

Prevalence of Tobacco Use Among Junior High and Senior High School Students in Taiwan

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ABSTRACT

BACKGROUND: Tobacco use is a major preventable cause of death in the world. This article describes and compares tobacco use prevalence for students attending junior high schools and senior high schools in Taiwan.

METHODS: This report uses data from the Global Youth Tobacco Survey (GYTS) completed among 4689 junior high school students and 4426 senior high school students in Taiwan in 2004-2005. The GYTS uses a 2-stage sampling design to produce nationally representative data for junior and senior high students in general and vocational schools.

RESULTS: Higher smoking prevalence was observed among senior high (10.1% general schools and 15.9% vocational schools) than junior high (5.5%) school students. Smoking prevalence of girls in junior high (3.2%) and senior high schools (4.6% general and 11.1% vocational) was almost as high or higher than adult females' (4.3%) smoking rates. The pattern of smoking intensity across school years and type of school shows that the percentage of smokers who were experimenters (47.1%) was higher in junior high school and the percentage of smokers who were regular/established smokers (over 50%) was higher in senior high school.

CONCLUSIONS: Smoking prevalence described in this report shows that there are challenges facing the tobacco prevention and control program in Taiwan. The findings suggest that schools should increase their smoking initiation prevention efforts and make available cessation programs and counseling to help students quit smoking. If effective youth tobacco control programs are not developed and implemented in Taiwan, future morbidity and mortality attributed to tobacco will surely increase, especially among women.

Keywords: tobacco; schools; surveillance; Taiwan.

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Tobacco use is a major preventable cause of death in the world. The World Health Organization (WHO) attributes over 4 million deaths per year to tobacco, a figure that is expected to increase to 10 million deaths a year by 2020.¹ Almost half (46.8%) of adult men and 4% of adult women in Taiwan are smokers, resulting in over 18,000 deaths from tobacco-related diseases each year.^{2,3} Lung cancer is the second leading cause of cancer death in Taiwan.⁴ Studies have found that tobacco use most often begins during adolescence.⁵ Results from the 2001 Taiwan National Health Interview Survey suggest that tobacco control efforts in Taiwan face several challenges: low quit rates among males, high exposure to secondhand smoke, a sharp increase in smoking prevalence after students leave high school, and the potential for rapid increase in female smoking if prevalence of smoking among girls persists into adulthood.³ The Bureau of Health Promotion (BHP) in Taiwan was established in 2003 and has made tobacco use prevention among adolescents a primary health issue.

Surveillance of tobacco use is necessary in order to plan, evaluate, and revise tobacco control program efforts. Previous research on tobacco in Taiwan used a number of survey instruments, sampling frames, and data collection protocols. Because of these differences, data from these surveys are not comparable to each other or to data from other countries. In order to address the need for comparable data, Taiwan implemented the Global Youth Tobacco Survey (GYTS) in 2004-2005. The GYTS, part of the Global Tobacco Surveillance System initiated by WHO, US Centers for Disease Control and Prevention, and the Canadian Public Health Association, was developed to monitor youth tobacco use, attitudes, and exposure to secondhand smoke among adolescents aged 13-15 years using standardized methods and has been completed by over 2 million students in 150 countries.⁶ In 2004, Taiwan conducted the GYTS in junior high schools to gather information for 13- to 15-year-old students. In 2005, Taiwan expanded the GYTS to include general and vocational senior high schools to gather information for 16- to 18-year-old students.

The purposes of this article are to describe and compare tobacco use prevalence for students attending junior and senior high schools in Taiwan. The analyses will focus on 3 groups of students: junior high, general senior high, and vocational senior high.

METHODS

Procedure

GYTS uses standardized methods for constructing sampling frames, selecting schools and classes, preparing questionnaires, carrying out field procedures, and processing data. The GYTS questionnaire is self-administered in classrooms, and school, class, and student ano-

nymity is maintained throughout the GYTS process. The GYTS questionnaire was translated into Chinese and checked for accuracy and comprehension in Taiwan.

Subject

The GYTS was implemented in Taiwan among junior and senior secondary students in 2004 and 2005, respectively. These surveys targeted students in all 3 grades of junior secondary schools and all 3 grades of senior secondary general and vocational schools. For the most part, general senior high school graduates will go to a university for further education, and vocational high school graduates will enter the job market with the professional training they received at school. Junior and senior high samples were drawn from comprehensive lists of all schools that included the target grades. Schools were selected for participation proportional to total enrollment in the targeted grades, and classes were selected for participation through systematic random selection within schools.

