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Alcohol Use Disorders, Nicotine Dependence and Co-occurring Mood and Anxiety Disorders In the United States and South Korea – a Cross-national Comparison

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Abstract

Background—The strong comorbidity between substance use disorders (SUDs) and mood and anxiety disorders has been well documented. In view of lack of research findings addressing the co-occurrence of SUD and mood and anxiety disorders, this study examined the pattern of comorbidity of alcohol use disorders (AUD) and nicotine dependence (ND) between two culturally diverse countries, the U.S. and South Korea.

Methods—Using the nationally representative samples of the U.S. and Korean general populations: we directly compared rates and comorbidity patterns of AUD, ND and mood and anxiety disorders between the two countries. We further examined the rates and the comorbidity pattern among individuals with AUD who sought treatment in the last 12 months. Twelve-month prevalence rates were derived to estimate country differentials, and odds ratios and 95% confidence intervals were estimated to measure the strength of comorbid associations, while adjusting for all sociodemographic characteristics in multivariable logistic models specific to each country.

Results—The 12-month prevalences of AUD, ND, and any mood and any anxiety disorder were 9.7%, 14.4%, 9.5% and 11.9% among Americans, whereas the corresponding rates were 7.1%, 6.6%, 2.0% and 5.2% among Koreans. These rates were significantly greater (except for any alcohol use disorder) among Americans than among their Korean counterparts. With respect to comorbidity, both countries showed comparable patterns that the prevalences of mood and anxiety disorders were consistently the highest among persons with AD. Also, a disparate pattern was observed in Korea that the prevalences of mood and anxiety disorders were generally lower among individuals with ND than among those with AA and AD. Furthermore, despite significantly

greater prevalence of AD in Korea (5.1%) than in the U.S. (4.4%), alcohol dependent Americans were four times (OR=3.93) more likely to seek treatment compared to their Korean counterparts.

Conclusions—Our results indicated that the prevalence of AD in Korea was substantially greater than that in both Western and other Asian countries, suggesting a maladaptive pattern of alcohol use in Korea which is different from the general use pattern of other East Asian countries. The low rate of treatment utilization among Koreans might be attributable to perceived social stigma toward SUD or mental health problems, despite the fact that the Korean government offers national health insurance.

Keywords

alcohol use disorders (AUD); nicotine dependence (ND); comorbidity; DSM-IV mood and anxiety disorders; multivariate logistic regression

Introduction

Neuropsychiatric disorders account for approximately 14% of the global burden of disease and affect over 450 million people worldwide, with the most important contributors including depression and alcohol use disorders (Prince et al., 2007). Hazardous alcohol use and depression are also among the 10 leading causes of disability and premature death worldwide (World Health Organization, 2001).

The emerging trend has indicated that many low- to middle-income countries have demonstrated a steady increase in alcohol use while experiencing an early stage of the tobacco epidemic (Ezzati et al., 2004). It was estimated that by 2030, approximately 8.3 million premature deaths are attributable to tobacco, representing 10% of all deaths globally (Mathers & Loncar, 2006).

The strong comorbidity among alcohol use disorders (AUDs), nicotine dependence (ND) and mood and anxiety disorders has been well documented in both clinical and epidemiologic studies. The majority of those with mental disorders will meet the criteria for another mental disorder or AUD or ND at some point in their lives (Merikangas & Kalaydjian, 2007; Kessler & Wang, 2008). This comorbidity of AUD, ND and psychiatric disorders complicates service utilization, diagnosis, treatment outcome and prognosis, and thus has been recognized as a major public health concern associated with substantial personal and societal costs (Australian Ministerial Council on Drug Strategy, 1998; U.S. Office of National Drug Control Policy, 2001).

Considerable evidence from psychiatric epidemiology studies suggests that patterns of disorder, their sociodemographic correlates, and the respective underlying mechanisms differ between East Asian and Western cultures. However, despite the increasing availability of epidemiologic survey data from multiple countries, few cross-national comparisons of the prevalence and comorbidity of substance use disorders (SUD) and psychiatric disorders have been conducted (Teesson et al., 2006). As a result, little is known about the magnitudes and nature of such differences, especially in the comorbidity patterns of AUD, ND and mood and anxiety disorders.

Given that the significance of the disease burden of mental disorders has been highlighted among many societies in the world, comprehensive understanding of cross-national variations may be critical in identifying risk and protective factors, and for developing prevention and treatment interventions. It is equally important to clarify whether the comorbid patterns observed in prior studies were inherent to AUD and ND, or occurring only in the context of certain cultural variables.

Thus, to fill an important gap in public health knowledge related to the consistencies of the comorbid patterns of AUD, ND and mood and anxiety disorders across culturally diverse countries, especially of Asian countries, this study was aimed at comparing the prevalences and comorbidity of AUD, ND and mood and anxiety disorders between the United States and Korea. Two contemporary nationally representative surveys conducted in the United States (2001–2002) and South Korea (2001) provided a unique opportunity to address these questions.

