CONTEXTUAL AND INDIVIDUAL DEMOGRAPHIC DETERMINANTS OF ALCOHOL CONSUMPTION AND SMOKING: A COMPARATIVE STUDY IN SOUTHWESTERN CHINA AND SOUTHERN THAILAND

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Abstract. The aim of this study was to investigate the association between contextual and individual demographic characteristics and alcohol consumption and smoking in southwestern China and southern Thailand. In 2000, a cross-sectional study was carried out in southern Thailand on 703 subjects ≥45 years old, and in 2005 in southwestern China on 6,006 subjects. Each participant was interviewed by trained interviewers using a standard questionnaire. Information regarding demographic characteristics, alcohol drinking and smoking was obtained. Multilevel logistic regression was used to model variation in the prevalence of alcohol consumption and tobacco smoking. The findings in both countries indicate that age was negatively associated with the probability of consuming alcohol and males were more likely to consume alcohol and tobacco than females. Chinese communities with a lower level of education were more likely to smoke. Thai individuals with a higher educational level were less likely to smoke. Yi ethnicity was associated with a higher probability of drinking both at the contextual level and at the individual level in China. Non-Muslims were more likely to consume alcohol in Thailand. Future contextual and individual level interventions regarding alcohol drinking and smoking are needed in China, and further studies with larger sample sizes are needed in Thailand before conclusions can be drawn.

INTRODUCTION

Excessive alcohol drinking and alcohol dependence are serious public health issues worldwide. Excessive alcohol consumption can cause social and legal problems, such as divorce and driving under the influence of alcohol (Bohning and na-Ayuthaya, 1997), as well as alcohol abuse and dependence.

Mean annual alcohol consumption and alcohol-related problems are increasing steadily in many countries, including China (Collaborating Research Group on Alcoholism and Related Problems, 1992a,b; Liu *et al*, 1992) and Thailand (Chongsuvivatwong *et al*, 2002). A recent survey conducted in five areas of China indicated the 1-year drinking rate was 59.0%, and the point prevalence of alcohol dependence was 3.8% (Hao *et al*, 2003). In Thailand in 1991, 31.4% of the population over age 14 years was estimated to drink alcohol (Office of National Statistics, 1992) (33.6% for males, 21.7% for females), much higher than that estimated in

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1985 (26%) (Institute of Population and Social Research, 1985). This figure increased to 37.4% for males in 2001 (Chongsuvivatwong *et al*, 2002). A study conducted among emergency room patients in three regional hospitals in Thailand estimated the overall prevalence of alcohol-related problems was 39% for males and 8% for females (Lapham *et al*, 1998).

Tobacco use is another major global public health challenge. It is reported to be responsible for cardiovascular disease, chronic obstructive pulmonary disease and cancer (Peto *et al*, 1996). Currently, approximately 4 million people worldwide die from smoking-induced diseases each year (Peto and Lopez, 2001). The cumulative number will reach nearly 450 million deaths during the next 50 years (World Health Organization, 1999). By 2030, 70% of annual smoking-related deaths worldwide will occur in developing countries (Peto *et al*, 1994). In 1990, smoking caused approximately 12% of deaths in Chinese middle age males, and the proportion is predicted to rise to 33% by 2030 (Niu *et al*, 1998). Unlike many other developing countries, China and Thailand have had a decline in the prevalence of smoking. In China, the prevalence of smoking was 68.9% for men and 8.3% for women in 1991 (Gao *et al*, 1991). The figures fell to 63% for men and 3.8% for women in 1996 (Yang *et al*, 1999). In Thailand, between 1986 and 1999, the prevalence of smoking fell from 26.4% to 20.5%, with a significant drop in males from 48.8% to 38.9% (Sanford, 2003).

Genetics (Swan *et al*, 1990), occupational, social and cultural factors (Peele, 1997), and family history of alcohol use play a role in determining alcohol consumption patterns. Studies from the United States indicate that patterns of alcohol consumption have been found to vary across ethnic groups (Galvan and Caetano, 2003), and cultural forces exert a strong effect on drinking behavior (Dawson, 1998). In developed countries, alcohol consumption is directly linked to individual socioeconomic level. The higher the social standing, the less the risk of being a drinker (Rice *et al*, 1998; Scribner *et al*, 2000). Some studies have found people living in a low socioeconomic level neighborhood were more likely to consume alcohol (Karvonen and Rimpela, 1996; Twigg *et al*, 2000), but less likely to be heavy drinkers. (Karvonen and Rimpela, 1997). Genetic heritability has also been reported to be related to cigarette smoking (Swan *et al*, 1990). Higher educational level is related to a lower prevalence of smoking (Kaplan and Keil, 1993; Diez-Roux et al, 1997). Sex differences in alcohol use and cigarette smoking are well recognized worldwide (Hao *et al*, 2003).