Instrument

The GYTS core questionnaire includes items on prevalence of cigarette and other tobacco use, perceptions and attitudes about tobacco, access to and availability of tobacco products, exposure to secondhand smoke, school curricula, media and advertising, and smoking cessation. Estimates in this article are presented for measures of tobacco use prevalence and cigarette smoking intensity among current cigarette smokers. The measures of smoking prevalence include lifetime cigarette smoking status (ever smokers are defined as the percentage of students who responded "Yes" to the question, "Have you ever smoked a cigarette, even one or two puffs?"), current cigarette smoking status (current smokers are defined as the percentage of students who responded 1 or more days to the question, "During the past 30 days (1 month), on how many days did you smoke cigarettes?"), and tobacco use in forms other than cigarettes (other tobacco users are defined as the percentage of students who answered "Yes" to the question, "During the past 30 days (one month), have you ever used any form of tobacco products other than cigarettes (e.g. chewing tobacco, snuff, dip, cigars, cigarillos, little cigars, pipe)?" Among current smokers, estimates of smoking intensity are presented for experimenters (defined as current smokers who smoked 5 or fewer days in the past month) and regular/established smokers (defined as current smokers who smoked 20 or more days in the past month).

Data Analysis

Taiwan GYTS data were weighted to adjust for sample selection (school and class levels), nonresponse

(school, class, and students levels), and poststratification of the sample population relative to the grade and sex distribution in the total population. SUDAAN⁷ was used to calculate weighted prevalence estimates and standard errors (SEs) of the estimates (95% confidence intervals were calculated from the SEs). Differences in proportions were considered statistically significant at the $p < .05$ level.

RESULTS

Response Rates

Both the junior high and the senior high samples were stratified by urbanization (ie, large city, small city, small town, rural). The junior high sample included 52 schools and the senior high 61 schools. The school response rate was 100% for both, and the student response rate was 97.0% for the junior high and 93.4% for the senior high. In total, 4689 students participated in the junior high survey, and 4426 students participated in the senior high survey. For the senior high, 2074 students were in general schools and 1844 in vocational schools. The remaining 508 students attended night schools and were excluded from this study.

Smoking Status

Overall, 25.5% of junior high students, 34.0% of general senior high students, and 46.7% of vocational senior high students had ever smoked a cigarette (Table 1). Vocational senior high students were significantly more likely than junior high students to have ever smoked cigarettes. Boys and girls in vocational high schools were significantly more likely than boys and girls in junior high schools to have ever smoked cigarettes. Among senior high students, girls in vocational schools were significantly more likely than girls

in general schools to have ever smoked a cigarette. Boys were significantly more likely than girls to have ever smoked cigarettes among junior high and general senior high students.

Overall, 5.5% of junior high students, 10.1% of general senior high students, and 15.9% of vocational senior high students currently smoked cigarettes (Table 1). Vocational senior high students were significantly more likely than junior high students to currently smoke cigarettes, overall and among both boys and girls. Boys were significantly more likely than girls to currently smoke cigarettes in junior high.

Vocational senior high year 1 students were 2.6 times more likely to currently smoke than year 3 students in junior high, whereas general senior high year 1 students were only 1.1 times more likely than year 3 junior high students to currently smoke (Figure 1). Vocational senior high school students were more likely to currently smoke than general senior high school students at each year in school but the differential varied (2.3 times higher at year 1, 1.2 times higher at year 2, and 1.5 times higher at year 3). For general senior high school students, the pattern of smoking prevalence between the years shows that year 2 was 1.7 times higher than year 1, but the rates are similar in years 2 and 3. For vocational senior high school students, the pattern was inconsistent with year 1 lower than year 2 and the rate for year 3 similar to year 1.

Smoking Intensity

Smoking intensity varied significantly among junior high and senior high students (Table 2). Almost half (47.1%) of junior high students who currently smoke were experimenters compared to about 3 in 10 senior high students (28.9% for both general and vocational senior high students). In comparison,

Table 1. Prevalence of Tobacco Use by Type of School and Sex—Taiwan, GYTS, 2004 Junior High and 2005 Senior High*