For the purposes of the current investigation, and henceforth, SUD refers to AUD and ND only. Drug use disorders were excluded because of their extremely low prevalence in the Korean sample, which precluded meaningful analyses and cross-country comparisons. Furthermore, it has been demonstrated that AUD and ND account for approximately 80% to 90% of all SUD-attributable burden of disease.

In addition to examining rates and comorbidity patterns in the total sample, we examined these variables among individuals with AUD who sought treatment in the last 12 months. The disparate findings of treatment utilization between the two countries may provide the clues prompting treatment seeking and provide useful information for developing and refining prevention and treatment strategies.

Methods

Samples

National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

—The 2001–2002 NESARC is based on face-to-face interviews with a nationally representative sample of the adult population (18 years and older) of the United States and was conducted by the National Institute on Alcohol Abuse and Alcoholism. The target population of the NESARC was the civilian noninstitutionalized population residing in the United States, including Alaska and Hawaii, and persons living in households and group quarters. The final sample (n=43,093) was weighted to adjust for oversampling and nonresponse at the individual and household levels. The overall survey response rate was 81.0%, and details of this survey have been described elsewhere (Grant et al., 2003b).

Korean Epidemiologic Catchment Area (KECA)—The Korean Epidemiologic Catchment Area (KECA) study is a nationally representative sample of South Korea targeting all eligible residents listed in the updated 2000 population census of the community registry offices (Korean National Statistical Office, 2000). It was conducted in collaboration with the Korean Ministry of Health and Welfare and the Seoul National University College of Medicine.

A stratified, multistage and cluster sampling design was adopted. The 2000 Population Census at the Korea National Statistical Office was the sampling frame. Face-to-face interviews were conducted among a total of 7,867 sample persons and the response rate was 79.8%. The technical details of the Korean version of the CIDI 2.1 can be found in an earlier publication by Cho and his colleagues (Cho et al., 2002).

Sociodemographic characteristics

We restricted the NESARC sample to respondents aged 18–65 for comparability with the age range of KECA respondents. In addition, to ensure the comparability between the two surveys categorical variables were created using identical cut points, i.e., age: 18–24, 25–34, 35–44, 45–65; marital status: married/cohabiting, widowed/divorced/separated, never married; educational attainment: < 12 years, 12 years, 13–15 years, 16+ years; income: low, moderate, high. Cutoffs for low, moderate and high incomes quarters were based on the observed income distributions for both countries. Low income level was set at the 1st quartile; moderate income level was at the 2nd and 3rd quartiles; and high income level was set at the 4th quartile.

DSM-IV alcohol use disorders, nicotine dependence and mood and anxiety disorders

The diagnostic interview used in the NESARC was the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV, Grant et al., 2003a). The AUDADIS-IV is a state-of-the-art structured diagnostic interview schedule designed for use by lay interviewers. The KECA study administered the Korean version of Composite International Diagnostic Interview 2.1(K-CIDI 2.1) to each subject (Cho et al., 2002). The K-CIDI 2.1 (World Health Organization, 1990) is a fully structured diagnostic interview designed to detect *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (DSM-IV; American Psychiatric Association, 1994) Axis I disorders. The K-CIDI 2.1 was validated according to guidelines published by the World Health Organization (1997).

The concordance between the AUDADIS-IV and K-CIDI 2.1 DSM-IV alcohol use disorder diagnoses and criteria were fair to good ($\kappa > 0.67$) in an international survey conducted under the auspices of the World Health Organization/National Institute of Health Joint Project on Diagnosis and Classification (Cottler et al., 1997; Ustun et al., 1997). Within the context of this international study, the reliability and validity of the AUDADIS-IV and CIDI 2.1 were fair to good (Chatterji et al., 1997; Hasin et al., 1997; Pull et al., 1997).

Service utilization

To facilitate comparability between the data obtained in the NESARC and the KECA, treatment seeking was defined as any AUD or mental health treatment in the past 12 months from a wide range of providers. Specifically, in the United States treatment seeking referred to going somewhere or seeing someone to get help or obtain services for SUD or other mental health problems, whereas in Korea, this question assessed any service use in the 12 months prior to the interview (World Health Organization, 1997).

Statistical analysis

All analyses were conducted using SUDAAN software (Research Triangle Institute, 2006) to account for complex sample design effects that differed between the two surveys. The prevalence estimates and their standard errors were obtained with sampling weights taken into consideration. Significant ($p < 0.05$) country differences were assessed by t-statistics or Chi-squared tests, as appropriate. Odds ratios and 95% confidence intervals (CIs) were estimated to describe the strength of comorbid associations between pairs of the 12-month AUD, ND and mood and anxiety disorders, while adjusting for all sociodemographic characteristics in multivariable logistic models specific to each country.

Results

Sample characteristics

Table 1 presents the sociodemographic characteristics of NESARC and KECA respondents. Sex distributions were comparable between the two countries. However, the Koreans were younger, less likely to be widowed/separated/divorced, to be employed, and to have college educations, and more likely to have moderate incomes and urban residence than their U.S. counterparts.

