Age</b>			
Hispanic x Age	.008***	.002	.027
Asian x Age	.007***	.004	.010
Black x Age	.015***	.002	.055
<b>Race x Marital Status</b>			
Hispanic x Married	.255***	.050	.036
Asian x Married	.247***	.114	.016
Black x Married	.382***	.052	.045
<b>Race x Gender</b>			
Hispanic x Male	.184***	.052	.025
Asian x Male	-.485***	.115	-.027
Black x Male	-.214***	.051	-.027

*Adjusted R<sup>2</sup> = .133*

p<.05, \*\* p<.01, \*\*\* p<.001; ^ White as reference group; ♦ mean centered variable  
† For interaction terms and race, statistical significance judged by change in F

**Table 8: OLS Regression Results of Average Consumption Regressed onto Interaction Effects**

	<u>Average Consumption</u>		
	<b>(n=41,626)</b>		
	b	s.e.	$\beta$
<b>Main Effects</b>			
Gender	.818***	.024	.202
Age $\blacklozenge$	-.020***	.002	-.183
Nativity	.406***	.033	.076
Poverty	-.064	.081	-.012
Education $\blacklozenge$	-.012	.010	-.013
Employment	.090**	.031	.022
Marital Status	-.409***	.024	-.102
<u>Race</u>			
Hispanic $\wedge$ $\dagger$	-.363***	.059	-.071
Asian $\wedge$ $\dagger$	-.409***	.136	-.035
Black $\wedge$ $\dagger$	-.643***	.056	-.128
<b>Interaction Terms <math>\dagger</math></b>			
Employment x Poverty	-.113*	.051	-.017
Education x Poverty	.033*	.013	.016
Nativity x Poverty	-.062*	.073	-.006
Age x Nativity	-.014***	.002	-.116
Education x Nativity	-.021	.010	-.021
<u>Race x Poverty</u>			
Hispanic x Poverty	.068	.072	.007
Asian x Poverty	.021	.155	.001
Black x Poverty	.067	.061	.008
<u>Race x Employment</u>			
Hispanic x Employed	.216***	.060	.036
Asian x Employed	-.025***	.134	-.002
Black x Employed	-.005***	.060	-.001
<u>Race x Age</u>			
Hispanic x Age	.005***	.002	.019
Asian x Age	.004***	.004	.005
Black x Age	.012***	.002	.048
<u>Race x Marital Status</u>			
Hispanic x Married	.147***	.048	.022
Asian x Married	.068***	.110	.005
Black x Married	.216***	.050	.026
<u>Race x Gender</u>			
Hispanic x Male	.456***	.049	.064
Asian x Male	-.166***	.109	-.010
Black x Male	-.014***	.048	-.002

*Adjusted R<sup>2</sup> = .163*

\* p<.05, \*\* p<.01, \*\*\* p<.001;  $\wedge$  White as reference group;  $\blacklozenge$  mean centered variable  
 $\dagger$  For interaction terms and race, statistical significance judged by change in F

### *Average Consumption*

This section details the results from the final model analyses of the average consumption outcome measure. The significant interactions are added to the model in separate blocks, and the findings are discussed for each block and then overall. The complete results for these analyses are displayed in Table 8.

The addition of the significant interactions to the base model influences some of the relationships between main effect predictors and the average consumption outcome measure. With the addition of the significant interactions, poverty and education fail to maintain statistically significant relationships with the dependent variable. The beta coefficients for most main effects predictors weaken slightly.

The addition of the interaction term between employment and poverty to the average consumption regression model is statistically significant (F change=5.513,  $p < .05$ ). As previously noted, this interaction is coded to represent the conditional effects of unemployment and poverty on average consumption. The negative coefficient ( $b = -.113$ ) observed indicates that the effect of poverty on the mean number of drinks consumed is less for individuals who are unemployed relative to those who are employed. Poor individuals who are unemployed are shown to consume less alcohol on average than poor employed individuals. This finding is suggestive of a relationship between social stress and higher rates of drinking. Employed individuals, who despite their employment remain impoverished, are likely to have increased levels of stress which may increase average alcohol consumption. Virtually no change in the variance explained is observed with the addition of the interaction between employment and poverty.

The introduction of the interaction between education and poverty to the model is statistically significant ( $F$  change=9.212,  $p<.01$ ). The positive coefficient ( $b=.033$ ) indicates that the effect of an increase in education on the average number of drinks consumed is greater for individuals living below poverty than those not living below poverty. As education increases, individuals who live below poverty consume more alcohol on average than individuals who are not below poverty. Once again, virtually no change in the amount of variance explained is observed.