Type of School and Sex	Ever Smoked Cigarettes, [†] % (95% CI)	Currently Smoke Cigarettes, [‡] % (95% CI)	Current Other Tobacco Use, [§] % (95% CI)
Junior high			
Total	25.5 (23.4-27.8) [4573]	5.5 (4.7-6.3) [4559]	4.0 (3.5-4.7) [4638]
Boy	30.8 (28.7-33.0) [2250]	7.4 (6.2-8.7) [2227]	4.8 (4.0-5.7) [2283]
Girl	19.8 (17.6-22.2) [2255]	3.2 (2.4-4.3) [2263]	3.3 (2.6-4.0) [2284]
Senior high—general			
Total	34.0 (25.8-43.2) [2055]	10.1 (5.1-19.0) [2040]	5.5 (3.6-8.2) [2074]
Boy	43.3 (30.3-57.3) [970]	15.6 (7.4-30.0) [955]	7.5 (4.4-12.4) [977]
Girl	24.2 (19.1-30.2) [1055]	4.6 (2.4-8.9) [1055]	3.6 (2.5-5.2) [1068]
Senior high—vocational			
Total	46.7 (40.3-53.2) [1813]	15.9 (11.3-21.8) [1800]	5.9 (4.2-8.0) [1843]
Boy	50.4 (42.6-58.1) [882]	20.3 (12.7-30.7) [871]	7.2 (4.7-10.8) [894]
Girl	42.2 (34.3-50.5) [891]	11.1 (7.0-17.1) [891]	4.5 (2.4-8.3) [910]

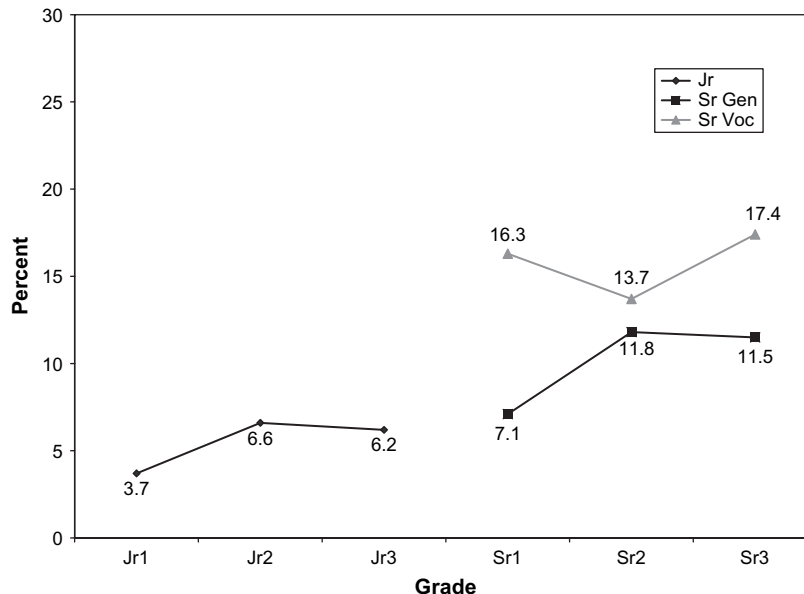
*The values within square brackets indicate unweighted number of cases. Differences across cells occur due to nonresponse and consistency/logic edits.

[†]Ever smoked cigarettes, even 1 or 2 puffs.

[‡]Smoked cigarettes on 1 or more days during the past 30 days (month).

[§]Used tobacco products other than cigarettes (chewing tobacco, snuff, dip, cigars, cigarillos, little cigars, and pipe) in the past 30 days (month).

Figure 1. Percentage of Students Who Currently Smoked Cigarettes by Grade and Type of School, Taiwan, GYTS, 2004-2005



Jr1, Jr2, and Jr3—junior high school students, years 1, 2, and 3; Sr1, Sr2, and Sr3—senior high school students, years 1, 2, and 3.

over half of senior high students (53.9% general and 51.4% vocational) were regular/established smokers compared to 25.9% among junior high students. In all 3 types of schools, girls were more likely than boys to be experimenters and less likely to be regular/established smokers. For junior high year 1, 66.8% of the smokers were experimenters, but by year 3 of senior high school, the percent experimenters was 21.7% for general and 23.4% for vocational smokers (Table 3). In contrast, for junior high year 1, 20.1% of the smokers were regular/established smokers, but by year 3 of senior high school, the percent regular/established was 60.7% for general and 62.1% for vocational smokers.

Tobacco Use Other Than Cigarettes

Overall, 4.0% of junior high students, 5.5% of general senior high students, and 5.9% of vocational senior high students currently used tobacco products other than cigarettes (Table 1). There were no significant differences in other tobacco use by gender or type of school.

