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Factors Associated with College Students' Excessive Alcohol Consumption Within the Occupational Therapy Practice Framework: an Epidemiological Analysis

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FACTORS ASSOCIATED WITH COLLEGE STUDENTS' EXCESSIVE ALCOHOL CONSUMPTION WITHIN THE OCCUPATIONAL THERAPY PRACTICE FRAMEWORK: AN EPIDEMIOLOGICAL ANALYSIS

by

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ABSTRACT

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OBJECTIVE: The purpose of this study was to estimate the relative influence of predictor variables on excessive alcohol consumption among college students for providing effective prevention and intervention. Also, this study suggests the roles of occupational therapy in Health promotion and Well-being. METHOD: The data from 7,166 college students (3,176 males, 3,990 females) aged between 18 – 25 years from the 2012 National Survey on Drug Use and Health (NSDUH) conducted by the US Department of Health and Human Services was used. Two criterion variables, binge drinking and heavy drinking, were used as indicators of excessive alcohol consumption. There were 12 predictor variables within four Context and Environment classifications as described by the Occupational Therapy Practice Framework (OTPF): Domain and Process (AOTA, 2008a). Multiple logistic regression analyses were conducted to estimate associations between excessive alcohol consumption and predictor variables, adjusting for other predictor variables. Hierarchical Regression was conducted stepwise in four Context and Environment classifications. RESULTS: Perceived risk of excessive drinking and importance of religious beliefs were strong negative predictors of excessive alcohol consumption. The Cultural classification provided the largest influence on

excessive alcohol consumption in both males and females. The second largest classifications influencing binge drinking differed based upon gender. Personal classification was the second largest one for males, while Temporal classification was the second largest one for females. Occupational therapy can play significant roles in Health promotion and Well-being by helping people to actively engage in their meaningful occupations. CONCLUSION: Cultural factors among college students should be managed to prevent excessive alcohol consumption among them. Occupational therapists can provide prevention programs by using knowledge on the OTPF: Domain and Process.

우리 아빠 조용국, 우리 엄마 김해결, 우리 형 조세종, 김정숙, 조건우,

그리고 우리 은경이 감사합니다. 하나님 감사합니다.

당신들의 사랑과 헌신으로 가능했습니다. 사랑합니다.

To my Dad, Mom, Bro, Sister-in-law, Nephew, Grace, and God,

It was impossible without your love and dedication. I love you.

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I. INTRODUCTION

Excessive Alcohol Consumption

Excessive alcohol consumption is one of the most well-known risk factors of various chronic diseases and conditions, such as liver cirrhosis, cancers, and fetal alcohol spectrum disorder (Davis et al., 1994; Nichols, Scarborough, Allender, & Rayner, 2012). According to a report of World Health Organization (WHO) in 2011, excessive alcohol consumption results in about 2.5 million deaths each year and is a significant causal factor of 60 kinds of diseases and injuries around the world (WHO, 2011). In the United State (US), almost 79,000 deaths is caused by excessive alcohol consumption each year, so that it is the third-leading preventable cause of death (Bouchery, Harwood, Sacks, Simon, & Brewer, 2011). Thus, preventing excessive alcohol consumption is a very important matter of public health.

Although alcohol consumption is simply defined as the drinking of beverages containing ethyl alcohol (Encyclopedias Britannica, 2014), in terms of alcohol consumption levels, people, even researchers, use slightly different terminology for representing problematic alcohol consumption. These include high-risk drinking, heavy-episodic drinking, and excessive alcohol consumption, and sometimes these terms are used interchangeably (Laufer Green Isaac, 2009). For example, Moos and his colleagues used excessive alcohol consumption synonymously with high-risk alcohol consumption (Moos, Brennan, Schutte, & Moos, 2004). Some studies used binge drinking as the equivalent of high-risk drinking (Laufer Green Isaac, 2009). There are not clear differences between the two terms, high-risk and excessive, but only some specific conditions on high-risk alcohol use, as compared to excessive alcohol consumption, such

as drinking while on medication and ill or drinking too much too fast (Office of Alcohol and Drug Education, 2008). In this study, the term excessive alcohol consumption will be used to represent problematic alcohol consumption. Excessive alcohol consumption is defined as one of four following drinking patterns: binge drinking, heavy drinking, any alcohol consumption of people under age 21 years old, and any alcohol consumption of pregnant women (Bouchery et al., 2011). Binge drinking and heavy drinking will be used to represent excessive alcohol consumption among college students in this study.

Target Population: College Students

Many public health practitioners have identified target populations that are highly susceptible to alcohol consumption and its associated problems. Among these populations, excessive alcohol consumption among young people, especially college students, is one of the most important public health concerns in many countries around the world, including the United Kingdom and the Netherlands as well as the US (Fager & Melnyk, 2004; Bewick et al., 2008; Hendriks, de Bruijn, & van den Putte, 2012). This is because many young people first consume alcohol after entering college, and even if a higher percentage of college students just started drinking before becoming a college student, most of them experience binge and heavy drinking during college (Meding, 2012). Moreover, according to the latest statistic from the US Department of Health and Human Services in 2012, the drinking pattern of young people between 18 and 25 is heavier than adults above 25 years old in the US (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013c). College students also have a higher prevalence of heavy drinking than young people in the same age group in the US who do not attend college (Wechsler, Dowdall, Davenport, & Castillo, 1995; Carter, Brandon, &

Goldman, 2010). Therefore, alcohol consumption of college students is the highest among populations, and they are very susceptible to excessive alcohol consumption.

This tendency can be found in the other countries. For example, Korea is one of the countries with a high rate on prevalence of alcohol consumption among college students. According to a report of the Korean Alcohol Research Foundation (KARF) in 2010, 85.4% of college students experienced drinking during the past month, and 71.3% were high-risk drinkers which is defined as consumption of five or more drinks for males and four or more drinks for females in one occasion in the last two weeks (KARF, 2011). Canada is another country which has a similar pattern of alcohol consumption. Canada is often compared to the US in many characteristics because the two countries resemble each other and are in geographically similar locations. Approximately 90% of college students in Canada use alcohol, and 32% were heavy drinkers at least once a month (Tamburri, 2012). College students in the US show comparable behaviors. Alcohol consumption of college students is the highest among the US population. In 2012, 67.7% of college students in the US reported alcohol consumption during the past month, and 37.4% were in the category labeled high-risk drinking which is defined as consumption of five or more in a row in the last two weeks (Johnston, O'Malley, Bachman, & Schulenberg, 2013).

Consequences of Excessive Alcohol Consumption among College Students

In general, excessive alcohol consumption leads to various negative consequences on body functions. For example, it causes impairments in cognitive functions, including poor decision making and impulsiveness, and motor skills including

balance and movement (White & Hingson, 2014). In addition to the effects on body functions, excessive alcohol consumption is closely related to adverse social consequences including increased health care costs, unintentional injuries and violence, increased crime, and reduced work productivity (Sacks et al., 2013).These negative consequences of excessive alcohol consumption also apply to college students. According to the National Center for Addiction and Substance Abuse (CASA) in 2007, 68.1% of students experienced missing classes, 52% of students experienced blackouts, and 21.3% of students engaged in unplanned sexual activity (CASA, 2007).

In terms of duration, negative consequences are divided into two types: short-term and long-term consequences. Short-term consequences include injuries, risky sexual behaviors and interpersonal conflicts. Problems of college life such as missing classes and lower academic performance are examples of the short-term consequences of excessive alcohol consumption. Drunk-driving is also a high risk alcohol-related consequences among college students. According to research of Hingson and colleagues in 2009, approximately 2.7 million college students in the US between 18 and 24 years old have driven while drunk (Hingson, Zha, & Weitzman, 2009). Long-term consequences include likelihood for the development of alcohol use disorder later in life, chronic diseases, and even premature death (Lee, Chassin, & Villalta, 2013; White & Hingson, 2014). It implies that not only excessive alcohol consumption creates drinking-related problems in the present, but also can make negative consequences later in life (O'Neil, Parra, & Sher, 2001; Lee et al.).

Excessive Alcohol Consumption and Occupational Therapy

According to the Occupational Therapy Practice Framework (OTPF) Domain and Process (American Occupational Therapy Association [AOTA], 2008a), there are eight areas of occupation including Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Rest and Sleep, Education, Work, Play, Leisure, and Social Participation. Occupational therapy practitioners consider these eight areas in which clients engage when they work with their clients. However, the client's perception of how an occupation is classified may differ depending on the client's various socio-demographic backgrounds. For example, most people may cook as an IADL, while chefs perform it as Work. Quiz games may be classified as Play for some groups, while it is Education for students. Similarly, excessive alcohol consumption can be considered differently based on the different point of views, including as Malfunctioned Leisure or a Malfunctioned Instrumental Activities of Daily Living.

As Malfunctioned Leisure, excessive alcohol consumption can affect human occupations. There have not been many studies about occupational therapy for the excessive alcohol consumption, but researchers have classified drinking as Leisure among the eight areas of occupation (Maloney, 2011), so excessive alcohol consumption can be considered as a Maladaptive Leisure Activity. Occupational therapy interventions mainly have been focused on how occupational therapists can make people engage in an appropriate leisure occupation. Prevention of excessive alcohol consumption may be an occupational therapy intervention because drinking itself was classified as Leisure.

As Malfunctioned IADL, excessive alcohol consumption can affect human occupations. Appropriate level of alcohol consumption can be classified as a proper IADL. The occupational area of IADL has 12 sub-areas. One of them is 'Health Management and Maintenance' and includes decreasing health risk behaviors (AOTA, 2008a). Since excessive alcohol consumption is a typical health risk behavior (Burgess Dowdell, 2006), decreasing or preventing excessive alcohol consumption would be an occupational therapy intervention when excessive alcohol consumption is classified as a Malfunctioned IADL. In contrary, doing not decrease health risk behaviors among clients will be a malfunctioned in IADL. Historically, ADLs and IADLs have received more priority than the other areas of occupation, including Leisure, as an intervention goal for occupational therapy. Thus, preventing excessive alcohol consumption as a health risk behavior related to IADLs would be an important intervention for allowing clients to engage in a meaningful occupation. In this study, excessive alcohol consumption will be considered as Malfunctioned IADL rather than as Malfunctioned Leisure.

National Survey on Drug Use and Health (NSDUH) and Core Based Statistical Area (CBSA)

The National Survey on Drug Use and Health (NSDUH) is a huge nationwide survey that annually conducted to estimate drug use among the US population. Approximately 70,000 randomly selected people aged 12 and older are participated in this survey each year. This survey funded by the Substance Abuse and Mental Health Services Administration (SAMHSA) in the US Department of Health and Human Services (DHHS). NSDUH began in 1971 and is currently conducted annually. The survey is aimed to provide accurate prevalence of substance including tobacco, alcohol,

illicit drugs, and mental health in the US, to track trends in the use of various types of drugs, to assess the consequences of substance use, and to identify those who are at high risk for substance abuse. Various researchers and organizations use NSDUH data to track progress and make drug control strategy. For example, the White House Office of National Drug Control Policy uses NSDUH data to make the goals in the National Drug Control Strategy. The Center for Disease Control and Prevention (CDC) also uses NSDUH data to estimate trends and patterns of substance use in the US (SAMHSA, 2013b).

Core substances assessed in NSDUH include tobacco, alcohol, marijuana, cocaine, heroin, hallucinogens, inhalants, pain relievers, tranquilizers, stimulants, and sedatives. Information about prevalence, severity, risk, and related variables are assessed by questionnaires. Also, participants' demographic and geographic variables are measured. Demographics include age, gender, race, experience in the US ARMY, marital status, education level, family income, employment status, and etc. (SAMHSA, 2013b). To measure geographical characteristics among participants, NSDUH uses the 2003 Core Based Statistical Area (CBSA) (SAMHSA, 2013c). CBSA is a geographic area classification method provided by the Office of Management and Budget (OMB). In 2003, OMB announced the first set of areas based on 2000 Census data. CBSAs include a county or counties with at least 10,000 population. There are three different levels of area based upon population: metropolitan statistical area contains a core urban area with population of 50,000 or more, micropolitan statistical area contains areas with population of 10,000 to 50,000, and areas outside CBSAs with population of less than 10,000 (United States Census Bureau [USCB], 2012).

The National Survey on Drug Use and Health is a nationally representative source to estimate drug use and mental illness among the US population aged 12 and older. Despite well-established information of the survey, it has some limitations. First, the data are self-rated reports, so that the results depend on participants' frankness and memory. Also, although NSDUH can provide overall prevalence of substance use among the US populations, it is a cross-sectional study, therefore, provides only information at a specific point rather than considering time shifts (SAMHSA, 2013b).

Purpose of the Study

In order to support occupational therapy intervention for excessive alcohol consumption as an area of IADL, specifically Health Management and Maintenance, it must be understood within the contexts and environments of occupational therapy. This study provides classification of variables used in the association between a wide variety of predictor variables among college students and their excessive alcohol consumption into the terminology of the OTPF Domain and Process (AOTA, 2008a). To provide proper prevention services for excessive alcohol consumption among college students, health practitioners should identify determinants of excessive alcohol consumption. These predictor variables then have to be understood within their practice framework. For occupational therapists, the OTPF Domain and Process is a very important framework for understanding clinical practice. Thus, the variables studied here, including criterion variables and predictor variables, will be classified within Contexts and Environments based on the OTPF Domain and Process. This study is mainly aimed to estimate influences of predictor variables as defined by the OTPF Domain and Process Contexts

and Environments and their relative influence on excessive alcohol consumption among college students.

Additionally, this study will suggest roles of occupational therapy in health promotion and well-being, especially prevention sciences of problematic alcohol consumption. Historically, occupational therapy plays a role in the tertiary prevention stage for people with alcoholic or alcohol abuse to promote their proper occupations. However, these days, excessive alcohol consumption as a malfunctioned occupation is more common. Therefore, occupational therapists could work with those who do not need to receive rehabilitation services after diagnosed as alcoholism or alcohol abuse, but need to receive interventions for prevention of excessive alcohol consumption. It is proposed that occupational therapists can work in prevention programs for college students' excessive alcohol consumption, as primary and secondary prevention, using the OTPF Domain and Process. These results will help health professionals, including occupational therapists, to provide interventions more effectively for college students with excessive alcohol consumption.

Research Questions

The research questions which were considered in this study are:

1. What are the influences of predictor variables within Cultural (perceived risk of excessive alcohol consumption, importance of religious beliefs, and experience in the US ARMY), Personal (age, family income, and student type), Temporal (year of college, marital status, and employment status), and Physical (population density) classifications on excessive alcohol consumption?

2. What is the relative influence of Cultural, Personal, Temporal and Physical classifications on excessive alcohol consumption?