The introduction of the interaction between poverty and nativity is statistically significant ( $F$  change=5.079,  $p<.05$ ). As previously noted, this interaction is coded so that the conditional effects of immigration and poverty are assessed. The negative coefficient ( $b=-.062$ ) indicates that poverty effects the difference in the mean level of alcohol consumption less for poor immigrants than poor native born citizens. Immigrants who live below poverty are shown to consume less alcohol on average than native born citizens who live below poverty. Virtually no change in the variance explained is observed for this block.

The addition of the interaction between age and nativity to the average consumption model is statistically significant ( $F$  change=88.647,  $p<.001$ ). The negative coefficient observed ( $b=-.014$ ) indicates that as age increases mean number of drinks consumed is less for native born individuals than for immigrants. Simply put, as age increases native born U.S. citizens are shown to consume less alcohol on average than immigrants. A higher rate of average alcohol consumption is associated with youthfulness for native born citizens, as the positive coefficient observed for nativity's

main effect indicates that U.S. nativity is associated with increased average alcohol consumption. An  $R^2$  change of .002 is obtained for this block of the regression.

The addition of the interaction between education and nativity is not significant in the final model. The slight negative effect of the education-nativity interaction that is observed when the interaction is added to the base model is no longer statistically significant in the presence of the other significant interactions. The introduction of the interaction between race and poverty is also not statistically significant in the final model. The positive coefficients associated with the age-race interaction are no longer significant when the other significant interactions are included in the model.

The addition of the interaction between race and employment is statistically significant ( $F$  change=17.646,  $p<.001$ ). As observed earlier, the coefficients differ in direction across minority groups. The negative coefficients observed for Asians ( $b=-.025$ ), and African-Americans ( $b=-.005$ ) indicate that the effect of employment on mean level of alcohol consumption is weaker for these two groups than whites. However, the beta coefficients observed for these relationships are very weak ( $\beta=.002$ ) for Asians, and ( $\beta=.001$ ) for African-Americans. The positive coefficient observed for Hispanics ( $b=.216$ ) indicates that employment effects the mean number of drinks consumed more for Hispanics relative to whites. This shows that employed Hispanics consume greater quantities of alcohol on average than employed white individuals. An  $R^2$  change of .001 is observed for this block of the regression.

The inclusion of the interaction between race and age is also statistically significant ( $F$  change=25.097,  $p<.001$ ). The positive coefficients observed for Hispanics ( $b=.005$ ), Asians ( $b=.004$ ), and African-Americans ( $b=.012$ ) indicate that an increase in

age affects the difference in mean level of alcohol consumption more for these minority groups relative to whites and other subgroups. This shows that as age increases by one unit, members of these minority groups consume more alcohol on average than whites. An  $R^2$  change of .002 is associated with this block.

The introduction of the interaction between race and marital status is statistically significant ( $F$  change=8.308,  $p<.001$ ). The positive coefficients observed for Hispanics ( $b=.147$ ), Asians ( $b=.068$ ), and African-Americans ( $b=.216$ ) indicate that the effect of being married on the mean number of drinks consumed by these minority groups is greater relative to married whites. This implies that married members of these minority groups consume more alcohol on average than whites. An  $R^2$  change of .001 is associated with this block.

The addition of the interaction between race and gender is statistically significant ( $F$  change=32.218,  $p<.001$ ). The direction of the coefficients differs across the minority groups. The negative coefficients observed for Asians ( $b=-.166$ ), and African-Americans ( $b=-.014$ ) illustrate that the effects of male gender on the mean level of consumption are lesser for these two groups, than for whites. This suggests that Asian and African-American males drink less on average than white and Hispanic males. The positive coefficient associated with Hispanic race ( $b=.456$ ) suggests that the effects of male gender on the mean number of drinks consumed are greater for Hispanics relative to whites, suggesting that Hispanic males consume more alcohol on average than males from the white subgroup.

In the final models for the average consumption outcome measure, significant interactions between employment and poverty, education and poverty, nativity and

poverty, age and nativity, race and employment, race and age, race and marital status, and race and gender are observed. It is observed that as education increases, the effect of poverty is greater on the average consumption of alcohol. Racial differences are seen between minority groups and whites in terms of the conditional effect of employment, age, marital status, and gender.

The findings across both models of drinking are quite similar. Five of the interactions are identical in significance and direction for both outcome measures, indicating the consistency of their relationship with increased levels of alcohol use. These relationships and their implications are discussed in more detail in the discussion section of this study. Many of these findings are consistent with previous studies as well. The key study findings and their implications are discussed in the section that follows.