DISCUSSION

The Taiwan GYTS data collected in 2004 and 2005 provided a nationally representative and internationally comparable source of information on tobacco-related behavior and attitudes for adolescents. Data from 13- to 15-year-olds in the Taiwan junior high GYTS can be compared to GYTS data for 13- to 15-year-olds from other countries in the Western Pacific. Current cigarette smoking among 13- to 15-year-old students in Taiwan (5.5%) was similar to the Western Pacific region average (6.5%).⁵ Comparing individual

countries in the Western Pacific region, the rate for boys in Taiwan (7.4%) was similar to that of boys in 3 sites in China: Guangdong (6.7%), Shandong (4.6%), and Macao (8.1%). Prevalence of smoking among boys was higher in Fiji (13.1%), Northern Mariana Islands (40.7%), Palau (20.0%), Philippines (26.2%), and Singapore (10.5%).⁸ The rate for girls in Taiwan (3.2%) was similar to that for 5 sites in China: Chongqing (1.9%), Guangdong (2.2%), Shandong (0.2%), Tianjin (1.5%), and Macao (5.6%) but lower than in Fiji (7.1%), Northern Mariana Islands (37.5%), Palau (23.3%), Philippines (12.4%), and Singapore (7.5%).⁸

Findings from the Taiwan junior high GYTS raised concerns at the BHP regarding the tobacco control effort in Taiwan. First, the prevalence of smoking for girls in junior high (3.2%) is almost as high as adult females in Taiwan (4.3%);² the smoking prevalence for girls in both the general high school (4.6%) and the vocational senior high school (11.1%) was higher. Smoking prevalence for girls in vocational high schools was 2.6 times higher than for adult females. Second, the prevalence of smoking for boys in junior high (7.4%) was considerably lower than for adult males in Taiwan (46.8%). The smoking prevalence for boys in general high schools (15.6%) was more than double that of junior high boys; however, the adult male rate was still 3 times higher. For boys in vocational high schools (20.3%), prevalence was almost 3 times higher than for boys in junior high, and the adult male rate was only 2.3 times higher. Findings from the GYTS are consistent with the results reported by Wen et al³ using the 2001 Taiwan National Health Interview Survey. These results suggest that smoking by females,

Table 2. Smoking Intensity Among Current Cigarette Smokers[†] by Type of School and Sex—Taiwan, GYTS, 2004 Junior High and 2005 Senior High*

Junior High	Total, % (95% CI)	Boy, % (95% CI)	Girl, % (95% CI)
Experimenters [‡]	47.1 (41.8-52.5) [242]	43.3 (37.4-49.3) [162]	56.4 (42.5-69.4) [72]
Regular/established [§]	25.9 (20.7-31.9) [242]	28.8 (21.8-37.0) [162]	18.7 (11.6-28.6) [72]
Senior high—general			
Experimenters [‡]	28.9 (15.8-47.0) [207]	24.2 (11.0-45.4) [152]	45.1 (22.6-69.7) [51]
Regular/established [§]	53.9 (35.0-71.7) [207]	59.0 (36.4-78.3) [152]	37.2 (19.9-58.5) [51]
Senior high—vocational			
Experimenters [‡]	28.9 (19.9-40.0) [277]	24.9 (15.5-37.4) [168]	38.1 (23.6-55.1) [98]
Regular/established [§]	51.4 (39.5-63.1) [277]	59.5 (44.6-72.8) [168]	35.7 (24.6-48.6) [98]

*The values within square brackets indicate unweighted number of cases. Differences across cells occur due to nonresponse and consistency/logic edits.

[†]Smoked cigarettes on 1 or more days during the past 30 days (month).

[‡]Experimenters are current smokers who smoked 5 or fewer days in the past 30 days (month).

[§]Regular/established smokers are current smokers who smoked 20 or more days in the past 30 days (month).

especially young girls, should be a priority in Taiwan. This is consistent with previous studies on the prevalence of smoking among young girls in many Western Pacific countries.⁸ For decades, the tobacco industry has targeted females and continues to expand this market.^{9,10} The tobacco industry targets women through advertisements showing smoking associated with independence, stylishness, weight control, sophistication, and power.¹¹

The Taiwan GYTS also found differences in smoking intensity between junior high and senior high smokers. The pattern of smoking intensity across years and type of school shows that the percentage of smokers who are experimenters is higher in junior high school and the percentage of smokers who are regular/established smokers is higher in senior high school. These findings are consistent with much of the work that has conceptualized adolescent smoking as a progression across stages based on smoking frequency and intensity.¹²⁻¹⁵ These stages frequently include preparation, initial trying, experimentation, and regular/established use.^{12,13} Several studies have found that age or grade in school has a strong positive association with regular/established smoking among adolescents.^{14,15}