II. BACKGROUND OF THE STUDY

The following background of the study will discuss literature regarding four topics including (1) a main occupational therapy model for relevant factors of excessive alcohol consumption, (2) previous studies about predictors of excessive alcohol consumption among college students, (3) prevention of excessive alcohol consumption, and (4) relevance of prevention for excessive alcohol consumption to occupational therapy. This background information will explain fundamental concepts about relevant factors of excessive alcohol consumption within occupational therapy framework and prevention of excessive alcohol consumption among college students.

The first background information is about the main model, the OTPF Domain and Process, for relevant factors of excessive alcohol consumption. In this part, definitions of six main Contexts and Environments and relevant factors will be explained. The second section will deal with previous studies about predictor variables based upon the OTPF Domain and Process Contexts and Environments. The third part will describe prevention of excessive alcohol consumption, particularly, important concepts of prevention science including predictive relationships between criterion variables and predictor variables, epidemiological analysis, and prevention stages. The final background information will describe relevance of prevention for excessive alcohol consumption to occupational therapy. Then, a summary will be provided to combine all of the related knowledge that is covered in this background section.

A Model for Relevant Factors of Excessive Alcohol Consumption within Contexts and Environments of the Occupational Therapy Practice Framework

Human occupations are performed in various environments situated within contexts. The term Environment is defined as "external environments surrounding a person where the occupations occur" (AOTA, 2008a, p. 645). The term Context is defined as various conditions intricately connected within a person. Sometimes, the two terms are used interchangeably. The OTPF Domain and Process provides six Context and Environment classifications including Personal, Cultural, Temporal, Social, Virtual, and Physical context and environments (AOTA). See Figure 1.

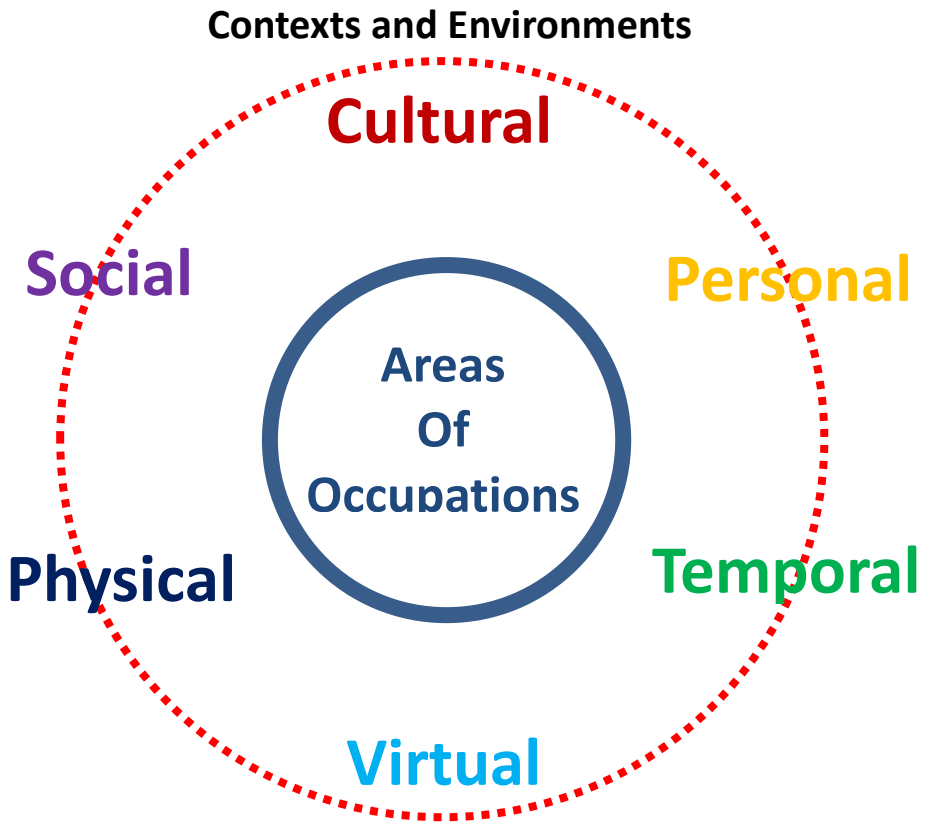

Figure 1. Contexts and Environments in Occupational Therapy Practice Framework

Every internal and external human factor can be included in these classifications. So, when we think about various factors associated with excessive alcohol consumption among college students, we can match these factors within the Occupational Therapy Practice Framework. For example, all variables that may predict excessive alcohol consumption, such as gender, age, family income, student type, race, level of perceived risk on excessive drinking, level of importance on religious beliefs, experience in the US ARMY, year of college, marital status, employment status and population density, can be classified into each Context and Environment conditions in the Occupational Therapy Practice Framework. This classification will give a better understanding to occupational therapists who want to provide preventive interventions for excessive alcohol consumption among college students (Table 1).

Table 1. Classification of predictor variables within the Occupational Therapy Practice Framework

Context and Environment Classifications	Predictor variables of the 2012 NSDUH[a]
Cultural	Perceived Risk on Excessive Drinking Importance of Religious Beliefs Experience in the US ARMY
Personal	Gender Age Race Family Income Student Type (Full-time or Part-time)
Temporal	Year of College Marital Status Employment Status
Virtual	No applicable variables in the 2012 NSDUH
Physical	Population Density (CBSA[b])
Social	No applicable variables in the 2012 NSDUH

a. National Survey on Drug Use and Health
b. 2003 Core-Based Statistical Area classifications

Cultural Classification

According to the OTPF Domain and Process, Cultural context and environment is defined as "Customs, beliefs, activity patterns, behavior standards, and expectations accepted by the society of which the client is a member. It includes ethnicity and values as well as political aspects, such as laws that affect access to resources and affirm personal rights. Also it includes opportunities for education, employment, and economic support" (AOTA, 2008a, p. 645). In this study, level of perceived risk on excessive drinking, level of importance on religious beliefs, and experience in the US ARMY were classified as factors in the Cultural context and environment. Both perceived risk on excessive drinking and importance on religious beliefs can represent behavior standards whether college students have excessive alcohol consumption or not. Also, experience in the US ARMY was classified in Cultural context and environment because it can be considered as a custom learned by a specific cultural group, the military.

Personal Classification

Personal factors are the fundamental source to identify an individual's functions. According to the OTPF Domain and Process, "Personal context refers to demographic features of the individual such as age, gender, socioeconomic status, and educational status that are not part of a health condition" (AOTA, 2008a, p. 642). In this study, gender, age, race, family income, and student type were classified as factors in the Personal context and environment. Gender, age, and race are the basic factors of personal characteristics. Family income can represent socioeconomic status of college students.

Student type, whether the participant is a full-time or part-time student, can represent educational status among college students.

Temporal Classification

According to the OTPF Domain and Process, Temporal context and environment is defined as "Location of occupational performance in time. The experience of time as shaped by engagement in occupations. The temporal aspects of occupation which contribute to the patterns of daily occupations are the rhythm…tempo…synchronization…duration…and sequence. It includes stages of life, time of day or year, duration, rhythm of activity, or history." (AOTA, 2008a, p. 645). In this study, year of college, marital status, and employment status were classified as factors in the Temporal context and environment. Year of college is changed annually, so that it could be classified as a factor in Temporal context and environment. Marital status and employment status can be considered as a stage of life, so that both of them could be classified in Temporal context and environment.

Virtual Classification

According to the OTPF Domain and Process, Virtual context and environment is referred as the "Environment in which communication occurs by means of airways or computers and an absence of physical contact. Includes simulated or real-time or near-time existence of an environment via chat rooms, email, video-conferencing, radio transmissions" (AOTA, 2008a, p. 645). With the growth of information technology and high accessibility of the internet, many people meet on virtual world using social networking system. Thus, factors in Virtual context and environment can affect many

part of people's occupation. However, in this study, there is no applicable predictor variable in Virtual context and environment.

Physical Classification

According to the Occupational Therapy Practice Framework, "Physical environment refers to the natural and built nonhuman environment and the objects in them" (AOTA, 2008a, p. 642). Natural environment includes geographic terrain. A variable, population density, was classified as a factor in the Physical context and environment. Participants were divided into three different population density groups based upon the CBSA.

Social Classification

Currently, considerations about effects of social aspects on health are increased. For example, many public health researchers in the US pay attention to the social determinants of health. Studies on this topic also have been growing rapidly in the 21st century (Braveman, Egerter, & Williams, 2011). This is because social aspects of a person are strongly associated with health status and health behaviors. Thus, analysis of social factors is very important to promote health. According to the Occupational Therapy Practice Framework, "Social context and environment is constructed by presence, relationships, and expectations of persons, organizations, populations. It includes availability and expectations of significant individuals, such as spouse, friends, and caregivers. Also, it includes relationships with individuals, groups, or organizations and relationships with systems (e.g., political, legal, economic, institutional) that are influential in establishing norms, role expectations, and social routines" (AOTA, 2008a,

p. 645). In this study, there is no applicable predictor variable in Social context and environment.

Previous Studies about Predictors of Excessive Alcohol Consumption among College Students

Excessive alcohol consumption among college students is affected by various socio-demographic factors, and these factors can be classified within the Contexts and Environments of the OTPF Domain and Process (AOTA, 2008a). There are some predictor variables considered in previous studies such as fraternity or sorority, gender, year of college, and employment status that will be reviewed here.

Cultural: Fraternity or Sorority

Drinking behavior is a kind of habit learned by interactions between social environments and people (Stoffel & Moyers, 2005). Many studies suggested that people who drink with others, especially college peers, get more opportunities to experience excessive alcohol consumption (Donovan, 2004). Particularly, there is a common culture that involves alcohol consumption during social gatherings. For college students, fraternities or sororities are commonly organized around social gatherings, so that many college students experience excessive alcohol consumption through participating in those organizations. Controlling alcohol consumption among college students joining fraternal or sorority organizations could play a significant role in reducing the overall prevalence of problematic alcohol consumption among college students.

Personal: Gender Differences

Albeit prevalence of overall alcohol consumption among college students is high in both males and females, the consumption by male students is greater than female students in general (O'Malley & Johnston, 2002). According to Velazquez and her colleagues, prevalence of binge drinking among female students in 2-year colleges was 26.2%, while prevalence of binge drinking among male students was 35.9%. Further, female students in 4-year colleges reported binge drinking at 31.7%, while 45.2% of male students reported the same (Velazquez et al., 2011). A Korean study in 2010 also showed a similar tendency in gender differences. Prevalence of alcohol consumption during the past month among male college students at 89.9% was higher than female college students at 82.6% (KARF, 2010).

Temporal: Year of College

The year of college may not be thought of as a crucial factor directly affecting alcohol consumption among college students, but data shows an increase in drinking each year that they spend in college (Carter et al., 2010). This information reveals that college students who spend more time in college might have more opportunities for being in a problematic alcohol consumption group or situation. In fact, Korean data reveals that prevalence of alcohol consumption during the past month among college students who were not freshmen was 88.2%, while the rate dropped to 82.3% among freshmen (KARF, 2010). This tendency is also shown in the US. According to the NSDUH in 2012, prevalence of binge drinking among freshmen was 32.1%, while prevalence of binge drinking among 2nd or 3rd year college students was 40.0% and among 4th or higher year

college students was 50.6% (SAMHSA, 2013c). Thus, the alcohol consumption of more advanced students who are in higher years in college should be controlled, and drinking behaviors among college students have to be managed continuously during the students' entire college career.

Temporal: Employment Status

Having a job during college is a factor associated with increased drinking behavior among college students. According to Bachman and colleagues, the intensity of part-time jobs negatively affected young people's health behaviors because those who worked more hours in a week were more frequently involved in substance abuse, like cigarettes, alcohol, and marijuana (Bachman, Safron, Sy, & Schulenberg, 2003). Thus, college students who have full-time or part-time jobs may be more susceptible to poor health behaviors including alcohol consumption. Interventions focusing on college students who are employed in jobs may help to reduce the prevalence of alcohol consumption among college students. For example, policy change that offers more financial aid or scholarships for students may serve as an alternative intervention.

Prevention of Excessive Alcohol Consumption

Excessive alcohol consumption among college students is affected by variables from the personal level to the environmental level commonly called predictor variables. The OTPF Domain and Process classifies all of these factors within six Contexts and environments. Level of perceived risk on excessive drinking, level of importance on religious beliefs, and experience in the US ARMY are included in the

Personal context and environment. Year of college, marital status, and employment status are included in the Temporal context and environment. Population density of the region where students live is included in the Physical context and environment. These factors can effect excessive alcohol consumption among college students, so that these predictor variables have been considered in various prevention programs.

Research on prevention strategies for alcohol consumption among college students has been conducted on both the individual level and the environmental level. Some studies have focused only on individual factors as prevention or intervention methods, such as a personal education. This research has been inconclusive as individually-oriented approaches have been only partly effective or ineffective (Babor et al., 2010). They did not get significant changes on the prevalence of excessive alcohol consumption among college students. Indeed, an integrated analysis between socio-environmental factors among college students and their personal characteristics was recommended to develop strategies for reducing drinking behavior at the campus level (Larimer & Cronce, 2002). However, there are only limited resources for prevention programs for alcohol consumption among college students on the college campus and its surrounding areas due to the lack of political support from the local government (Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). Therefore, needs for collaboration between colleges and surrounding communities to conduct interventions in order to prevent excessive alcohol consumption are growing. (Hingson, 2010). Also, various prevention approaches of excessive alcohol consumption among college students developed by various experts including occupational therapists would be required.

Some Core Concepts in Prevention Approaches

Understanding some core concepts in prevention approaches would be helpful for practitioners to provide effective prevention services for excessive alcohol consumption. These include predictive relationships, epidemiological analysis, and prevention stages. Sufficient evidence about predictive relationships between predictor variables and excessive alcohol consumption can be a good source for prevention of excessive alcohol consumption among college students. Epidemiological analysis is one of the most important fundamental skills in prevention science and public health. Predictive relationships and crucial determinants of target problems can be identified by epidemiological analysis. Also, knowledge on prevention stages can enable various health practitioners to understand their and other's roles in prevention sciences. These concepts are reviewed next.

Predictive Relationship

In the prevention sciences, a predictive relationship between causes and a target problem is considered at the beginning step of prevention strategies. This is due to the fact that we can prevent the target problem more easily if we identify the predictive factors of the target problem as much as possible. Also, predictive relationship can be explained by a dose-response relationship. That is, greater exposure to predictive factors, yields a greater chance of the target problem (Carr, Unwin, & Pless-Mulloli, 2007). Thus, once we control the predictive factors, we would expect changes in the target problem. For example, when public health practitioners want to prevent obesity level of a population, they think about predictive factors of obesity in that population. In general,

physical inactivity and inappropriate eating habit are well-known causes of obesity. There is a clear predictive relationship between physical inactivity and inappropriate eating habit with obesity. After identifying predictive factors of obesity including physical inactivity and inappropriate eating habit they may control these factors, then they will prevent prevalence of obesity among the population. In this predictive relationship, predictive factors like physical inactivity and inappropriate eating habit are commonly called as predictor variables and the outcome, prevalence of obesity, is called as a criterion variable. In the same way, we can think about prevention of the excessive alcohol consumption among college students. There would be a wide variety of predictor variables for excessive alcohol consumption. To prevent it among college students, we have to identify predictive factors of excessive alcohol consumption precisely.