## **Chapter 6**

### **Discussion**

The goal of this study is to gain a better understanding of the factors that influence racial differences in alcohol use behaviors. Previous studies have established predictors that illustrate utility for explaining differential alcohol use behaviors across racial and ethnic subgroups (Barr et al., 1993; Herd, 1990; 1994; Jones-Webb et al., 1995). Others have examined trends in rates of alcohol use, while continuing to establish consistent relationships between specific predictors and increased rates of alcohol use (Caetano & Clark, 1998a; Caetano & Kaskutas, 1995; Midanik & Clark, 1994). In addition to single-factor predictors, a number of these studies have also examined the conditional effects of interactions between some of these demographic predictors and racial differences in alcohol use (Barr et al., 1993; Herd, 1990; 1994; Jones-Webb et al., 1995). Throughout the evolution of this body of literature, results have suggested only limited explanations of the causes of differential alcohol use behaviors. The findings of this study and their meanings are addressed in the following pages.

Overall, the results of the current study support what has been established in the existing literature. Bivariate analyses reveal pronounced and consistent racial differences in alcohol use behaviors. The bivariate results for both outcome measures indicate that whites and Hispanics are more likely to be current drinkers and to have engaged in heavy drinking at all within the past year. Across all categories of the dependent variables

whites and Hispanics are more likely to engage in heavy drinking behaviors than either African-Americans or Asians. Consistent with the extant literature, the bivariate results from this study reveal that Hispanics have the highest rate of frequent heavy drinking, followed closely by whites. African-Americans and Asians are considerably less likely to engage in frequent heavy drinking, than whites and Hispanics.

The bivariate results for the remaining demographic predictors are consistent with what has been found repeatedly across previous studies. Male gender and younger age are the strongest demographic predictors of increased amounts of heavy drinking. The bivariate results concerning the relationship between poverty and the dependent variables indicate that poverty does impact higher drinking levels. Individuals living below the poverty threshold are shown to have higher average consumption levels than non poor individuals, and the two groups are very similar in terms of frequent heavy drinking. Consistent with the existing literature, non poor individuals are shown to drink more than impoverished individuals at lower levels of consumption, but in terms of the heaviest drinking categories, poor individuals drink more than non poor (see tables 4 & 5). This finding is supportive of the prediction that economic stress has a significant impact of heavier alcohol use. Poverty may also be related to social and psychological stress.

The bivariate relationships observed warranted further investigation. Multivariate regression models and interaction terms reveal more about the differential alcohol use behaviors across racial and ethnic subpopulations in the United States. The main effects for model 1, displayed in Table 6, indicate that all but one of the single-factor predictors tested are shown to be significantly related to frequency of heavy drinking. In model 2, all the main effects are shown to be significantly related to the average number of drinks

consumed. Male gender and youthfulness continue to be the strongest predictors of higher levels of alcohol use.

A number of results from the interaction models are consistent with previous studies as well. In addition to the similar patterns that are observed, these findings provide some indications of relationships between increased social and economic stress and higher levels of drinking; a topic that has been the subject of more recent studies of racial and ethnic differences in alcohol use (see Caetano et al., 1998).

The findings that are consistent across the models for both dependent variables are discussed here. In both the frequency of heavy drinking model and the average level of consumption model, as education increases higher levels of drinking are observed for impoverished individuals. This may be attributable to higher levels of stress associated with living below poverty despite increased education. The disempowerment felt by these individuals who are unable to maintain more than a minimal standard of living may lead to their increased rates of heavy drinking and higher levels of consumption.

Socioeconomic stress is addressed as a probable cause of increased minority alcohol use in a number of previous studies (Al-Issa, 1997; Caetano et al., 1998). More in-depth analysis of the relationship between social, economic, and psychological stressors and alcohol use is needed, especially in terms of racial and ethnic differences.

Across both models, an increase in age is associated with higher drinking for immigrants and minority groups relative to native-born citizens and whites. The finding for race is consistent with the findings of previous studies, which find that heavier drinking among whites is associated with youthfulness relative to African-Americans, and that being over 50 is a protective factor against heavy drinking for whites, but not for

Hispanics or African-Americans (Caetano & Clark, 1998a; Caetano et al., 1998; Herd, 1990). The findings from the age-nativity interactions, which display the strongest relationships with the outcome variables, may be attributable to the increased stress brought on by immigration and social adjustment to dominant U.S. culture discussed by Caetano and colleagues (1998) and Al-Issa (1997). This is classified as acculturative stress (see Al-Issa, 1997), which is typically felt by immigrants who are faced with leaving their homeland and adapting to a new society (Caetano et al., 1998) Immigrants who come to the United States as adults may have difficulty adapting which could lead to increased drinking throughout adulthood. The cultural drinking norms are also likely to differ between immigrants' country of origin and the United States. Studies have shown that some immigrant groups are likely to maintain the drinking norms of their homeland, which may be characterized by heavier drinking during adulthood (see Higuchi et al., 1994).

