RESEARCH PAPER

Adolescent smoking behaviour and cigarette brand preference in Japan

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Objectives: As part of efforts to develop a smoking control strategy for Japanese adolescents, the results of two nationwide surveys on adolescent smoking behaviour were compared.

Design: Descriptive study on smoking behaviour among high school students was conducted. Self-reporting anonymous questionnaires were administered to 115 814 students in 1996 and 106 297 in 2000 through randomly sampled junior and senior high schools throughout Japan.

Main outcome measures: Smoking prevalence, proportion of smokers by usual sources of cigarettes, national estimated cigarettes consumed by minors, share of cigarette brands smoked by high school students.

Results: The experiment rate among junior high school boys decreased in 2000 compared with that in 1996, whereas current and daily smoking rates did not. Although prevalence among Japanese girls was much lower than that among boys, prevalence among girls increased in 2000. The main source of cigarettes among high school smokers was vending machines. The proportion of smokers who usually purchased cigarettes from vending machines increased in 2000, in spite of the 1998 introduction of restrictions on night-time operations. Japanese adolescents were more likely than adults to smoke American cigarette brands, and the adolescent market share of American brands has increased rapidly, especially for menthol brands.

Conclusions: This survey revealed the seriousness of the problem of smoking behaviour among Japanese high school students, and suggested that this behaviour may be influenced by social environmental factors, including the marketing strategies of the tobacco industry. Action should be taken to reduce the prevalence and impact of pro-tobacco marketing messages and to abolish cigarette vending machines.

The prevalence of cigarette smoking among Japanese males aged 20 years or over (52.8% in 1999) is the highest in the developed world, whereas among females it is one of the lowest (13.4% in 1999).¹ Recently, however, prevalence has been increasing among females in their 20s and 30s.¹

Western countries have monitored adolescent smoking behaviour closely.²⁻⁸ In the case of Japan, although it has long been considered that most adult Japanese smokers begin smoking while minors, despite the Act to Prohibit Minors from Smoking enacted in 1900, it was not until 1996 that this was investigated in a representative nationwide survey on adolescent smoking behaviour.⁹ A second nationwide survey conducted in 2000¹⁰ has allowed for comparison of the 1996 and 2000 results. Although preventing minors from smoking is an important national smoking control measure, the Japanese government has not adopted measures to prevent this occurring. In addition to pricing policies, advertising controls, and regulating access to cigarettes, other means of de-normalising tobacco use include anti-tobacco mass media campaigns and smoke-free air laws.

In the present study, to demonstrate the importance of minor smoking as a national public health issue, we attempted to estimate the total number of cigarettes consumed by minors in Japan. Since findings that cigarette purchasing behaviour among adolescent smokers may be influenced by the large number of cigarette vending machines in Japan,^{11 12} the route by which cigarettes are obtained was analysed to assess the effectiveness of the tobacco industry's voluntary regulations restricting the late-night operation of cigarette vending machines.

A great deal of research in Western countries has shown that cigarette advertisements can influence adolescent

smoking behaviour, including cigarette brand preferences,¹³⁻¹⁷ such that advertising is now strictly prohibited by national or local law in many countries.¹⁸ However, there is no law prohibiting such advertising in Japan. Knowing what brands young smokers prefer may provide evidence for the hazardous influence of cigarette advertising on minor smoking and clues to the development of smoking prevention programmes for adolescents.¹⁹

METHODS

Subjects

Secondary education in the Japanese system comprises three years of compulsory junior and three years of non-compulsory senior high school. In 1998, some 95.9% of junior high school students continued to senior high school. The first grade of junior high school corresponds to seventh grade in the United States, and the third grade of senior high school corresponds to 12th grade.

The survey design was a cross-sectional random sampling survey targeting junior and senior high school students throughout Japan.^{9 10} The 1996 survey was conducted by sampling 122 of 11 274 junior high schools (selection rate 1.1%) and 109 of 5501 senior high schools (2.0%) registered in the 1996 National School Directory. The survey period was from December 1996 to the end of January 1997. The 2000 survey was conducted by sampling 132 of 11 200 junior high schools (1.2%) and 102 of 5315 senior high schools (1.9%) registered in the 2000 National School Directory. The study period was from December 2000 to the end of January 2001.

The sampling method used was a stratified, single-stage cluster sampling. The country was divided into 12 geographic areas for junior and six for senior high schools, from which schools were then randomly selected according to school size.

Procedures

We requested the cooperation of the principals of these schools and sent questionnaires to each. All students enrolled in the selected schools were subjected to the survey. The students' teachers were instructed to inform them of the voluntary nature of their participation and to urge them to answer honestly. Anonymous questionnaires and envelopes were handed to the students for completion during school time. Upon completion, the questionnaires were sealed in envelopes by the students themselves, collected by their teachers, and returned to our institute unopened. The content of the survey was determined by reference to previous surveys on minor smoking behaviour conducted in Japan and elsewhere.

