ALCOHOL CONSUMPTION AMONG UNIVERSITY STUDENTS: APPLYING A SOCIAL ECOLOGICAL APPROACH FOR MULTI-LEVEL PREVENTIONS

Somphol Vantamay

College of Population Studies, Chulalongkorn University, Bangkok, Thailand

Abstract. This study investigates factors affecting alcohol consumption among university students through a social ecological approach as a theoretical framework. A multistage sampling technique was used to select 1,200 university students in Bangkok, Thailand. Data were collected by a self-administered questionnaire. Descriptive statistics and multiple regression analysis at the 0.05 level of statistical significance were used to analyze the data. The results showed that all 22 independent variables can co-predict alcohol consumption among university students at 41.2 % (Adjusted = 40.1%). However, there were only 13 variables that affected alcohol consumption significantly: gender, age, monthly income, living arrangement, attitude toward alcohol use, perceived susceptibility of alcohol use, perceived self-efficacy, peer drinking, relatives drinking, accessibility of alcohol around university, accessibility of alcohol around community, exposure to anti-alcohol campaign, and exposure to alcohol advertising. The findings suggested that alcohol consumption was not only affected by the individual-level factor, but it was also affected by multi-level environmental factors, including interpersonal-level, institutional-level, community-level, and societal-level factors. Consequently, multi-level preventions should be urgently considered to prevent alcohol use among university students in Thailand.

INTRODUCTION

Alcohol consumption among Thai youth has become a major public health concern in Thailand over the past few decades. National studies (National Statistical Office, 2002, 2005, 2006) have indicated a significant increase in the use of alcohol among the 15-24-year-old age group; national surveys have found that the proportion of Thai youth using alcohol increased from 21.6% in 2001, to 23.5% in 2004, and to 23.7% in 2006. Moreover, 79.7 % of current Thai drinkers over 15 years old reported that they first tried alcohol at the age of 15-24 years old (National Statistical Office, 2005). One study indicated that 37.3 % of Thai adolescents in Bangkok were alcohol users. Among them, 42.1% were lifetime alcohol users, 56.1% were frequent drinkers (1-20 days in the preceding 30 days of the survey), and 1.7% were heavy drinkers (more than 20 days in the preceding 30 days of the survey) (Ruangkanchanasetr *et al*, 2005). Between 1991 and 2004, the percentage of drinkers among young Thai females increased by 14% and 50% in the 15-19-year-old and 20-24-year-old age groups, respectively (National Statistical Office, 2005). Consequently, Thai youth should be recognized as a major risk group involved in alcohol use,

Correspondence: Somphol Vantamay, College of Population Studies, Visid Prachuabmoh Building, Chulalongkorn University, Bangkok 10330, Thailand.
E-mail: pon_genious@hotmail.com

particularly university students. Several studies in Thailand reported the widespread use of alcohol among Thai university students (18-24 years old). A majority (83.5 %) of public university students in Bangkok reported using alcohol (Sukda, 2000), and 97.2 % of private university students in Bangkok reported trying alcohol (Samul, 2002). One study reported a 54.5 % prevalence of alcohol use among university students in Silpakorn University (Jongwutiwes *et al*, 2002). Another study indicated that the prevalence of alcohol use among university students in southern Thailand was 82.5% of male and 56.6% of female students (Wungthanakorn *et al*, 2007). A recent study indicated that 53 % of university students in the west of Bangkok and Metropolitan areas were lifetime alcohol users (Inglab, 2008). Furthermore, alcohol use among Thai university students was related to a wide variety of problems including drunk driving, fighting, social relationship, academic problems, health problems, and financial problems (Center for Alcohol Studies, 2007).

Social ecological approach

A social ecological approach is a comprehensive approach to the explanation of human behavior. This approach suggests that human behaviors are not only affected at the individual level, but they are also affected by various levels of influence (Alihan, 1938). The key concept of this approach is that behavior is multifaceted, with social and environmental issues being important contributing factors. McLeroy *et al* (1988) outlined a social ecological perspective whereby health behaviors are affected by five hierarchical levels of influence. These levels ranged from the individual level to successively broader interpersonal, institutional, community, and societal levels.

The individual level includes demographic characteristics, such as sex and age; socio-economic characteristics, such as income, occupation, or education; and psychographic characteristics, such as personal knowledge, attitudes, and beliefs. The psychographic variables of the Health Belief Model (Rosenstock *et al*, 1988), which include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy, can be the determinants of health behavior at this level (Gregson *et al*, 2001). The interpersonal level includes influences of family members, peers, or close social networks on health behavior. The institutional level includes the influences of workplaces, schools, or universities that affect health behavior. The community level includes the environment where people live, their neighborhoods, or living conditions within a prescribed geographical area. The societal level, often called the policy level, includes policies, laws, regulations, and social campaigns for healthy actions, as well as disease prevention and control actions that affect populations at the state or national level (Gregson *et al*, 2001). McLeroy *et al* (1988) noted that health interventions should be based on behavior theories and beliefs; therefore, this theoretical approach can signify the array of strategies available for health promotion programming. This approach has been adopted by several organizations, such as CDC (2007) and WHO (1991). It was explicitly included in the Ottawa Charter for Health Promotion (WHO, 1986): "Health cannot be separated from other goals. The inextricable links between people and their environment constitutes the basis for a socio-ecological approach to health."