Prevalences of 12-month AUD, ND and mood and anxiety disorders

Considering broad categories, the 12-month prevalences of any AUD, ND, any mood disorder and any anxiety disorder were 9.7%, 14.4%, 9.5% and 11.8%, respectively, among Americans (Table 2). The corresponding rates (7.1%, 6.6%, 2.0% and 5.2%) among Koreans were significantly lower ($p < 0.05$). After taking into consideration the differences in sociodemographic characteristics, the excess rates among Americans remained statistically significant except for AUD. Of note, however, even though Americans exhibited greater prevalences of most of the disorders considered in this study, the adjusted odds of alcohol dependence (AD) was significantly lower in U.S. than Korea (adjusted OR=0.69). Both in the U.S. and Korea, MDD was the most prevalent mood disorder and specific phobia was the most prevalent anxiety disorder.

Comorbidity of AUD and ND with mood and anxiety disorders

Adjusted odds ratios (ORs) for associations of AUD and ND with mood and anxiety disorders are presented in Table 3. In the U.S. sample, the associations were positive and generally statistically significant (78% of ORs with $p < 0.05$) except for alcohol abuse (AA), in which associations with specific mood or anxiety disorders were not always significant. Conversely, among Korean respondents, few associations between AUD and specific mood or anxiety disorders reached statistical significance, owing to the wide confidence intervals resulting from the small KECA sample. Among statistically significant associations, however, the ORs were consistently larger among Koreans than among Americans, although the differences between country-specific ORs were not themselves statistically significant.

Associations between ND and specific mood and anxiety disorders in the NESARC sample were all substantial in magnitude (ORs varied from 2.30 to 3.95), and statistically significant ($p < 0.05$, Table 3). Also, ND was most strongly associated with panic disorder and GAD

(OR=3.95 and 3.03, respectively). In contrast, among Koreans none of the associations between ND and specific mood and anxiety disorders was statistically significant.

Prevalences of DSM-IV mood and anxiety disorders among respondents with AUD and ND

The 12-month prevalences of mood and anxiety disorders among those with AUD and ND are given in Table 4. Considering the broad categories (any AUD, mood or anxiety disorders) in Table 4, 17.5% of NESARC respondents with any AUD also had at least 1 mood disorder in the past 12 months. A comparable percentage (17.3%) of them had at least 1 anxiety disorder. Likewise, among nicotine-dependent Americans, 19.8% had at least 1 past-year mood disorder, and 22.4% had at least 1 past-year anxiety disorder. The corresponding rates among Koreans were significantly ($p<0.001$) lower at 4.3% and 6.6% among those with any 12-month alcohol use disorder, and 2.6% and 3.5% among those with 12-month ND, respectively.

Among persons with ND, comorbid MDD and specific phobia were more prevalent (10.8% and 14.6% respectively for Americans; 2.4% and 2.4% respectively for Koreans) than other mood or anxiety disorders.

Prevalences of DSM-IV AUD and ND among respondents with mood and anxiety disorders

Tables 5a and 5b present the 12-month prevalences of AUD and ND among NESARC and KECA respondents with mood disorders and anxiety disorders, respectively. Among those with at least 1 past-year mood disorder, rates of any comorbid past-year AUD were comparable among Americans and Koreans (17.9% and 15.0%, respectively) (Table 5a). Among those with at least 1 past-year anxiety disorder, rates of any past-year AUD were numerically greater among Americans than Koreans (14.2% vs. 8.9%), though the difference was not statistically significant (Table 5b). In contrast, a significantly greater rate of ND was observed in the U.S. than in Korea among individuals with any 12-month mood disorder (30.0% versus 8.4%, $p<0.001$), and among those with any 12-month anxiety disorder (27.2% versus 4.3%, $p<0.001$). The significant excess of comorbid ND among Americans compared to Koreans was also reflected in rates of almost all specific disorders considered in this study.

In both countries the prevalences were consistently lower for AA than for AD. However, prevalences were consistently lower for AD than for ND among Americans, whereas the opposite was true among Koreans.

Treatment utilization among respondents with AUD

Table 6 presents 12-month treatment seeking among individuals with any alcohol use disorder in the U.S. and Korea. Treatment data on ND were omitted because no comparable data among persons with ND were available from the NESARC. Americans with any AUD were roughly twice as likely (11.8%) to seek treatment than their Korean counterparts (6.5%) but this difference fell slightly short of statistical significance. Furthermore, Americans with AD were four times (OR=3.93) more likely to seek treatment than their Korean counterparts, despite significantly greater prevalence of AD in Korea than in the U.S.

Table 7 depicts psychiatric comorbidity among those with AUD who sought medical attention in the last 12 months. Among Americans with any AUD, the prevalence of any comorbid mood disorder (53.6%) was substantially higher than that of any comorbid anxiety disorder (36.5%). Conversely, among Koreans with any AUD, the prevalence of any comorbid anxiety disorder was substantially higher (50.4%) than that of any comorbid mood disorder (34.7%).