Epidemiological Analysis

Epidemiology is the study of distribution of diseases or health conditions and identifying causes of these problems. According to Carr and colleagues, epidemiology is described as "the study of the distribution and determinants of health-related states or events in human populations and the application of this study to the control of health problems. The core of epidemiology is the use of quantitative methods to study disease and risk factors in human populations" (Carr et al., 2007, p. 8). Generally, epidemiological study is divided into two different types: descriptive or analytic epidemiology. Descriptive epidemiology studies information on the pattern of diseases or specific health conditions based upon various socio-demographic factors, such as age, sex, ethnic group, occupation. Also, it helps identify or suggest associations between target diseases and risk factors. Analytic epidemiology tests the conclusions of

descriptive epidemiology or experimental observations. One of the main purposes of epidemiological analysis is to identify associations between various determinants and health outcome. Epidemiological analysis on a specific health condition is used to identify causal factors, make preventive strategies, and plan novel health care services. In this study, epidemiological analysis will be used to show the prevalence of excessive alcohol consumption among college students based upon their socio-environmental characteristics and to identify crucial factors within occupational contexts and environments. Furthermore, this epidemiological analysis can be significant evidence for interventions in prevention stages.

Prevention Stages

In health care, the prevention process is usually categorized into three distinct stages: Primary, Secondary, and Tertiary (Carr et al., 2007). Primary prevention is defined as actions to avoid disease or health condition occurring. In this stage, services to reduce the incidence of the disease or health condition can be conducted, such as modifying causal environments of disease itself. Secondary prevention is defined as actions to decrease the prevalence of a disease or health condition. Shortening the duration of disease or health condition by early detecting and curing is the main goal of this prevention stage, such as screening for cancer or routine medical check-up. Tertiary prevention is defined as actions to reduce difficulties including disability and handicap of a disease. The treatment of pathological problems and rehabilitation are conducted in this stage (Foxcroft, Ireland, Lister-Sharp, Lowe, & Breen, 2002). Rehabilitation of individuals with hemiplegia after getting stroke is an example of tertiary prevention.

In general, rehabilitation deals with clients who already have diseases or injuries, and indeed, most occupational therapists in the US work in rehabilitation settings (AOTA, 2010). However, increasingly many people who do not have any pathological diseases or injuries become clients of occupational therapy. For example, with the growing numbers in the aging population, there are many elders who need to have occupational therapy interventions even though they do not have any specific diseases or injuries. This suggests that occupational therapy can be applied not only in rehabilitation services as a tertiary prevention, but also in primary and secondary prevention services to avoid novel problems in everyday life that have not been previously diagnosed as a disease or injury.

There are many attempts to activate the role of occupational therapy in health promotion and well-being. According to the Canadian Association of Occupational Therapy (CAOT), "health is strongly influenced by having choice and control in everyday occupations." (CAOT, 2002, p.31). This is because health and well-being can be fully promoted by active engagement in meaningful occupations (AOTA, n.d.). In this relationship, occupational therapy can play a significant role to promote one's health and well-being by providing occupational therapy interventions not only to individuals, families and groups, but also communities and populations (AOTA, 2013). Since occupational therapists have a deep understanding regarding dynamic interactions between people, their environments and everyday activities or occupations, their work can be influenced in people's lives more efficiently. One of the most important roles of occupational therapy practitioners in health promotion and disease prevention is to promote healthy lifestyles for people (AOTA, 2008b; AOTA). In terms of prevention

stages, occupational therapy can fully contribute to primary and secondary prevention stages for people's health promotion and disease prevention by helping them to actively engage in their meaningful occupations.

Relevance of Prevention for Excessive Alcohol Consumption to Occupational Therapy

Occupational therapists work with individual clients. When occupational therapists provide interventions for individual clients to encourage them to engage in proper occupations, they may consider the client factors that are negatively influencing functional engagement in daily occupations including socio-economic status and environmental factors. This is because the therapists can treat clients' problems by managing these client factors which cause occupational dysfunction. Likewise, when occupational therapists provide interventions for individual clients to have appropriate health behaviors, they have to consider those client factors that are negatively influencing health risk behaviors, such as excessive alcohol consumption. By managing predictive factors of health risk behaviors, the occupational therapists can reduce clients' health risk behavior as a Malfunctioned IADL.

Until now, occupational therapy practice for people having problems with alcohol consumption has focused on diagnosed substance abuse groups and assisting them to undertake and maintain changes in possible behavioral and health problems that may occur from the substance abuse (Maloney, 2011). These approaches are a kind of rehabilitation that is included in the tertiary stage among the three prevention stages. However, prevention approaches of excessive alcohol consumption should be different

from approaches for people with alcohol abuse because excessive alcohol consumption is different from alcohol abuse or alcohol dependence. A study by Tuithof and colleagues indicated there is only a limited overlap between excessive alcohol consumption and alcohol use disorder (Tuithof, ten Have, van den Brink, Vollebergh, & de Graaf, 2014). Moreover, excessive alcohol consumption is not in any criteria as a disease, so that a traditional rehabilitation as the tertiary prevention may not be an appropriate approach in terms of prevention of excessive alcohol consumption.

Occupational therapists can play a significant role in population level prevention programs because they have clear knowledge about human occupations as well as contexts and environments which have to be considered in developing prevention programs. To reduce prevalence of excessive alcohol consumption among college students, occupational therapists should understand predictive relationship between excessive alcohol consumption and its determinants. Then, they can create and implement prevention programs on university campuses with other experts, including other health care practitioners, mental health counselors, and university administrators.

Summary: Background of the Study

Human occupations are influenced by various factors. All external and internal factors affecting human occupations can be classified into six contexts and environments of the OTPF Domain and Process (AOTA, 2008a). Likewise, predictive factors of excessive alcohol consumption among college students can be classified within six contexts and environments of the OTPF Domain and Process. Some well-known predictors of excessive alcohol consumption among college students including fraternity

or sorority, gender differences, year of college, and employment status have been investigated by several studies. Classification of these predictors within the OTPF Domain and Process will give a better understanding for occupational therapists who use this framework to provide preventive interventions for excessive alcohol consumption.

To prevent excessive alcohol consumption among college students, studies on prevention strategies have been conducted on both the individual level and the environmental level. Some studies have focused only on individual factors, but these individually-oriented approaches have been only partly effective or ineffective: they did not make significant changes on the prevalence of excessive alcohol consumption (Babor et al., 2010). Although an integrated approach between socio-environmental factors among college students and their personal characteristics was recommended, they have not been successfully implemented due to the lack of resources for developing prevention programs and political support from local government (Larimer & Cronce, 2002; Neighbors et al., 2007). To overcome these problematic situations, the need for collaborations between colleges and surrounding communities on prevention of excessive alcohol consumption has grown (Hingson, 2010). The application of prevention approaches developed by various fields of practice would be useful to assist these collaborations.

Understanding predictive relationships between criterion variables and predictor variables plays an important role in prevention of excessive alcohol consumption. Epidemiology can provide a better understanding about this relationship by identifying predictor variables of excessive alcohol consumption. In health care, the prevention process is usually categorized into three distinct stages: Primary, Secondary, and Tertiary.

(Carr et al., 2007). Historically, occupational therapists work as rehabilitation practitioners in the tertiary prevention stage, but new roles of occupational therapy in health promotion settings are emerging. Health and wellbeing can be promoted by active engagement in meaningful occupations (AOTA, n.d.).

III. METHODS

Study Design

This study is a predictive correlational design. Predictive correlational study design is used to estimate prevalence of matters and predictive relationships by using data at a period of time. In this study, the 2012 National Survey on Drug Use and Health (NSDUH) conducted by the US Department of Health and Human Services was mainly used to estimate overall prevalence of excessive alcohol consumption based upon each predictor variable and predictive relationships between excessive alcohol consumption and predictor variables among the US college students.

Data Collecting Methods of the 2012 NSDUH

Individuals of households aged 12 and older was randomly selected by scientific random sampling methods throughout the US. Once participants were selected, a pre-trained professional interviewer visited each selected household to obtain information of the household. Data of a person or persons in each household were collected at the household's home. A professional interviewer brought a laptop computer and conducted NSDUH questionnaires with each person in the household. Interviews were conducted for about an hour by a combination Computer-Assisted Personal Interviewing (CAPI) and Audio Computer-Assisted Self-Interviewing (ACASI) method. Private questions were conducted with ACASI that the participant entered directly into the computer and less sensitive items were recorded by the professional interviewer on the CAPI (SAMHSA, 2013c).

Participants and Selection Procedures

Data from 7,166 US college students who participated in the 2012 NSDUH were used in this study. There were 3,176 male students (44.3%) and 3,990 female students (55.7%) aged between 18 - 25 years old.

The NSDUH is a huge nationwide survey annually conducted to estimate drug use among the US population. Originally, 55,268 people in the US aged 12 and older participated as the study sample of the 2012 NSDUH. To specify study participants as college students having proper variables within Contexts and Environments, those who are not college students and do not fulfill various characteristics as the participants were excluded. Figure 2 shows inclusion and exclusion criteria from the NSDUH. At the first stage, non-college students from the original sample of the 2012 NSDUH were excluded. Also, participants whose age were under 18 and above 25 were excluded. Any participants with unanswered and missing data for key predictor variables including student type, experience in the US ARMY, level of perceived risk on excessive drinking, and level of religious belief were excluded during data analysis procedures. As a result, the data from 7,166 college students were included in the study from the 2012 NSDUH.

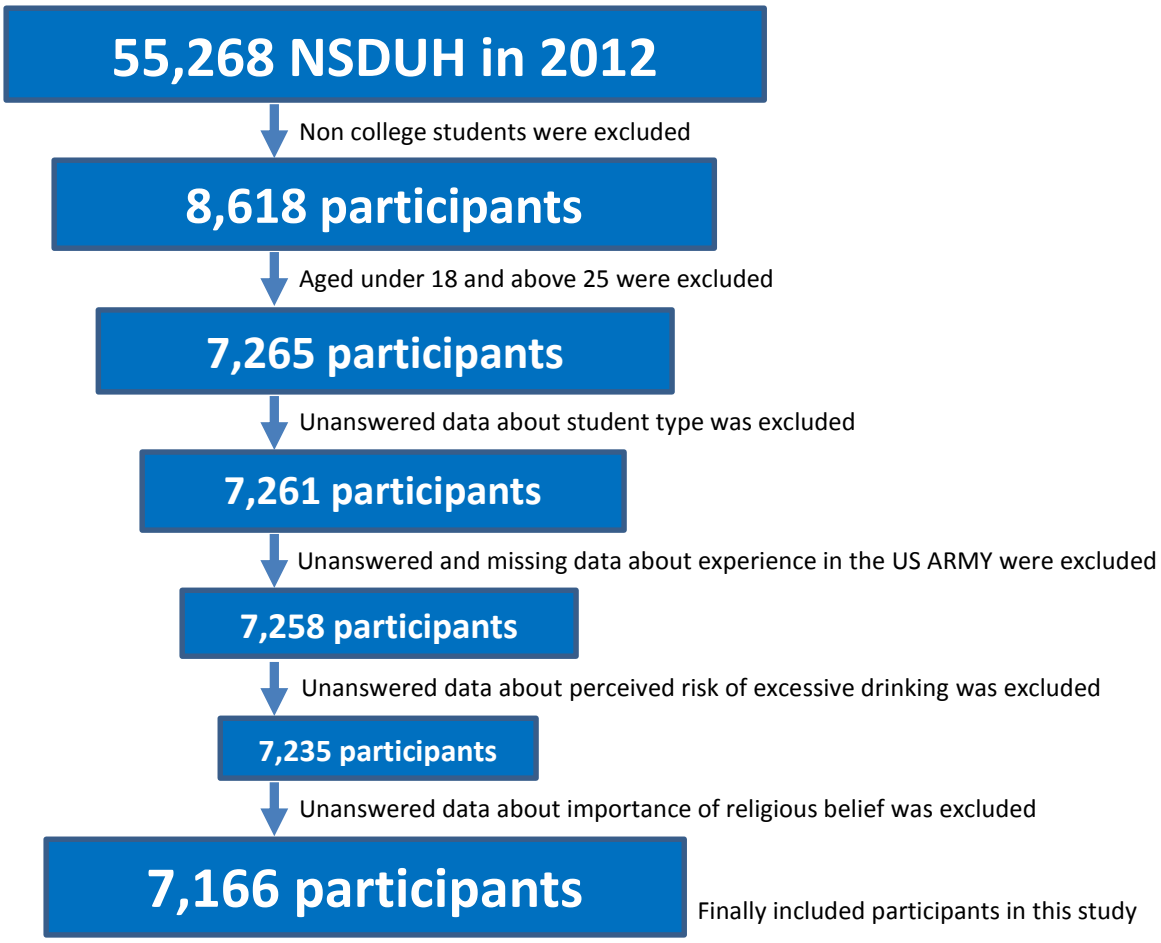

Figure 2. Sample selection procedures from the original NSDUH data in 2012

Criterion Variables

Excessive alcohol consumption was used as the target behavior in this study. According to the Center for Disease Control and Prevention, excessive alcohol consumption consists of four different drinking patterns including binge drinking, heavy drinking, any alcohol consumption of people under age 21 years old, and any alcohol consumption of pregnant women (Bouchery et al., 2011). There were two patterns of

excessive alcohol consumption, binge drinking and heavy drinking, in the 2012 NSDUH. Thus, these two patterns of excessive alcohol consumption were used as criterion variables in this study. Binge drinking was defined as "the drinking five or more drinks on the same occasion on at least one day in the past 30 days" and heavy drinking was defined as "the drinking five or more drinks on the same occasion on each of five or more days in the past 30 days" (SAMHSA, 2013c).

Predictor Variables

There were 12 predictor variables (Table 1). Each variable was divided into the four Context and Environment classifications by definitions of Context and Environment in the OTPF Domain and Process (AOTA, 2008a). Level of perceived risk on excessive drinking, level of importance on religious beliefs, and experience in the US ARMY were included in the Cultural classification. Age, race, family income, and student type were included in the Personal classification. Gender is a predictor variable in the Personal classification, but every analysis in this study was done separately by gender. So, gender was not included in regression analyses. Year of college, marital status, and employment status were included in the Temporal classification. Population density of the region where students live was included in the Physical classification.