This approach has been widely used for the study and prevention of health-risk behaviors, such as tobacco use (Corbett, 2001), obesity (Pepin *et al*, 2004), physical activities (Blanchard *et al*, 2005), HIV prevention (Latkin and Knowlton, 2005), sexual risk

behaviors (Raneri and Wiemann, 2007), and diabetes prevention (Whittemore *et al*, 2004) for a number of reasons. First, this approach is a conceptual framework that is inclusive of the multiple effects and interrelatedness of social elements and provides a comprehensive perspective to analyze various contexts affecting health behaviors. Moreover, it can signify strategies for multi-level preventions, including single or combined action, at the individual, interpersonal, institutional, community, and societal levels (Grzywacz and Fuqua, 2000; Stokols, 2000). Second, this approach is appropriate for application to the analysis of complex human behavior related to health. This is not only explained by the individual level, but it also needs to be explained by other multiple environmental contexts. Consequently, the study of health behavior at the individual level only cannot imply the preventions for health-risk behaviors correctly (Stokols, 1992; Earls and Carlson, 2001; Saltz and Dejong, 2002). Third, using a social ecological approach to develop multilevel interventions for reducing health-risk behavior will help any related persons in each level to recognize the problems and know his or her roles in health-risk behavior preventions. These related persons can include individuals, family, friends, educational institution administrators, organizational administrators, community leaders, health practitioners, or even national policy makers (Stokols, 1996; Saltz and Dejong, 2002). Therefore, it can be said that this approach is an appropriate method to make behavioral change for a sustained success.

Therefore, interventions that target alcohol use among the Thai university students in Thailand are urgently needed. Accordingly, the aim of this study was to investigate factors affecting alcohol consumption among this population group by applying a social ecological approach as a theoretical framework to understand the multifactor effects on alcohol use and to design effective strategies of multi-level preventions, respectively.

MATERIALS AND METHODS

A cross-sectional survey was undertaken from September to November 2008 to investigate factors affecting alcohol consumption among Thai university students. The proposal was reviewed and approved by The Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (No. 089/2551). The self-reporting questionnaires were collected from 1,200 undergraduate students in six universities located in Bangkok Metropolitan area by multistage sampling technique (Kasetsart University, Srinakharin Wirot University, Phranakon Rajaphat University, Rajamangala University of Technology Krungthep, Sripatum University, and Dhurakij Pundit University).

First, simple random sampling technique was used in selecting six universities (200 samples per university) from the university listings in Bangkok (Commission on Higher Education of Thailand, 2008). With simple random sampling, each university had an equal chance of inclusion in the sample. Second, simple random sampling technique was used to select two faculties of each university (100 samples per faculty). Third, two classes of each faculty were selected by simple random sampling, and later all students in each class received an explanation of the details of the study and invited to participate. The students were asked to complete the questionnaire after they were informed that their participation was voluntary, that their responses were anonymous and confidential, and that results would be reported only in a group format. All signed informed consent forms were separated

from their questionnaires.

The dependent variable in this study was "alcohol consumption." To assess this variable, participants were asked to make the followings ratings: "Thinking about your behavior over the past 12 months, how often did you consume alcoholic beverages?" Response categories were "never" (0), "rarely" (1), "sometimes" (2), "usually" (3), and "always" (4).

The twenty-two independent variables were classified as five-level factors based on a social ecological approach. First, the individual level included gender, age, monthly income, monthly family income, living arrangement, knowledge of alcohol's dangers, attitude toward alcohol use, perceived susceptibility of alcohol use, perceived severity of alcohol use, perceived benefits of alcohol avoidance, perceived barriers of alcohol avoidance, and perceived self-efficacy. Gender was measured on male-female format. Age, monthly income, and monthly family income were measured as open-ended questions. Living arrangement was measured as multiple choice. Knowledge of alcohol's dangers was measured using true/false format in 22 items (true = 1, false = 0). The other variables were measured using a five-point rating scale (1 = strongly disagree/very little, 5 = strongly agree/very much). Most of the questions in this level were adapted from previous studies (Reis, 2001; Rhodes *et al*, 2003; Simons and Gaher, 2004; Haines *et al*, 2006). Second, the interpersonal level included peer drinking, father drinking, mother drinking, and relatives drinking. Peer drinking was measured by the number of close friends who drink alcohol. The variables in this level were measured using a dichotomous format (drink and not drink). Third, the institutional level included senior drinking and accessibility of alcohol around university. Senior drinking was also measured on a similar dichotomous format. Accessibility of alcohol around university was measured as an open-ended question by asking students to estimate time spent to reach alcohol around university. Fourth, the community level included community member drinking and accessibility of alcohol around community. Community member drinking was also measured on a dichotomous format. Accessibility of alcohol around community was measured as an open-ended question by asking students to estimate time spent to reach alcohol around community. Fifth, the societal level included exposure to anti-alcohol campaigns and exposure to alcohol advertising. They were measured using a three-point rating scale (0 = never, 1 = sometimes, 2 = always). A pretest was conducted with forty university students in Bangkok.

The reliability analysis by Cronbach's alpha was done to evaluate the internal consistency of summed scale. The internal consistency among "attitude toward alcohol use," "perceived susceptibility of alcohol use," "perceived severity of alcohol use," "perceived benefits of alcohol avoidance," "perceived barriers of alcohol avoidance," and "perceived self-efficacy" was tested. The results showed that alpha levels ranged from 0.74 to 0.90. Scores within this range are considered as an adequate indication of internal consistency of the data (Cottrell and McKenzie, 2005). Moreover, difficulty and discrimination were tested for the items of knowledge of alcohol's dangers. The results showed that the difficulty of all items ranged from 0.28 to 0.78, and the discrimination of all items was more than 0.2. Hence, these scores indicated that the items of knowledge could be suitably used in this study (Cottrell and McKenzie, 2005). For statistical analyses, means, standard deviation, and percentage were used in describing characteristics of the study sample, and multiple regression analysis was used in examining which

factors affected alcohol consumption among university students at the 0.05 level of significance.

RESULTS

In this section, the characteristics of the study sample and factors affecting alcohol consumption among university students on multivariate analysis have been presented, respectively.

