

## RESEARCH ARTICLE

# Socioeconomic Inequality in Concurrent Tobacco and Alcohol Consumption

Nirun Intarut<sup>1,2\*</sup>, Piyalak Pukdeesamai<sup>3</sup>

### Abstract

**Background:** Whilst several studies have examined inequity of tobacco use and inequity of alcohol drinking individually, comparatively little is known about concurrent tobacco and alcohol consumption. The present study therefore investigated inequity of concurrent tobacco and alcohol consumption in Thailand. **Methods:** The 2015 Health and Welfare Survey was obtained from Thailand's National Statistical Office and used as a source of national representative data. Concurrent tobacco and alcohol consumption was defined as current and concurrent use of both tobacco and alcohol. The wealth assets index was used as an indicator of socioeconomic inequity. Socioeconomic status included 5 groups ranging from poorest (Q1) to richest (Q5). A total of 55,920 households and 113,705 participants aged 15 years or over were included and analyzed. A weighted multiple logistic regression was performed. **Results:** The prevalence of concurrent tobacco and alcohol consumption, tobacco consumption only, and alcohol consumption only were 15.2% (95% CI: 14.9, 15.4), 4.7% (95% CI: 4.5, 4.8), and 18.9% (95% CI: 18.7, 19.1), respectively. Weighted multiple logistic regression showed that concurrent tobacco and alcohol consumption was high in the poorest socioeconomic group (P for trend: <0.001), and tobacco consumption only was also high in the poorest group (P for trend: <0.001). A high prevalence of alcohol consumption was observed in the richest group (P for trend: <0.001). **Conclusions:** These findings suggest that tobacco and alcohol consumption prevention programs would be more effective if they considered socioeconomic inequities in concurrent tobacco and alcohol consumption rather than focusing on single drug use.

**Keywords:** Inequity- socioeconomics- co-use- smoking and alcohol

*Asian Pac J Cancer Prev*, 18 (7), 1913-1917

### Introduction

Tobacco use is a risk factor for several non-communicable diseases including lung cancer and cardiovascular disease (Collaborators, 2016). In 2015, the prevalence of tobacco use in Thailand was 19.9%, while the prevalence of alcohol consumption was 65% (Wakabayashi et al., 2015; Pitayangsarit et al., 2016). Thailand has run smoking and alcohol prevention programs for over 2 decades, but few programs have sought to prevent concurrent tobacco and alcohol consumption. Several studies have highlighted the impact of concurrent smoking and drinking to health (Drobes, 2002; Jackson et al., 2002; Falk et al., 2006; Verplaetse and McKee, 2017) including one showing that men who concurrently smoke and drink have a high risk of chronic heart disease, stroke, and mortality (Hart et al., 2010). Despite evidence showing the high risk of co-use, the prevalence of co-use remains high. In Australia, for example, the prevalence of co-use is 40%, smoking only is 31%, and heavy alcohol consumption is 11% (Twyman et al., 2016). A behavioral study has shown that concurrent smoking and drinking is highest among males, adolescents and young adults, people with depression, and people

with close friends who smoke and/or drink (Nguyen et al., 2012).

Several studies have investigated the relationship between socioeconomic inequity and the prevalence of smoking (Pfortner et al., 2016; Tsai et al., 2016) and socioeconomic inequity and alcohol drinking (Carlson and Y, 2016; Torikka et al., 2017), but few studies have investigated the relationship between socioeconomic inequity and concurrent tobacco and alcohol consumption. This study therefore aimed to investigate the impact of socioeconomic status on concurrent tobacco and alcohol consumption in Thailand.

### Materials and Methods

#### Methods

The 2015 Health and Welfare Survey was obtained from Thailand's National Statistical Office and used as a source of national representative data. Health and Welfare Surveys have been conducted in Thailand every 2 years since 1974. The aims of this survey are to collect information on health insurance, illness, use of health services including dental clinics, health expenditure,

<sup>1</sup>Clinical Epidemiology Unit, <sup>2</sup>Graduate Division, Faculty of Medicine, Mahasarakham University, Muang, Mahasarakham, <sup>3</sup>Phanomphrai Hospital - Phanom Phrai, Roi Et, Thailand. \*For Correspondence: nirun.i@msu.ac.th

tobacco use, alcohol use, and other health information. In this survey, stratified two-stage sampling is used to recruit participants from a community stratified by urban and rural residence in 77 provinces. In total, data were collected from 55,920 households and 113,882 participants. All participants were aged 15 years and over and interviewed by trained interviewers in face-to-face interviews.