All of these variables were measured by the questionnaires in the 2012 NSDUH. The level of perceived risk on excessive drinking was measured by the question: "*How much do people risk harming themselves physically and in other ways when they have five or more drinks of an alcoholic beverage once or twice a week?"* (SAMHSA, 2013a). Each participant was included in a group among the following four groups based upon

the levels of perceived risk on excessive drinking: great perceived risk, moderate perceived risk, slight perceived risk, or no perceived risk. For example, if a participant thinks excessive alcohol consumption is a great risk, then this participant was included in the great perceived risk group. The level of importance on religious beliefs was measured by how much participants agree toward the sentence, "*Your religious beliefs are a very important part of your life."* (SAMHSA, 2013a). Each participant was included in a group among the following four groups based upon the levels of importance: strongly important, important, unimportant, and strongly unimportant. Experience in the US ARMY was measured by whether participants have been in the US ARMY or not. Gender was classified as male or female. All participants were aged between 18 and 25. Participants were included in one of the following six race groups: White, African American, Hispanic, Asian, Two or more races, and Native American / Alaska Native / Native Hawaiians / Other Pacific Islander. There were four family income groups: less than $20,000, $20,000 - $49,999, $50,000 - $74,999, and $75,000 or more. Participants were classified into two student types by whether they are full-time students or part-time students. Year of college was classified based upon participants' current school year and there were three groups: 1st year, 2nd or 3rd year, and 4th or higher year. Marital status was divided into two groups: married or widowed/divorced/separated/not married group. Employment status was divided into three groups: unemployed, part-time, and full-time. Population density was divided into three groups based upon the 2003 CBSA: nonmetropolitan area, small metropolitan area, and large metropolitan.

Data Management and Statistical Analysis

Descriptive statistics were conducted to show descriptive results of population by predictor variables of the study. Prevalence of binge drinking and heavy drinking based upon each predictor variable were examined with Chi-square tests. Multiple logistic regression analyses were conducted to estimate associations between excessive alcohol consumption and predictor variables, adjusting for all the other predictor variables. The multiple logistic regression model can be formed as the following equation.

$$logit[p(y = 1)] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$$

$P =$ Probability of binge drinking or heavy drinking (yes = 1)

$X =$ Predictor variables

$K =$ Number of predictor variables

To estimate influence of predictor variables and each classification on excessive alcohol consumption, the Standardized Logistic Regression Coefficients were calculated. Also, Hierarchical Regression analyses were conducted stepwise in four Context and Environment classifications. The four classifications were included as independent steps in the hierarchical regression. The relative influence of each classification was analyzed by using R-squares and Max-rescaled R-squares provided by the statistical software. Every statistic was conducted separately by gender. All statistical analysis was done by Statistical Analysis System (SAS) version 9.3 for Microsoft Windows.

IV. RESULTS

Descriptive Results of Population by Predictor Variables

Descriptive results of population by predictor variables of the study are shown in Table 2. Data from a total of 7,166 US College students, 3,176 males (44.3%) and 3,990 females (55.7%), aged between 18 - 25 years old were examined. The predictor variables were sorted by the OTPF Context and Environment from Cultural classification, Personal classification, Temporal classification, to Physical classification. According to level of perceived risk on excessive drinking, only 27% of males and 37.9% of females thought that binge drinking poses great risk of harming them physically and in other ways. Otherwise, 36.3% of males and 23.6% of females thought that binge drinking poses slight risk or no risk of harming them physically and in other ways. For level of importance on religious beliefs, 27.8% of males and 32.8% of females agreed that their religious beliefs are strongly important parts of their life. 2.6% of males and 0.9% of females had experience in the US ARMY. Participants were almost equally divided based on age. According to race classifications, more than half were White. Hispanic was second, Black/African American was third, and Asian was the fourth majority participants in both males and females. Regarding family income, 37.5% of males and 40% of females had less than $20,000. Almost 80% were full-time students. 30% of males and 27.4% of females were 1st year students, 44.5% of males and 44.7% of females were 2nd or 3rd year, and 24.7% of males and 27.8% of females were 4th or higher year of college. 4.4% of males and 8.3% of females were married. 60.5% of males and 64.3% of females were employed in part-time or full-time work. About 44% of participants lived in a large metropolitan area and almost 52% of participants lived in a small metropolitan area.

Table 2. Descriptive Results of Population by Predictor Variables (*N* = 7,166)

Context/ Environment	Variables	Male		Female	
		n	%	*n*	%
Cultural					
	Level of Perceived Risk on Excessive Drinking (inverse order)				
	Great perceived risk	857	27.0	1513	37.9
	Moderate perceived risk	1166	36.7	1535	38.5
	Slight perceived risk	952	30.0	847	21.2
	No perceived risk	201	6.3	95	2.4
	Level of Importance on Religious Beliefs (inverse order)				
	Strongly important	883	27.8	1310	32.8
	Important	1072	33.8	1391	34.9
	Unimportant	551	17.4	689	17.3
	Strongly unimportant	670	21.1	600	15.0
	Experience in the US ARMY				
	No	3094	97.4	3954	99.1
	Yes	82	2.6	36	0.9
Personal					
	Age				
	18	450	14.2	556	13.9
	19	566	17.8	689	17.3
	20	547	17.2	639	16.0
	21	475	15.0	669	16.8
	22~23	699	22.0	896	22.5
	24~25	439	13.8	541	13.6
	Race				
	White	1863	58.7	2312	57.9
	Black/African American	403	12.7	552	13.8
	Hispanic	523	16.5	675	16.9
	Asian	233	7.3	236	5.9
	Two or more races	114	3.6	138	3.5
	Native American/Alaska Native/ Native Hawaiians/ Other Pacific Islander	40	1.3	77	1.9

Table 2. Descriptive Results of Population by Predictor Variables, cont'd

Context/ Environment	Variables	Male		Female	
		n	%	*n*	%
Personal (continue)	Family Income				
	< $20,000	1191	37.5	1595	40.0
	$20,000 ~ $49,999	842	26.5	1124	28.2
	$50,000 ~ $74,999	383	12.1	519	13.0
	$75,000 =<	760	23.9	752	18.9
	Student Type				
	Part-time	614	19.3	842	21.1
	Full-time	2562	80.7	3148	78.9
Temporal	Year of College				
	1st year	981	30.9	1094	27.4
	2nd or 3rd year	1412	44.5	1785	44.7
	4th or higher year	783	24.7	1111	27.8
	Marital Status (inverse order)				
	Married	138	4.4	332	8.3
	Widowed/Divorced/ Separated/Not married	3038	95.6	3658	91.7
	Employment Status				
	Unemployed	1252	39.4	1424	35.7
	Employed part-time	1132	35.6	1647	41.3
	Employed full-time	792	24.9	919	23.0
Physical	Population Density (CBSA[a])				
	Nonmetropolitan area	110	3.5	190	4.8
	Small metropolitan area	1674	52.7	2017	50.6
	Large metropolitan area	1392	43.8	1783	44.7

a. 2003 Core-Based Statistical Area classifications

Prevalence of Binge Drinking

Prevalence of binge drinking among the US College students in 2012 is shown in Table 3. Binge drinking was defined as "the drinking five or more drinks on the same occasion on at least one day in the past 30 days" (SAMHSA, 2013c). Prevalence based upon predictor variables and statistical significance of differences between groups were measured by Chi-square tests. 46.6% of males and 35.7% of females were in binge drinking ($x^2 = 38.33$, $p<.0001$).

Cultural Variables

Prevalence of binge drinking was different based upon level of perceived risk on excessive drinking in both males and females, and these differences were strongly significant ($x^2 = 320.18$, $p<.0001$ in males; $x^2 = 270.8$, $p<.0001$ in females). Students who have no perceived risk on excessive drinking had the highest prevalence in both males (71.6%) and females (63.2%). Prevalence of binge drinking was different based upon level of importance on religious beliefs in both males and females, and these differences were strongly significant ($x^2 = 150.05$, $p<.0001$ in males; $x^2 = 137.42$, $p<.0001$ in females). Students who thought religious beliefs are unimportant had highest prevalence in males (58.1%), while those who thought religious beliefs are strongly unimportant had the highest prevalence of binge drinking in females (45.7%). Prevalence of binge drinking was slightly different based upon experience in the US ARMY in both males and females, but these differences were not statistically significant.

Personal Variables

Prevalence of binge drinking was varied by age in both males and females, and these differences were strongly significant (x^2 = 97.68, p<.0001 in males; x^2 = 86.65, p<.0001 in females). Students aged 22~23 years old had the highest prevalence in males (58.5%), while students aged 21 years old had the highest prevalence of binge drinking in females (47.1%). Prevalence of binge drinking was varied by race in both males and females, and these differences were strongly significant (x^2 = 119.67, p<.0001 in males; x^2 = 121.98, p<.0001 in females). Students who are white had the highest prevalence in both males (53.4%) and females (42.4%). Prevalence of binge drinking was different based upon family income in both males and females, and these differences were strongly significant (x^2 = 26.38, p<.0001 in males; x^2 = 39.03, p<.0001 in females). Students who have family income less than $20,000 had the highest prevalence in both males (52.1%) and females (41.0%). There were no significant differences on prevalence of binge drinking between part-time students and full-time students in both males and females.

Temporal Variables

Prevalence of binge drinking was varied by year of college in both males and females, and these differences were strongly significant (x^2 = 100.07, p<.0001 in males; x^2 = 58.26, p<.0001 in females). Students who are in 4th or higher year had the highest prevalence in both males (59.9%) and females (44.1%). Prevalence of binge drinking was different based upon marital status in both males and females, and these differences were strongly significant (x^2 = 13.88, p<.001 in males; x^2 = 65.2, p<.0001 in females), but bigger in females than males. Students who do not live with a spouse, including

widowed, divorced, separated, and not married, had a higher prevalence than married students in both males (47.3%) and females (37.5%). Prevalence of binge drinking was different based upon employment status in both males and females, and these differences were strongly significant (x^2 = 10.19, p<.01 in males; x^2 = 25.16, p<.0001 in females), but bigger in females than males. Students employed in part-time jobs had the highest prevalence in both males (49.0%) and in females (38.9%).

Physical Variable

Prevalence of binge drinking was slightly different based upon population density in both males and females, but these differences were significant only in males (x^2 = 8.76, p<.05). Students who live in small metropolitan areas had the highest prevalence (49.1%).

Summary

Overall, male students had higher prevalence of binge drinking than female students. Based upon predictor variables, students who (1) have no perceived risk on excessive drinking, (2) think religious beliefs are unimportant (males) or strongly unimportant (females), (3) are aged 22~23 years old (males) or 21 years old (females), (4) are white, (5) have family income less than $20,000, (6) are in 4th or higher year of college, (7) do not live with a spouse, including widowed, divorced, separated, and not married, (8) are employed in part-time jobs, and (9) live in small metropolitan (males) area had the highest prevalence of binge drinking, and these results were statistically significant.

Table 3. Prevalence of Binge Drinking[a] among the US College Students in 2012

Context/ Environment	Variables	Male %	Male x^2	Female %	Female x^2
Cultural					
	Level of Perceived Risk on Excessive Drinking (inverse order)				
	Great perceived risk	26.5		22.5	
	Moderate perceived risk	42.5	320.18****	36.8	270.80****
	Slight perceived risk	64.5		54.1	
	No perceived risk	71.6		63.2	
	Level of Importance on Religious Beliefs (inverse order)				
	Strongly important	29.9		23.5	
	Important	49.4	150.05****	38.7	137.42****
	Unimportant	58.1		44.1	
	Strongly unimportant	54.9		45.7	
	Experience in the US ARMY				
	No	46.4	3.03	35.8	0.99
	Yes	56.1		27.8	
Personal	Age				
	18	35.6		27.5	
	19	37.1		28.7	
	20	42.4	97.68****	34.1	86.65****
	21	54.1		47.1	
	22~23	58.5		41.4	
	24~25	48.5		31.2	
	Race				
	White	53.4		42.4	
	Black/African American	26.3		23.2	
	Hispanic	43.0		30.5	
	Asian	33.9	119.67****	19.1	121.98****
	Two or more races	49.1		31.2	
	Native American/Alaska Native/ Native Hawaiians/ Other Pacific Islander	50.0		28.6	

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days
*p<.05; **p<.01; ***p<.001; ****p<.0001

Table 3. Prevalence of Binge Drinking[a] among the US College Students in 2012, cont'd

Context/ Environment	Variables	Male %	Male x^2	Female %	Female x^2
Personal (continue)	Family Income				
	< $20,000	52.1		41.0	
	$20,000 ~ $49,999	41.5	26.38****	31.1	39.03****
	$50,000 ~ $74,999	42.6		29.3	
	$75,000 =<	45.8		35.6	
	Student Type				
	Part-time	46.7	0.00	35.8	0.00
	Full-time	46.6		35.7	
Temporal	Year of School				
	1st year	36.0		28.7	
	2nd or 3rd year	46.7	100.07****	34.7	58.26****
	4th or higher year	59.9		44.1	
	Marital Status (inverse order)				
	Married	31.2		15.4	
	Widowed/Divorced/ Separated/Not married	47.3	13.88***	37.5	65.20****
	Employment Status				
	Unemployed	43.1		30.6	
	Employed part time	49.0	10.19**	38.9	25.16****
	Employed full time	48.6		37.8	
Physical	Population Density (CBSA[b])				
	Nonmetropolitan area	42.7		32.1	
	Small metropolitan area	49.1	8.76*	36.6	2.09
	Large metropolitan area	44.0		35.1	

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days
b. 2003 Core-Based Statistical Area classifications
*p<.05; **p<.01; ***p<.001; ****p<.0001

Prevalence of Heavy Drinking

Prevalence of heavy drinking among the US College students in 2012 is shown in Table 4. Heavy drinking was defined as "the drinking five or more drinks on the same occasion on each of five or more days in the past 30 days" (SAMHSA, 2013c). Prevalence based upon predictor variables and statistical significance of differences between groups were measured by Chi-square tests. 18.2% of males and 10.0% of females were in heavy drinking ($x^2 = 100.96$, $p<.0001$).

Cultural Variables

Prevalence of heavy drinking was different based upon level of perceived risk on excessive drinking in both males and females, and these differences were strongly significant ($x^2 = 199.95$, $p<.0001$ in males; $x^2 = 258.19$, $p<.0001$ in females). Students who have no perceived risk on excessive drinking had the highest prevalence in both males (40.8%) and females (34.7%). Prevalence of heavy drinking was different based upon level of importance on religious beliefs in both males and females, and these differences were strongly significant ($x^2 = 76.07$, $p<.0001$ in males; $x^2 = 57.21$, $p<.0001$ in females). Students who thought religious beliefs are unimportant had highest prevalence in males (26.1%), while those who thought religious beliefs are strongly unimportant had the highest prevalence of binge drinking in females (16.2%). Prevalence of heavy drinking was slightly different based upon experience in the US ARMY in both males and females, but these differences were not statistically significant.