In both models, being married is associated with higher levels of drinking for minority groups relative to whites. This is consistent with the findings of Caetano and Clark (1998a) which indicate that not being married is a risk factor for heavy drinking among whites, but not among Hispanics or African-Americans. The findings from the current study imply that marriage is less of a protective factor for minority group members than it is for whites.

Also significantly related to both dependent variables is the interaction between race and gender. Hispanic males are shown to drink more heavily than whites, while Asian and African-American males are shown to drink less heavily than whites. Findings that suggest high rates of Hispanic male alcohol consumption are consistent with a

number of previous studies (see Aguirre-Molina & Caetano, 1994). Studies typically refer to “standard” Hispanic cultural norms that promote heavy male alcohol consumption, but Caetano and colleagues (1998) have warned that this generalization glosses over subgroup differences within the Hispanic category, claiming that high rates of alcohol consumption among Hispanic males cannot be fully explained without taking into account social, economic, cultural, and historical aspects of Hispanic life in the United States. These aspects must be considered when examining the drinking behaviors of all racial and ethnic groups. The basic demographic predictors are only able to account for a limited amount of the variability in drinking behaviors across racial and ethnic subgroups.

The findings in terms of race indicate that when demographic predictors are included as controls, the magnitude of the relationship between race and drinking outcome measures is lessened. This suggests that other demographic factors may be more influential in predicting and explaining drinking behaviors than race. In the multivariate models, the beta coefficients observed for race are small in magnitude relative to other predictors (e.g., age, gender). These findings may suggest that race is just one of many factors influencing the drinking behaviors of people in the United States and that further consideration of the utility of race as a focus in the study of alcohol use should be considered further.

The interaction between age and poverty was significantly related to the frequency of heavy drinking, but not to the average number of drinks consumed. As age increases, the frequency of heavy drinking increases more for poor individuals than for non-poor. Continuing heavy drinking with increased age for impoverished individuals

may be a sign of higher stress related to the inability to attain a minimal standard of living. Consistent with the arguments made throughout this discussion, socioeconomic stress is likely to be an important predictor of increased alcohol use. If this is the case we should expect a positive relationship between poverty and drinking, however the negative main effect of poverty in the current study suggests that absolute poverty is not the best measure of socioeconomic stress. Socioeconomic stress may be better measured in terms of relative poverty, which represents inequality or social class.

In the average consumption model, the interactions between poverty and employment as well as poverty and nativity are statistically significant. These findings indicate that poor individuals who are employed and native born drink more alcohol on average relative to poor unemployed persons and poor immigrants. Again, this may be associated with higher levels of social and economic stress experienced by individuals who are employed, but still impoverished and for those who are native born and impoverished, who are continually unable to attain economic success in a culture that values such successes very highly. Alcohol use may be part of a coping strategy used to deal with continued frustration over inability to achieve economic stability.

This study finds no statistically significant relationship between the interaction of race and economic status and the outcome measures, unlike Jones-Webb and colleagues (1995) who find that relationships between socioeconomic status and race/ethnicity vary in terms of their effects on drinking behaviors. This is likely due to the difference in this study's measure of economic status. Jones-Webb and colleagues examine social class rather than absolute poverty which is considered here. As noted above, the social class of an individual, which represents their standing within society, may be more important than

simply being below a somewhat arbitrary level of minimal sustenance. No significant interaction is observed between race and nativity in this study. This is contrary to other studies which have found higher rates of drinking for Asian-Americans when compared to Asians who migrate to the U.S., or who still live in their ancestral homelands (see Higuchi et al., 1994; Makimoto, 1998).

This study, like many similar studies is limited in its ability to explain much of the variance in alcohol use among subpopulations in the United States. This study accounts for roughly 13% of the variance in frequency of heavy drinking and roughly 16% in the average consumption of alcohol. The strongest predictors in this study attain moderate relationships with the outcome measures. A possible reason for the lack of stronger relationships may be due to the fact that the sample contained such a large portion of non drinkers. This may have affected some findings and weakened the strength of others. In the analysis of dependent variables that are largely grouped at zero or one, other statistical approaches may be better suited. In this case a Tobit regression analysis technique may be more appropriate and may be utilized in further examination of these outcome variables.

