

Gender differences in cigarette smoking and alcohol drinking among adolescents and young adults in Hanoi, Shanghai, and Taipei

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Abstract

Objective: This study aimed to examine gender differences in smoking and alcohol drinking behaviors in three Asian cities of Hanoi, Shanghai, and Taipei, and to assess the magnitude of gender differences across the three cities.

Methods: A total of 17,016 adolescents (age: 15–19 years) and young adults (age: 20–24 years) were selected using multi-stage sampling methods and surveyed in face-to-face interviews. A total of 16,554 unmarried respondents were included in this analysis.

Results: Gender differences were significant for smoking only, drinking only, and both behaviors in each city. Male respondents were 30.66 times more likely to report smoking only than female respondents in Hanoi, followed by Shanghai and Taipei. This pattern was similar for drinking only and both smoking and drinking behaviors.

Conclusions: The magnitude of gender differences in smoking only, drinking only, and both behaviors widely varies across the three cities. Further research can examine how these differences may be used to prevent and reduce smoking and drinking in the adolescent and young adult population.

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Keywords

Adolescent, young adult, gender, smoking, drinking, Asian city

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Introduction

Adolescence is a risk period when many people can adopt different problem behaviors, such as smoking, drinking, and fighting.¹⁻³ Smoking and alcohol drinking in adolescence are important public health concerns because they are associated with many adverse health consequences.⁴ Smoking is associated with lung cancer, cardiovascular disease, and nicotine addiction, and it is also an important preventable cause of premature mortality and mobility.⁵ Alcohol use is related to liver disease, high blood pressure, and alcohol addiction, and it is also one of the main risk factors contributing to global disability-adjusted life-year loss in 10- to 24-year-olds.⁶

Significant gender differences in adolescents' smoking and drinking have been reported.⁷⁻⁹ Women are more likely to respond to health concerns and are less likely to take up risky health behaviors compared with men.^{10,11} Generally, women smoke and drink less than men in different societies and cultures, and women have a higher expectation of self-control than men.^{12,13} Previous research has shown that sex differences in adolescents' smoking and drinking are related to social sanctions.¹⁴ Smoking and drinking are usually considered as part of male characteristics, demonstrating male masculinity and improving male bonding.¹⁵ However, for women, smoking and drinking are discouraged because they are not traditionally feminine traits. Different countries also have different acceptance levels of women smoking or drinking, depending on their socioeconomic levels and cultures.^{15,16} Countries

in which women are independent and work outside have a higher proportion of women who smoke and drink compared with countries in which women are expected to be confined to domestic chores or to be subordinate to their husbands or partners.¹³

Although research on gender differences in smoking and drinking has been performed in many cities, there has been relatively little study of Asian cities with different socioeconomic levels and cultures. This study focused on the three Asian cities of Hanoi, Shanghai, and Taipei. While all of these cities have been influenced by Confucian values for more than 2000 years, they are at different stages of economic and social transitions. Taipei is the most industrialized city, followed by Shanghai, and then Hanoi. Their traditional cultures have also changed by varying degrees because they have opened to outside influences in different ways for different periods. This study examined whether gender differences in smoking and drinking exist in Hanoi, Shanghai, and Taipei. We also investigated to what extent gender differences vary across cities. We hypothesize that there are gender differences in smoking and drinking in these three cities, and that these differences vary across cities in accordance with different socioeconomic levels and cultures.

Methods

Sampling and data collection

This study used data from a cross-sectional study, which was conducted in Hanoi, Shanghai, and Taipei by researchers from

the Bloomberg School of Public Health of Johns Hopkins University, the Hanoi Institute for Family and Gender Studies, the Shanghai Institute for Planned Parenthood Research, and the Population and Health Research Center of Taiwan's Bureau of Health Promotion. In this study, a total of 17,016 adolescents (age: 15–19 years) and young adults (age: 19–24 years), residing in urban and rural areas of Hanoi, Shanghai and Taipei, were selected using multi-stage sampling methods. In Hanoi and Shanghai, private residences and group living facilities were included in the sample. In Taipei, students were recruited and interviewed in their schools, and a nonstudent subsample was interviewed at private residences and group living facilities. More details of the study design have been described by Zabin.¹⁷ Most of the interview process was conducted face-to-face, and a computer-assisted self-interview was used for sensitive questions. This study obtained ethical approval from the Committee on Human Research of Johns Hopkins University and local collaborating organizations. The participants provided verbal informed consent. In this study, only 16,554 unmarried adolescents and young adults were included.