Personal Variables

Prevalence of heavy drinking was varied by age in both males and females, and these differences were strongly significant (x^2 = 38.34, p<.0001 in males; x^2 = 20.4, p<.01 in females), but bigger in males than females. Students aged 21 years old had the highest prevalence in both males (25.1%) and females (14.2%). Prevalence of heavy drinking was varied by race in both males and females, and these differences were strongly significant (x^2 = 127.34, p<.0001 in males; x^2 = 75.74, p<.0001 in females). Students who are white had the highest prevalence in males (24.1%), while those who are Native American/Alaska Native/Native Hawaiians/Other Pacific Islander had the highest prevalence in females (14.3%). Prevalence of heavy drinking was different based upon family income in both males and females, and these differences were strongly significant (x^2 = 48.34, p<.0001 in males; x^2 = 41.84, p<.0001 in females). Students who have family income less than $20,000 had the highest prevalence in both males (23.9%) and females (13.5%). Prevalence of heavy drinking among full-time students was higher than prevalence among part-time students in both males and females, but these differences were not statistically significant.

Temporal Variables

Prevalence of heavy drinking was varied by year of college in both males and females, but these differences were significant only in males (x^2 = 25.82, p<.0001). Students who are in 4th or higher year had the highest prevalence in both males (23.2%) and females (11.7%). Prevalence of heavy drinking was different based upon marital status in both males and females, and these differences were strongly significant (x^2 =

10.14, $p<.01$ in males; $x^2 = 21.38$, $p<.0001$ in females), but bigger in females than males. Students who do not live with a spouse, including widowed, divorced, separated, and not married, had a higher prevalence than married students in both males (18.7%) and females (10.7%). Prevalence of heavy drinking was slightly different based upon employment status in both males and females, but these differences were not statistically significant.

Physical Variable

Prevalence of heavy drinking was different based upon population density in both males and females, but these differences were significant only in males ($x^2 = 16.89$, $p<.001$). Students who live in nonmetropolitan areas (20.9% in males) and small metropolitan areas (20.7% in males) had a higher prevalence than live in large metropolitan areas.

Summary

Overall, male students had higher prevalence of heavy drinking than female students. Based upon predictor variables, students who (1) have no perceived risk on excessive drinking, (2) think religious beliefs are unimportant (males) or strongly unimportant (females), (3) are aged 21 years old, (4) are white (males) or Native American/Alaska Native/Native Hawaiians/Other Pacific Islander Native (females), (5) has family income less than $20,000, (6) are in 4th or higher year of college (males), (7) do not live with a spouse, and (8) live in nonmetropolitan areas small metropolitan areas (males) had the highest prevalence of heavy drinking, and these results were statistically significant.

Table 4. Prevalence of Heavy Drinking[a] among the US College Students in 2012

Context/ Environment	Variables	Male %	Male x^2	Female %	Female x^2
Cultural	Level of Perceived Risk on Excessive Drinking (inverse order)				
	Great perceived risk	6.4	199.95****	3.8	258.19****
	Moderate perceived risk	16.0		8.2	
	Slight perceived risk	26.8		21.5	
	No perceived risk	40.8		34.7	
	Level of Importance on Religious Beliefs (inverse order)				
	Strongly important	10.0	76.07****	5.7	57.21****
	Important	17.6		10.3	
	Unimportant	26.1		12.3	
	Strongly unimportant	23.4		16.2	
	Experience in the US ARMY				
	No	18.1	1.40	10.0	0.11
	Yes	23.2		8.3	
Personal	Age				
	18	14.9	38.34****	9.7	20.40**
	19	15.0		8.6	
	20	18.5		10.5	
	21	25.1		14.2	
	22~23	21.8		9.6	
	24~25	12.3		7.0	
	Race				
	White	24.1	127.34****	13.2	75.74****
	Black/African American	4.7		4.2	
	Hispanic	13.0		6.1	
	Asian	5.6		2.5	
	Two or more races	21.1		8.7	
	Native American/Alaska Native/ Native Hawaiians/ Other Pacific Islander	15.0		14.3	

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

*p<.05; **p<.01; ***p<.001; ****p<.0001

Table 4. Prevalence of Heavy Drinking[a] among the US College Students in 2012, cont'd

Context/ Environment	Variables	Male %	Male x^2	Female %	Female x^2
Personal (continue)	Family Income				
	< $20,000	23.9	48.34****	13.5	41.84****
	$20,000 ~ $49,999	12.8		6.2	
	$50,000 ~ $74,999	13.6		7.9	
	$75,000 =<	17.5		9.7	
	Student Type				
	Part-time	15.6	3.36	9.4	0.45
	Full-time	18.8		10.2	
Temporal	Year of School				
	1st year	13.9	25.82****	9.1	5.12
	2nd or 3rd year	18.4		9.5	
	4th or higher year	23.2		11.7	
	Marital Status (inverse order)				
	Married	8.0	10.14**	2.7	21.38****
	Widowed/Divorced/ Separated/Not married	18.7		10.7	
	Employment Status				
	Unemployed	17.6	2.75	8.5	5.68
	Employed part time	19.7		11.0	
	Employed full time	17.1		10.6	
Physical	Population Density (CBSA[b])				
	Nonmetropolitan area	20.9	16.89***	11.1	5.60
	Small metropolitan area	20.7		11.0	
	Large metropolitan area	15.0		8.8	

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

b. 2003 Core-Based Statistical Area classifications

*p<.05; **p<.01; ***p<.001; ****p<.0001

Associations between Binge Drinking and Predictor Variables

Associations between binge drinking and predictor variables are shown in Table 5. Multiple logistic regressions were conducted to estimate likelihoods of binge drinking within each predictor variable classification by using Odds Ratio (*OR*) and 95% Confidence Interval (CI).

Cultural Variables

Level of perceived risk on excessive drinking was strongly associated with binge drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students who have lower levels of perceived risk on excessive drinking tended to have a higher likelihood of binge drinking. For females, moderate level of perceived risk had an *OR* at 1.7 with 95% CI [1.4 - 2.0], slight level of perceived risk had an *OR* at 3.3 [2.7 - 4.0], and no perceived risk had an *OR* at 4.9 [3.1 – 7.7] comparing to great level of perceived risk on excessive drinking (reference group). This tendency was steeper in males: an *OR* at 1.7 [1.4 – 2.1] for moderate level and an *OR* at 4.1 [3.3 – 5.1] for slight level. It is notable that male students who have no perceived risk had a 5.7 times higher *OR* with 95% CI [3.9 – 8.2] comparing to the reference group.

Level of importance on religious beliefs was also strongly associated with binge drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students who have lower levels of importance on religious beliefs tended to have a higher likelihood of binge drinking even though the unimportant group had the highest *OR* at 2.5 [2.0 – 3.3] in males. The important group had an *OR* at 2.1 [1.7 – 2.5] and the strongly unimportant group had an *OR* at 2.2 [1.8 – 2.8]. This

tendency was clearer in females: important group had an *OR* at 1.8 [1.5 – 2.1], unimportant group had an *OR* at 2.0 [1.6 – 2.4], and strongly unimportant group had an *OR* at 2.1 [1.7 – 2.6].

Experience in the US ARMY did not have a strong association with binge drinking. Male students who had experience in the US ARMY had a higher *OR* at 1.3, while female students showed an opposite result with an *OR* at 0.9, but these results were not statistically significant.

Personal Variables

Age was associated with binge drinking. Overall, older students tended to have a higher likelihood of binge drinking than younger students even though 22~23 years old had the highest *OR* at 2.1 [1.5 – 3.0] in males and 21 years old had the highest *OR* at 2.0 [1.5 – 2.8].

According to race classification, White tended to have a higher likelihood of binge drinking even though the Two or more races group had the highest *OR* at 1.1 in males, but this result was not statistically significant. Asian group had the lowest *OR* in both males at 0.4 and females at 0.3, and this results were statistically significant with 95% CI for males [0.3 - 0.6] and for females [0.2 – 0.4].

Family income was strongly associated with binge drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students whose family income is less than $20,000 had the highest likelihood of binge drinking both in males and females.

Students type whether they are part-time or full-time was not associated with binge drinking. An *OR* of part-time students and full-time students was the same in males, while full-time students had a slightly lower *OR* at 0.9 than the reference group in females, but this result was not statistically significant with 95% CI [0.8 – 1.1].

Temporal Variables

Year of college was associated with binge drinking after adjusting all the other predictors and this influence was statistically significant in every level. More advanced students who are in higher years in college tended have a higher likelihood of binge drinking. For female students, 2nd or 3rd year of college group had an *OR* at 1.3 [1.0 - 1.6] and 4th or higher year of college group had an *OR* at 1.3 [1.0 - 1.7] comparing to freshmen. This tendency was steeper in males: an *OR* at 1.4 [1.1 – 1.7] for 2nd or 3rd year of college group and an *OR* at 1.7 [1.3 – 2.2] for 4th or higher year of college group.

Marital status was strongly associated with binge drinking after adjusting all the other predictors and this influence was statistically significant. Students who do not live with a spouse tended to have a higher likelihood of binge drinking both in males with an *OR* at 2.4 [1.6 – 3.6] and females with an *OR* at 3.2 [2.3 – 4.5], and this tendency was steeper in males.

Employment status was associated with binge drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students who are employed in jobs tended to have a higher likelihood of binge drinking. Employed in part-time jobs had an *OR* at 1.2 [1.0 – 1.5] in males and 1.3 [1.1 – 1.5] in

females. Employed in a full-time job had an *OR* at 1.3 [1.1 – 1.6] in males and 1.3 [1.1 – 1.6] in females.

Physical Variable

Population density was not associated with binge drinking. Although an *OR* of metropolitan areas were higher than nonmetropolitan area, these results were not statistically significant.

Table 5. Multiple Logistic Regressions: Associations between Binge Drinking[a] and Predictor Variables

Context/ Environment	Variables	Male		Female	
		OR[b]	95% CI[c]	*OR*[b]	95% CI[c]
Cultural	Level of Perceived Risk on Excessive Drinking (inverse order)				
	Great perceived risk	1.0	Reference	1.0	Reference
	Moderate perceived risk	1.7	(1.4~2.1)	1.7	(1.4~2.0)
	Slight perceived risk	4.1	(3.3~5.1)	3.3	(2.7~4.0)
	No perceived risk	5.7	(3.9~8.2)	4.9	(3.1~7.7)
	Level of Importance on Religious Beliefs (inverse order)				
	Strongly important	1.0	Reference	1.0	Reference
	Important	2.1	(1.7~2.5)	1.8	(1.5~2.1)
	Unimportant	2.5	(2.0~3.3)	2.0	(1.6~2.4)
	Strongly unimportant	2.2	(1.8~2.8)	2.1	(1.7~2.6)
	Experience in the US ARMY				
	No	1.0	Reference	1.0	Reference
	Yes	1.3	(0.8~2.2)	0.9	(0.4~1.9)
Personal	Age				
	18	1.0	Reference	1.0	Reference
	19	1.0	(0.7~1.3)	1.0	(0.8~1.3)
	20	1.1	(0.8~1.5)	1.1	(0.8~1.5)
	21	1.7	(1.2~2.4)	2.0	(1.5~2.8)
	22~23	2.1	(1.5~3.0)	1.8	(1.3~2.4)
	24~25	1.6	(1.1~2.3)	1.4	(1.0~2.0)
	Race				
	White	1.0	Reference	1.0	Reference
	Black/African American	0.5	(0.3~0.6)	0.5	(0.4~0.6)
	Hispanic	0.9	(0.7~1.1)	0.7	(0.6~0.9)
	Asian	0.4	(0.3~0.6)	0.3	(0.2~0.4)
	Two or more races	1.1	(0.7~1.7)	0.6	(0.4~0.9)
	Native American/Alaska Native/ Native Hawaiians/ Other Pacific Islander	1.0	(0.5~1.9)	0.6	(0.3~1.0)

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days
b. *OR*-Odds Ratio; c. CI-Confidence Interval

Table 5. Multiple Logistic Regressions: Associations between Binge Drinking[a] and Predictor Variables, cont'd

Context/ Environment	Variables	Male		Female	
		OR[b]	95% CI[c]	*OR*[b]	95% CI[c]
Personal (continue)	Family Income				
	< $20,000	1.0	Reference	1.0	Reference
	$20,000 ~ $49,999	0.7	(0.6~0.9)	0.7	(0.6~0.9)
	$50,000 ~ $74,999	0.7	(0.5~0.9)	0.6	(0.5~0.7)
	$75,000 =<	0.7	(0.6~0.9)	0.7	(0.6~0.8)
	Student Type				
	Part-time	1.0	Reference	1.0	Reference
	Full-time	1.0	(0.8~1.2)	0.9	(0.8~1.1)
Temporal	Year of College				
	1st year	1.0	Reference	1.0	Reference
	2nd or 3rd year	1.4	(1.1~1.7)	1.3	(1.0~1.6)
	4th or higher year	1.7	(1.3~2.2)	1.3	(1.0~1.7)
	Marital Status (inverse order)				
	Married	1.0	Reference	1.0	Reference
	Widowed/Divorced/ Separated/Not married	2.4	(1.6~3.6)	3.2	(2.3~4.5)
	Employment Status				
	Unemployed	1.0	Reference	1.0	Reference
	Employed part-time	1.2	(1.0~1.5)	1.3	(1.1~1.5)
	Employed full-time	1.3	(1.1~1.6)	1.3	(1.1~1.6)
Physical	Population Density (CBSA[d])				
	Nonmetropolitan area	1.0	Reference	1.0	Reference
	Small metropolitan area	1.2	(0.8~1.9)	1.2	(0.9~1.8)
	Large metropolitan area	1.2	(0.8~1.9)	1.3	(0.9~1.9)

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days
b. *OR*-Odds Ratio; c. CI-Confidence Interval
d. 2003 Core-Based Statistical Area classifications

Associations between Heavy Drinking and Predictor Variables

Associations between heavy drinking and predictor variables are shown in Table 6. Multiple logistic regressions were conducted to estimate likelihoods of binge drinking within each predictor variable classification by using Odds Ratio (*OR*) and 95% Confidence Interval (CI).