Tobacco consumption status was defined as a participant who reported currently smoking. Participants were asked the question "Currently, do you smoke?" If they said "yes", they were classified as current smokers. For alcohol consumption status, participants were asked the question "Have you consumed alcohol or an alcoholic beverage in the past 12 months?" If they said "yes", they were classified as current drinkers. In the present study, we further sub-classified participants as consumers of tobacco only (TCO), alcohol only (ACO), and tobacco and alcohol in combination (CTA).

Socioeconomic status was calculated by assessing household assets. Twenty items were taken into consideration including type of dwelling, construction materials, tenure, electricity in the dwelling, cooking fuel, drinking water, water supply for general use, toilet facilities, television, video/vcd/dvd, mobile phone, computer, refrigerator, microwave oven, washing machine, air conditioner, automobile, motorcycle, pick-up, and van. All variables were analyzed using principal component analysis (PCA), and computed as wealth index scores. We divided the wealth index scores into five quintiles where

the 1st quintile represented the poorest wealth quintile and the 5th quintile represented the richest (Howe et al., 2011; Pullum, 2016).

#### Statistical analysis

Characteristics of participants, socioeconomic status quintile, CTA, TCO, and ACO were described by frequency and percentages. We also used weighted-multiple logistics regression (sampling weight) to investigate the association between socioeconomic status quintile and CTA, TCO, and ACO. All statistical analysis was performed using the R statistical program version 3.4 (R Development Core Team, 2017).

## Results

Of the 113,705 participants included and analyzed in this study, most were aged over 55 years (30.7%), male (46.8%), attended school less than 7 years (55.5%), Buddhist (93.9%), and resident in an urban area (55.0%).

Table 1 shows that the overall prevalence of TCO, ACO, and CTA were 4.7% (95% CI: 4.5, 4.8), 18.9% (95% CI: 18.7, 19.1), and 15.2% (95% CI: 14.9, 15.4) respectively. Stratified analysis shows an increased trend of TCO amongst older participants. ACO was more prevalent among younger than older participants. CTA was most prevalent among participants aged 26-36 (34.4%), and 36-45 (25.0%) years. Males had a higher prevalence of TCO, ACO and CTA. Also, participants who had attended

Table 1. The Prevalence of Tobacco Consumption Only, Alcohol Consumption Only and Co-Use Across Sample Characteristics

Variables	N	Tobacco consumption only (95%CI)	Alcohol consumption only (95%CI)	Co-use (95%CI)
Overall	113,705	4.7 (4.5, 4.8)	18.9 (18.7, 19.1)	15.2 (14.9, 15.4)
Age (year)				
15-25	17493 (15.4)	3.0 (2.8, 3.3)	16.3 (15.8, 16.9)	11.9 (11.4, 12.3)
26-36	16550 (14.5)	4.1 (3.8, 4.4)	23.7 (23.0, 24.3)	18.9 (18.3, 19.5)
36-45	21656 (19.0)	4.5 (4.3, 4.8)	23.5 (22.9, 24)	18.8 (18.3, 19.3)
46-55	23231 (20.4)	5.3 (5.0, 5.6)	21.3 (20.8, 21.9)	17.0 (16.5, 17.5)
≥ 56	34952 (30.7)	6.4 (6.2, 6.7)	10.6 (10.2, 10.9)	8.6 (8.3, 8.9)
Gender				
Male	53262 (46.8)	9.7 (9.5, 10.0)	25.0 (24.6, 25.4)	29.5 (29.1, 29.9)
Female	60620 (53.2)	0.8 (0.8, 0.9)	11.9 (11.6, 12.1)	0.9 (0.9, 1.0)
Number of years of education attended in schools				
≤ 6	63200 (55.5)	6.3 (6.1, 6.5)	14.3 (14.1, 14.6)	14.9 (14.6, 15.2)
7-12	33858 (29.7)	4.0 (3.8, 4.2)	21.0 (20.6, 21.5)	16.0 (15.6, 16.4)
≥ 13	16824 (14.8)	1.9 (1.7, 2.1)	25.7 (25.1, 26.4)	8.4 (7.9, 8.8)
Religion				
Buddhism	106876 (93.9)	4.0 (3.9, 4.1)	18.9 (18.7, 19.2)	14.9 (14.7, 15.2)
Islam	6103 (5.4)	22.4 (21.3, 23.4)	-	-
Christianity	859 (0.8)	5.5 (4.0, 7.1)	18.3 (15.7, 20.9)	17.9 (15.3, 20.5)
Others	44 (0.04)	2.3 (-2.2, 6.7)	20.5 (8.4, 32.5)	18.2 (6.7, 29.7)
Residence				
Urban	62788 (55.1)	4.1 (4.0, 4.3)	18.9 (18.6, 19.2)	13.3 (13.1, 13.6)
Rural	51094 (44.9)	6.0 (5.8, 6.2)	16.9 (16.6, 17.2)	15.4 (15.1, 15.7)