While there are numerous studies of demographic factors at the individual level being associated with alcohol and tobacco consumption, discrimination of the contextual effect is lacking. Alcohol and tobacco consumption patterns may be influenced by ethnicity through culture, life style or genetics. It is important to separate contextual and individual effects on consumption patterns, and to investigate how contextual variation in the population changes according to individual characteristics. Understanding both contextual and individual factors that influence alcohol consumption and smoking can help guide the development of culturally appropriate alcoholism and smoking treatment and prevention programs.

The purpose of this study was to investigate the association between contextual and individual demographic characteristics and alcohol consumption and smoking in southwestern China and southern Thailand.

MATERIALS AND METHODS

Study design

Cross-sectional surveys were conducted in southwestern China and southern Thai-

land. The Thai survey was part of the Inter-ASIA study, and the protocols for the study design have been described previously (Cheepudomwit *et al*, 2003). Only data from southern Thailand evaluated cultural factors. Thai Muslims have a different lifestyle from the majority of Thai Buddhists, and southern Thailand has the largest Muslim population in the country. The southwestern Chinese study modified the Inter-ASIA protocol but kept the same definitions for alcohol and tobacco consumption. In this area ethnic composition was important, since the Yi, the prevailing local ethnic minority, have a different lifestyle from the Han, who are the major ethnic group in China.

Study area and population

The Thai survey was conducted in two urban and five rural villages of Songkhla Province, in southern Thailand, which had a population of 1.2 million in 2000, approximately 20% of whom were Muslin.

The Chinese survey was conducted in Shi Lin County, a rural area of Kunming, the capital of Yunnan Province (one of the poorest provinces in southwestern China). In 2004, it had a population of 205,186 and contained 10 townships and 90 villages. Shi Lin County was a typical minority rural county, with a predominantly Yi ethnicity.

Sampling technique

For the Thai survey, one representative slum village and one representative non-slum village were selected from the urban district, as well as five rural villages (two developed and three developing) from the rural district. At each level, selection of the community for sampling was based on broad socio-demographic representativeness. Within the selected villages in each district, the names of those ≥35 years old were obtained from local government registers of households; the populations were grouped by age (35-44, 45-54, 55-64, and ≥65 years) and sex. Simple random sampling was used to select eligible individuals from each age and sex group, but only one individual was recruited from each household.

For the Chinese survey, each of the 10 townships in Shi Lin County was divided into 3 blocks based on the size of the population and geographic area. From the list of villages in each of the 30 blocks, a cluster sampling technique was used to select a cluster or village. In each selected cluster or village, a list of individuals ≥45 years old was obtained from the village committee, and 200 eligible subjects were chosen by simple random sampling.

Data collection

The survey in China was conducted in 2005, and the survey in Thailand was conducted in 2000. In both surveys, each participant was given a full explanation of the purpose of the research, invited to participate, asked to sign a consent form, and personally interviewed by trained interviewers using a pre-tested structured questionnaire. The questionnaire was adapted from that used by the Inter-ASIA collaborative group (Cheepudomwit *et al*, 2003). The questionnaire, originally written in English, was translated into each language and verified by reverse translation. Information regarding demographic characteristics, alcohol consumption and tobacco use was obtained. This study was approved by the Ethics Committee of the Faculty of Medicine, Prince of Songkla University, before carrying out the research.

Definitions of outcome variables

Current drinker was defined as a person who drank alcohol regularly on 12 or more days during the past 12 months. Current smoker was defined as a person who smoked at least 100 cigarettes in his/her lifetime and currently smoked tobacco at the

time of the survey.

Independent variables

Independent variables included both individual and contextual characteristics. Individual characteristics were age, sex, ethnicity, household income and education. The contextual variables were adult literacy rate, community average income and percentage of the minority.