How can Taiwan use the findings from the junior high and senior high GYTS to assist in developing their tobacco control program? In general, the main goal of a comprehensive tobacco control program is to improve the health of the population by encouraging smokers to quit, eliminating exposure to secondhand smoke, and encouraging people not to initiate tobacco use. Previous studies have shown that demand reduction measures, primarily those that increase the price of tobacco, are effective in significantly reducing initiation of tobacco use and consumption among young people.¹⁶ In addition to demand reduction measures, comprehensive tobacco control programs often include nonprice interventions such as restrictions on smoking in public places and workplaces, a complete ban on advertising and promotion by tobacco companies, dissemination of information on the health consequences of smoking through various media such as prominent warning labels on cigarette packets and countermarketing campaigns, and development and implementation of school-based educational programs in combination with community-based activities.^{16,17}

Taiwan should consider a range of components when developing and implementing tobacco prevention and control strategies. Tobacco control efforts for adolescents

Table 3. Smoking Intensity Among Current Cigarette Smokers[†] by Type of School and Year in School—Taiwan, GYTS, 2004 Junior High and 2005 Senior High*

Junior High	Total, % (95% CI)	Year 1, % (95% CI)	Year 2, % (95% CI)	Year 3, % (95% CI)
Experimenters [‡]	47.1 (41.8-52.5) [242]	66.8 (56.0-76.1) [57]	44.5 (32.3-57.4) [105]	38.6 (27.6-51.0) [77]
Regular/established [§]	25.9 (20.7-31.9) [242]	20.1 (12.6-30.4) [57]	23.5 (17.1-31.5) [105]	30.6 (20.3-43.2) [77]
Senior high—general				
Experimenters [‡]	28.9 (15.8-47.0) [207]	37.1 (15.6-65.3) [58]	30.3 (12.3-57.3) [78]	21.7 (9.1-43.4) [70]
Regular/established [§]	53.9 (35.0-71.7) [207]	43.6 (22.8-66.8) [58]	55.1 (23.5-83.1) [78]	60.7 (40.2-78.1) [70]
Senior high—vocational				
Experimenters [‡]	28.9 (19.9-40.0) [277]	33.5 (17.0-55.4) [104]	29.5 (15.4-48.9) [86]	23.4 (9.9-45.9) [80]
Regular/established [§]	51.4 (39.5-63.1) [277]	45.1 (23.7-68.4) [104]	47.5 (25.9-70.1) [86]	62.1 (46.1-75.9) [80]

*The values within square brackets indicate unweighted number of cases. Differences across cells occur due to nonresponse and consistency/logic edits.

[†]Smoked cigarettes on 1 or more days during the past 30 days (month).

[‡]Experimenters are current smokers who smoked 5 or fewer days in the past 30 days (month).

[§]Regular/established smokers are current smokers who smoked 20 or more days in the past 30 days (month).

can benefit from a multicomponent approach that involves the school environment. The school component could include elements that provide information about the dangers of smoking; improve understanding of media, peer, and family influences; and teach refusal skills. Also, implementing and enforcing tobacco-free school policies can protect students from secondhand smoke exposure and reduce the social acceptability of tobacco use. These school-based initiatives reach their maximum effectiveness working with an effective broader tobacco control program.¹⁸

Limitations

The findings in this report are subject to at least 3 limitations. First, because GYTS is limited to students, the survey might not be representative of all youths aged 13-18 years. However, in Taiwan, junior high school attendance is compulsory, and the gross enrollment rate for senior high schools was over 95% in 2005.¹⁹ Second, these data apply only to youths who were in school on the day of the survey and who completed the survey. However, school response rates were 100%, and student response rates were very high (more than 90%), suggesting that bias attributable to absence or nonresponse was limited. Finally, data were based on the self-report of students, who might underreport or overreport their behaviors or attitudes. The extent of this bias cannot be determined from these data; however, reliability studies in the United States have indicated good test-retest results for similar tobacco-related questions.²⁰

CONCLUSIONS

Smoking prevalence among students described in this report shows that there are opportunities to improve tobacco control and prevention in Taiwan. Taiwan GYTS data indicated that smoking prevalence was significantly higher among senior high than junior high school students. Furthermore, higher smoking prevalence among girl students is an emerging challenge for tobacco control in Taiwan as it is for many countries in Asia. The majority of smokers in junior high school were experimenters, but the percentage of regular/established smokers was significantly higher among senior high school students. These findings suggest that, in conjunction with a broader tobacco control program and in addition to smoking initiation prevention efforts in junior and senior high schools, schools should develop and make available cessation programs and counseling to help students quit smoking in senior high. If effective youth tobacco control programs are not developed and implemented in Taiwan, future morbidity and mortality attributed to tobacco will surely increase, especially among women. Ongoing surveillance is necessary to track trends and patterns of youth smok-

ing among different school programs as a means of evaluating youth tobacco control program efforts.

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