Cultural Classification

Level of perceived on excessive drinking risk was strongly associated with heavy drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students who have lower levels of perceived risk on excessive drinking tended to have a higher likelihood of heavy drinking. For males, moderate level of perceived risk had an *OR* at 2.1 [1.5 - 2.9], slight level of perceived risk had an *OR* at 3.7 [2.7 - 5.1], and no perceived risk had *OR* at 6.9 [4.6 – 10.5] comparing to great level of perceived risk on excessive drinking. This tendency was steeper in females: an *OR* at 1.8 [1.3 – 2.4] for moderate level and an *OR* at 5.1 [3.7 – 7.1] for slight level. A notable thing was that female students who have no perceived risk had a 10.6 times higher *OR* with 95% CI [6.3 – 17.7] comparing to the reference group.

Level of importance on religious beliefs was also strongly associated with heavy drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students who have lower levels of importance on religious beliefs tended to have a higher likelihood of heavy drinking even though the unimportant group had the highest *OR* 2.3 [1.7 – 3.1] in males. The important group had an *OR* at 1.6 [1.2 – 2.2] and the strongly unimportant group had an *OR* at 1.9 [1.4 – 2.6]. This

tendency was clearer in females: the important group had an *OR* at 1.5 [1.1 – 2.0], the unimportant group had an *OR* at 1.6 [1.1 – 2.3], and the strongly unimportant group had an *OR* at 2.2 [1.6 – 3.1].

Experience in the US ARMY had not a strong association with heavy drinking. Students who had experience in the US ARMY had a higher *OR* at 1.5 in males and 1.3 in females, but these results were not statistically significant with 95% CI for males [0.8 – 2.7] and for females [0.4 – 4.6].

Personal Classification

Age was not associated with heavy drinking. 21 years old had the highest *OR* both males at 1.6 [1.0 – 2.5] and females at 1.2 [0.8 – 2.0].

According to race classification, White tended to have a higher likelihood of heavy drinking even though Two or more races group had the highest *OR* at 1.1 in males and Native American/Alaska Native/Native Hawaiian/Other Pacific Islander had the highest *OR* at 1.4 in females, but this result was not statistically significant with 95% CI for males [0.7 – 1.8] and for females [0.7 – 2.8]. Asian group had the lowest *OR* in both males at 0.2 and females at 0.2, and this results were statistically significant with 95% CI for males [0.1 - 0.4] and for females [0.1 – 0.4].

Family income was strongly associated with heavy drinking after adjusting all the other predictors and this influence was statistically significant in every level. Students whose family income is less than $20,000 had highest likelihood of heavy drinking both in males and females.

Students type whether they are part-time or full-time was not associated with heavy drinking. An *OR* of part-time students and full-time students were same in males, while full-time students had a slightly lower *OR* at 0.9 than the reference group in females, but this result was not statistically significant.

Temporal Classification

Year of college was associated with heavy drinking after adjusting all the other predictors, but this influence was statistically significant only in males. More advanced students who are in higher years in college tended to have a higher likelihood of heavy drinking. For female students, 2nd or 3rd year of college group had an *OR* at 1.2 [0.9 - 1.7] and 4th or higher year of college group had an *OR* at 1.2 [0.8 - 1.8] comparing to freshmen. This tendency was steeper in males: *OR* at 1.3 [1.0 – 1.8] for 2nd or 3rd year of college group and an *OR* at 1.4 [1.0 – 2.0] for 4th or higher year of college group.

Marital status was strongly associated with heavy drinking after adjusting all the other predictors and this influence was statistically significant. Students who do not live with a spouse tended to have a higher likelihood of heavy drinking both in males with an *OR* at 2.1 [1.1 – 4.2] and females with an *OR* at 3.4 [1.7 – 6.9], and this tendency was steeper in females.

Employment status was slightly associated with heavy drinking after adjusting all the other predictors. Overall, students who are employed in jobs tended to have a higher likelihood of heavy drinking even though the associations had low level statistical significances excepting only full-time employment group in females. Employed in part-

time jobs had an *OR* at 1.1 [0.9 – 1.4] in males and 1.2 [0.9 – 1.5] in females. Employed in a full-time job had an *OR* at 1.1 [0.9 – 1.5] in males and 1.5 [1.1 – 2.0] in females.

Physical Classification

Population density was not associated with heavy drinking. Although an *OR* of metropolitan areas were lower than nonmetropolitan area in males, these results were not statistically significant. For females, *OR*s of three group were the same.

Table 6. Multiple Logistic Regressions: Associations between Heavy Drinking[a] and Predictor Variables

Context/ Environment	Variables	Male		Female	
		OR[b]	95% CI[c]	*OR*[b]	95% CI[c]
Cultural	Level of Perceived Risk on Excessive Drinking (inverse order)				
	Great perceived risk	1.0	Reference	1.0	Reference
	Moderate perceived risk	2.1	(1.5~2.9)	1.8	(1.3~2.4)
	Slight perceived risk	3.7	(2.7~5.1)	5.1	(3.7~7.1)
	No perceived risk	6.9	(4.6~10.5)	10.6	(6.3~17.7)
	Level of Importance on Religious Beliefs (inverse order)				
	Strongly important	1.0	Reference	1.0	Reference
	Important	1.6	(1.2~2.2)	1.5	(1.1~2.0)
	Unimportant	2.3	(1.7~3.1)	1.6	(1.1~2.3)
	Strongly unimportant	1.9	(1.4~2.6)	2.2	(1.6~3.1)
	Experience in the US ARMY				
	No	1.0	Reference	1.0	Reference
	Yes	1.5	(0.8~2.7)	1.3	(0.4~4.6)
Personal	Age				
	18	1.0	Reference	1.0	Reference
	19	0.9	(0.6~1.4)	0.9	(0.6~1.3)
	20	1.1	(0.7~1.7)	0.8	(0.5~1.3)
	21	1.6	(1.0~2.5)	1.2	(0.8~2.0)
	22~23	1.3	(0.9~2.1)	0.9	(0.5~1.4)
	24~25	0.8	(0.5~1.3)	0.9	(0.5~1.5)
	Race				
	White	1.0	Reference	1.0	Reference
	Black/African American	0.3	(0.2~0.4)	0.4	(0.2~0.6)
	Hispanic	0.7	(0.5~0.9)	0.6	(0.4~0.8)
	Asian	0.2	(0.1~0.4)	0.2	(0.1~0.4)
	Two or more races	1.1	(0.7~1.8)	0.6	(0.3~1.2)
	Native American/Alaska Native/ Native Hawaiians/ Other Pacific Islander	0.6	(0.2~1.5)	1.4	(0.7~2.8)

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

b. *OR*-Odds Ratio; c. CI-Confidence Interval

Table 6. Multiple Logistic Regressions: Associations between Heavy Drinking[a] and Predictor Variables, cont'd

Context/ Environment	Variables	Male		Female	
		OR[b]	95% CI[c]	*OR*[b]	95% CI[c]
Personal (continue)	Family Income				
	< $20,000	1.0	Reference	1.0	Reference
	$20,000 ~ $49,999	0.6	(0.4~0.8)	0.5	(0.4~0.7)
	$50,000 ~ $74,999	0.6	(0.4~0.8)	0.6	(0.4~0.8)
	$75,000 =<	0.7	(0.5~0.9)	0.6	(0.4~0.8)
	Student Type				
	Part-time	1.0	Reference	1.0	Reference
	Full-time	1.0	(0.8~1.4)	0.9	(0.7~1.2)
Temporal	Year of College				
	1st year	1.0	Reference	1.0	Reference
	2nd or 3rd year	1.3	(1.0~1.8)	1.2	(0.9~1.7)
	4th or higher year	1.4	(1.0~2.0)	1.2	(0.8~1.8)
	Marital Status (inverse order)				
	Married	1.0	Reference	1.0	Reference
	Widowed/Divorced/ Separated/Not married	2.1	(1.1~4.2)	3.4	(1.7~6.9)
	Employment Status				
	Unemployed	1.0	Reference	1.0	Reference
	Employed part-time	1.1	(0.9~1.4)	1.2	(0.9~1.5)
	Employed full-time	1.1	(0.9~1.5)	1.5	(1.1~2.0)
Physical	Population Density (CBSA[d])				
	Nonmetropolitan area	1.0	Reference	1.0	Reference
	Small metropolitan area	0.9	(0.5~1.5)	1.0	(0.6~1.7)
	Large metropolitan area	0.8	(0.5~1.4)	1.0	(0.6~1.6)

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

b. *OR*-Odds Ratio; c. CI-Confidence Interval

d. 2003 Core-Based Statistical Area classifications

Influence of Predictor Variables on Excessive Alcohol Consumption

Hierarchical logistic regression analyses were conducted using the 10 predictor variables which were entered stepwise in four Context and Environment classifications to estimate the influences on excessive alcohol consumption. The three predictor variables within Cultural classification including level of perceived risk on excessive drinking, level of importance on religious beliefs, and experience in the US ARMY were included in step 1. The three predictor variables within Personal classification including age, family income, and student type were included in step 2. The three predictor variables within Temporal classification including year of college, marital status, and employment status were included in step 3. Finally, population density in Physical classification was included in step 4. Race was excluded in the hierarchical logistic regressions because it cannot provide information about direction of influence to excessive alcohol consumption. The Standardized Coefficients (SC) were calculated to estimate independent influence of each predictor variable. The relative influence of each Context and Environment classification was estimated by the change in R^2 attributable to the classification, after adjusting for other predictor variables in each model. In this regression analyses, Max-rescaled R^2changes, which was provided by the SAS, were also delivered in order to compare easily the change of R^2 when these changes are very small.

Binge Drinking among Male Students

Influences of predictor variable classifications on binge drinking among male students are shown in Table 7. The largest R^2 change (11.7%) was found in Cultural classification. Level of perceived risk on excessive drinking (SC = -0.36) and level of importance on religious beliefs (SC = -0.18) were strong negative predictor variables and their influences on binge drinking were statistically significant ($p<.0001$). Experience in the US ARMY was a positive predictor variable (SC = 0.02), but it did not contribute significantly. The second largest R^2 change (2.1%) was found in Personal classification even though a gap from the third largest R^2 change (1.5%) in Temporal classification was very small. Age was a positive predictor variable (SC = 0.11) and its influence on binge drinking was statistically significant ($p<.001$). Family income (SC = -0.05) and student type (-0.01) were negative predictor variables, but only family income contributed statistically significantly ($p<.05$). For Temporal classification, year of college and employment status were positive predictor variables (SC = 0.13 for year of school; 0.06 for employment status) and marital status was a negative predictor variable (SC = -0.11). Their influences on binge drinking were statistically significant ($p<.0001$ for both year of school and marital status; $p<.05$ for employment status). Only Physical classification did not contribute significantly (R^2 change = 0%). Population density was a negative predictor variable (SC = -0.02), but its influence on binge drinking was not statistically significant.

Table 7. Hierarchical Regression: Relative Influence of four Predictor Variable Classifications based upon Context and Environment on Binge Drinking[a] among Male Students

Context/ Environment	Predictor Variables	Model1[b]	Model2[c]	Model3[d]	Model4[e]
		Standardized Coefficients			
Cultural	Perceived Risk on Excessive Drinking (normal order)	-0.35****	-0.36****	-0.36****	-0.36****
	Importance on Religious Beliefs (normal order)	-0.18****	-0.18****	-0.18****	-0.18****
	Experience in the US ARMY	0.02	0.00	0.02	0.02
Personal	Age		0.18****	0.11***	0.11***
	Race		-	-	-
	Family Income		-0.04	-0.05*	-0.05*
	Student Type		0.01	-0.01	-0.01
Temporal	Year of College			0.13****	0.13****
	Marital Status (normal order)			-0.10****	-0.11****
	Employment Status			0.06*	0.06*
Physical	Population Density				-0.02
R^2change		11.7%	2.1%	1.5%	0%
Max-rescaled R^2change		15.7%	2.8%	2.0%	0%

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days

b. Model 1 = Cultural classification

c. Model 2 = Cultural + Personal classifications

d. Model 3 = Cultural + Personal + Temporal classifications

e. Model 4 = Cultural + Personal + Temporal + Physical classifications

*p<.05; **p<.01; ***p<.001; ****p<.0001

Binge Drinking among Female Students

Influences of predictor variable classifications on binge drinking among female students are shown in Table 8. The largest R^2 change (8.2%) was also found in Cultural classification even though its amount of change was smaller than the change in males. Level of perceived risk on excessive drinking (SC = -0.29) and level of importance on religious beliefs (SC = -0.15) were strong negative predictor variables and their influences on binge drinking were statistically significant ($p<.0001$). Experience in the US ARMY was also a negative predictor variable (SC = -0.01), but it did not contribute significantly. The second largest R^2 change (2.4%) was found in Temporal classification. For Temporal classification, year of college and employment status were positive predictor variables (SC = 0.11 for year of school; 0.06 for employment status) and marital status was a negative predictor variable (SC = -0.19). Their influences on binge drinking were statistically significant ($p<.0001$ for both year of college and marital status; $p<.01$ for employment status). Personal classification showed the third largest R^2 change (1.0%). Age was a positive predictor variable (SC = 0.07) and its influence on binge drinking was statistically significant ($p<.01$). Family income (SC = -0.07) and student type (SC = -0.01) were negative predictor variables, but only family income contributed statistically significantly ($p<.001$). Only Physical classification did not contribute significantly (R^2 change = 0%). Population density was no influence on binge drinking in female students.

Table 8. Hierarchical Regression: Relative Influence of four Predictor Variable Classifications based upon Context and Environment on Binge Drinking[a] among Female Students

Context/ Environment	Predictor Variables	Model1[b]	Model2[c]	Model3[d]	Model4[e]
		Standardized Coefficients			
Cultural	Perceived Risk on Excessive Drinking (normal order)	-0.28****	-0.29****	-0.29****	-0.29****
	Importance on Religious Beliefs (normal order)	-0.16****	-0.16****	-0.15****	-0.15****
	Experience in the US ARMY	-0.03	-0.04	-0.01	-0.01
Personal	Age		0.11****	0.07**	0.07**
	Race		-	-	-
	Family Income		-0.06**	-0.07***	-0.07***
	Student Type		0.01	-0.01	-0.01
Temporal	Year of College			0.11****	0.11****
	Marital Status (normal order)			-0.19****	-0.19****
	Employment Status			0.06**	0.06**
Physical	Population Density				0.00
R^2change		8.2%	1.0%	2.4%	0%
Max-rescaled R^2change		11.3%	1.4%	3.2%	0%

a. Drinking five or more drinks on the same occasion on at least one day in the past 30 days

b. Model 1 = Cultural classification

c. Model 2 = Cultural + Personal classifications

d. Model 3 = Cultural + Personal + Temporal classifications

e. Model 4 = Cultural + Personal + Temporal + Physical classifications

*p<.05; **p<.01; ***p<.001; ****p<.0001

Heavy Drinking among Male Students

Influences of predictor variable classifications on heavy drinking among male students are shown in Table 9. The largest R^2 change (7.3%) was found in Cultural classification. Level of perceived risk on excessive drinking (SC = -0.34) and level of importance on religious beliefs (SC = -0.16) were strong negative predictor variables and their influences on heavy drinking were statistically significant ($p<.0001$). Experience in the US ARMY was a positive predictor variable (SC = 0.03), but it did not contribute significantly. The second largest R^2 change (0.7%) was found in Temporal classification even though a gap from the third largest R^2 change (0.4%) in Personal classification was very small. For Temporal classification, year of college and employment status were positive predictor variables (SC = 0.14 for year of school; 0.02 for employment status) and marital status was a negative predictor variable (SC = -0.10). Influences of year of college and marital status were statistically significant ($p<.001$ for year of college and $p<.01$ for marital status), but employ status did not contribute significantly. Personal classification showed the third largest R^2 change. Age (SC = -0.04) and family income (SC = -0.07) were negative predictor variables, but only family income contributed significantly ($p<.01$). Student type (SC = 0.01) was positive predictor variable, but it did not contribute statistically significantly. Physical classification showed the smallest R^2 change (0.02%). Population density was a negative predictor variable (SC = -0.07), and its influence on heavy drinking was statistically significant ($p<.01$).