Measures

The questionnaire focused on smoking experience, smoking frequency, age (by school grade) when the respondent first tried smoking, number of cigarettes consumed daily by smokers, sources for cigarettes, and smoking status of the student's family. Smokers were also asked to spell out in full the name of the brand they smoked most. Lifetime smokers, current smokers and daily smokers were defined as students who had tried smoking at least once, students who had smoked at least once during the previous 30 days, and students who had smoked every day during the previous 30 days, respectively.

In the analysis of trends in cigarettes sales, total sales indicate the annual number of cigarettes sold in Japan. Adult consumption was calculated by multiplying adult smoking prevalence with the average number of cigarettes smoked by adult smokers.

Market share of individual cigarette brands was calculated by dividing the sum of cigarettes smoked for each brand by the sum for all brands.

In the analysis of cigarette brands, brand indicates each brand name on the cigarette package. Brand indicates all styles sold under the same trademark and differentiated from one another by means of additional modifiers or descriptors, such as menthol, lights, mild, pianissimo, etc.

Response rate

In the 1996 survey, replies were obtained from 80 of the 122 junior high schools (school response rate 65.6%), and 73 of 109 senior high schools (67.0%). A total of 117 325 envelopes were collected. Student response rate as a proportion of enrolled students in the sampled schools was 96.6% in the junior and 90.8% in the senior high schools, giving an overall response rate of 64.1% in junior and 62.5% in senior high schools. After the exclusion of 1421 insufficiently completed forms, a total of 115 814 questionnaires were entered into analysis.

In the 2000 survey, replies were obtained from 99 of 132 junior (school response rate 75.0%) and 77 of 102 senior high schools (75.5%). A total of 107 907 envelopes were collected. Student response rate was 89.5% for junior and 88.3% for senior high schools, giving an overall response rate of 66.1% for junior and 59.3% for senior high school students. After the exclusion of 1610 insufficiently completed forms, a total of 106 297 questionnaires were entered into analysis.

Data analysis

Percentages in the tables were calculated by a weighting method based on one-stage stratified cluster sampling.²⁰ Cigarette consumption was estimated using data on current smoking rates and cigarette consumption per day.^{11–21} The number of cigarettes per day was provided in intervals of less than 1, 1–4, 5–9, 10–14, 15–19, and 20+. The lowest limit of respective intervals was used for the lower estimations,

namely 0.1, 1, 5, 10, 15, and 20, respectively, while the mid-value of the intervals was used for the higher estimations, namely 0.5, 2.5, 7, 12, 17, and 22, respectively.

A linear model and a number of non-linear models (logarithmic, inverse, quadratic, cubic, compound, power, S-shaped, growth, exponential, and logistic models) were applied to fit the age-specific smoking prevalence and cigarette consumption by sex. The formulas of these curves were then used to estimate smoking prevalence and cigarette consumption by age (from 12 to 19 years) and by sex. The sex- and age-specific number of cigarettes per year was estimated by multiplying smoking prevalence and daily cigarette consumption (the lowest number or higher number) by 365. The crude number of cigarettes consumed by adolescents was calculated by summing the age- and sex-specific cigarette consumption.

To calculate the share of each brand, the daily average number of cigarettes by each cigarette brand was summed and divided by the total of daily average consumption. We also calculated share by brand family because some brands have a number of individual varieties.^{22–25} Since it is broadly considered a typical American brand by the general population in Japan, Marlboro was classified as an American brand despite being produced by Japan Tobacco Inc under cross-license with an American tobacco company. Data were analysed using SPSS for Windows (version 11.5) software (SPSS Inc, USA).

RESULTS

Smoking behaviour

Lifetime smokers—those having tried smoking at least once—accounted for 29.9% of boys and 16.7% of girls in the seventh grade in 1996, and for 22.5% of boys and 16.0% of girls in 2000, showing that prevalence of lifetime use has decreased among junior high school students, particularly among boys. The prevalence of lifetime use increased in each grade, and by the 12th grade 55.6% of boys and 38.5% of girls were regarded as lifetime smokers in 1996, and 55.7% and 36.7%, respectively, in 2000 (table 1); 7.5% of boys and 3.8% of girls in the seventh grade were current smokers (monthly smokers), compared with 36.9% of boys and 15.6% of girls in the 12th grade in 1996. These figures for 2000 were 5.9% for seventh grade boys and 4.2% for seventh grade girls, and 36.9% for 12th grade boys and 15.8% for 12th grade girls (table 1). Less than 1% of boys and girls in the first grade of junior high school were classed as daily smokers in both 1996 and 2000; however, this figure increased notably with age, particular among boys, rising to 25.4% of boys and 7.1% of girls in the 12th grade in 1996, and 25.9% of boys and 8.2% of girls in the 12th grade in 2000 (table 1). Daily smoking rate among senior high school girls slightly rose in 2000.

The major source of cigarettes reported by current smokers was vending machines (table 2). Stores (convenience stores and supermarkets) and tobacconist shops were also important sources for smokers in senior high school. The proportion of smokers who purchased cigarettes in face-to-face settings (convenience stores or tobacconist shops) markedly increased with school grade. The proportion of smokers who purchased cigarettes from vending machines increased in 2000 comparing to 1996 in both sexes.