Measures

The questionnaire was constructed on the basis of a literature review and discussion among researchers from Johns Hopkins University and the three local partner organizations.

Cigarette smoking and alcohol drinking. The dependent variables were current cigarette smoking and current alcohol drinking. Respondents were classified as current cigarette smokers if they smoked in the past 30 days, and the rest of the respondents were classified as current nonsmokers.

Similarly, those who drank in the past 30 days were recorded as current alcohol drinkers and the rest were nondrinkers. Respondents who both smoked and drank in the past 30 days were defined as both current smokers and drinkers. Respondents who only smoked or drank in the past 30 days were defined as only current smokers or only current drinkers.

Control variables. Independent variables included age, sex, residence, economic status (above average, average, and below average), education level (high school or lower, college, and university or higher), employment, living with parents, peer smoking, and peer drinking.¹⁸ Respondents were divided into two groups according to their ages, as follows: older adolescents (age: 15–19 years) and young adults (age: 20–24 years).¹⁹ Employment was divided into four categories, as follows: a student without a job, a student with a job, not a student with a job, or not a student without a job.

Statistical analysis. First, we conducted descriptive statistical analysis to describe the distribution of demographics by sex across the three cities. Second, we applied the chi-square test to assess differences in smoking only, drinking only, or both smoking and drinking by city, age group, and sex. Finally, we estimated odds ratios (ORs) and 95% confidence intervals (CIs) for the associations between sex and outcome variables (smoking only, drinking only, both smoking and drinking) using logistic regression models. These models were adjusted for the effects of covariates, such as age, sex, residence, economic status, education level, employment, living with parents, peer smoking, and peer drinking. Statistical significance was considered as $p \leq 0.05$. The sample was weighted according to the probability of a respondent being selected from the sample. Statistical

analysis was conducted with SAS software 9.2 (SAS Institute Inc., Cary, NC, USA).

Results

Demographic characteristics

The descriptive results for demographic characteristics by city and sex are shown in Table 1. After exclusion of married respondents, the sample for this study included 16,554 adolescents and young adults aged 15–24 years, with 6204 from Hanoi, 6023 from Shanghai, and 4327 from Taipei. Sex was almost equally distributed among respondents in each city. More than half of the study participants were aged 15 to 19 years in each city, with 50.8% from Hanoi, 58.3% from Shanghai, and 52.5% from Taipei. Slightly more than two thirds of the respondents in these three cities lived in urban areas. More than half of respondents in these three cities were students without a job. Male respondents were more likely to report peers who smoked and drank than female respondents.

Prevalence of smoking only, drinking only, and both smoking and drinking across cities, age group, and sex

The percentages of male and female respondents with smoking only, drinking only, and both smoking and drinking behaviors are shown in Table 2. The prevalence of smoking only, drinking only, and both behaviors was significantly higher for male than for female respondents across the three cities (all $p < 0.001$), except for drinking only in Taipei. When stratified by age group, a significantly higher prevalence was observed for smoking only and both smoking and drinking behaviors in male compared with female respondents across both age groups in all three cities (all $p < 0.001$). These sex differences were also observed for drinking only in respondents aged 15 to 19

years and 20 to 24 years in Hanoi and in respondents aged 15 to 19 years in Shanghai (all $p < 0.001$). Generally, the prevalence of each of the three behaviors (smoking only, drinking only, both smoking and drinking) increased from Hanoi to Shanghai to Taipei among females aged 15 to 24 years. The three cities all showed a significantly higher prevalence of smoking only, drinking only, and both smoking and drinking for male and female respondents in the older age group (20–24 years old) compared with those in the younger age group (15–19 years old, all $p < 0.05$). Additionally, the prevalence of drinking only and both smoking and drinking was higher than that of smoking only among male and female respondents across the three cities (all $p < 0.05$).