Table 9. Hierarchical Regression: Relative Influence of four Predictor Variable Classifications based upon Context and Environment on Heavy Drinking[a] among Male Students

Context/ Environment	Predictor Variables	Model1[b]	Model2[c]	Model3[d]	Model4[e]
		Standardized Coefficients			
Cultural	Perceived Risk on Excessive Drinking (normal order)	-0.35****	-0.35****	-0.35****	-0.34****
	Importance on Religious Beliefs (normal order)	-0.17****	-0.16****	-0.16****	-0.16****
	Experience in the US ARMY	0.02	0.01	0.03	0.03
Personal	Age		0.04	-0.04	-0.04
	Race		-	-	-
	Family Income		-0.08**	-0.08**	-0.07**
	Student Type		0.04	0.01	0.01
Temporal	Year of College			0.14***	0.14***
	Marital Status (normal order)			-0.09*	-0.10**
	Employment Status			0.02	0.02
Physical	Population Density				-0.07**
R^2change		7.3%	0.4%	0.7%	0.2%
Max-rescaled R^2change		11.8%	0.6%	1.2%	0.3%

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

b. Model 1 = Cultural classification

c. Model 2 = Cultural + Personal classifications

d. Model 3 = Cultural + Personal + Temporal classifications

e. Model 4 = Cultural + Personal + Temporal + Physical classifications

*p<.05; **p<.01; ***p<.001; ****p<.0001

Heavy Drinking among Female Students

Influences of predictor variable classifications on heavy drinking among female students are shown in Table 10. The largest R^2 change (6.1%) was found in Cultural classification. Level of perceived risk on excessive drinking (SC = -0.41) and level of importance on religious beliefs (SC = -0.15) were strong negative predictor variables and their influences on heavy drinking were statistically significant ($p<.0001$). Experience in the US ARMY was a positive predictor variable (SC = 0.01), but it did not contribute significantly. The second largest R^2 change (0.7%) was found in Temporal classification even though a gap from the third largest R^2 change (0.3%) in Personal classification was very small. For Temporal classification, year of college and employment status were positive predictor variables (SC = 0.18 for year of school; 0.06 for employment status) and marital status was a negative predictor variable (SC = -0.19). Influences of year of college and marital status were statistically significant ($p<.05$ for year of college and $p<.001$ for marital status), but employ status did not contribute statistically significantly. Personal classification showed the third largest R^2 change. Age (SC = -0.05) and family income (SC = -0.10) were negative predictor variables, but only family income contributed statistically significantly ($p<.01$). Student type was no influence on heavy drinking. Physical classification showed the smallest R^2 change (0.01%). Population density was a negative predictor variable (SC = -0.06), and its influence on heavy drinking was statistically significant ($p<.05$).

Table 10. Hierarchical Regression: Relative Influence of four Predictor Variable Classifications based upon Context and Environment on Heavy Drinking[a] among Female Students

Context/ Environment	Predictor Variables	Model1[b]	Model2[c]	Model3[d]	Model4[e]
		Standardized Coefficients			
Cultural	Perceived Risk on Excessive Drinking (normal order)	-0.41****	-0.41****	-0.41****	-0.41****
	Importance on Religious Beliefs (normal order)	-0.16****	-0.15****	-0.15****	-0.15****
	Experience in the US ARMY	-0.02	-0.02	0.01	0.01
Personal	Age		0.00	-0.05	-0.05
	Race		-	-	-
	Family Income		-0.10**	-0.11***	-0.10**
	Student Type		0.01	0.00	0.00
Temporal	Year of College			0.08*	0.08*
	Marital Status (normal order)			-0.19***	-0.19***
	Employment Status			0.06*	0.06
Physical	Population Density				-0.06*
R^2change		6.1%	0.3%	0.7%	0.1%
Max-rescaled R^2change		12.8%	0.5%	1.4%	0.2%

a. Drinking five or more drinks on the same occasion on each of five or more days in the past 30 days

b. Model 1 = Cultural classification

c. Model 2 = Cultural + Personal classifications

d. Model 3 = Cultural + Personal + Temporal classifications

e. Model 4 = Cultural + Personal + Temporal + Physical classifications

*p<.05; **p<.01; ***p<.001; ****p<.0001

Relative Influence of Four Classifications on Binge Drinking

The relative influence of four Context and Environment classifications on binge drinking among males is shown in Figure 3. Cultural classification provided the largest influence on binge drinking both in males and females. There were differences of the second largest classification between males and females. For males, the relative influence of Personal classification on binge drinking was the second largest, while the relative influence of Temporal classification on binge drinking was the second largest in females. The relative influence of Physical classification on binge drinking was almost zero both in males and females.

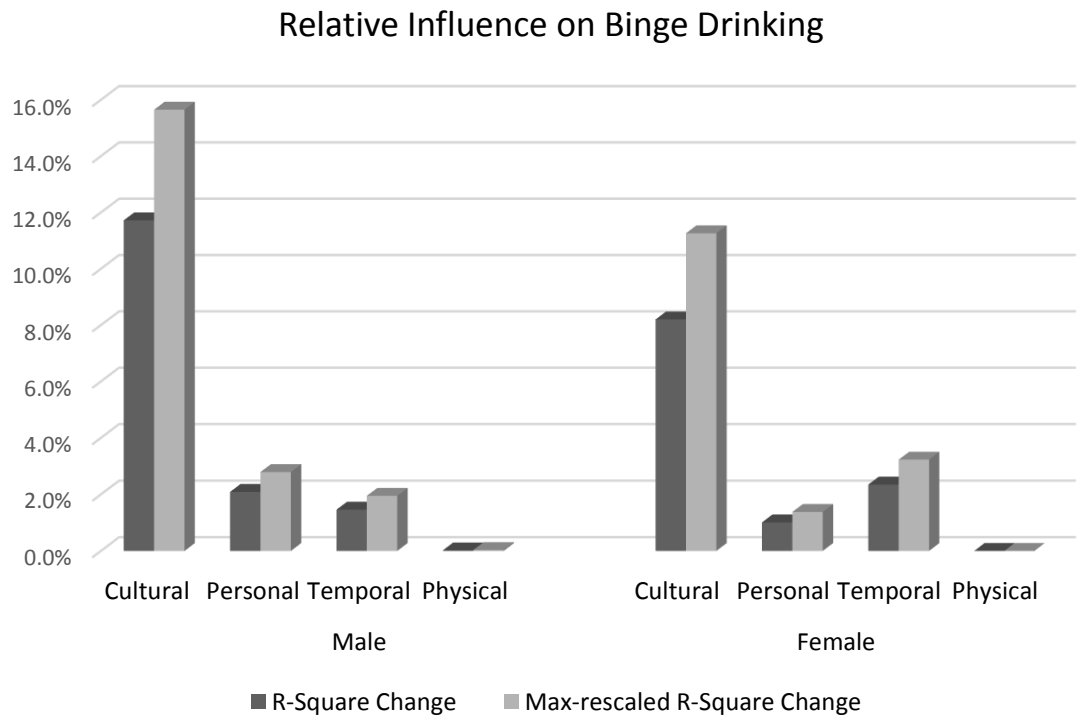

Figure 3. Relative influence of four predictor variable classifications on binge drinking

Relative Influence of Four Classifications on Heavy Drinking

The relative influence of four Context and Environment classifications on heavy drinking among males is shown in Figure 4. There were no significant differences on relative influences between males and females. Cultural classification provided the largest influence on heavy drinking both in males and females. The relative influence of Temporal classification on heavy drinking was the second largest, and the relative influence of Personal classification on heavy drinking was the third largest in both males and females. The relative influence of Physical classification on binge drinking was almost zero both in males and females.

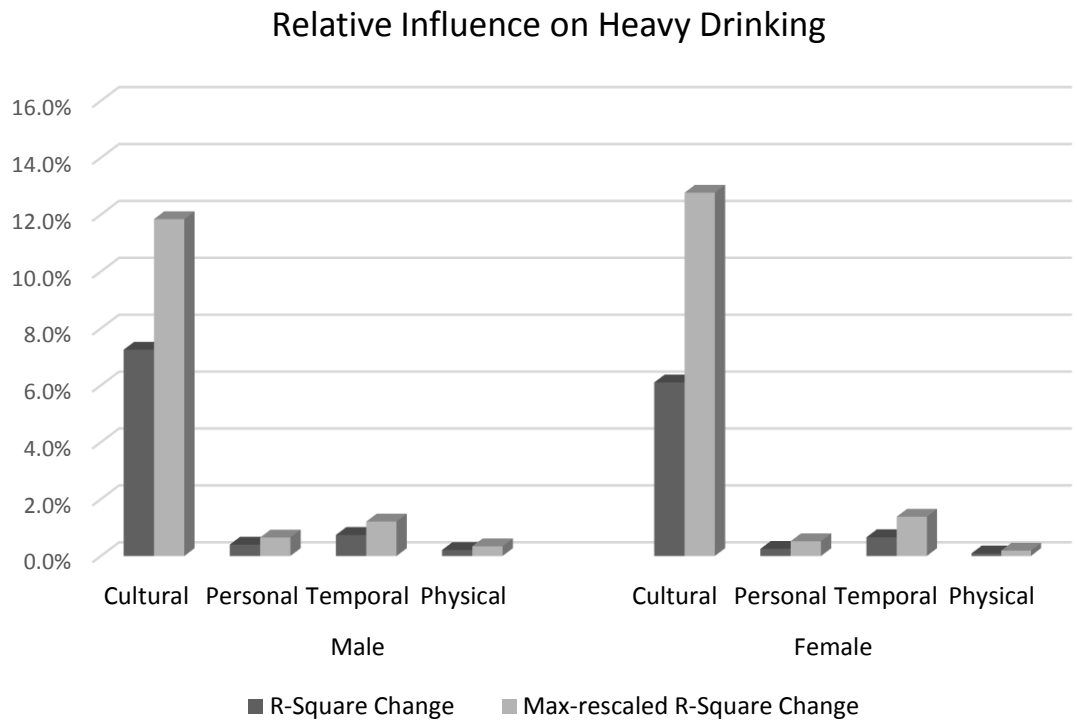

Figure 4. Relative influence of four predictor variable classifications on heavy drinking

V. DISCUSSION

Purpose of This Study

This study was conducted to estimate influences of predictor variables and their relative influence on excessive alcohol consumption among college students. To provide effective prevention services for excessive alcohol consumption among college students, independent and relative influences of predictors on excessive alcohol consumption should be understood within a well-structured framework. For occupational therapists in the US, the OTPF Domain and Process is an important framework for understanding their practice. Thus, the variables studied here, including criterion variables and predictor variables, were classified within Contexts and Environments as described by the OTPF Domain and Process. The influence of predictor variable groups and their relative influence on excessive alcohol consumption among college students was then estimated.

Furthermore, this study aimed to suggest new roles of occupational therapy in health promotion and well-being, especially prevention sciences of problematic alcohol consumption. Occupational therapy can play an important role in health promotion and well-being by helping people to engage in their meaningful occupations, especially when those occupations are also health promoting versus high risk to one's health. In terms of Health Management and Maintenance, an area of IADL, prevention of health risk behavior like excessive alcohol consumption can be an appropriate occupation. Preventing excessive alcohol consumption among college students using the OTPF Domain and Process can be a potential occupational therapy intervention for health promotion and well-being, especially when it is replaced by health-promoting

occupations, from as simple as drinking water to focusing on dancing as opposed to drinking cocktails at a dance club.

Factors Influencing Excessive Alcohol Consumption among College Students

Cultural Classification

Perceived risk of excessive drinking was a very important predictor on prevalence of excessive alcohol consumption among college students. In this study, the prevalence of binge drinking among those who do not have any perceived risk on excessive drinking was 71.6% in male students and 63.2% in female students, as well as the prevalence of heavy drinking among them was 40.8% in male students and 34.7% in female students. After adjusting the other predictor variables, male students among them have a 5.7 times higher likelihood of binge drinking and a 6.9 times higher likelihood of heavy drinking than those who are highly aware of perceived risk associated with excessive drinking. Female students among them have a 4.9 times higher likelihood of binge drinking and a 10.6 times higher likelihood of heavy drinking than those who have great level of perceived risk on excessive drinking. These imply that many college students consume alcohol excessively because they do not have an accurate perceived risk about excessive drinking. Thus, health professionals who want to provide prevention services for excessive alcohol consumption among college students may expect to achieve their goal by educating college students to have proper perceived risk on excessive drinking.

Self-reported perceived risk is a very strong predictor of excessive alcohol consumption among college students; similarly, alcohol-related attitudes of relevant people around college students are very important. This is because perceived risk on

excessive alcohol consumption among people around college students can influence perceived risk among college students themselves as a cultural norm. According to Cail and LaBrie, alcohol consumption among college students was strongly influenced by the perceived attitudes of peers (Cail & LaBrie, 2010). If a student has peers who have no perceived risk on excessive alcohol consumption, the student may reflect the same attitude about perceived risk on excessive alcohol consumption. Fraternity or sorority memberships are examples of a peer influences. Low proportion of college students who have the great level of perceived risk on excessive drinking can represent a higher possibility of excessive alcohol consumption among them.

The importance of religious beliefs was strongly associated with the prevalence of excessive alcohol consumption among college students. In this study, the prevalence of binge drinking among those who thought religious beliefs are strongly unimportant in their life was 54.9% in male students and 45.7% in female students, as well as the prevalence of heavy drinking among them was 23.4% in male students and 16.2% in female students. After adjusting the other predictor variables, male students among them have 2.2 times higher likelihood of binge drinking and 1.9 times higher likelihood of heavy drinking than those who thought religious beliefs are strongly important in their lives. Female students among them have 2.1 times higher likelihood of binge drinking and 2.2 times higher likelihood of heavy drinking than those who thought religious beliefs are strongly important in their life. These imply that importance of religious beliefs was also a crucial predictor of excessive alcohol consumption, so that this factor would be considered when health professionals make prevention programs for excessive alcohol consumption among college students.