Characteristics of the study sample

The sample included 1,200 undergraduate students, aged 18-24 years old in six universities in the Bangkok Metropolitan Area. Most of them were female (57%). The average age was 20.28 years (SD = 1.594). The majority of the sample (59.4%) had an income per month ranging from THB 5,000-10,000 (Mean = 6,623.93, SD = 4,303.87). About half of them (45.2 %) had a family income per month ranging from THB 20,000-40,000 (Mean = 47,086.92, SD = 54,833.78), and about 40% of them were living in privately rented dormitories surrounding university.

Factors affecting alcohol consumption among university students

Before analysis, checking the problem of multicollinearity was performed by considering all correlations among independent variables. The results found that all correlations in this study were less than 0.6 (Table 1). This range of correlation coefficients was considered an acceptable level without the problem of multicollinearity (Cooper and Schindler, 2001; Hair *et al*, 1992). Therefore, multiple regression analysis was performed in which all 22 independent variables were entered simultaneously to calculate the overall level of variance accounted for alcohol consumption among university students. The results, standardized regression coefficients (β), *t*-test, and the overall R^2 for this analysis, found that there were 13 independent variables affecting alcohol consumption significantly (Table 2).

At the individual level, they were gender (males tended to be more frequent drinkers than females, β = .149), age (β = .098), monthly income (β = .067), living arrangement (students living in privately rented dormitory surrounding their university tended to be more frequent drinkers, β = .109), attitude toward alcohol use (students who had supportive attitude toward alcohol use tended to be more frequent drinkers, β = -.259), perceived susceptibility of alcohol use (β = -.065), and perceived self-efficacy (β = -.058). At the interpersonal level, they were peer drinking (β = .186) and relatives drinking (β = .071). At the institutional level, accessibility of alcohol around university affected alcohol consumption (β = -.064). At the community level, accessibility of alcohol around community affected alcohol consumption (β = -.114). At the societal level, the significant variables were exposure to anti-alcohol campaign (β = -.092) and exposure to alcohol advertising (β = .106). The variance of the dependent variable explained by all 22 independent variables was 41.2 % (40.1% adjusted).

DISCUSSION

This study investigated the factors affecting alcohol consumption among university students using a social ecological approach as a theoretical framework. It has at least two limitations to note. First, this research was limited by the sampling area being only in Bangkok. This would reduce the generalizability of the findings. Future research may need to be broadened to get the picture of the whole country more representatively. The second limitation was because the measures were self-reported; the respondents may have underreported their alcohol

Table 1
Correlation matrix among variables (n=1,200).

Variables	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11
v1 = Gender (Male = 1)	1										
v2 = Age	0.011	1									
v3 = Monthly income	0.006	.167**	1								
v4 = Monthly family income	-0.047	0.003	.354**	1							
v5 = Living arrangement (privately rented dormitory = 1)	0.043	.061*	.254**	-0.022	1						
v6 = Knowledge of alcohol's dangers	-.074**	.065*	.066*	-0.007	0.025	1					
v7 = Attitude toward alcohol use	-.192**	-.070*	-.063*	-0.012	-0.008	.289**	1				
v8 = Perceived susceptibility	-.061*	-0.007	-0.006	-.060*	0.017	.371**	.402**	1			
v9 = Perceived severity	-.119**	0.021	-0.016	-0.033	0.008	.367**	.416**	.538**	1		
v10 = Perceived benefit	-0.051	-0.043	0.004	-0.014	-0.023	.205**	.281**	.308**	.382**	1	
v11 = Perceived barriers	.221**	.112**	.062*	-0.003	.074*	-.129**	-.373**	-.065*	-.221**	-.240**	1
v12 = Perceived self-efficacy	-.101**	-.075**	-0.027	.069*	0.009	.180**	.336**	.236**	.317**	.285**	-.310**
v13 = Peer drinking	.160**	0.025	.059*	0.012	-0.013	-0.026	-.259**	-.099**	-.083**	-.058*	.155**
v14 = Father drinking (drink = 1)	-0.041	-0.011	0.038	0.023	.098**	0.015	-.134**	-.057*	-.069*	-0.047	.145**
v15 = Mother drinking (drink = 1)	0.016	0.016	0.043	-0.032	.096**	-0.051	-.140**	-.069*	-0.052	-0.051	.096**
v16 = Relatives drinking (drink = 1)	-0.037	0.007	0.042	-0.053	.129**	0.005	-.110**	-0.01	-0.013	0.011	
v17 = Senior drinking (drink = 1)	.062*	-0.037	0.032	0.048	0.052	0.026	-0.027	0.007	0.042	0.051	-.098**
v18 = Accessibility of alcohol around university	-.124**	-0.027	0.016	0.008	-.068*	0.052	.183**	.060*	.079**	0.004	-.122**
v19 = Community member drinking (drink = 1)	0.027	0.045	0.012	-.080**	.068*	-.057*	-.154*	-.105**	-.057*	-0.036	0.054
v20 = Accessibility of alcohol around community	-.125**	-0.033	0.036	0.005	-0.055	.082**	.181**	.074*	.063*	0.011	-0.051
v21 = Exposure to anti-alcohol campaign	0.005	.106**	0.01	-0.02	-0.021	.111**	0.05	.145**	.113**	.117**	.141**
v22 = Exposure to alcohol advertisement	-0.01	.166**	.123**	0.034	-0.041	.067*	.170**	0.048	0.026	0.028	.256**
V23 = Alcohol consumption (dependent variable)	.271**	.166**	.144**	-0.006	.158**	-.145**	-.480**	-.253**	-.251**	-.172**	.262**
Mean	0.43	20.28	6623.9	47087	0.37	9.48	52.17	18.41	19.95	27.62	12.2
Standard Deviation (SD)	0.495	1.594	4303.9	54834	0.484	4.698	8.239	4.652	3.839	6.16	5.789

Table 1 (Continued)