Multivariate analysis of sex and smoking only, drinking only, and both smoking and drinking

Table 3 shows the results of the multivariate logistic regression models for estimating the association of sex with outcome variables (smoking only, drinking only, both smoking and drinking). Sex differences were significant for smoking only, drinking only, and both smoking and drinking in each city. The magnitude of sex differences in smoking only, drinking only, and both behaviors widely varied across the three cities. Male respondents were 30.66 times more likely to report smoking only compared with female respondents in Hanoi (OR: 30.66, 95% CI = 12.18–77.18, $p < 0.001$), followed by Shanghai (OR: 4.84, 95% CI = 3.38–6.93, $p < 0.001$), and Taipei (OR: 3.27, 95% CI = 2.41–4.44, $p < 0.001$). This pattern was similar for drinking only ($p < 0.001$ for Hanoi and Taipei) and both smoking and drinking ($p < 0.001$ for all three cities). The smoking only, drinking only, and both behaviors of adolescents and young adults showed

Table 1. Characteristics of the study population in Hanoi, Shanghai, and Taipei.

Characteristic	Hanoi			Shanghai			Taipei		
	Male (n = 3095) n (%)	Female (n = 3109) n (%)	Total (n = 6204) n (%)	Male (n = 2983) n (%)	Female (n = 3040) n (%)	Total (n = 6023) n (%)	Male (n = 2168) n (%)	Female (n = 2159) n (%)	Total (n = 4327) n (%)
Age, years									
15–19	1554 (50.21)	1616 (51.98)	3170 (50.80)	1697 (56.89)	1812 (59.61)	3509 (58.26)	1123 (51.80)	1147 (53.15)	2270 (52.47)
20–24	1541 (49.79)	1493 (48.02)	3034 (48.90)	1286 (43.11)	1228 (40.39)	2514 (41.74)	1045 (48.20)	1011 (46.85)	2056 (47.53)
Residence									
Rural	876 (28.30)	858 (27.60)	1734 (27.95)	848 (28.43)	761 (25.03)	1609 (26.71)	280 (12.92)	237 (10.98)	517 (11.95)
Urban	2219 (71.70)	2251 (72.40)	4470 (72.05)	2135 (71.57)	2279 (74.97)	4414 (73.29)	1888 (87.08)	1922 (89.02)	3810 (88.05)
Economic status									
Below average	964 (31.15)	920 (29.59)	1884 (30.37)	960 (32.18)	1011 (33.26)	1971 (32.72)	470 (21.68)	491 (22.74)	961 (22.21)
Average	1053 (34.02)	1024 (32.94)	2077 (33.48)	905 (30.34)	866 (28.49)	1771 (29.40)	805 (37.13)	795 (36.82)	1600 (36.98)
Above average	1078 (34.83)	1165 (37.47)	2243 (36.15)	1118 (37.48)	1163 (38.26)	2281 (37.87)	893 (41.19)	873 (40.44)	1766 (40.81)
Education level									
High school or lower	1445 (53.16)	1260 (47.48)	2705 (50.35)	1806 (60.54)	1593 (52.40)	3399 (56.43)	1007 (46.45)	987 (45.72)	1994 (46.08)
College	489 (17.99)	547 (20.61)	1036 (19.29)	456 (15.29)	517 (17.01)	973 (16.15)	102 (4.70)	135 (6.25)	237 (5.48)
University or higher	784 (28.84)	847 (31.91)	1631 (30.36)	721 (24.17)	930 (30.59)	1651 (27.41)	1059 (48.85)	1037 (48.03)	2096 (48.44)
Employment/school status									
A student without a job	1756 (56.83)	1872 (60.27)	3628 (58.55)	1724 (58.40)	1837 (60.43)	3579 (59.42)	1329 (61.30)	1278 (59.19)	2607 (60.25)
A student with a job	289 (9.35)	390 (12.56)	679 (10.96)	163 (5.46)	270 (8.88)	433 (7.19)	668 (30.81)	729 (33.77)	1397 (32.29)
Not a student with a job	767 (24.82)	677 (21.80)	1444 (23.31)	844 (28.29)	816 (26.84)	1660 (27.56)	120 (5.54)	109 (5.05)	229 (5.29)
Not a student without a job	278 (9.00)	167 (5.38)	445 (7.18)	234 (7.84)	117 (3.85)	351 (5.83)	51 (2.35)	43 (1.99)	94 (2.17)
Living with parents									
Yes	2337 (75.51)	2314 (74.43)	4651 (74.97)	1839 (61.65)	1697 (55.82)	3536 (58.71)	1531 (70.62)	1540 (71.33)	3071 (70.97)
No	758 (24.49)	795 (25.57)	1553 (25.03)	1144 (38.35)	1343 (44.18)	2487 (41.29)	637 (29.38)	619 (28.67)	1256 (29.03)
Peer smoking									
Yes	1951 (63.04)	1182 (38.02)	3133 (50.50)	1624 (54.44)	799 (26.28)	2423 (40.23)	1550 (71.49)	1090 (50.49)	2640 (61.01)
No	1144 (36.96)	1927 (61.98)	3071 (49.50)	1359 (45.56)	2241 (73.72)	3600 (59.77)	618 (28.51)	1069 (49.51)	1687 (38.99)
Peer drinking									
Yes	1837 (59.35)	1063 (34.19)	2900 (46.74)	1695 (56.82)	900 (29.61)	2595 (43.08)	1399 (64.53)	1058 (49.00)	2457 (56.78)
No	1258 (40.65)	2046 (65.81)	3304 (53.26)	1288 (43.18)	2140 (70.39)	3428 (56.92)	769 (35.47)	1101 (51.00)	1870 (43.22)