Discussion

The current study directly compared rates and patterns of comorbidity of AUD, ND, and mood and anxiety disorders between the U.S. and Korean general populations. Wide variability in rates and comorbidity patterns was noted between the two countries.

Approximately 1 in 6 Americans with any 12-month AUD also had at least 1 past-year mood (17.5%) or anxiety (17.3%) disorder. Corresponding rates among Koreans were significantly lower at 4.3% and 6.6%, respectively. Conversely, 17.9% of Americans with at least 1 past-year mood disorder, and 14.2% of Americans with at least 1 past-year anxiety disorder had a comorbid 12-month AUD. Corresponding rates among Koreans were slightly lower at 15.1% and 8.9%, respectively. Similar patterns of comorbidity were noted between ND and mood and anxiety disorders between the U.S. and Korea except that the country differentials were more pronounced.

Even though significantly greater prevalence of AD was noted in Korea (5.1%) than in the United States (4.4%), alcohol-dependent Americans were 4 times (OR=3.93) more likely to seek treatment compared to their Korean counterparts. One plausible explanation of the low rate of treatment utilization among Koreans might reflect perceived social stigma among those with SUD or mental health problems, despite the fact that the Korean government offers national health insurance. One may also argue that the Korean culture typically define AD in terms of physiological consequences of drinking, ignoring any alcohol-related social and behavioral problems. Thus, those whose AD symptoms were primarily social, behavioral or interpersonal nature might not perceive the need for treatment.

A recent comparative study utilizing data from the NCS and the KECA explored factors that might explain the causes the low prevalence of MDD reported in Korea (Chang et al., 2008). Importantly, results suggested that certain depressive symptoms were differentially expressed between the Americans and Koreans. In particular, there were higher diagnostic thresholds and different symptom patterns in the KECA than in the NCS. The authors concluded that a syndromal or dimensional approach may be preferable for detecting MDD among Koreans.

Prior studies including the European Study of the Epidemiology of Mental Disorders, the International Consortium for Psychiatric Epidemiology, and various reports generated from epidemiologic studies of general populations from 10 high-income countries (Jane-Llopis et al., 2006) suggested that comorbidity patterns were consistent cross-nationally (Merikangas et al., 1998). Specifically, these reports indicated that mood or anxiety disorders were more prevalent among people with SUD (particularly illicit drugs) than vice versa (Jane-Llopis et

al., 2006). The striking disparity observed in Korea, however, showed that a substantially greater proportion of Koreans with a mood or anxiety disorder reported having comorbid AD than vice versa.

Koreans with psychiatric disorders are less likely than affected individuals in other countries to utilize mental health services due to social stigma or loss of face (Cho et al., 2009; Abe-Kim et al., 2007). Being reluctant and embarrassed about seeking help related to their mental problems, Koreans might be more inclined to self-medicate the symptoms of mood or anxiety problems than their Western counterparts. This may also help explain why the degree of the SUD-psychiatric comorbidity among Koreans was consistently greater than that among Americans when statistically significant ORs were examined. However, this postulation is speculative and warrants further investigation.

There is converging evidence that alcohol-dependent individuals with co-occurring major depressive disorder constitute a patient group particularly difficult to treat (Pettinati HM, 2004). Further, people with co-occurring SUD and mood and anxiety disorders are less likely than persons with pure disorders alone to comply with treatment regimen, more likely to experience suicidal behavior, adverse psychosocial consequences, depression, homelessness; they also incur higher treatment costs (Bartels et al., 1992; Drake et al., 1996). From a treatment perspective, the converse is likely to be true that alleviation of one condition may facilitate recovery from the other. Previous research has suggested that treating a comorbid affective disorder may reduce the likelihood of substance abuse and craving (Cornelius et al., 1997).

One strength of the current study lies in the fact that the current (12-month) co-occurrence of substance and mood or anxiety disorders was considered. Twelve-month data were used to minimize recall bias and maximize clinical relevance. Previous research has consistently indicated that SUD and mood or anxiety disorders have strong associations when considered on a lifetime basis. In providing explanations and implications of the lifetime associations relating SUD to mood and anxiety disorders recent work separating past and current disorders has demonstrated that the intoxication or withdrawal effects fail to account for the associations entirely (Hasin et al., 2002), as implicated in earlier studies (Kadden RM, et al., 1995; Schuckit MA et al., 1997). Nevertheless, twelve-month comorbidity has been shown to have greater impact on affected individuals and treatment systems (Scott KM, et al., 2006), and has also been suggested to be more strongly associated with disability and poorer treatment outcomes than lifetime comorbidity (Burns et al., 2002). Additionally, we were able to examine prevalence rates and comorbidity pattern for specific mood and anxiety disorders, rather than those of the broad categories of mood and anxiety disorders.