Variables	V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23
v1 = Gender (Male = 1)												
v2 = Age												
v3 = Monthly income												
v4 = Monthly family income												
v5 = Living arrangement (privately rented dormitory = 1)												
v6 = Knowledge of alcohol's dangers												
v7 = Attitude toward alcohol use												
v8 = Perceived susceptibility												
v9 = Perceived severity												
v10 = Perceived benefit												
v11 = Perceived barriers												
v12 = Perceived self-efficacy	1											
v13 = Peer drinking	-.101**	1										
v14 = Father drinking (drink = 1)	-0.019	.075**	1									
v15 = Mother drinking (drink = 1)	-0.037	0.05	.342**	1								
v16 = Relatives drinking (drink = 1)	0.023	.069*	.378**	.255**	1							
v17 = Senior drinking (drink = 1)	.093**	.106**	.131**	.110**	.205**	1						
v18 = Accessibility of alcohol around university	.100**	-.158**	-.086**	-.081**	-.099**	-.090**	1					
v19 = Community member drinking (drink = 1)	-.099**	.145**	.229**	.144**	.283**	.209**	-.110**	1				
v20 = Accessibility of alcohol around community	.061*	-.091**	-.071*	-.062*	-.109**	-.080**	.571**	-.142**	1			
v21 = Exposure to anti-alcohol campaign	0.056	-.076**	-.071*	-0.024	-0.016	-.096**	.096**	-0.024	.145**	1		
v22 = Exposure to alcohol advertisement	-.090**	.063*	0.03	-0.051	.072*	0.006	-.060*	.105**	-0.021	.482**	1	
V23 = Alcohol consumption (dependent variable)	-.250**	.344**	.125**	.101**	.165**	.084**	-.284**	.201**	-.286**	-.111**	.149**	1
Mean	7.72	13.13	0.58	0.23	0.76	0.82	15.51	0.8	13.4	26.88	15.34	1.43
Standard Deviation (S.D.)	1.938	16.775	0.494	0.422	0.429	0.386	11.031	0.399	10.928	11.391	5.955	1.111

* * = .01 statistical significance, * = .05 statistical significance

Table 2
Multiple regression analysis of alcohol consumption among university students (n =1,200).

Independent Variables	β	t-test
Individual factor		
1. Gender	.149**	6.262**
2. Age	.098**	4.239**
3. Monthly income	.067**	2.616**
4. Monthly family income	-0.025	-1.036
5. Living arrangement	.109**	4.598**
6. Knowledge of alcohol's dangers	-0.005	-0.181
7. Attitude toward alcohol use	-.259**	-9.019**
8. Perceived susceptibility of alcohol use	-.065*	-2.108*
9. Perceived severity of alcohol use	-0.019	-0.618
10. Perceived benefits of alcohol avoidance	-0.017	-0.684
11. Perceived barriers of alcohol avoidance	0.014	0.517
12. Perceived Self-efficacy	-.058*	-2.274*
Interpersonal factor		
13. Peer drinking	.186**	7.801**
14. Father drinking	0.008	0.298
15. Mother drinking	0.02	0.833
16. Relatives drinking	.071**	2.776**
Institutional factor		
17. Senior drinking	0.008	0.333
18. Accessibility of alcohol around university	-.064*	-2.069*
Community factor		
19. Community member drinking	0.043	1.737
20. Accessibility of alcohol around community	-.114**	-3.703**
Societal factor		
21. Exposure to anti-alcohol campaign	-.092**	-3.431**
22. Exposure to alcohol advertising	.106**	3.871**
Overall R^2 = 0.412 (Adjusted R^2 = 0.401)		

* p <.05; ** p <.01

use, possibly because of shame and guilt. However, the anonymous nature of responses in this study reduces the likelihood of such biased responses. Despite these limitations, the main strength of the present study was the analysis of the multiple influences on drinking behavior among Thai university students. Thus, the results of this study provide a good understanding of alcohol consumption behavior among this young group. In conclusion, the results found that alcohol consumption was not only affected by the individual-level factors, but it was also affected by various multilevel environmental factors, including the interpersonal-level factor, the institutional-level factor, the community-level factor, and the societal-level factor.

At the individual level, males (Slicker, 1997; Prince and Bernard, 1998; Yu and Shacket, 2001; Lewis, 2005; Yeh, 2006; Assanangkornchai *et al*, 2007; Casey and

Table 3
Potential multi-level intervention strategies for university students in Thailand.

Levels	Multi-level intervention strategies
1. Individual level	- Provide training and guidance in refusal skills and self-protective skills - Specify perceived susceptibility and describe negative consequences of alcohol drinking - Increase beliefs in self-efficacy - Reinforce health message overtime, using various media - Present the facts about risks of alcohol use - Modify attitude toward alcohol drinking - Use appropriate communication channels for university students, such as entertainment, extra-curricular activities, and outdoor activities, as an appropriate vehicle for education
2. Interpersonal level	- Foster peer-to-peer communication to change social norms about alcohol use - Provide peer education programs about alcohol harms, particularly in groups of students who share an affiliation (eg, member of athletic team, fraternity house, or dormitory members) - Train student leaders to be aware the problems of alcohol drinking and to serve as role models for other students - Foster university students networks with non-drinker students - Encourage parents to serve as role models for their offspring - Support a close relationship within family - Train family leaders to be aware the problems of alcohol drinking - Provide family education programs about alcohol harms - Address no-alcohol rules in home
3. Institutional level	- Offer and promote extra curricular activities, public services options, and other special events (eg, freshmen orientation, and alcohol awareness weeks) - Create a social environment that supports health-promoting norms - Limit alcohol accessibility in and around university - Ban the use and sales of alcohol in and around university - Promote anti-alcohol campaign through various media in university - Train senior students to be aware alcohol harms and to serve as role model for younger students - Coordinate with community around university to prevent alcohol use among university students - Develop and enforce anti-alcohol policies and regulations in university - Provide curriculum infusion where faculty can introduce alcohol-related issues in to their regular academic courses - Train and ask for participations from the owners of dormitory around university to provide healthy-promoting environment

Dollinger, 2007; Chaveepojnkamjorn and Pichainarong, 2007; Gillespie *et al*, 2007), higher age students (Reis and Riley, 2000; McKinnon *et al*, 2003; Casey and Dollinger, 2007; Chaveepojnkamjorn and Pichainarong, 2007), students receiving higher monthly income (Lapham *et al*, 1998; Odo *et al*, 1999; Chaveepojnkamjorn and Pichainarong, 2007), and students living in privately rented dormitory surrounding university (Villiant and

Table 3 (Continued).