Table 2. Percentage of adolescents and young adults who reported smoking or drinking, by city, sex, and age.

	Only smoking n (%)	Only drinking n (%)	Smoking and drinking n (%)
Hanoi			
All			
Male	210 (6.79)***	873 (28.21)***	685 (22.13)***
Female	6 (0.19)	398 (12.80)	23 (0.74)
15–19 years			
Male	97 (6.24)***	338 (21.75)***	153 (9.85)***
Female	2 (0.12)	150 (9.28)	4 (0.25)
20–24 years			
Male	113 (7.33)***	535 (34.72)***	532 (34.52)***
Female	4 (0.27)	248 (16.61)	19 (1.27)
Shanghai			
All			
Male	255 (8.55)***	603 (20.21)***	602 (20.18)***
Female	38 (1.25)	497 (16.35)	52 (1.71)
15–19 years			
Male	128 (7.54)***	324 (19.09)***	215 (12.67)***
Female	23 (1.27)	262 (14.46)	19 (1.05)
20–24 years			
Male	127 (9.88)***	279 (21.70)	387 (30.09)***
Female	15 (1.22)	235 (19.14)	33 (2.69)
Taipei			
All			
Male	181 (8.35)***	448 (20.66)	318 (14.67)***
Female	55 (2.55)	451 (20.89)	132 (6.11)
15–19 years			
Male	92 (8.19)***	170 (15.14)	131 (11.67)***
Female	31 (2.70)	166 (14.47)	70 (6.10)
20–24 years			
Male	89 (8.52)***	278 (26.60)	187 (17.89)***
Female	24 (2.37)	284 (28.09)	62 (6.13)

The chi-square test was used for differences between male and female respondents.