Table 3. Shows The Results from Weighted Multiple Logistic Regression

	OR adjusted (95%CI)		
	Co-use	Tobacco consumption only	Alcohol consumption only
<b>Socioeconomics</b>			
Poorest	Reference	Reference	Reference
Poor	0.9 (0.8, 1.0)	0.9 (0.8, 1.1)	1.2 (1.1, 1.3)
Medium	0.8 (0.7, 0.8)	0.8 (0.7, 1.0)	1.3 (1.2, 1.5)
Rich	0.6 (0.6, 0.7)	0.6 (0.5, 0.7)	1.4 (1.3, 1.6)
Richest	0.5 (0.4, 0.5)	0.5 (0.4, 0.6)	1.5 (1.3, 1.7)
<b>Age (year)</b>			
15-25	Reference	Reference	Reference
26-36	1.6 (1.3, 2.0)	1.4 (0.9, 2.2)	0.9 (0.7, 1.1)
36-45	1.6 (1.3, 1.9)	1.8 (1.1, 2.7)	0.8 (0.7, 1.0)
46-55	1.2 (1.0, 1.5)	2.0 (1.3, 3.1)	0.8 (0.7, 0.9)
≥ 56	0.5 (0.4, 0.6)	2.6 (1.7, 4.0)	0.4 (0.3, 0.5)
<b>Gender</b>			
Male	Reference	Reference	Reference
Female	0.03 (0.02, 0.03)	0.1 (0.1, 0.1)	0.4 (0.4, 0.4)
<b>Number of years of education attended in schools</b>			
≤ 6	Reference	Reference	Reference
7-12	0.9 (0.8, 1.0)	0.7 (0.6, 0.9)	1.3 (1.2, 1.4)
≥ 13	0.5 (0.4, 0.6)	0.6 (0.5, 0.8)	1.5 (1.3, 1.6)
<b>Residence area</b>			
Urban	Reference	Reference	Reference
Rural	1.0 (1.0, 1.1)	1.2 (1.1, 1.4)	1.0 (0.9, 1.1)
<b>Religious</b>			
Buddhism		Reference	
Islam		7.7 (6.7, 8.9)	
Christianity		1.0 (0.6, 1.7)	
Others		1.2 (0.1, 9.9)	

school for less than 7 years had a higher prevalence of TCO and CTA than those who had attended school for 7 years or more. Participants who had attended school for more than 12 years had a high rate of ACO.

Table 2 shows the relationship between CTA, TCO, and ACO and wealth index. CTA prevalence increased from the poorest to the richest groups (P for trend: <0.001), and among rural and urban groups the trend was similar to the overall trend. TCO prevalence also rose from the poorest to the richest groups, and was higher among urban residents (P for trend: <0.001). ACO prevalence was lower in the poorest households than the richest households (P for trend: <0.001). These trends were confirmed by weighted-multiple logistic regression as shown in Table 3. After adjustment for residence area, age, gender, and the number of years of school attended, a trend in CTA prevalence was observed (P for trend: <0.001). CTA prevalence was lower in the richest households than the poorest households. This trend was similar to TCO prevalence (P for trend: <0.001). By contrast, ACO prevalence was lower in the poorest households than the richest households after adjustment for residence area, age, gender, and the number of years of school attended