Caution is warranted in interpreting the study results because of several limitations. Most importantly, despite the fact that the concordance between the AUDADIS-IV and K-CIDI 2.1 DSM-IV diagnoses and criteria were fair to good, they were two different diagnostic instruments. Hence, the observed disparities between the two countries might reflect differences between the two interview schedules. Another reflects the insufficient numbers of cases in the Korean sample for several psychiatric disorders, due either to low prevalences in the Korean general population or to a substantially smaller sample drawn in Korea than in

the United States. As a result, several comorbid associations could not be fully examined. In addition, as a cross-sectional study the current investigation could not address causality, or underlying mechanisms, of the SUD-mental disorder relationship. Longitudinal studies are needed to elucidate the progression and processes associated with comorbidity. Future research should also investigate the temporal sequencing of comorbid disorders. Alternatively, to examine the prospective associations between mental disorders and SUD one may examine several different transition points, e.g., from use to abuse, and from abuse to dependence. This approach would further refine our understanding of the associations between primary psychiatric disorders and the subsequent onset of substance use, abuse and dependence (Swendsen, et al., 2010; Behrendt S., et al., 2010; Kalaydjian A., et al., 2009).

Taken together, the results of the current study have important public health implications. As suggested in clinical samples comorbidity is the norm rather than the exception. Therefore, the research base for understanding and treating comorbid SUD and mood and anxiety disorders needs to be broadened to include heterogeneous and complex combinations of problems (Baillie et al., 2010). Understanding the nature of specific comorbid relationships may provide a rationale for sequential, parallel or integrated treatment protocols (Oei et al., 1997). Further, relative to their American counterparts the greater tendency toward substance use disorders among Koreans with mood or anxiety disorders (than vice versa) may present special challenges for public health professionals and clinicians. The social stress accompanying rapid modernization and industrialization that occurred over the past decade in Korea might exert its impacts on the comorbidity pattern examined here. The distinctly different comorbid patterns in Korea versus Western countries may also underscore the need to target the processes that underlie or maintain such comorbidity. Additionally, one may expand the current study to examine other Asian countries to determine whether the comorbidity pattern similar to Korea is pervasive in other parts of Asia.

The delivery of adequate treatment to persons with SUD, mood or anxiety disorders, especially to those with co-occurring disorders has been of increasing concern to clinicians, administrators and public health professionals. A methodical, staged screening and assessment can ease the burden of distinguishing symptoms of mood disorders from manifestations of substance intoxication and withdrawal. Integration of treatment programs and services, and expansion of collaborations between substance abuse and mental health providers, can optimize outcomes when SUD and mood and anxiety disorders converge. Current and up-to-date knowledge of the prevalence, onset, comorbidity, severity, and disability are critical to improve existing and future prevention and intervention programs in addressing these major personal and public health problems.

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Table 1
Distribution of the NESARC and KECA Respondents by Selected Sociodemographic Characteristics

Sociodemographic Characteristics	NESARC (USA)		KECA (Korea)		P-value for difference
	N	% (SE)	N	% (SE)	
Total	35336	100(0.0)	6253	100(0.0)	
Sex					0.894
Male	15619	49.04(0.34)	2743	49.30(1.92)	
Female	23227	50.96(0.34)	3510	50.70(1.92)	
Age					0.000
18–24	5199	15.34(0.31)	578	13.17(1.08)	
25–34	7759	21.86(0.35)	1546	30.62(2.04)	
35–44	9090	25.00(0.32)	1758	26.72(2.15)	
45–65	13288	37.80(0.41)	2371	29.39(2.36)	
Marital Status					0.000
Married/cohabiting	18859	62.61(0.49)	4642	68.32(2.91)	
Widowed/separated/divorced	6981	13.41(0.24)	460	5.49(1.24)	
Never married	9496	23.98(0.51)	1151	26.19(2.04)	
Employment Status					0.000
Yes	29438	84.33(0.34)	3417	55.50(1.66)	
No	5898	15.67(0.34)	2836	44.50(1.66)	
Education(years)					0.000
<12	5310	13.37(0.54)	2237	24.64(3.03)	
12	10033	28.41(0.58)	2309	35.94(1.71)	
13–15	11132	31.86(0.47)	729	15.20(1.21)	
16+	8861	15.20(1.21)	975	24.22(3.87)	
Place of Residence					0.001
Urban	29243	80.80(1.60)	4533	90.53(2.17)	
Rural	6093	19.20(1.60)	1720	9.47(2.17)	
Income					0.000
Low	11259	26.76(0.60)	2110	24.30(4.33)	
Moderate	16448	46.45(0.50)	2981	55.35(3.16)	

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Sociodemographic Characteristics	NESARC (USA)		KECA (Korea)		P-value for difference
	N	% (SE)	N	% (SE)	
High	7629	26.79(0.77)	1020	20.35(2.09)	

N : unweighted; % : weighted

Twelve-Month Prevalence and Odds Ratios of DSM-IV Alcohol Use Disorders, Nicotine Dependence, and Mood and Anxiety Disorders by Country