*** $p < 0.001$.

significant positive associations with the same behavior of peers (all $p < 0.001$). Respondents were more likely to smoke or drink if they reported that most of their close friends did. With regard to smoking only, the ORs of peer smoking relative to non-smoking peers were greater than 3 in all of the three cities. With regard to drinking only, the ORs of peer drinking relative to non-drinking peers were all greater than 2. For both smoking and drinking, the ORs

of peer smoking relative to non-smoking peers were greater than 2, and the ORs of peer drinking relative to non-drinking peers were also greater than 2.

Discussion

To the best of our knowledge, this is the first study to examine gender differences in smoking and drinking among adolescents and young adults aged 15 to 24 years in

Table 3. Associations of sociodemographic characteristics with smoking only, drinking only, and both smoking and drinking among adolescents and young adults in Hanoi, Shanghai, and Taipei.

Characteristic	Only smoking, OR (95% CI)			Only drinking, OR (95% CI)			Smoking and drinking, OR (95% CI)		
	Hanoi	Shanghai	Taipei	Hanoi	Shanghai	Taipei	Hanoi	Shanghai	Taipei
Age, years									
15–19	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
20–24	0.80 (0.55–1.16)	0.61 (0.44–0.84)**	1.32 (0.91–1.91)	1.28 (1.07–1.54)**	0.98 (0.82–1.17)	1.09 (0.89–1.32)	2.68 (2.07–3.47)***	1.56 (1.22–2.00)***	1.52 (1.14–2.01)**
Sex									
Female	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Male	30.66 (12.18–77.18)***	4.84 (3.38–6.93)***	3.27 (2.41–4.44)***	2.53 (2.18–2.94)***	1.05 (0.91–1.21)	0.82 (0.71–0.95)***	34.89 (22.73–53.55)***	10.91 (7.98–14.93)***	2.09 (1.70–2.58)***
Residence									
Rural	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Urban	0.99 (0.68–1.46)	0.94 (0.71–1.25)	0.64 (0.46–0.89)**	0.83 (0.68–0.99)*	0.76 (0.65–0.90)**	1.24 (0.95–1.60)	1.19 (0.92–1.55)	0.72 (0.57–0.90)**	0.91 (0.69–1.21)
Economic status									
Below average	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Average	0.92 (0.62–1.38)	1.30 (0.93–1.81)	1.02 (0.71–1.47)	0.99 (0.82–1.20)	1.02 (0.84–1.23)	0.95 (0.77–1.17)*	1.01 (0.78–1.31)	0.83 (0.64–1.07)	0.86 (0.66–1.13)
Above average	1.05 (0.66–1.66)	1.18 (0.82–1.71)	1.13 (0.79–1.63)	1.28 (1.03–1.59)**	1.23 (1.01–1.49)*	1.28 (1.05–1.57)***	0.93 (0.69–1.26)	0.96 (0.73–1.27)	0.95 (0.73–1.25)
Education level									
High school or lower	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
College	1.01 (0.67–1.50)	1.37 (0.98–1.94)*	0.53 (0.30–0.95)	1.64 (1.35–1.99)*	1.52 (1.25–1.85)	1.64 (1.15–2.34)	0.98 (0.75–1.28)	1.01 (0.77–1.34)	0.65 (0.43–0.96)
University or higher	0.64 (0.40–1.05)***	0.92 (0.61–1.40)	0.35 (0.24–0.52)***	1.91 (1.54–2.36)***	1.84 (1.52–2.24)***	2.71 (2.19–3.35)***	0.97 (0.71–1.31)	0.70 (0.51–0.97)*	0.32 (0.24–0.43)***
Employment/school status									
A student without a job	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
A student with a job	1.10 (0.63–1.93)	1.40 (0.77–2.53)	2.37 (1.73–3.24)**	1.12 (0.90–1.38)	1.20 (0.92–1.55)	1.21 (1.03–1.43)*	0.98 (0.70–1.37)***	2.53 (1.66–3.86)	1.68 (1.31–2.14)*

(continued)

Table 3. Continued.