Religious beliefs have been considered as a good predictor of risk and negative behaviors among college students, such as excessive alcohol consumption and risky sexual behavior. According to Poulson and colleagues, college students with strong religious beliefs consumed less alcohol, but this association was only significant in females (Poulson, Eppler, Satterwhite, Wuensch, & Bass, 1998). A negative influence of religious beliefs on alcohol consumption in their study was the same as results in this study even though it was only significant in females. More recent research conducted by Neighbors and colleagues also provided influence of religious beliefs on excessive alcohol consumption among college students (Neighbors, Brown, Dibello, Rodriguez, & Foster, 2013). Strong religious beliefs can be a protector against excessive alcohol consumption by moderating the perceived cultural norm among college students.

Both perceived risk of excessive drinking and importance of religious beliefs play a role as shaping cultural norms, and their influences on excessive alcohol consumption among college students were very strong.

Personal Classification

Gender is an important personal factor affecting various behaviors. Traditionally, male students tend to have higher prevalence of alcohol consumption than females (O'Malley & Johnston, 2002; Velazquez et al., 2011). Of course, a more recent study reported an opposite result on gender differences in college drinking. According to the study, females were more likely to have binge drinking than male students when the weekly alcohol intake limit was considered (Hoeppner, Paskausky, Jackson, & Barnett, 2013). These may imply that drinking patterns among college students are totally

different based upon gender difference. Thus, this study conducted all statistical analysis separately by gender, so that associations between predictor variables and excessive alcohol consumption were considered within each gender, and so those results could be compared.

Older students tend to have higher prevalence of excessive alcohol consumption. According to a study in the 1980s, there was some difference of its effects on alcohol consumption between males and females: age was a positive predictor of alcohol consumption for females only (Mooney, Fromme, Kivlahan, & Marlatt, 1987). However, age's effects on alcohol consumption are applied in both males and females these days. Age was considered as a strong risk factor of alcohol consumption among college students (Zuba et al., 2012). In this study, there were also similar patterns of excessive alcohol consumption by age in both genders.

Many studies were interested in study about college drinking on race. Overall, White has the highest rate of alcohol consumption (O'Malley & Johnston, 2002; Mounts, 2004; Paschall, Bersamin, & Flewelling, 2005). In the present study, there was the same result. However, studies focusing on specific subgroups of college students including not only race but also ethnic minority were suggested for the future research (Maloney, 2011).

Socio-economic status is a very important determinant of health outcome (Williams, Mohammed, Leavell, & Collins, 2010). This is due to the fact that people with a low level of socio-economic status can be exposed in health risk habits easily, such as eating low quality foods or getting more physical workloads. In this study, family income

was used to estimate influence of socio-economic status on excessive alcohol consumption. Students with family income less than $20,000 had the highest prevalence of excessive alcohol consumption. As a result, the risk on health among students with the low socio-economic status can be increased. This implies that prevention of excessive alcohol consumption should be focused on students with low family income.

Temporal Classification

Excessive alcohol consumption increased for students enrolled in higher years of college. Prevalence of excessive alcohol consumption grew as year of college increased, and this association was maintained after adjusting various confounding variables. According to a recent study about college drinking, alcohol consumption among students who have been in college for a 'long spell' was higher than those who have not spent much time in college (Lorant, Nicaise, & Soto, 2013). College students who spend more time in college might have more opportunities for being in problematic alcohol consumption situations. This shows that prevention of excessive alcohol consumption should be focusing more on students with higher years of college.

Marital status is considered as a positive predictor of health. According to Cramm and colleagues, marital status positively related to well-being (Cramm, Møller, & Nieboer, 2012). In the present study, there was also a significant difference in the prevalence of excessive alcohol consumption between students who are married and their counterpart. Students who are widowed, divorced, separated, and not married were included in the counterpart. Thus, the marital status in this study may be translated as students who live with a spouse or not. As a result, the result of this study about the

association between marital status and excessive alcohol consumption implies that those who live with a spouse had a lower prevalence of excessive alcohol consumption than others. Actually, since most college students are unmarried, this association cannot be applied in prevention of college drinking. Nonetheless, its effect on excessive alcohol consumption among college students was significant.

Employment status or time associated with work was a positive predictor of excessive alcohol consumption. Alcohol consumption may be affected by various factors including type of work, working environments, and shift of time. In this study, however, employment status was classified by only number of hours worked, so that the result of this study about the association between employment status and excessive alcohol consumption may have some errors and need a closer investigation.

Physical Classification

Physical environment is also a relevant factor influencing alcohol consumption among college students. The prevalence of excessive alcohol consumption among them varies depending on where they live. Many studies reported the association between on-campus housing and alcohol consumption: college students who live in on-campus housing reported a higher likelihood of drinking than other students (Presley, Meilman, & Cashin, 1996; Wechsler, Lee, Kuo, & Lee, 2000; Lorant et al., 2013). However, there have not been many studies including population density as a predictor variable. In this study, population density was included as a variable in Physical classification. Students who live in areas with the largest population density had the lowest prevalence of excessive alcohol consumption, but this result was statistically significant in males only.

Relative Influence of Classifications on Excessive Alcohol Consumption

There were four Context and Environment classifications in this study, and the relative influences of each classification on excessive alcohol consumption among college students was estimated. The relative influence of Cultural classification on excessive alcohol consumption, both in binge drinking and heavy drinking, was the largest in both males and females (Figure 3 & 4). In other words, Cultural classification strongly influenced excessive alcohol consumption among college students more than the other classifications in this study. Cultural norms are one of the most important factors of promoting or reducing behaviors. Like perceived risk on excessive drinking and importance on religious beliefs, cultural norms can change people's behaviors. This implies that excessive alcohol consumption can be decreased by controlling these predictor variables in Cultural classification.

Also, the relative influence of the four Context and Environment classifications was a little bit different based upon gender. Regarding the relative influence on binge drinking, Personal classification was the second largest classification for male students, while Temporal classification was the second largest one for female students (Figure 3). This result implies that the prevention approaches also should be set up differently by gender. For example, we can expect more effective outcomes of prevention for male students when we manage their cultural risk factors with their personal risk factors. In contrast, we can expect more effective outcomes of prevention for female students when we manage their cultural risk factors with their temporal risk factors. Of course, we can expect the most effective outcome of prevention for college students when we manage all of their risk factors of excessive alcohol consumption. However, when we consider real

situations of prevention approaches, this result can be enough evidence to make proper priority-based prevention strategies.

Need for Continuous Investigations on College Drinking

Many studies on college drinking have already identified several key factors associated with excessive alcohol consumption among college students. So, it is true that research on college drinking is not conducted as actively today as compared to a decade ago. However, a few experts cast doubt on this situation. They suggest that investigations on college drinking should be continued, and there is evidence to support that. According to a review article about alcohol consumption among the US college students reported by Kilmer and colleagues, "the field of research studying college student drinking is relatively young although neither college student drinking nor its associated harms are new phenomena" (Kilmer, Cronce, & Larimer, 2014, p.26). They mentioned that research on college drinking prevention should be continued to lead to greater understanding on this issue for the future and make more effective methods for reducing alcohol related problems among college students.

Another point is that the prevalence of excessive alcohol consumption among college students remains high. According to the study of Johnson and colleagues, 67.7% of the US college students reported alcohol consumption during the past month, and 37.4% were in excessive drinking in the last two weeks (Johnston et al., 2013). The 2012 NSDUH also showed the same results that the current prevalence of excessive alcohol consumption among the US college students remains at pretty high levels in both male

(46.6%) and female (35.7%) students (SAMHSA, 2013c). Therefore, investigations on college drinking should be continued.

Furthermore, research on identifying factors currently associated with excessive alcohol consumption should be continued to provide more proper prevention approaches. Although trends of excessive alcohol consumption were studied by many researchers, these results will become outdated. And sometimes these trends fluctuate just after one year. For example, full-time students had a higher excessive alcohol consumption than part-time students in 2011 (SAMHSA, 2012), but part-time students had a higher excessive alcohol consumption than full-time students in 2012 (SAMHSA, 2013c). Many researchers think that we don't need to study about basic factors associated with excessive alcohol consumption because most variables were already identified. However, these patterns may vary by time differences. Thus, we should continue to study about factors associated with excessive alcohol consumption to estimate the current patters among college students more precisely.

Occupational Therapy's Roles in Health Promotion and Well-being

Occupational therapy can work in population level health promotion and well-being programs. Historically, occupational therapists work with individuals and play a primary role in rehabilitation sciences. However, recently, new roles of occupational therapy in public health including health promotion and well-being have been suggested by many leaders in the profession (Hildenbrand & Lamb, 2013; AOTA, 2013; AOTA, n.d.). Like the AOTA, associations of occupational therapy in many developed countries in occupational therapy including Canada, Australia, and the United Kingdom reported

their roles in health and well-being (Moll, Gewurtz, Krupa, & Law, 2013; Wood, Fortune, & McKinstry, 2013; British Association of Occupational Therapy [BAOT], n.d.). They commonly said that occupational therapy can fully contribute to people's health promotion and disease prevention by helping them to actively engage in their meaningful occupations.

This study also recommends new roles of occupational therapy in health promotion and well-being for populations. Particularly, occupational therapy's role in prevention of excessive alcohol consumption as a health risk behavior among college students is suggested. Occupational therapists will be able to provide occupational therapy interventions to prevent excessive alcohol consumption. It can be done by identifying predictive relationships between factors as well as influences of critical predictor variables on excessive alcohol consumption within the OTPF Domain and Process which is a very important clinical framework in Occupational Therapy. This study provided evidence an epidemiological analysis for prevention of excessive alcohol consumption among college students by using the OTPF Domain and Process. Not only were all variables used in this study classified within the OTPF Domain and Process, but also predictive relationships between factors as well as relative influences of variable classifications were described by the OTPF Domain and Process. Similarly, predictive relationships between predictor variables of various target occupations can be understood within the OTPF Domain and Process. Therefore, occupational therapists can play significant roles in the population level health promotion and well-being programs using these knowledge.

Occupational therapists can fully participate in interventions for health promotion and well-being at the population level. However, some occupational therapists have concerns on situations now occupational therapists have that they do not have a clear recognition as prevention practitioners not only in the past, but also in present (Hildenbrand & Lamb, 2013). According to Moll and colleagues, "there is relatively little awareness in the broader public health field regarding the role of occupational engagement in promoting health and well-being" (Moll et al., 2013, p.112). To realize occupational therapy's roles in health promotion and wellbeing, occupational therapists should have a clear recognition about prevention sciences and increase their awareness in the broader public health fields.

Limitations of This Study

There were some limitations in this study. Firstly, this study used cross-sectional survey data. Although statistical results could show strong associations between relevant predictor variables and excessive alcohol consumption among college students, these results might not fully explain the predictive relationships between causes and the outcomes in terms of time dimensions. Thus, further study such as a longitudinal study should be conducted. Secondly, this study considered only 12 variables as predictors of excessive alcohol consumption among college students. Also, only variables within four Context and Environment classifications were included in this study. However, the other factors within not only the four classifications, but also Virtual and Social Context and Environment classifications in the OTPF Domain and Process might impact on excessive alcohol consumption. So, studies adjusting for more predictor variables should be conducted. Thirdly, the data used in this study were collected by face to face interviewing

between various pre-trained interviewers and participants using survey questionnaires. Thus, there might be some reporting errors during the data collecting process including recall bias of participants or biases occurring by differences between interviewers.

Significance and Implications for Future Research

This study provided information about prevention of excessive alcohol consumption among college students by using the lens of the OTPF Domain and Process. There are not many studies investigating the prevention of alcohol consumption problems in the field of Occupational Therapy. Thus, this study can be significant evidence for future research on prevention of problematic alcohol consumption by using the OTPF Domain and Process. Also, prevention approaches provided in this study were accompanied with identifying predictive relationships and relative influences of factors by conducting epidemiological analysis which is one of the most important methods in Public Health and Health Promotion. However, this analysis has not been conducted frequently in previous occupational therapy research and practice. Therefore, this study can be evidence for future research on finding predictive relationships and relative influences of various client factors on occupations. Finally, this study focused on an area of IADL, specifically Health Management and Maintenance, as a target occupation. The Health Management and Maintenance includes ‘decreasing health risk behaviors’. The ultimate goal of this study is associated with decreasing a health risk behavior, excessive alcohol consumption. This is well matched to the future research issue of occupational therapy. According to a report of the AOTA in 2013, promoting healthy lifestyles for people is one of the most important roles of occupational therapy in health promotion and disease prevention (AOTA, 2013). This study provided evidence to suggest the roles of

occupational therapy in prevention of excessive alcohol consumption as a health risk behavior for promoting proper occupation as an area of IADL, specifically Health Management and Maintenance. The research methods used in this study can be applied to other health risk behaviors.

VI. CONCLUSIONS

This study provided novel information on factors associated with college students' excessive alcohol consumption and the prevention of excessive alcohol consumption using the 2012 NSDUH data within the Occupational Therapy Practice Framework Domain and Process as a model for prevention approach.

1. Influences of predictor variables within Cultural (perceived risk of excessive alcohol consumption, importance of religious beliefs, and experience in the US ARMY), Personal (age, family income, and student type), Temporal (year of college, marital status, and employment status), and Physical (population density) classifications on excessive alcohol consumption

Perceived risk of excessive alcohol consumption and importance of religious beliefs in Cultural classification strongly influenced excessive alcohol consumption among college students. Students who have no perceived risk of excessive alcohol consumption tended to have more excessive alcohol consumption. Students who strongly disagree that their religious beliefs are important parts of their life tended have more excessive alcohol consumption. Family income in Personal classification strongly influenced on excessive alcohol consumption among college students. Students who have family income less than $20,000 tended to have more excessive alcohol consumption. Year of college and marital status in Temporal classification strongly influenced on excessive alcohol consumption among college students. Students who enrolled in higher

years of college tended to have more excessive alcohol consumption. Students who do not live a spouse tended to have more excessive alcohol consumption.

2. The relative influence of Cultural, Personal, Temporal and Physical classifications on excessive alcohol consumption

The Cultural classification provided the largest influence on excessive alcohol consumption. It implies that managing Cultural classification would provide the most effective outcome in prevention of excessive alcohol consumption among college students. In addition, the second largest classifications influencing on binge drinking were differed based upon gender. Personal classification was the second largest one for males, while Temporal classification was the second largest one for females. Thus, prevention strategies for excessive alcohol consumption among college students should be created differently based upon gender of target populations as priority-based prevention strategies.

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