Wealth Index	Co-use			Tobacco consumption only			Alcohol consumption only		
	Overall	Urban	Rural	Overall	Urban	Rural	Overall	Urban	Rural
Poorest	23.0 (22.2, 23.9)	23.3 (22.0, 24.6)	23.0 (21.8, 24.1)	9.9 (9.3, 10.5)	7.0 (6.2, 7.8)	11.0 (10.2, 11.9)	15.0 (14.2, 15.7)	18.3 (17.1, 19.5)	13.7 (12.8, 14.6)
Poor	22.7 (21.9, 23.5)	24.5 (23.3, 25.7)	21.6 (20.4, 22.8)	8.3 (7.8, 8.9)	5.8 (5.2, 6.5)	9.8 (9.0, 10.7)	19.0 (18.2, 19.8)	20.0 (18.9, 21.1)	18.4 (17.3, 19.5)
Medium	20.3 (19.5, 21.1)	19.9 (18.9, 21.0)	20.5 (19.4, 21.7)	7.4 (6.9, 7.9)	6.3 (5.7, 7.0)	8.2 (7.4, 9.0)	21.5 (20.7, 22.3)	23.5 (22.4, 24.7)	20.1 (18.9, 21.2)
Rich	16.5 (15.7, 17.2)	15.5 (14.5, 16.4)	17.6 (16.3, 18.8)	5.0 (4.6, 5.4)	4.0 (3.5, 4.5)	6.1 (5.3, 6.9)	22.8 (21.9, 23.6)	23.0 (22.0, 24.1)	22.5 (21.2, 23.8)
Richest	11.7 (11.0, 12.4)	11.1 (10.3, 11.9)	13.3 (11.8, 14.8)	3.3 (2.9, 3.7)	3.4 (3.0, 3.9)	3.0 (2.2, 3.7)	25.3 (24.3, 26.2)	24.1 (23.0, 25.1)	28.5 (26.5, 30.5)
P for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

(P for trend: <0.001).

## Discussion

This study aimed to investigate the inequity of tobacco and alcohol co-use, tobacco consumption only, and alcohol consumption only across socioeconomic status. Our findings can be summarized as follows: 1) Co-use: the prevalence of co-use increased across socioeconomic status with poorer households co-using more than richer households. 2) Tobacco consumption only: prevalence decreased across wealth index quintile with poorer households consuming tobacco only more than richer households. 3) Alcohol consumption only: richer households consumed alcohol more than poorer households across the socioeconomic status quintiles.

Studies show that tobacco and alcohol co-use is a risk factor for poor consumer health (Verplaetse and McKee, 2017), and has a negative effect on perinatal health also (Cannon et al., 2012; Meschke et al., 2013). In addition, one study has shown inequity in the prevalence of smoking in relation to wealth index (Thakur et al., 2013). Our findings show a high prevalence of tobacco and alcohol co-use in the poorest households, with prevalence much lower in the richest households. Previous studies have shown an association between co-use and consumption (Elliott et al., 2014; Haider et al., 2015), with co-use leading to higher smoking intensity (Jackson et al., 2002). We found a high prevalence of co-use overall, possibly because people engage in social smoking and social drinking during parties and other social situations (Kenford et al., 2005; Levinson et al., 2007). Future tobacco and alcohol intervention programs in Thailand and elsewhere should take this finding into account. Further studies are warranted to quantify the increase in frequency of tobacco consumption associated with alcohol co-use and vice versa. Factors related to co-use are known to include genetics, neurobiological mechanisms, conditioning mechanisms, and psychosocial factors (Drobes, 2002). Another risk factor for co-use, one affecting college students, is stress (Witkiewitz et al., 2012). Based on our findings, socioeconomic status should be added to the above list of risk factors for co-use and taken into account in future prevention programs.

A major strength of the current study is that data was obtained from a nationally representative survey, so results are likely to be representative of the whole country and can be used as such by researchers and policy makers. However, there are some limitations. The Health and Welfare Survey design is cross-sectional, so smoking and alcohol consumption patterns were not investigated and we cannot state whether tobacco use preceded alcohol use or vice versa for the participants. Also, participants were interviewed in their homes and some participants, especially younger participants, might have been afraid to talk about substance abuse in front of their parents. Substance abuse may therefore have been underestimated. This possibility could be investigated by conducting a study in a school-based setting.

In conclusion, the present study shows an inequity in the prevalence of concurrent tobacco and alcohol

consumption affecting persons of low socioeconomic status. Tobacco consumption only was also high among the poorest participants, whilst alcohol consumption only was high among the richest participants. Programs aiming to reduce or prevent substance use should take these inequities into account and consider co-use rather than focusing on single drug use.

## Acknowledgements

The authors would like to acknowledge Thailand's National Statistics Office for supplying the dataset, and Dr. Tim Cushnie for assistance with manuscript presentation.

### Funding

None.