Estimated cigarette consumption by minors

Estimated consumption by minors was calculated at 4.8–5.7 billion cigarettes in 1996 and 4.6–5.7 billion cigarettes in 2000. The proportion of consumption by minors to total sales was 1.4–1.7%. The corresponding amount of tax raised was 31–39 billion yen in 1996, and 35–43 billion yen in 2000 (table 3). When adult consumption of cigarettes was estimated by multiplying adult smoking prevalence by the

Table 1 Smoking prevalence by sex and school grade (1996, 2000)

Sex	High school	Grade	Lifetime smoking		Current smoking		Daily smoking		Sample size	
			1996 ($\pm$ CI)	2000 ($\pm$ CI)	1996 ($\pm$ CI)	2000 ($\pm$ CI)	1996 ($\pm$ CI)	2000 ($\pm$ CI)	1996	2000
Boy	Junior	1st (7th)	29.9 (0.5)	22.5 (0.4)	7.5 (0.3)	5.9 (0.2)	0.7 (0.1)	0.5 (0.0)	7211	8248
		2nd (8th)	35.1 (0.5)	28.0 (0.4)	10.8 (0.4)	8.2 (0.3)	1.9 (0.1)	1.9 (0.1)	7152	8541
		3rd (9th)	38.7 (0.5)	35.4 (0.5)	14.4 (0.5)	14.0 (0.4)	4.6 (0.3)	5.2 (0.2)	7108	8559
	Senior	1st (10th)	47.7 (0.8)	45.0 (0.6)	24.7 (0.9)	24.3 (0.7)	10.8 (0.6)	12.4 (0.6)	12079	10590
		2nd (11th)	52.6 (0.8)	51.3 (0.5)	31.0 (1.0)	29.5 (0.7)	18.3 (0.8)	18.0 (0.6)	12645	9662
		3rd (12th)	55.6 (0.8)	55.7 (0.6)	36.9 (1.0)	36.9 (0.8)	25.4 (0.9)	25.9 (0.7)	10921	8976
Girl	Junior	1st (7th)	16.7 (0.4)	16.0 (0.3)	3.8 (0.2)	4.2 (0.2)	0.4 (0.0)	0.4 (0.0)	7158	7124
		2nd (8th)	20.4 (0.4)	20.5 (0.3)	5.4 (0.2)	5.7 (0.2)	0.7 (0.1)	1.0 (0.1)	6966	7375
		3rd (9th)	22.7 (0.4)	23.5 (0.4)	5.5 (0.2)	6.9 (0.2)	1.0 (0.1)	1.8 (0.1)	7203	7399
	Senior	1st (10th)	29.2 (0.6)	30.6 (0.6)	9.2 (0.4)	10.9 (0.4)	2.4 (0.1)	3.0 (0.2)	12617	10552
		2nd (11th)	33.6 (0.7)	34.2 (0.6)	13.3 (0.5)	13.0 (0.4)	4.5 (0.2)	5.3 (0.2)	12771	9938
		3rd (12th)	38.5 (0.7)	36.7 (0.6)	15.6 (0.5)	15.8 (0.5)	7.1 (0.3)	8.2 (0.3)	11983	9333

Lifetime smoking: students who had tried smoking at least once.

Current smoking: students who smoker ≥ 1 day of the 30 days preceding the survey.

Daily smoking: students who smoked every day of the 30 days preceding the survey.

CI, 95% confidence interval.

average number of cigarettes smoked by adult smokers, the difference between total sales and adult consumption was shown to have increased gradually over the last 30 years (fig 1). Logically, some part of this increase should be attributed to cigarettes consumed by minors. The increase in the difference appears to have kept pace with the increasing number of cigarettes vending machines (fig 1).

Cigarette brand preference among high school smokers

The three most popular cigarette brands were Mild Seven, Marlboro and Seven Stars in both sexes and both surveys. Mild Seven was the most popular brand in 1996, but was replaced by Marlboro in 2000 (table 4). In terms of overall Japanese market share, by contrast, only one American brand variety ranked in the top 10 brands in 1996, and even in 2000 only two American brand varieties ranked in the top 10 (tables 5 and 6). For high school student smokers, seven varieties for boys and six for girls ranked among the top 10 overall varieties in both the 1996 and 2000 surveys (tables 5

and 6). The consumption-based share of US brands for high school student smokers was 37.7% for boys and 38.0% for girls in 1996, jumping to 51.8% for boys and 61.9% for girls in 2000, against an overall market share of 22.3% in 1996 and 25.1% in 2000.

Moreover, the consumption-based share of brands with the words "Lights," "Mild" or "Pianissimo" in their brand name, which convey a sense of harmlessness, was 29.3% for boys and 40.9% for girls in 1996, and 30.8% for boys and 38.5% for girls in 2000. The share of light, mild, or pianissimo brands among the top 20 brands by overall sales in 1995 and 2000 were 61.0% and 63.8%, respectively.