Table 2

	USA (NESARC) % (SE)	KOREA (KECA) % (SE)	NESARC vs. KECA Crude Odds Ratio (95% CI) ^b	NESARC vs. KECA Adjusted ^a Odds Ratio (95% CI) ^b
Alcohol Use Disorder	9.7(0.3)	7.1(0.6)	1.42[1.12–1.74] ^b	1.13[0.93–1.38]
Alcohol Abuse	5.3(0.2)	2.0(0.3)	2.74[1.96–3.83] ^b	2.16[1.52–3.09] ^b
Alcohol Dependence	4.4(0.2)	5.1(0.5)	0.87[0.70–1.08]	0.69[0.56–0.86] ^b
Nicotine Dependence	14.4(0.5)	6.6(0.7)	2.39[1.88–3.04] ^b	2.23[1.82–2.74] ^b
Any mood disorder	9.5(0.3)	2.0(0.2)	5.11[4.01–6.52] ^b	5.03[3.95–6.41] ^b
Major Depression	5.8(0.2)	1.6(0.2)	3.63[2.77–5.03] ^b	3.58[2.63–4.87] ^b
Dysthymia	1.4(0.1)	0.4(0.1)	4.03[2.26–7.18] ^b	4.44[2.43–8.13] ^b
Bipolar disorder	3.3(0.1)	0.1(0.1)	23.43[9.18–59.83] ^b	22.10[9.03–54.13] ^b
Any Anxiety disorder	11.8(0.4)	5.2(0.4)	2.43[2.01–2.94] ^b	2.47[2.01–3.04] ^b
Panic disorder	2.3(0.1)	0.2(0.1)	12.81[5.58–29.39] ^b	14.75[6.41–33.98] ^b
Specific Phobia	7.6(0.3)	4.2(0.4)	1.90[1.50–2.40] ^b	1.86[1.45–2.39] ^b
Social Phobia	3.0(0.1)	1.6(0.6)	19.26[9.12–40.65] ^b	19.90[9.32–42.52] ^b
Generalized Anxiety disorder	2.2(0.1)	1.0(0.3)	2.19[1.31–3.66] ^b	2.42[1.41–4.13] ^b

^a Adjusted for gender, age, marital status, employment status, education, urbanicity, and income.

^b Significant, p<0.05.

Table 3
Adjusted Odds Ratios between Alcohol Use Disorders and Nicotine Dependence, and Mood and Anxiety Disorders by Country

Comorbid Disorder	Adjusted ^a Odds Ratios (95% Confidence Interval) ^b											
	Alcohol Use Disorder			Alcohol Abuse			Alcohol Dependence			Nicotine Dependence		
	NESARC	KECA	KECA	NESARC	KECA	KECA	NESARC	KECA	KECA	NESARC	KECA	KECA
Any mood disorder	2.31[2.01–2.68] ^b	4.35[1.45–13.00] ^b	4.35[1.45–13.00] ^b	1.27[1.05–1.53] ^b	3.45[0.81–14.74]	4.06[1.18–13.98] ^b	3.31[2.73–4.00] ^b	4.06[1.18–13.98] ^b	2.75[2.47–3.06] ^b	2.88[1.00–8.31]	2.75[2.47–3.06] ^b	2.88[1.00–8.31]
Major Depression	1.88[1.58–2.24] ^b	3.63[1.07–12.24] ^b	3.63[1.07–12.24] ^b	1.40[1.11–1.71] ^b	4.14[0.90–19.07]	2.96[0.75–11.64]	2.22[1.75–2.82] ^b	2.96[0.75–11.64]	2.30[2.02–2.62] ^b	3.01[0.94–9.63]	2.30[2.02–2.62] ^b	3.01[0.94–9.63]
Dysthymia	1.74[1.17–2.58] ^b	---	---	1.05[0.60–1.83]	---	---	2.38[1.45–3.91] ^b	---	2.34[1.84–3.00] ^b	2.29[0.34–15.59]	2.34[1.84–3.00] ^b	2.29[0.34–15.59]
Bipolar disorder	2.71[2.22–3.31] ^b	0.38[0.04–3.46]	0.38[0.04–3.46]	1.04[0.77–1.41]	2.04[0.23–18.25]	---	4.16[3.25–5.33] ^b	---	3.15[2.69–3.71] ^b	---	3.15[2.69–3.71] ^b	---
Any Anxiety disorder	2.01[1.76–2.30] ^b	2.23[1.03–4.84] ^b	2.23[1.03–4.84] ^b	1.23[1.03–1.46] ^b	1.83[0.65–5.16]	2.32[0.89–5.97]	2.86[2.44–3.36] ^b	2.32[0.89–5.97]	2.61[2.35–2.90] ^b	1.24[0.67–2.30]	2.61[2.35–2.90] ^b	1.24[0.67–2.30]
Panic disorder	2.66[2.10–3.38] ^b	---	---	1.16[0.79–1.69]	---	---	4.22[3.18–5.60] ^b	---	3.95[3.33–4.69] ^b	---	3.95[3.33–4.69] ^b	---
Specific Phobia	1.83[1.56–2.16] ^b	1.87[0.86–4.09]	1.87[0.86–4.09]	1.24[0.99–1.56]	1.76[0.64–4.86]	1.85[0.74–4.61]	2.40[1.99–2.90] ^b	1.85[0.74–4.61]	2.55[2.28–2.86] ^b	1.19[0.57–2.46]	2.55[2.28–2.86] ^b	1.19[0.57–2.46]
Social Phobia	1.72[1.35–2.20] ^b	1.09[0.39–3.05]	1.09[0.39–3.05]	1.02[0.72–1.44]	0.88[0.08–9.71]	1.23[0.31–4.86]	2.42[1.78–3.29] ^b	1.23[0.31–4.86]	2.38[1.98–2.86] ^b	1.04[0.23–4.61]	2.38[1.98–2.86] ^b	1.04[0.23–4.61]
GAD	2.23[1.71–2.90] ^b	3.61[1.08–12.14] ^b	3.61[1.08–12.14] ^b	1.05[0.69–1.60]	0.61[0.11–3.46]	5.20[1.34–20.19] ^b	3.46[2.55–4.71] ^b	5.20[1.34–20.19] ^b	3.03[2.45–3.74] ^b	2.15[0.94–4.90]	3.03[2.45–3.74] ^b	2.15[0.94–4.90]