Statistical methods

To make the data from the two surveys comparable, only individuals from the Thai survey with the same age range as the Chinese survey (≥45 years) were used in the study. In both countries, the mean yearly family income of the village, percentage of the minority and adult literacy rate were computed from each community in the dataset for using as contextual variables. Descriptive statistics were used for data summary. Multilevel logistic regression was used to model the variation in prevalence of alcohol consumption and smoking. Individual characteristics were set at the first level and contextual characteristics at the second. While both individual and contextual characteristics were modeled as fixed effects (single coefficient for each variable), the baseline prevalence of each village was considered to be randomly distributed (no coefficient). Data analyses were done under the package "MASS" and "nlme" of R software version 2.3.1 (R Development Core Team, 2006). The associations between contextual variables and alcohol drinking and smoking were expressed in terms of odds ratios, and their 95% confidence intervals (95% CI).

RESULTS

The study sample from southwestern China of those ≥45 years old consisted of 6,006 subjects. The southern Thailand sample had 1,005 subjects recruited, but only 703 were ≥45 years old; these were included in the present study. Their demographic characteristics are summarized in Table 1. The Thai participants on average had a higher educational level than their Chinese counterparts.

Table 2 shows the prevalences of current drinkers among the subjects from China and Thailand. The prevalence of current drinkers among males was remarkably higher than among females in both countries. The Yi had a higher prevalence of current drinkers than the Han in China. In Thailand, non-Muslims had a higher prevalence of current drinkers than Muslims. The overall prevalence of current drinkers decreased with increasing age in China, but this trend was not seen in Thailand. In Thais, the 50-54 year old age group had the highest prevalence of current drinkers. The Chinese had a higher overall prevalence of current drinkers than Thai subjects.

Table 3 presents the prevalences of current smokers by country. Males had a remarkably higher prevalence of current smokers than females in both countries. The Yi ethnic minority had a higher prevalence of current smokers than the Han majority in China. In Thailand, Muslims had a higher prevalence of current smokers than non-Muslims. The prevalence of current smokers varied by age in both countries. There was a higher age-adjusted prevalence of smokers among males in the Chinese and among females in Thais.

Table 4 summarizes the contextual variables. Table 5 shows the results of multilevel analysis of the effect of contextual variables on alcohol drinking and smoking after adjusting for sex, age, ethnicity, education and income. In China, villages with a higher average level of education had a lower probability of smoking. Living in a village dominated by Yi ethnic people increased the individual probability of being a current

Table 1
Demographic characteristics of the study participants.

Variables	Southwestern China		Southern Thailand	
	N	%	N	%
Sex				
Male	2,905	48.4	287	40.8
Female	3,101	51.6	416	59.2
Age (years)				
45-49	1,102	18.3	146	20.8
50-54	1,106	18.4	135	19.2
55-59	879	14.6	115	16.4
60-64	909	15.1	118	16.8
≥65	2,010	33.5	189	26.9
Educational level				
Illiterate	3,328	55.4	183	26.0
Primary (grade 1-6) or higher	2,678	45.6	520	74.0
Ethnic and religious groups[a]				
Majority	3,664	61.0	478	68.0
Minority	2,272	39.0	225	32.0

[a]China: majority=Han, minority=Yi ethnic
  Thailand: majority=non-Muslim, minority=Muslim

Table 2
Prevalence (%) of current drinkers.

Variables	Southwestern China			Southern Thailand		
	Han N (%)	Yi ethnic N (%)	All N (%)	Muslim N (%)	Non-Muslim N (%)	All N (%)
Sex						
Male	789 (43.5)	604 (55.3)	1,393 (48.0)	7 (7.4)	82 (42.5)	89 (31.0)
Female	38 (2.1)	28 (2.2)	66 (2.1)	0 (0.0)	15 (5.3)	15 (3.6)
Age (years)						
45-49	155 (23.6)	137 (30.7)	292 (26.5)	2 (3.5)	17 (19.1)	19 (13.0)
50-54	165 (24.8)	123 (28.0)	288 (26.2)	2 (5.4)	25 (25.8)	27 (20.1)
55-59	122 (22.6)	108 (31.8)	230 (26.0)	2 (5.4)	15 (19.2)	17 (14.8)
60-64	136 (24.4)	84 (23.9)	220 (24.2)	0 (0.0)	14 (17.1)	14 (11.9)
≥65	249 (20.0)	180 (23.5)	429 (21.3)	1 (1.8)	26 (19.7)	27 (14.3)
All	827 (22.6)	632 (27.0)	1,459 (24.3)	7 (3.1)	97 (20.3)	104 (14.8)

drinker. For individual demographic variables, the probability of being a current smoker or current drinker decreased with age. Females had a lower probability of be-

ing a current smoker or current drinker than males. In addition to the contextual effect of Yi ethnicity, an individual Yi person had an independently increased probability of

Table 3
Prevalence (%) of current smokers.