The share of brand varieties with the word "Menthol" in their name was 4.2% for boys and 8.0% for girls in 1996, jumping to 16.8% for boys and 33.2% for girls in 2000. The share of menthol brands among the top 20 brands by overall sales in 1995 and 2000 were 1.7% and 4.3%, respectively. Most menthol brands were US brands. The top and number two brands among girl smokers in 2000 were both US menthol brands (table 6).

Table 2 Usual sources of cigarettes reported by current smokers (1996, 2000)

Sex	Year	High school	Grade	Tobacconist shop ($\pm$ CI)	Searching in house ($\pm$ CI)	Received from acquaintance, etc ($\pm$ CI)	Stores ($\pm$ CI)	Vending machine ($\pm$ CI)
Boy	1996	Junior	1st (7th)	5.8 (0.7)	15.9 (1.1)	17.5 (1.3)	5.5 (0.7)	20.4 (1.8)
			2nd (8th)	6.1 (0.7)	15.8 (0.9)	22.4 (1.0)	7.6 (1.2)	29.8 (2.2)
			3rd (9th)	11.4 (1.1)	14.3 (0.5)	25.3 (0.8)	12.4 (1.1)	41.5 (2.2)
		Senior	1st (10th)	17.0 (0.9)	13.3 (0.3)	32.4 (0.5)	24.8 (1.5)	59.8 (1.8)
			2nd (11th)	20.2 (0.9)	12.3 (0.4)	28.2 (0.4)	33.2 (1.5)	67.1 (1.4)
			3rd (12th)	26.0 (0.8)	13.9 (0.4)	25.3 (0.4)	40.3 (1.3)	74.4 (1.0)
	2000	Junior	1st (7th)	3.5 (0.5)	13.7 (0.9)	17.3 (1.3)	4.4 (0.6)	17.8 (1.6)
			2nd (8th)	4.2 (0.5)	13.7 (0.8)	20.4 (1.0)	8.0 (0.9)	27.9 (1.8)
			3rd (9th)	9.2 (0.6)	12.7 (0.5)	28.3 (0.7)	14.3 (0.8)	44.5 (1.5)
		Senior	1st (10th)	16.3 (0.8)	10.6 (0.4)	34.0 (0.5)	28.3 (1.1)	62.2 (1.5)
			2nd (11th)	20.3 (0.9)	12.4 (0.4)	29.8 (0.5)	39.0 (1.1)	69.5 (1.1)
			3rd (12th)	25.1 (0.6)	13.2 (0.3)	28.0 (0.5)	49.8 (0.9)	75.7 (0.9)
Girl	1996	Junior	1st (7th)	2.3 (0.7)	14.8 (1.4)	14.7 (2.3)	3.2 (1.1)	9.0 (2.3)
			2nd (8th)	4.6 (0.7)	19.8 (1.3)	16.0 (1.8)	4.7 (1.0)	19.6 (2.7)
			3rd (9th)	3.5 (0.8)	15.1 (1.3)	17.5 (1.6)	5.1 (0.8)	19.2 (2.7)
		Senior	1st (10th)	4.8 (0.6)	13.4 (0.7)	23.1 (1.4)	9.1 (1.1)	33.0 (2.7)
			2nd (11th)	5.9 (0.7)	11.5 (0.6)	23.7 (0.9)	13.3 (1.3)	40.4 (2.5)
			3rd (12th)	8.7 (0.9)	14.1 (0.6)	23.9 (0.8)	19.4 (1.6)	46.5 (2.3)
	2000	Junior	1st (7th)	2.0 (0.6)	12.7 (1.4)	13.4 (2.0)	3.4 (0.7)	12.7 (2.4)
			2nd (8th)	2.5 (0.5)	12.9 (1.0)	17.8 (1.6)	4.5 (0.8)	18.5 (2.0)
			3rd (9th)	3.1 (0.5)	12.4 (0.7)	20.2 (1.5)	7.8 (1.2)	24.8 (2.2)
		Senior	1st (10th)	4.2 (0.5)	11.9 (0.6)	29.1 (1.2)	12.3 (1.1)	38.7 (2.4)
			2nd (11th)	4.8 (0.4)	11.3 (0.5)	25.8 (0.9)	20.0 (1.4)	44.8 (2.2)
			3rd (12th)	7.3 (0.5)	9.8 (0.5)	21.4 (0.7)	26.2 (1.5)	51.8 (2.1)

Percentages add up to more than 100%, as some students mentioned more than one source of cigarettes.

CI, 95% confidence interval.

Table 3 Estimated cigarette consumption by minors (1996, 2000)

Year	Sex	Annual consumption (million)		Annual amount of cigarette sales (billion yen)		Annual amount of cigarette tax (billion yen)	
		Lower estimate	Higher estimate	Lower estimate	Higher estimate	Lower estimate	Higher estimate
1996	Boy	3764.4	4613.9	41.4	50.8	24.7	30.3
	Girl	997.4	1289.1	11.0	14.2	6.6	8.5
	Total	4761.9	5903.0	52.4	64.9	31.3	38.8
2000	Boy	3545.3	4300.1	44.3	53.8	27.2	33.0
	Girl	1076.6	1355.4	13.5	16.9	8.3	10.4
	Total	4621.9	5655.5	57.8	70.7	35.4	43.3

The population of 12–19 years old decreased 1.22 million between 1996 and 2000 in Japan.