Levels	Multi-level intervention strategies
4. Community level	- Encourage community mobilization to form youth advocacy groups in community - Encourage community participation - Eliminate irresponsible alcohol salers in community - Limit the number and concentration of alcohol outlets in community - Limit the days or hours of alcohol sales in community - Train and ask for participations from the owners of alcohol outlets in community to be responsible retailers - Train community leaders to be aware alcohol harms and to serve as role model for community members - Train and ask for participations from community leaders to provide healthy-promoting environment in community - Form a community coalition linking multiple sectors - Promote social marketing campaign and media advocacy, using various media in community, targeted to opinion leaders in community - Develop local regulations in community - Promote participations among community members - Reduce alcohol drinking by adults in community
5. Societal level	- Declare anti-alcohol policy as a national policy - Use IEC Interventions to deliver health messages widely by a variety of IEC materials - Increase excise tax rates on alcohol - Enact laws and develop further regulations relating to alcohol prevention - Increase laws enforcement - Reduce density of retail outlets and distribution - Restrict days and hours of sales - Restrict alcohol availability during national festivals - Limit alcohol advertisement and other alcohol promotions - Use social marketing campaign through mass media and other media - Increase penalties for illegal persons - Limit age accessible to alcohol - Promote counter-advertising to challenge image of alcohol industry - Restrict sales to youth - Support budgets for activities of universities and communities - Form a national alcohol committee handling with this issue specifically - Increase minimum age for driver's license - Facilitate and encourage multi-level coordination among all levels including individual, interpersonal, institutional, community, and societal level for a sustained success

Scanlan, 1996; Odo *et al*, 1999; McKinnon *et al*, 2003) tended to drink more frequently. As a result, these students should be a main target group for interventions. When psychological variables were considered, it found that attitude toward alcohol use, perceived susceptibility of alcohol use, and perceived self-efficacy affected alcohol consumption. These findings are consistent with previous studies; the students who had positive atti-

tudes toward alcohol use (Simons and Gaher, 2004; Shim and Magg, 2005), lower perceived susceptibility of alcohol use (Rosenstock *et al*, 1988; Konlaeaid, 2005), and lower perceived self-efficacy (Reis and Riley, 2000; Reis, 2001) tended to drink more frequently. Therefore, it is necessary that the prevention strategies at this level, called target-based prevention interventions, be involved in modifying these variables, such as identifying perceived susceptibilities and describing negative consequences of alcohol drinking, training refusal skills to increase self-efficacy, and reinforcing health messages over time through various media to modify attitudes for appropriate alcohol consumption.

At the interpersonal level, the results were consistent with previous studies in Thailand; they indicated that students who had more peers using alcohol (Chaveepojnkamjorn and Pichainarong, 2007) and had relatives who drink alcohol (Ruangkanchanasetr *et al*, 2005; Chaveepojnkamjorn and Pichainarong, 2007) tended to drink more frequently. Moreover, the results were also consistent with previous studies in other countries (Odo *et al*, 1999; Karam *et al*, 2004, 2007; Lewis, 2005; Yeh, 2006). Therefore, interventions in this level should involve family-based and peer-based prevention interventions, such as fostering peer-to-peer communication to change social norms about alcohol use among university students, providing peer education programs about the dangers of alcohol, particularly in groups of students who share an affiliation (eg, a member of an athletic team, fraternity house, or dormitory), supporting close relationships within a family, addressing no-alcohol rules at home, and encouraging parents to serve as role models for their offspring.

At the institutional level, students who had easier access to alcohol around university tended to drink more frequently. This is also consistent with previous studies (White *et al*, 2000; Lindsay, 2006). Therefore, university-based preventions to restrict accessibility of alcohol should be addressed, such as limiting alcohol accessibility in and around university, creating a social environment that supports health-promoting norms, banning the use and sale of alcohol in and around university, and promoting anti-alcohol campaign through various media in the university.

At the community level, students who had easier access to alcohol around community tended to drink more frequently. This is consistent with previous studies (Wechsler *et al*, 2003; Weitzman *et al*, 2003; Dent *et al*, 2005). Thus, community-based prevention to restrict accessibility to alcohol should be addressed, such as limiting the number and concentration of alcohol outlets in community, eliminating irresponsible alcohol distributors in community, limiting the days or hours of alcohol sales in community, and encouraging the participation of community leaders to provide a health-promoting environment in community.

At the societal level, the low exposure to anti-alcohol campaign and the high exposure to alcohol advertising were associated with the higher alcohol consumption. These findings are consistent with previous studies (Unger *et al*, 2003; Donohue, 2004; Dorsett and Dickerson, 2004; Ellickson *et al*, 2005; Lewis, 2005). Therefore, promoting anti-alcohol campaigns, limiting the advertising of alcohol, and other regulatory actions to decrease alcohol accessibility among youth including tax and pricing, restricting drinking areas, and limiting distribution should be addressed. When alcohol policy process in Thailand is considered, it reflects the incompatibility of different interests, particularly between health and economic interests. When regulatory interventions are introduced, such as taxation, control on alcohol availability, anti-alcohol promotion campaign, and control on alcohol promo-

tions, these are often criticized for neglecting public health values (Sornphaisarn, 2005). Furthermore, reliability of enforcement is still a critical problem in policy implementation in Thailand (Thamarangsi, 2006).