Characteristic	Only smoking, OR (95% CI)			Only drinking, OR (95% CI)			Smoking and drinking, OR (95% CI)		
	Hanoi	Shanghai	Taipei	Hanoi	Shanghai	Taipei	Hanoi	Shanghai	Taipei
Not a student with a job	1.20 (0.63-1.93)	2.80 (1.98-3.98) ^{***}	1.63 (1.05-2.54)	0.96 (0.78-1.17)	1.05 (0.87-1.28)	1.19 (0.91-1.55)	3.01 (2.30-3.95) ^{***}	3.72 (2.82-4.90) ^{***}	2.76 (2.00-3.82) ^{**}
Not a student without a job	1.43 (0.89-2.30)	2.72 (1.77-4.17) ^{**}	1.70 (0.98-2.96)	0.91 (0.69-1.20)	0.95 (0.69-1.29)	0.75 (0.51-1.12) [*]	2.30 (1.64-3.23) ^{**}	3.59 (2.53-5.10) ^{**}	3.75 (2.55-5.54) ^{***}
Living with parents									
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Yes	1.47 (0.89-2.41)	1.31 (0.97-1.78)	1.23 (0.87-1.74)	0.82 (0.66-1.01)	1.03 (0.87-1.21)	0.87 (0.73-1.04)	0.99 (0.75-1.33)	0.65 (0.52-0.82) ^{***}	0.62 (0.49-0.79) ^{***}
Peer smoking									
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Yes	3.48 (2.26-5.35) ^{***}	4.98 (3.58-6.94) ^{***}	5.95 (3.72-9.52) ^{***}	2.23 (1.72-2.83) ^{***}	2.15 (1.62-2.76) ^{***}	2.87 (2.16-3.28) ^{***}	2.66 (1.91-3.30) ^{***}	3.30 (2.42-4.50) ^{***}	12.49 (6.59-23.68) ^{***}
Peer drinking									
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Yes	2.13 (1.83-2.58) ^{***}	2.32 (1.93-2.72) ^{***}	2.67 (2.35-3.18) ^{***}	1.32 (1.13-1.53) ^{**}	2.04 (1.76-2.36) ^{***}	2.52 (2.15-2.96) ^{***}	2.51 (1.91-3.30) ^{***}	2.12 (1.58-2.85) ^{***}	3.75 (2.62-5.37) ^{***}

Adjusted odds ratios were from multivariable logistic models. OR, odds ratio; CI, confidence interval.
^{*}p < 0.05, ^{**}p < 0.01, ^{***}p < 0.001.

the three Asian cities of Hanoi, Shanghai, and Taipei. These cities have shared Confucian values for more than 2000 years, but are at different stages of economic and social transitions. We found that the prevalence of smoking and drinking was significantly different between male and female respondents across these three cities, and the magnitude of gender differences widely varied across the three cities.

This study showed that the prevalence of female respondents who reported smoking only was lowest in Hanoi (0.19%), followed by Shanghai (1.25%) and Taipei (2.55%). This pattern was similar for drinking only and both smoking and drinking across these three cities. This finding may be related to social sanctions. Each society has different acceptance levels for female smoking and drinking, and these levels are related to their socioeconomic levels and culture.¹⁵ In traditional culture, smoking and drinking are discouraged for women because they are incompatible with traditionally feminine traits. In this study, the three cities of Hanoi, Shanghai, and Taipei have been open to outside influences socially, culturally, and economically in different ways and for different periods. Taipei is the most industrialized city and has the most anti-Confucian values, followed by Shanghai and then Hanoi. Generally, Taipei has greater acceptance of smoking and drinking among women compared with Shanghai and Hanoi.