The price of most popular cigarette brand raised from 220 yen (1996) to 250 yen (2000).

The proportion of tobacco tax rose from 59.7% (1996) to 61.3% (2000).

The estimated consumption is equivalent to 1.4–1.7% of annual total cigarette sales.

US\$1 = approx 120 yen.

DISCUSSION

This study provides important information about adolescent smoking behaviour in Japan. The limitations of this survey are the relatively low school response rate and decrease in student response rate in 2000 survey. No significant differences were observed in school factors, such as school size, school location, school characteristics (for example, public or private, elite school or not) between responding and non-responding schools. We considered that there was no large selection bias in the sampled schools. The decrease in student response rate was due to the increased number of non-attending students at schools (long-term absentee students) and the low response rate of third graders in senior high schools preparing for entrance examinations to university or college, and the increased proportion of students who rejected participation in this survey. The former two reasons would tend to overestimate the smoking prevalence and the latter would lead to an underestimation. Hence, the net effect of the decrease in student response rate on the estimation on smoking prevalence is not clear. Comparison of the results from two nationwide surveys shows that the lifetime rate of cigarette smoking decreased

among boys between 1996 and 2000, whereas current smoking rate and daily smoking rate were similar between the two surveys. Smoking prevalence among junior high school students in Japan is among the lower-ranked countries for this variable,²⁶ but is higher than that of China.²⁷ The current smoking rate for senior high school boys was similar to that in the United States. In the United States,^{3–6 28 29} smoking prevalence among adolescents increased during the 1990s but has decreased since 2000,³ whereas this phenomenon was not observed in Japan.¹⁰ A characteristic of smoking behaviour among Japanese adolescents is the substantially lower prevalence among girls, which nevertheless appears to have increased. If this tendency continues, the sex difference in smoking prevalence among adolescents is likely to narrow toward that in western countries in the near future.

Thus, smoking behaviour among Japanese adolescents remains a serious problem. Moreover, the present study shows no evidence of an improvement in this situation as a result of anti-smoking educational programmes in schools.

Comparison of the two surveys did not allow us to investigate whether the age of first smoking experience has

Figure 1 Trends in cigarette sales, number of vending machines and market share of imported cigarettes.

Table 4 Share of cigarette brands smoked by high school students (share based on cigarette consumption by brand family: 1996, 2000)