In February 2008, legislation was enacted that introduced a number of new restrictions on alcoholic beverages (Alcohol Beverage Control Act, 2008). The Act provides for the designation of alcohol-free zones, restrictions on the methods for selling alcohol, and limits on advertising for alcoholic products. The consumption and sale of alcohol are prohibited in the alcohol-free zones. Such zones include temples or other places where religious rites are performed, medical and public health establishments, drug stores licensed to sell medication, governmental and educational settings, public parks, and oil and gasoline stations. The Act also prohibits the use of price discounts, as well as other sales promotions, to persuade consumption.. Moreover, the Act prohibits advertisements that include an image of the alcoholic beverage itself or its container, name, mark, or in a way that is meant to induce others to consume such alcoholic beverage. These limits appear to apply to all forms of advertising, including television, cinema, newspapers, magazines, and billboards.

However, the Act contains an exception for advertisements that give information or creative knowledge unrelated to the alcoholic beverage, provided that such advertisements do not carry images of the actual product or its container. However, the scope of this exception is not entirely clear, and it is hoped that ministerial regulations will provide further guidance. Although this Act has been enforced in Thailand, the enforcement remains unmonitored. At the same time, the alcohol industry has found ways to circumvent these regulations by using indirect advertising in the controlled media and increasing below-the-line media, such as internet, sponsorship events, and mobile advertisement (Thamarangsi, 2006). Youth, including university students, are the most vulnerable group for these risk-threatening scenarios. Therefore, the regular review of Thai alcohol policy is still needed in a dynamic situation in Thailand.

As presented above, these findings supported a social ecological approach because drinking behaviors were not only affected by individual factor, but they were also affected by multiple environmental factors. Consequently, two important recommendations can emerge from this study. First, the multi-level preventions through a social ecological approach should be urgently encouraged to prevent alcohol use among university students in Thailand. The logic model (Fig 1) suggests that if the interventions of all levels were simultaneously addressed, target populations would be exposed to anti-alcohol messages and receive preventive interventions through family, peers, university, and community. Furthermore, if the national policy and regulatory actions on alcohol were effectively mobilized, they would lead to several outputs: alcohol accessibility could be restricted, price on alcohol could be increased through tax, alcohol advertising and promotions could be limited, and anti-alcohol campaign could be widely promoted. As a result, the short-term outcomes expected would be changes in awareness, knowledge, skills, and attitude. Moreover, alcohol accessibility among youth would be decreased. Then, anti-alcohol norms will increase in the intermediate term. Finally, the long-term outcomes expected include reduced alcohol trial, reduced prevalence of alcohol use, reduced alcohol-related problems, and, subsequently, reduced alcohol-related morbidity and mortality.

Furthermore, in the near future, this

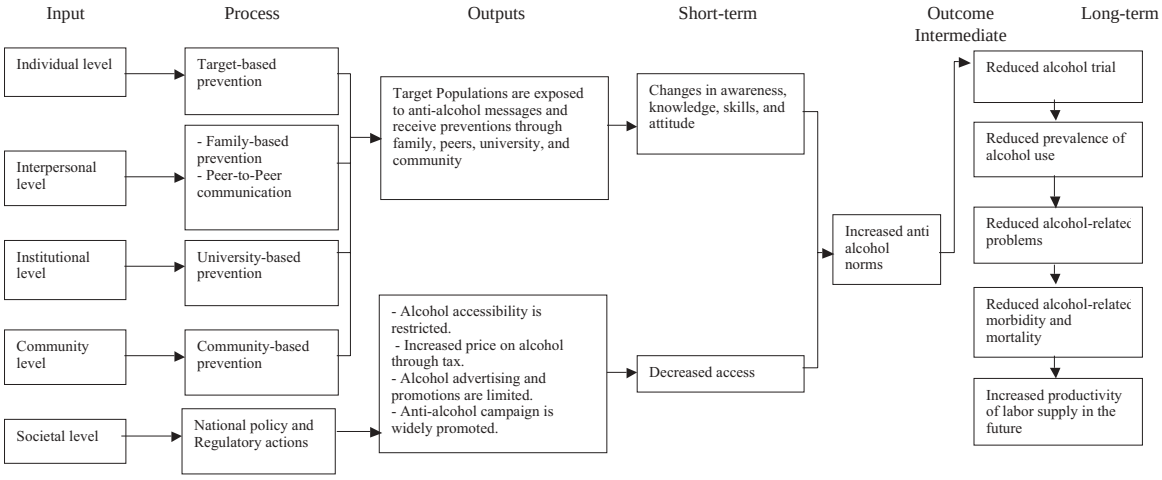

Fig 1-The logic model for preventing alcohol consumption among university students

population group will be healthy laborers. This situation could potentially lead to higher Thai labor productivity. Table 3 provides the potential multi-level prevention strategies based on factors affecting alcohol consumption behavior in this study. Second, any related persons in each level including university students, family, friends, educational institution administrators, community leaders, health practitioners, or even national policy makers should recognize the problem and know roles in prevention. If all levels of Thai societies collaborate with one another, the prevention of alcohol use among Thai youth will succeed effectively. For further research, investigating the effectiveness of interventions in each level by experimental research should be considered and a social ecological approach should be applied in the study for preventing other health-risk behaviors such as tobacco use, sexual-risk behaviors, unhealthy nutritional habit, insufficient physical activity and behaviors leading to unintentional and intentional injury.