## References

- Cannon MJ, Dominique Y, O'Leary LA, et al (2012). Characteristics and behaviors of mothers who have a child with fetal alcohol syndrome. *Neurotoxicol Teratol*, **34**, 90-5.
- Carlson P, Y BA (2016). Are area-level effects just a proxy for school-level effects? Socioeconomic differences in alcohol consumption patterns among Swedish adolescents. *Drug Alcohol Depend*, **166**, 243-8.
- Collaborators GBDMM (2016). Global, regional, and national levels of maternal mortality, 1990-2015: a systematic analysis for the global burden of disease study 2015. *Lancet*, **388**, 1775-812.
- Drobes DJ (2002). Concurrent alcohol and tobacco dependence: mechanisms and treatment. *Alcohol Res Health*, **26**, 136-42.
- Elliott JC, Stohl M, Wall MM, et al (2014). The risk for persistent adult alcohol and nicotine dependence: the role of childhood maltreatment. *Addiction*, **109**, 842-50.
- Falk DE, Yi HY, Hiller-Sturmhofel S (2006). An epidemiologic analysis of co-occurring alcohol and tobacco use and disorders: findings from the national epidemiologic survey on Alcohol and related conditions. *Alcohol Res Health*, **29**, 162-71.
- Haider MR, Salloum RG, Islam F, et al (2015). Factors associated with smoking frequency among current waterpipe smokers in the United States: Findings from the National College Health Assessment II. *Drug Alcohol Depend*, **153**, 359-63.
- Hart CL, Davey Smith G, Gruer L, et al (2010). The combined effect of smoking tobacco and drinking alcohol on cause-specific mortality: a 30 year cohort study. *BMC Public Health*, **10**, 789.
- Howe LD, Hargreaves JR, Ploubidis GB, et al (2011). Subjective measures of socio-economic position and the wealth index: a comparative analysis. *Health Policy Plan*, **26**, 223-32.
- Jackson KM, Sher KJ, Cooper ML, et al (2002). Adolescent alcohol and tobacco use: onset, persistence and trajectories of use across two samples. *Addiction*, **97**, 517-31.
- Kenford SL, Wetter DW, Welsch SK, et al (2005). Progression of college-age cigarette samplers: what influences outcome. *Addict Behav*, **30**, 285-94.
- Levinson AH, Campo S, Gascoigne J, et al (2007). Smoking, but not smokers: identity among college students who smoke cigarettes. *Nicotine Tob Res*, **9**, 845-52.
- Meschke LL, Holl J, Messelt S (2013). Older not wiser: risk of prenatal alcohol use by maternal age. *Matern Child Health J*, **17**, 147-55.
- Nguyen LT, Rahman Z, Emerson MR, et al (2012). Cigarette smoking and drinking behavior of migrant adolescents and

- young adults in Hanoi, Vietnam. *J Adolesc Health*, **50**, 61-7.
- Pfortner TK, Hublet A, Schnohr CW, et al (2016). Socioeconomic inequalities in the impact of tobacco control policies on adolescent smoking. A multilevel study in 29 European countries. *Addict Behav*, **53**, 58-66.
- Pullum TW (2016). Abbreviating the Wealth index to measure equity in health programs more easily. *Glob Health Sci Pract*, **4**, 4-5.
- Thakur JS, Prinja S, Bhatnagar N, et al (2013). Socioeconomic inequality in the prevalence of smoking and smokeless tobacco use in India. *Asian Pac J Cancer Prev*, **14**, 6965-9.
- Torikka A, Kaltiala-Heino R, Luukkaala T, et al (2017). Trends in Alcohol use among adolescents from 2000 to 2011: The role of socioeconomic status and depression. *Alcohol Alcohol*, **52**, 95-103.
- Tsai LT, Lo FE, Yang CC, et al (2016). Influence of socioeconomic factors, gender and indigenous status on smoking in Taiwan. *Int J Environ Res Public Health*, **13**.
- Twyman L, Bonevski B, Paul C, et al (2016). Factors associated with concurrent Tobacco smoking and heavy Alcohol consumption within a socioeconomically disadvantaged Australian sample. *Subst Use Misuse*, **51**, 459-70.
- Verplaetse TL, McKee SA (2017). An overview of alcohol and tobacco/nicotine interactions in the human laboratory. *Am J Drug Alcohol Abuse*, **43**, 186-96.
- Wakabayashi M, McKetin R, Banwell C, et al (2015). Alcohol consumption patterns in Thailand and their relationship with non-communicable disease. *BMC Public Health*, **15**, 1297.
- Witkiewitz K, Desai SA, Steckler G, et al (2012). Concurrent drinking and smoking among college students: An event-level analysis. *Psychol Addict Behav*, **26**, 649-54.