Variables	Southwestern China			Southern Thailand		
	Han N (%)	Yi ethnic N (%)	All N (%)	Muslim N (%)	Non-Muslim N (%)	All N (%)
Sex						
Male	854 (47.1)	601 (55.0)	1,455 (50.1)	47 (50.0)	75 (38.9)	122 (42.5)
Female	18 (1.0)	14 (1.1)	32 (1.0)	5 (3.8)	16 (5.6)	21 (5.1)
Age (years)						
45-49	156 (23.8)	127 (28.5)	283 (25.7)	13 (22.8)	12 (13.5)	25 (17.1)
50-54	152 (22.8)	114 (25.9)	266 (24.1)	6 (16.2)	19 (19.6)	25 (18.7)
55-59	132 (24.5)	98 (28.8)	230 (26.2)	9 (24.3)	17 (21.8)	26 (22.6)
60-64	153 (27.4)	87 (24.8)	240 (26.4)	10 (27.8)	18 (22.0)	28 (23.7)
≥65	279 (22.4)	189 (24.7)	468 (23.3)	14 (24.6)	25 (18.9)	39 (20.6)
All	872 (23.8)	615 (26.3)	1,487 (24.8)	52 (23.2)	91 (19.0)	143 (20.4)

Table 4
Distribution of contextual demographic characteristics.

Variables	Max	P_{75}	P_{50}	P_{25}	Min
China					
Adult literacy rate in %	69.0	52.0	41.0	33.0	17.0
Average yearly income in Chinese Yuan	9,200	7,500	6,200	5,725	4,900
Proportion of Yi ethnic minority in %	97.0	64.0	34.0	5.0	1.0
Thailand					
Adult literacy rate in %	85.0	85.0	75.7	67.7	48.7
Average yearly income in Thai Baht	134,908	134,908	71,516	52,176	50,637
Proportion of Muslims in %	98.3	52.7	12.7	0.5	0.5

being a current drinker. In Thailand, contextual demographic variables had no association with current drinkers or with current smokers. For individual demographic variables, the probability of being a current drinker decreased with age. Females had a lower probability of being a current smoker or current drinker than males. Individuals with a higher educational level had a lower probability of being a current smoker. Muslims had a lower probability of being a current drinker than non-Muslims. There were no significant interactions between or among contextual variables and individual variables.

DISCUSSION

The findings indicate that both contextual and individual demographic characteristics are associated with alcohol drinking and smoking in China, whereas only individual demographic characteristics are shown to have an influence on alcohol drinking and smoking in Thailand.

Table 5
Contextual and individual demographic characteristic effects on alcohol drinking and smoking after adjustment for each level.

Predictors	China		Thailand	
	Current drinkers[a] OR (95% CI)	Current smokers [b] OR (95% CI)	Current drinkers [a] OR (95% CI)	Current smokers [b] OR (95% CI)
Contextual variables				
Adult literacy rate (%)	1.00 (0.99, 1.01)	0.95[d] (0.92, 0.99)	1.04 (0.93, 1.16)	0.99 (0.95, 1.02)
Average yearly income (x 1,000)[c]	1.20 (1.00, 1.43)	1.34 (0.79, 2.27)	0.99 (0.96, 1.02)	1.00 (0.99, 1.02)
Proportion of minority (%)	1.11[e] (1.03, 1.35)	1.01 (1.00, 1.03)	0.99 (0.97, 1.01)	1.00 (0.99, 1.01)
Individual variables				
Age	0.97[f] (0.96, 0.98)	0.98[f] (0.97, 0.99)	0.97[d] (0.95, 0.99)	0.98 (0.96, 1.00)
Sex (reference: male)	0.02[f] (0.01, 0.03)	0.007[f] (0.005, 0.01)	0.06[f] (0.04, 0.11)	0.06[f] (0.03, 0.10)
Educational level (reference: illiterate)	1.04 (0.94, 1.15)	0.95 (0.85, 1.07)	0.93 (0.63, 1.38)	0.56[d] (0.39, 0.81)
Income (x 1,000)[c]	0.99 (0.97, 1.00)	0.99 (0.98, 1.01)	1.00 (0.99, 1.01)	1.00 (0.99, 1.00)
Ethnic (reference: majority)	1.26[d] (1.03, 1.53)	1.05 (0.81, 1.36)	0.10 (0.04, 0.24)[f]	0.74 (0.39, 1.41)