1996			Boys (n = 9809)			Girls (n = 3034)			2000			Boys (n = 9043)			Girls (n = 3647)		
Rank	Brand family	Nationality	% share ($\pm$ CI)	Brand family	Nationality	% share ($\pm$ CI)	Brand family	Nationality	Rank	Brand family	Nationality	% share ($\pm$ CI)	Brand family	Nationality	% share ($\pm$ CI)	Brand family	Nationality
1	Mild Seven	JPN	31.4 (1.0)	Mild seven	JPN	38.5 (2.4)	Marlboro	JPN	1	Marlboro	USA	35.8 (1.2)	Marlboro	USA	49.8 (2.7)	Marlboro	USA
2	Marlboro	USA	21.8 (0.8)	Marlboro	USA	18.7 (1.6)	Mild Seven	USA	2	Mild Seven	JPN	24.8 (1.2)	Mild Seven	JPN	21.8 (2.2)	Mild Seven	JPN
3	Seven Stars	JPN	20.7 (0.6)	Seven Stars	JPN	14.5 (1.4)	Seven Stars	JPN	3	Seven Stars	USA	19.4 (1.0)	Seven Stars	JPN	11.5 (1.6)	Seven Stars	JPN
4	Lucky Strike	USA	4.3 (0.4)	Virginia Slim	USA	4.7 (0.8)	Lark	USA	4	Lark	USA	7.8 (0.6)	Lark	USA	3.6 (0.8)	Lark	USA
5	Lark	USA	4.1 (0.4)	Parliament	USA	4.3 (0.8)	Lucky Strike	USA	5	Lucky Strike	USA	3.0 (0.4)	Kool	USA	2.3 (0.6)	Kool	USA
6	Kool	USA	3.4 (0.2)	Caster	JPN	2.8 (0.6)	Kool	JPN	6	Kool	USA	2.5 (0.4)	Virginia Slim	USA	1.8 (0.6)	Virginia Slim	USA
7	Parliament	USA	2.1 (0.2)	Lucky Strike	USA	2.3 (0.6)	Caster	USA	7	Caster	JPN	1.1 (0.2)	Lucky Strike	USA	1.6 (0.6)	Lucky Strike	USA
8	Hi-lite	JPN	1.8 (0.2)	Salem	USA	2.2 (0.6)	Hi-lite	USA	8	Hi-lite	JPN	0.7 (0.2)	Kent	USA	1.4 (0.6)	Kent	USA
9	Caster	JPN	1.6 (0.2)	Lark	USA	1.9 (0.6)	Kent	USA	9	Kent	USA	0.7 (0.2)	Salem	USA	1.2 (0.4)	Salem	USA
10	Peace	JPN	1.3 (0.2)	Kool	USA	1.7 (0.4)	Cabin	USA	10	Cabin	JPN	0.5 (0.2)	Caster	JPN	1.0 (0.4)	Caster	JPN
11	Hope	JPN	0.9 (0.2)	Cabin	JPN	1.3 (0.6)	Joker	JPN	11	Joker	JPN	0.3 (0.2)	Hi-lite	JPN	0.9 (0.4)	Hi-lite	JPN
12	Cabin	JPN	0.9 (0.2)	Peace	JPN	1.0 (0.4)	Parliament	JPN	12	Parliament	USA	0.3 (0.2)	Parliament	USA	0.7 (0.2)	Parliament	USA
13	Wakaba	JPN	0.7 (0.2)	Frontier	JPN	0.7 (0.4)	Wakaba	JPN	13	Wakaba	JPN	0.3 (0.2)	Joker	JPN	0.4 (0.2)	Joker	JPN
14	Salem	USA	0.6 (0.2)	Wakaba	JPN	0.7 (0.2)	Salem	USA	14	Salem	USA	0.3 (0.2)	Frontier	JPN	0.3 (0.2)	Frontier	JPN
15	Joker	JPN	0.6 (0.2)	Hi-lite	JPN	0.6 (0.4)	Mine	JPN	15	Mine	JPN	0.3 (0.2)	Cabin	JPN	0.2 (0.2)	Cabin	JPN
16	Kent	USA	0.6 (0.2)	Philip Morris	USA	0.5 (0.2)	Peace	USA	16	Peace	JPN	0.2 (0.2)	Wakaba	JPN	0.2 (0.2)	Wakaba	JPN
17	Camel	USA	0.5 (0.2)	Kent	USA	0.5 (0.2)	Philip Morris	USA	17	Philip Morris	USA	0.2 (0.2)	YSL	USA	0.2 (0.2)	YSL	USA
18	Echo	JPN	0.3 (0.0)	Camel	USA	0.4 (0.2)	Camel	USA	18	Camel	USA	0.2 (0.2)	Philip Morris	USA	0.2 (0.2)	Philip Morris	USA
19	Golden Bact	JPN	0.3 (0.0)	Hope	JPN	0.3 (0.2)	Frontier	JPN	19	Frontier	JPN	0.2 (0.2)	Echo	JPN	0.2 (0.2)	Echo	JPN
20	Philip Morris	USA	0.2 (0.0)	Bevel	JPN	0.3 (0.2)	Virginia Slim	JPN	20	Virginia Slim	USA	0.2 (0.2)	Hope	JPN	0.1 (0.2)	Hope	JPN
	Others		1.9			2.2	Others			Others		1.1	Others		0.5	Others	

CI, 95% confidence interval, YSL, Yves Saint Laurent.

Table 5 Share of cigarette brands smoked by high school students (share based on cigarette consumption by varieties: 1996)