Additional limitations include the lack of any measures of acculturation or alcohol availability. The influence of acculturation and acculturative stress on alcohol use behaviors appears across much of the contemporary literature on alcohol use and ethnicity (see Al-Issa, 1997). It is a topic that is of continuing interest to social scientists studying alcohol use behaviors. Acculturation has proven difficult to measure, and the NESARC does not provide any appropriate measures.

Another theme that appears evident across the existing ethnicity-focused alcohol research is that tremendous variability exists within each ethnic group, posing significant theoretical and methodological issues for researchers (Caetano et al., 1998). Caetano and colleagues (1998) warn that broad characterizations of ethnicity, such as “Hispanic” may lead to inaccurate generalizations and invalid findings. The decision not to account for this heterogeneity may be considered a limitation of the current study.

Future research in the area of alcohol use and race/ethnicity should expand the analysis of the stressors that impact heavy drinking across subgroups. These inquiries should include measures of social, economic, cultural, and psychological factors that lead to increased stress and increased alcohol use coping strategies. The development and application of accurate measures of the stressors that specifically relate to alcohol use will assist the understanding of the underlying causes of its increased use. Further application of theory may also be beneficial in the maturation of this field of study.

## **Conclusions**

Subgroup differences in drinking are observed, especially at the bivariate level. However, as controls are added, race becomes less of an important predictor of differences in drinking behaviors. Support is also provided for a link between social and economic stressors and increased alcohol use, but the effect sizes are often weak. The single factor demographic predictors are shown to be significantly related to increased rates of drinking across racial subgroups in the United States, but they are limited in the amount of variance that they can account for. In relation to the findings of previous studies of this issue, this study is quite similar. Although some different conclusions emerge, this study finds that race explains only a slight amount of variation in drinking



behaviors and other demographics are also limited in their ability to account for differential drinking behaviors. Despite using the NESARC data, which is the largest and most comprehensive comorbidity dataset available, the analysis of demographic predictors and their interactive effects on alcohol use behaviors is limited. NESARC contained an extensive battery of questions about present and past alcohol consumption and alcohol use behaviors. The NESARC is an adequate data source for this research agenda, due to its large representative sample which provides ample coverage of the relevant subgroups (e.g. racial and ethnic minorities, citizens and noncitizens), but large surveys such as NESARC are often unable to display much utility in terms of causal explanation due to an epidemiological focus. The small effect sizes and limited explained variance are certainly a limitation for the current study, but they may be related to the nature of the secondary data use, which does not allow for the measurement of specific concepts that would help answer the research questions of this study more thoroughly.

The lack of strength observed for the relationships between the demographic predictors and their interactions with the two outcome measures of drinking may indicate that as researchers have gone as far as we can with these demographic predictors. Previous studies have continually concluded that the differences in alcohol use behaviors across race and ethnicity are likely to be the product of a complex interplay of psychological, historical, cultural, and social factors that shape lives of individuals in the United States (see Caetano et al., 1998). A better understanding of the links between culture and addiction, decision making, and substance use is required in order to understand the complexity of alcohol use among subgroups within the United States.

Further consideration of this issue is vital. As noted in the introduction, the costs of alcohol use and abuse are extremely high. A better understanding of the causation of heavy drinking across racial and ethnic subpopulations will help policy makers and public health officials create better preventions and treatments for individuals dealing with the costs of alcohol-related problems.

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## Appendices

## Appendix A

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### Interaction Terms

#### **Heavy Drinking**

Education X Nativity  
Age X Nativity\*  
Poverty X Nativity  
Employment X Nativity\*  
Employment X Poverty  
Education X Poverty\*  
Marital Status X Poverty  
Age X Poverty\*  
Race X Nativity  
Race X Gender\*  
Race X Poverty  
Race X Employment\*  
Race X Marital Status\*  
Race X Age\*  
Race X Education

#### **Average Consumption**

Education X Nativity\*  
Age X Nativity\*  
Poverty X Nativity\*  
Employment X Nativity  
Employment X Poverty\*  
Education X Poverty\*  
Marital Status X Poverty  
Age X Poverty  
Race X Nativity  
Race X Gender\*  
Race X Poverty\*  
Race X Employment\*  
Race X Marital Status\*  
Race X Age\*  
Race X Education

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\* Denotes statistically significant interaction