[a]reference, non-current drinkers; [b]reference, non-current smokers; [c]the unit of income, China – Yuan, Thailand - Baht; [d]$p<0.05$; [e]$p<0.01$; [f]$p<0.001$

China is the world's largest tobacco producer and consumer (Yang *et al*, 1999). A previous national survey also reported a high prevalence of cigarette smoking in Chinese men (Yang *et al*, 1999). Thailand has some of the world's strongest anti-tobacco laws (Chantornvong and McCargo, 2001). Due to strict tobacco control laws and anti-smoking campaigns, Thailand has had a decrease in the prevalence of smoking (Supawong and Buasai, 1997). The prevalence of smoking among males in this study was higher among Chinese than Thais and in females was higher among Thais than Chinese.

This study found that education level plays an important role in influencing smoking. Chinese communities with a lower level of education were more likely to smoke, but there was no evidence of an individual effect due to education. There was no contextual educational level effect regarding the probability of smoking among Thais but there was an individual effect those with a higher educational level were less likely to smoke. This result is consistent with a previous study of Thai Buddhist monks (Chaveepojnkamjorn and Pichainarong, 2005). The risk of heavy alcohol consumption was not related to individual education level in either country in this study. These results are similar to those of a French study (Chaix and Chauvin, 2003) but different from a Portuguese study (Marques-Vidal and Dias, 2005), where a higher individual educational level was related to a higher frequency of alcohol consumption. The reasons for this inconsistent finding of the effect of education on alcohol consumption are unknown.

Muslims are less likely to consume alcohol than non-Muslims yet this was confirmed at the individual levels only, but not at the contextual level. Buddhism permits

alcohol drinking, whereas the Muslim religion strictly prohibits it. Religion has a greater influence on drinking alcohol in cohesive religious groups, but culture has a greater influence in less cohesive religious groups in Canada and the USA (Engs *et al*, 1990), and in Jews and Muslim Arabs in Israel (Neumark *et al*, 2001).

Yi ethnicity was associated with a higher drinking rate both at the contextual level and at the individual level in this study. In China, the phenomenon that ethnic minorities use alcohol more frequently than the Han majority has been found in other studies (Tang *et al*, 2005; Li *et al*, 2006). Some studies indicated the motives for alcohol consumption were to cope with work stress and emotional distress, or a response to social influences (Crum *et al*, 1995; Ames and Grube, 1999; Holahan *et al*, 2001). There is no evidence any ethnic minority group in China has a higher level of stress than the Han majority. Perhaps genetic, cultural or historic factors may influence drinking patterns among different ethnic groups (Caetano *et al*, 1998).

In our study, neither individual nor contextual income had an association with alcohol drinking or smoking among the Chinese or the Thais. In contrast, individual low income has been reported to be associated with a higher probability of consuming tobacco and alcohol in India (Neufeld *et al*, 2005). A previous study concluded that living in deprived neighborhoods was related to an increased risk for smoking after adjustment for individual indicators (Winkleby *et al*, 1992). As to whether alcohol is one of the methods used to relieve stress among people of a lower socioeconomic class in developing countries as in developed countries (Neumark *et al*, 2003) needs further research.

Some limitations of this study should be noted. First, information regarding the quantity and frequency of alcohol and to-bacco use is lacking in this study. Second, the dataset from Thailand in this study is rather small (703 subjects) compared to the Chinese survey (6,006). Failure to demonstrate any contextual effects in the Thai study may also be due to the small number of Thai villages surveyed. A larger Thai dataset is therefore needed. The surveys did not take place at the same time: 2000 in Thailand and 2005 in China. This difference in years may limit comparability.

The results of this comparative study suggest future contextual intervention regarding alcohol drinking and smoking in parallel with those at the individual level are needed in rural southwestern China. Further studies with larger numbers of subjects are needed in Thailand before further conclusions may be drawn.

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