1996		Boys (n=9809)				Girls (n=3034)				Overall market share (1995)			
Rank	Brand name	Nationality	Filter	Colour	% share ($\pm$ CI)	Brand name	Nationality	Filter	Colour	% share ($\pm$ CI)	Brand name	Nationality	% share
1	Seven Stars	JPN	CF	W/S	20.4 (0.6)	Mild Seven Lights	JPN	CF	W/B	19.3 (1.6)	Mild Seven	JPN	12.0
2	Marlboro	USA	CF	W/R	14.9 (0.6)	Seven Stars	JPN	CF	W/S	14.3 (1.4)	Mild Seven Lights	JPN	10.7
3	Mild Seven	JPN	CF	W/B	14.8 (0.6)	Mild Seven	JPN	CF	W/B	13.8 (1.6)	Mild Seven Super Lights	JPN	9.1
4	Mild Seven Lights	JPN	CF	W/B	14.2 (0.6)	Marlboro	USA	CF	W/R	8.7 (1.2)	Caster Mild	JPN	7.5
5	Lucky Strike BOX	USA	CF	W/R	4.0 (0.4)	Marlboro Lights	USA	F	W/G	5.1 (0.8)	Seven Stars	JPN	7.5
6	Kool	USA	F	W/G	2.8 (0.2)	Menthol BOX	JPN	CF	W/B	4.8 (0.8)	Cabin Mild BOX	JPN	3.7
7	Lark	USA	CF	R/W	2.8 (0.2)	Parliament FK	USA	O	W/B	3.6 (0.8)	Frontier Lights BOX	JPN	2.7
8	Marlboro Menthol BOX	USA	F	W/G	2.4 (0.2)	Marlboro Menthol BOX USA	USA	F	W/G	2.7 (0.6)	Lark Milds BOX	USA	2.2
9	Marlboro Lights	USA	CF	W/Go	2.1 (0.2)	Virginia Slim	USA	CF	W/G	2.3 (0.6)	Hope	JPN	1.9
10	Marlboro Lights Menthol BOX	USA	F	W/G	2.0 (0.2)	Lucky Strike BOX	USA	CF	W/R	2.0 (0.6)	Hi-lite	JPN	1.7
11	Mild Seven Super Lights	JPN	CF	W/B	1.9 (0.2)	Marlboro Lights	USA	CF	W/Go	1.9 (0.6)	Cabin Super Mild BOX	JPN	1.6
12	Parliament FK	USA	O	W/B	1.8 (0.2)	Caster Mild	JPN	CF	W/Y	1.8 (0.6)	Peace Lights BOX	JPN	1.5
13	Hi-lite	JPN	F	W/B	1.6 (0.2)	Lark	USA	CF	R/W	1.4 (0.4)	Mild Seven FK	JPN	1.4
14	Lark Milds	USA	CF	W/R	1.2 (0.2)	Virginia Slims Lights	USA	F	W/G	1.4 (0.4)	PM Super Lights BOX	USA	1.3
15	Caster Mild	JPN	CF	W/Y	1.1 (0.2)	Kool	USA	F	W/G	1.3 (0.4)	Marlboro BOX	USA	1.2
16	Peace	JPN	F	Y/Go	1.0 (0.2)	Cabin BOX	JPN	CF	R/W	1.0 (0.4)	Parliament 100 BOX	USA	1.2
17	Wakaba	JPN	F	Y/G	0.7 (0.2)	Salem BOX	USA	F	W/G	0.9 (0.4)	Virginia Slims Lights	USA	1.2
18	Hope	JPN	F	W/B	0.7 (0.2)	Peace	JPN	F	Y/Go	0.8 (0.4)	Menthol	USA	1.1
19	Joker	JPN	F	W/Bla	0.6 (0.2)	Caster	JPN	CF	W/Y	0.8 (0.4)	Kent Milds BOX	USA	1.1
20	Kool Milds FK BOX	USA	F	W/G	0.5 (0.2)	Wakaba	JPN	F	Y/G	0.7 (0.2)	Mild Seven Extra Lights	JPN	1.0
	Others				8.5	Others				11.2	Peace	JPN	1.0
											Others		28.4

CF, charcoal filter; F, plane filter (acetate filter); O, others without charcoal.

Colour indicates package colour: B/G, blue and gold; R/W, red and white; W/B, white and blue; W/Bla, white and black; W/G, white and green; W/Go, white and gold; W/R, white and red; W/S, white and silver; W/Y, white and yellow; Y/G, yellow and green; Y/Go, yellow and gold.

CI, 95% confidence interval.

Table 6 Share of cigarette brands smoked by high school students (share based on cigarette consumption by varieties: 2000)

2000	Boys (n = 9043)				Girls (n = 3647)				Overall market share (2000)				
Rank	Brand name	Nationality	Filter	Colour	% share (±CI)	Brand name	Nationality	Filter	Colour	% share (±CI)	Brand name	Nationality	% share
1	Seven Stars	JPN	CF	W/S	19.0 (0.8)	Marlboro Lights Menthol	USA	F	W/G	19.8 (1.6)	Mild Seven Super Lights	JPN	9.6
2	Marlboro	USA	CF	W/R	15.3 (0.8)	Marlboro Menthol	USA	F	W/G	14.6 (1.6)	Mild Seven Lights	JPN	9.3
3	Mild Seven	JPN	CF	W/B	11.3 (0.8)	Seven Stars	JPN	CF	W/S	11.0 (1.8)	Mild Seven	JPN	8.6
4	Mild Seven Lights	JPN	CF	W/B	10.8 (0.6)	Marlboro	USA	CF	W/R	10.2 (1.4)	Seven Stars	JPN	6.9
5	Marlboro Menthol	USA	F	W/G	8.4 (0.8)	Mild Seven	JPN	CF	W/S	9.5 (1.4)	Caster Mild BOX	JPN	5.0
6	Marlboro Lights	USA	F	W/G	7.8 (0.4)	Mild Seven Lights	JPN	CF	W/B	9.4 (1.4)	Marlboro Lights Menthol	USA	2.7
7	Lark	USA	CF	R/W	5.3 (0.4)	Marlboro Lights	USA	CF	W/Go	4.4 (1.2)	Cabin Mild	JPN	2.6
8	Marlboro Lights	USA	CF	W/Go	2.7 (0.4)	Lark	USA	CF	R/W	2.6 (1.0)	Mild Seven Extra Lights	JPN	2.3
9	Lucky Strike BOX	USA	CF	W/R	2.6 (0.4)	Mild Seven Super Lights	JPN	CF	W/B	2.4 (0.8)	Lark Milds KS BOX	USA	2.3
10	Lark Milds	USA	CF	W/R	2.4 (0.2)	Kool	USA	F	W/G	1.5 (0.8)	Frontier Lights BOX	JPN	2.1
11	Mild Seven Super Lights	JPN	CF	W/B	2.1 (0.4)	Virginia Slims	USA	CF	W/G	1.2 (0.6)	Hope	JPN	1.7
12	Kool	USA	F	W/G	1.4 (0.2)	Lucky Strike BOX	USA	CF	W/R	1.0 (0.4)	Marlboro BOX	USA	1.2
13	Marlboro Medium	USA	CF	W/R	0.8 (0.2)	Lark Milds	USA	CF	W/R	0.9 (0.4)	Hi-lite	JPN	1.2
14	Kool Milds FK BOX	USA	F	W/G	0.7 (0.2)	Hi-lite	JPN	F	W/B	0.9 (0.4)	Peace Lights BOX	JPN	1.2
15	Hi-lite	JPN	CF	W/B	0.7 (0.2)	Salem BOX	USA	F	W/G	0.7 (0.4)	Salem Planissimo	USA	1.1
16	Caster Mild	JPN	CF	W/Y	0.5 (0.2)	Kool Milds FK BOX	USA	F	W/G	0.7 (0.4)	Kent One BOX	USA	1.1
17	Caster	JPN	CF	W/Y	0.4 (0.2)	Caster Mild	JPN	CF	W/Y	0.6 (0.4)	Kent One 100's BOX	USA	1.1
18	Marlboro BOX	USA	CF	W/R	0.4 (0.2)	Kent FK	USA	F	W/B	0.6 (0.4)	Cabin Ultra Mild BOX	JPN	1.0
19	Joker	JPN	F	W/Blk	0.3 (0.2)	Kent Lights Menthol KS BOX	USA	F	W/G	0.6 (0.2)	Parliament 100's BOX	JPN	1.0
20	Seven Stars Menthol BOX	JPN	F	W/G	0.3 (0.2)	Lucky Strike Menthol Lights BOX	USA	F	W/G	0.5 (0.4)	Caster Super Mild BOX	JPN	1.0
	Others				6.6	Others				7.0	Others		37.0