ACKNOWLEDGEMENTS

The author, a doctoral candidate in Demography at the College of Population Studies, Chulalongkorn University, would like to express sincere thanks to Assistant Professor Dr Pattanawadee Xuto, College of Population Studies, Chulalongkorn University, who gave me valuable suggestions for this research; to the Department of Communication Arts, Faculty of Humanities, Kasetsart University for its financial support for part of this research; and to all the university students for their enthusiastic participation in this study.

REFERENCES

Alcohol Beverage Control Act. Alcohol Beverage Control Act BE 2551 (2008). *Government Gazette* 2008; 125 Sect 33 Gor: 34-49. [Cited 2009 Feb 12]. Available from: URL: http://www.thaiantialcohol.com/eng/images/law/alcohol_beverage_control_act.pdf

Alihan MA. Social ecology: a critical analysis. New York: Cooper Square, 1938.

Assanangkornchai S, Pattanasattayawong U, Samangsri N, Mukthong A. Substance use among high-school students in southern Thailand: trends over 3 years (2002-2004). *Drug Alcohol Depend* 2007; 86: 167-74.

Blanchard CM, McGannon KR, Spence JC, *et al.* Social ecological correlates of physical activity in normal weight, overweight, and

obese individuals. *Int J Obes* 2005; 29: 720-26.

Casey PF, Dollinger SJ. College students' alcohol-related problems: an autophotographic approach. *J Alcohol Drug Educ* 2007; 51: 8-25.

CDC. The social-ecological model: a framework for prevention [Webpage]. Atlanta: Division of Violence Prevention, CDC, 2007. [Cited 2008 Feb 2]. Available from: URL: http://www.cdc.gov/ncipc/dvp/Social_Ecological_Model_DVP.htm

Center for Alcohol Studies. Status of alcohol consumption. Bangkok: Office of Narcotics Control Board, 2007 (in Thai).

Chaveepojnkamjorn W, Pichainarong N. Factors associated with alcohol consumption among secondary school students. *Southeast Asian J Trop Med Public Health* 2007; 38: 146-51.

Commission on Higher Education of Thailand. Higher education information [Website] (in Thai). [Cited 2008 Jun 1]. Available from: URL: http://interapp.mua.go.th/CHE-app2552/INFO_UNIV/index.php

Cooper D, Schindler PS. Business research methods. New York: McGraw Hill, 2001.

Corbett KK. Susceptibility of youth to tobacco: a social ecological framework for prevention. *Respir Physiol* 2001; 128: 103-18.

Cottrell RR, McKenzie JF. Health promotion and education research methods. Sudbury, MA: Jones Bartlett, 2005.

Dent CW, Grube JW, Biglan A. Community level alcohol availability and enforcement of possession laws as predictors of youth drinking. *Prev Med* 2005; 40: 355-62.

Donohue B, Allen DN, Maurer A, Ozols J, DeStefano G. A controlled evaluation of two prevention programs in reducing alcohol use among college students at low and high risk for alcohol related problems. *J Alcohol Drug Educ* 2004; 48: 13-33.

Dorsett J, Dickerson S. Advertising and alcohol consumption in the UK. *Int J Advert* 2004; 23: 149-71.

Earls F, Carlson M. The social ecology of child health and well being. *Annu Rev Public Health* 2001; 22: 143-66.

Ellickson PL, Collins RL, Hambarsoomians K, McCaffrey DF. Does alcohol advertising promote adolescent drinking? Results from a longitudinal assessment. *Addiction* 2005; 100: 235-46.

Gillespie W, Holt JL, Blackwell RL. Measuring outcomes of alcohol, marijuana, and cocaine use among college students. *J Drug Issues* 2007; 7: 549-68.

Gregson J, Foerster SB, Orr R, *et al*. System, environmental, and policy changes: using the social-ecological model as a framework for evaluating nutrition education and social marketing programs with low-income audiences. *J Nutr Educ* 2001; 33 (suppl 1): 4-15.

Grzywacz J, Fuqua J. The social ecology of health: leverage points and linkages. *Behav Med* 2000; 26: 101-15.

Haines MP, Barker G, Rice RM. The personal protective behaviors of college student drinkers: evidence of indigenous protective norms. *J Am Coll Health* 2006; 55: 69-78.

Hair JF, Anderson RE, Tatham RL, Black WC. Multivariate data analysis. New York: McGraw-Hill, 1992.

Inglab L. Consumption behavior and perception of impacts on alcohol consumption of students in private higher education in West Bangkok and Metropolitan areas. Bangkok: Center for Alcohol Studies, 2008 (in Thai).

Jongwutiwes K, Nillapun M, Rojanalert N. Health behavior of university students: a case study of Silpakorn University. Nakhon Pathom: Silpakorn University, 2002 (in Thai).

Karam EG, Maalouf WE, Ghandour LA. Alcohol use among university students in Lebanon: The IDRAC University Substance Use Monitoring Study (1991 and 1999). *Drug Alcohol Depend* 2004; 76: 273-86.

Karam E, Kypri K Salamoun M. Alcohol use among college students: an international perspective. *Curr Opin Psychiatry* 2007; 20:

213-21.

Konlaeaid S. Factors affecting self-protective behavior from liquors drinking of high school students in Bangkok Metropolis. Bangkok: Kasetsart University, 2005 (in Thai). 132 pp. Thesis.

Lapham S, Skipper B, Brown P, Chadbunchachai W, Suriyawongpaisal P, Paisarnsilp S. Prevalence of alcohol problems among emergency room patients in Thailand. *Addiction* 1998; 93: 1231-39.

Latkin CA, Knowlton AR. Micro-social structural approaches to HIV prevention: a social ecological perspective. *AIDS Care* 2005; 17 (4 suppl 1): 102-13.

Lewis TF. Readiness to change, social norms, and alcohol involvement among college students. *J Addict Offender Couns* 2005; 26: 22-37.

Lindsay V. Factors that predict freshmen college students' preference to drink alcohol [Letter]. *J Alcohol Drug Educ* 2006; 50: 7-19.