^a Adjusted for gender, age, marital status, employment status, education, urbanicity and income

^b Significant, p<0.05.

---OR was not estimable because prevalence was too low

Table 4
 Twelve-Month Prevalence of Mood or Anxiety Disorders among Individuals with Alcohol Use Disorders or Nicotine Dependence by Country

Comorbid Disorder	Alcohol Use Disorder		Alcohol Abuse		Alcohol Dependence		Nicotine Dependence	
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Alcohol Use disorder								
NESARC	17.47(0.85) ***	10.88(0.83) *	25.31(1.58) ***	19.82(0.74) ***				
KECA	4.30(1.40)	3.47(2.35)	4.63(1.71)	2.57(1.24)				
Major Depression								
NESARC	8.87(0.59) **	6.87(0.69)	11.24(1.06) **	10.82(0.53) ***				
KECA	3.29(1.32)	3.38(2.34)	3.26(1.51)	2.38(1.22)				
Dysthymia								
NESARC	1.90(0.32)	1.20(0.31)	2.74(0.59)	2.88(0.28) ***				
KECA	1.68(0.95)	---	2.35(1.31)	0.19(0.19)				
Bipolar disorder								
NESARC	8.01(0.61) ***	3.56(0.50) ***	13.31(1.21)	8.39(0.51)				
KECA	0.03(0.03)	0.09(0.09)	---	---				
Any Anxiety disorder								
NESARC	17.27(0.87) ***	12.11(0.87) *	23.41(1.43) ***	22.40(0.80) ***				
KECA	6.59(2.06)	5.59(2.55)	6.98(2.76)	3.45(1.04)				
Panic disorder								
NESARC	4.15(0.41) **	2.09(0.37)	6.60(0.78) **	6.31(0.43)				
KECA	1.26(0.74)	1.04(1.04)	1.34(0.98)	---				
Specific Phobia								
NESARC	10.51(0.71) **	7.76(0.75)	13.78(1.16) **	14.55(0.65) ***				
KECA	4.45(1.37)	3.95(1.81)	4.65(1.74)	2.37(0.80)				
Social Phobia								

Comorbid Disorder	Alcohol Use Disorder	Alcohol Abuse	Alcohol Dependence	Nicotine Dependence
	% (SE)	% (SE)	% (SE)	% (SE)
NESARC	4.32(0.47) ***	2.70(0.44) ***	6.24(0.86) ***	5.93(0.44) ***
KECA	0.14(0.11)	0.12(0.13)	0.15(0.15)	0.11(0.12)
GAD				
NESARC	3.67(0.41)	1.94(0.40) *	5.74(0.72)	5.36(0.43) ***
KECA	2.05(1.03)	0.48(0.39)	2.66(1.47)	1.30(0.71)

--- Prevalence too low

Significant country difference, $p < .001$

**

Significant country difference, $p < .01$

*

Significant country difference, $p < .05$

Table 5

a. Twelve-Month Prevalences of Alcohol Use Disorders and Nicotine Dependence among Individuals with Mood Disorders by Country

Comorbid Disorder	Any mood disorder	Major Depression	Dysthymia	Bipolar Disorder
	% (SE)	% (SE)	% (SE)	% (SE)
Alcohol Use disorder				
NESARC	17.94(0.84)	15.02(0.92)	13.02(2.05)	23.95(1.61) *
KECA	15.12(4.95)	14.45(5.27)	34.02(14.35)	1.27(1.37)
Alcohol Abuse				
NESARC	6.07(0.45)	6.33(0.60)	4.56(1.17)	5.78(0.79)
KECA	3.45(2.21)	4.20(2.79)	---	1.27(1.37)
Alcohol Dependence				
NESARC	11.87(0.78)	8.70(0.83)	8.74(1.75)	18.17(1.54)
KECA	11.67(4.75)	10.25(4.67)	34.02(14.35)	---
Nicotine Dependence				
NESARC	30.02(1.08) ***	27.04(1.18) ***	29.67(2.48) **	36.98(1.92)
KECA	8.40(3.55)	9.71(4.30)	3.56(3.62)	---

b. Twelve-Month Prevalences of Alcohol Use Disorders and Nicotine Dependence among Individuals with Anxiety Disorders by Country