Gender differences in smoking only, drinking only, and both smoking and drinking were observed among adolescents and young adults across the three cities. Possible explanations for these findings are as follows. First, the critical period for teenagers entering adulthood has a series of developmental challenges, such as independence from the family and structural adjustments to social networking systems. The increased need for autonomy is a special characteristic of this period, and is

especially true for males. Males display a greater tendency to use substances in coping with their problems, whereas females are more likely to seek help from parents, friends, and professionals.²⁰ Second, in cities that are influenced by traditional values, cigarette and alcohol use are perceived as part of the male gender role, and can serve to demonstrate male masculinity and establish and maintain interpersonal and social bonds.²¹ In contrast, women are not encouraged to smoke or drink because these activities fail to comply with the traditional female gender role. Finally, previous research has shown that parental monitoring is associated with substance use among girls and boys.²²⁻²⁴ Parents who hold more traditional gender role attitudes are more likely to express a double standard for monitoring and punishment of deviance for girls and boys, which serves as a protective factor against female smoking and drinking.^{22,24,25}

The magnitude of gender differences in smoking and drinking widely varied across the three cities, with the largest in Hanoi, followed by Shanghai and then Taipei, which fits the socioeconomic status and social concepts of the three cities. In the last few decades, rapid socioeconomic changes have improved women's social status and made the restrictions concerning their behaviors diminish. This has resulted in male and female roles becoming increasingly similar.^{26,27} The changes in traditional gender roles are accompanied by increasing social acceptance of women smoking and drinking, which led to an increased prevalence of female smoking and drinking and narrowed the gender gap in smoking and drinking. Hanoi, Shanghai, and Taipei have differences in social acceptance of women smoking and drinking and a gender gap in smoking and drinking.²⁸ Social and economic interactions between Taiwan and the Western world started in the 1950s and increased in the following

decades. The situation in Taiwan appears to parallel many developed regions in Asia. The social and economic transformation of China's mainland began with reform and an opening up program that was introduced at the end of 1978, and rapid economic development and major social changes followed. Vietnam's economic transformation began in 1986 with its renovation policy; rapid development followed, foreign trade and investment expanded, and exposure to education and Western ideas increased.

Peer behavior increases in importance during adolescence and adulthood, which is a period when there is more independence from family and new peer networks are established. In this study, we found that peer behavior had a significant association with smoking and drinking, which is consistent with previous studies.^{18,29} Peer influences on smoking or drinking may be direct or indirect.^{30,31} Direct peer influences may be from encouragement, dares, or actual offers of the substance by peers. Indirect peer influences are from the adolescents' and young adults' associations with peers who smoke or drink. This could increase the availability of these substances, provide role models, establish substance use as normal, and create the perception that using these substances might increase social acceptance.

There are several limitations to this study. First, because the study design was cross-sectional, causal relationships could not be determined. Second, the study relied on self-reporting. Some female respondents might have under-reported substance use because of social desirability bias. However, computer-assisted self-interview software was used in this study to safeguard the respondents' privacy and help limit response bias. Finally, although the study involved a large sample in three Asian metropolitan cities, the findings may

not be applicable to the entire adolescent and young adult population.

Despite these limitations, our study provides additional evidence for gender differences in smoking and drinking among adolescents and young adults in Asian cities. The results of this study have important implications for the design of programs for preventing and intervening in smoking and alcohol drinking among adolescents and young adults. Future research should further examine the mechanisms behind these gender differences, and how these differences may be used to prevent and reduce smoking and drinking in the adolescent and young adult population.

Conclusions

Our study shows that gender differences are significant for smoking only, drinking only, and both smoking and drinking behaviors among adolescents and young adults in Hanoi, Shanghai, and Taipei. The magnitude of gender differences in smoking only, drinking only, and both behaviors widely varies across these three cities. Smoking only, drinking only, and both behaviors of adolescents and young adults have significant positive associations with the same behavior of peers. Gender differences and the influence of peers should be fully considered in intervention of alcohol drinking and smoking behaviors of adolescents and young adults.

Authors' contributions

Yuanqi Cui carried out statistical analysis and wrote the manuscript. Chao-hua Lou, Ersheng Gao, and Laurie S. Zabin obtained research funding and conducted the field survey. Qianqian Zhu and Yan Cheng participated in the field survey. Mark R. Emerson greatly contributed to the research design and statistical analysis.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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