McKinnon S, O' Rourke K, Byrd T. Increased risk of alcohol abuse among college students living in the US-Mexico border: implication for prevention. *J Am Coll Health* 2003; 51: 163-7.

McLeroy K, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion program. *Health Educ Q* 1988; 15: 351-77.

National Statistical Office. The cigarette smoking and alcoholic drinking behavior survey 2001. Bangkok: National Statistical Office, 2002 (in Thai).

National Statistical Office. The cigarette smoking and alcoholic drinking behavior survey 2004. Bangkok: National Statistical Office, 2005 (in Thai).

National Statistical Office. The 2006 health and welfare survey. Bangkok: National Statistical Office, 2006 (in Thai).

Odo J, Mcquiller L, Stretesky P. An empirical assessment of the impact of RIT's student alcohol policy on drinking and binge drinking behavior. *J Alcohol Drug Educ* 1999; 44: 49-67.

Pepin V, MaMahan S, Swan PD. A social ecological approach to the obesity epidemic. *Am J Health Stud* 2004; 19: 122-25.

Prince A, Bernard AL. Alcohol use and safer sex behaviors of students at a commuter university. *J Alcohol Drug Educ* 1998; 43: 2-19.

Raneri LG, Wiemann CM. Social ecological predictors of repeat adolescent pregnancy. *Perspect Sex Reprod Health* 2007; 39: 39-47.

Reis J. College student's determinants of alcohol consumption according to stage of change and weekly consumption: implications for intervention planning. *J Alcohol Drug Educ* 2001; 46: 46-54.

Reis J, Riley W. Predictors of college students' alcohol consumption: implications for student education. *J Genet Psychol* 2000; 161: 282-91.

Rhodes SD, Grimley DM, Hergenrather KC. Integrating behavioral theory to understand hepatitis B vaccination among men who have sex with men. *Am J Health Behav* 2003; 27: 291-300.

Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Health Educ Q* 1988; 15: 175-83.

Ruangkanchanasetr S, Plitponkarnpim A, Hetrakul P, Kongsakon R. Youth risk behavior survey: Bangkok, Thailand. *J Adolesc Health* 2005; 36: 227-35.

Saltz RF, DeJong W. Reducing alcohol problems on campus: a guide to planning and evaluation. 2002. [Cited 2008 Feb 6]. Available from: URL: http://www.collegedrinkingprevention.gov/NIAAACollegeMaterials/planEvalHandbook.aspx

Samul S. A study of sexual value and risk behaviors among students in private universities, Bangkok Metropolis. Bangkok: Chulalongkorn University, 2002 (in Thai). 121 pp. Thesis.

Shim S, Maggs J. A cognitive and behavioral hierarchical decision-making model of college students' alcohol consumption. *Psychol Mark* 2005; 22: 649-68.

Simons JS, Gaher RM. Attitudes toward alcohol and drug-free experience among college stu-

dents: relationships with alcohol consumption and problems. *Am J Drug Alcohol Abuse* 2004; 30: 461-71.

Slicker EK. University students' reasons for not drinking: relationships to alcohol consumption level. *J Alcohol Drug Educ* 1997; 42: 83-102.

Sornphaisarn B. Development of alcohol-related problem control policy. Bangkok: Center for Alcohol Studies, 2005 (in Thai).

Stokols D. Establishing and maintaining healthy environments: toward a social ecology of health promotion. *Am Psychol* 1992; 47: 6-22.

Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot* 1996; 10: 282-98.

Stokols D. Social ecology and behavioral medicine: implications for training, practice, and policy. *Behav Med* 2000; 26: 129-38.

Sukda S. A study of value and sex risk behaviors of students in public universities. Bangkok: Chulalongkorn University, 2000 (in Thai). 112 pp. Thesis.

Thamarangsi T. Thailand: alcohol today. *Addiction* 2006; 101: 783-7.

Unger JB, Schuster D, Zogg J, Dent CW, Stacy AW. Alcohol advertising exposure and adolescent alcohol use: a comparison of exposure measure. *Addict Res Theory* 2003; 11: 177-93.

Villiant PM, Scanlan P. Personality, living arrangements, and alcohol use by first year university students. *Soc Behav Pers* 1996; 24: 151-6.

Wechsler H, Lee JE, Nelson TF, Lee H. Drinking and driving among college students: the influence of alcohol-control policies. *Am J Prev Med* 2003; 25: 212-8.

Weitzman ER, Folkman A, Lemieux K, Wechsler H. The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities. *Health Place* 2003; 9: 1-6.

White VM, Hill DJ, Letcher TR. Alcohol use among Australian university students in 1996. *Drug Alcohol Rev* 2000; 19: 371-9.

Whittemore R, Melkus GE, Grey M. Applying the social ecological theory to type 2 diabetes prevention and management. *J Community Health Nurs* 2004; 21: 87-90.

WHO. Ottawa charter for health promotion in 1986. [Cited 2009 Jan 31]. Available from: URL: http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf

WHO. Health for all targets: the health policy for Europe. Copenhagen: WHO Regional Office for Europe, 1991.

Wungthanakorn S, Petchruschatachart U, Jittanoon P. Health risk behaviors of undergraduate students in southern Thailand. *Thai J Health Promot Environ Health* 2007; Jul-Sep: 68-79 (in Thai, abstract in English). [Cited 2009 Feb 12]. Available from: URL: http://advisor.anamai.moph.go.th/303/HEALTH_Vol30No3_06.pdf

Yeh M. Factors associated with alcohol consumption, problem drinking, and related consequences among high school students in Taiwan. *Psychiatry Clin Neurosci* 2006; 60: 46-54.

Yu J, Shacket RW. Alcohol use in high school: predicting alcohol use and alcohol problems in 4-year colleges. *Am J Drug Alcohol Abuse* 2001; 27: 775-9.