Comorbid Disorder	Any Anxiety Disorder	Panic Disorder	Specific Phobia	Social Phobia	GAD
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Alcohol Use disorder					
NESARC	14.21(0.72)	17.30(1.63)	13.44(0.87) *	14.20(1.40)	15.93(1.65)
KECA	8.89(2.70)	47.59(17.59)	7.55(2.36)	6.30(4.20)	13.91(7.20)
Alcohol Abuse					
NESARC	5.41(0.41) **	4.73(0.82)	5.39(0.55) **	4.83(0.75)	4.56(0.91) *
KECA	2.13(1.03)	11.15(11.51)	1.89(0.94)	1.57(1.66)	0.92(0.77)
Alcohol Dependence					
NESARC	8.79(0.58)	12.57(1.50)	8.04(0.69)	9.37(1.26)	11.37(1.39)

b. Twelve-Month Prevalences of Alcohol Use Disorders and Nicotine Dependence among Individuals with Anxiety Disorders by Country

Comorbid Disorder	Any Anxiety Disorder		Panic Disorder		Specific Phobia		Social Phobia		GAD	
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Nicotine Dependence										
KECA	6.75(2.46)	36.45(18.64)	5.65(2.02)	4.76(4.02)	12.99(7.09)					
NESARC	27.18(0.92)***	38.80(2.16)*	27.44(1.05)***	28.78(1.77)**	34.28(2.16)***					
KECA	4.32(1.13)	0.00(0.0)	3.73(1.23)	4.74(4.02)	8.22(3.02)					

--- Prevalence too low

*** Significant country difference, $p < .001$

** Significant country difference, $p < .01$

* Significant country difference, $p < .05$

Table 6 Twelve-Month Prevalence and Odds Ratios of Treatment Utilization among Persons with DSM-IV Alcohol Use Disorders by Country

	USA (NESARC) # of cases ^a	USA (NESARC) % (SE)	KOREA (KECA) # of cases ^a	KOREA (KECA) % (SE)	NESARC vs. KECA Crude Odds Ratio (95% CI)	NESARC vs. KECA Adjusted ^b Odds Ratio (95% CI)
Alcohol Use Disorder	3,231	11.8(0.62)	380	6.5(2.00)	1.92[0.99–3.71]	1.79[0.93–3.46]
Alcohol Abuse	1,767	6.5(0.66)	135	8.2(4.33)	0.78[0.24–2.48]	0.80[0.24–2.74]
Alcohol Dependence	1,464	18.2(1.14)	245	5.9(1.91)	3.55[1.77–7.15] ^c	3.93[1.88–8.21] ^c

^aNumbers were unweighted.

^bAdjusted for gender, age, marital status, employment status, education, urbanicity, and income.

^cSignificant, p<0.05.

Table 7

Twelve-Month Prevalence of DSM-IV Mood and Anxiety Disorders among Those with Alcohol Use Disorders Who Utilized Treatment Services in the Past 12 Months by Country

	Alcohol Use Disorder			Alcohol Abuse			Alcohol Dependence		
	NESARC %(SE)	KECA %(SE)	NESARC %(SE)	NESARC %(SE)	KECA %(SE)	KECA %(SE)	NESARC %(SE)	NESARC %(SE)	KECA %(SE)
Any mood disorder	55.6(3.03)	34.7(14.28)	50.1(5.32)	15.7(8.85)	55.1(3.79)	45.1(18.26)			
Major Depression	27.2(2.68)	34.1(14.22)	29.7(4.76)	15.7(8.85)	26.2(3.52)	44.1(18.20)			
Dysthymia	9.3(2.10)	11.4(10.36)	11.0(3.48)	---	8.6(2.59)	17.6(15.08)			
Bipolar disorder	24.3(2.82)	---	17.9(3.93)	---	27.0(3.53)	---			
Any Anxiety disorder	36.5(3.02)	50.4(15.55)	32.1(4.79)	26.6(18.42)	38.4(3.75)	63.4(14.95)			
Panic disorder	15.9(2.06)	11.9(8.64)	16.2(3.43)	12.7(8.80)	15.8(2.45)	11.5(11.31)			
Specific Phobia	18.3(2.25)	32.4(14.22)	17.2(3.72)	13.9(9.63)	18.7(2.83)	42.5(18.16)			
Social Phobia	9.2(1.86)	---	9.9(3.24)	---	9.0(1.97)	---			
GAD	12.3(2.13)	24.6(12.82)	8.4(3.31)	---	13.9(2.69)	38.1(15.56)			

--- Prevalence too low