CF, charcoal filter; F, plane filter (acetate filter); O, others without charcoal.

Colour indicates package colour; B/G, blue and gold; R/W, red and white; W/B, white and blue; W/Bla, white and black; W/G, white and green; W/Go, white and gold; W/R, white and red; W/S, white and silver; W/Y, white and yellow; Y/G, yellow and green; Y/Go, yellow and gold.

CI, 95% confidence interval.

decreased among adolescents.¹⁰ Observation on smoking rates and trends in age at which smoking is tried by periodical nationwide survey is required.

We observed that the proportion of smokers who smoke 20 or more cigarettes per day for boys and 10 or more for girls increased between the two surveys. This suggests that the proportion of moderate to heavy adolescent smokers has increased.

Compared with other countries, a popular source of cigarettes for Japanese adolescent smokers is cigarettes vending machines.^{30–32} The proportion of adolescent smokers who obtain cigarettes from vending machines in Japan was much higher than that in the United States.²⁹ In 1996 to 1998, the retail tobacco industry began night restrictions on vending machine sales between 11 pm to 5 am, and beginning 1998, all vending machines are now automatically shut down during these hours. In spite of this measure, however, the proportion of adolescent smokers who purchase cigarettes from vending machines increased between the 1996 and 2000 surveys, indicating that this voluntary restriction has had no impact on adolescent smokers. Since the rate of illegal merchant sales in the community is related to the adolescent smoking rate,³³ vending machines should be banned in Japan. Moreover, many adolescent smokers report purchasing their cigarettes from convenience stores or tobacconist shops, indicating the insufficiency of voluntary measures based on the identification of customer age by shop staff.

This study also reveals that a huge number of cigarettes are consumed annually by Japanese adolescents. Since the number of arrests under the Act to Prohibit Minors from Smoking is extremely low (only five individuals in 1996 and nine in 2000 by the National Police Agency), the law does not function at all. The increased number of cigarettes consumed by girl smokers in spite of the decrease in the minor population between 1996 and 2000 is a serious problem. This increase represents an increase in both the prevalence of regular smoking among girls and in the average daily number of cigarettes smoked per smoker. To deal with this, sex-oriented information, such as concerning the adverse consequences of smoking on younger females, including pregnant women, should be emphasised in school health education. Moreover, the discrepancy between annual total cigarette sales and annual adult cigarette consumption estimated from the smoking rate and daily cigarette consumption of adult smokers has increased in recent years. Cigarette consumption by adolescent smokers may account for an important part of this trend. However, data are available from two surveys only, 1996 and 2000, emphasising the need for ongoing periodic nationwide surveys on adolescent smoking. A proportion of the Japanese government's huge tobacco tax yield from adolescent smoking (35–43 billion yen in 2000) should be spent on surveys and anti-smoking measures, because national government spent only 75 million yen on prevention of minor smoking in 2004.

Since a large proportion of adolescent smokers purchase their cigarettes from vending machines and are likely to be affected by cigarette advertisements,¹⁴ along with the increase in the market share of imported cigarettes, the increase in the number of vending machines and in the market share of imported cigarettes indirectly supports the increase in adolescent smoking prevalence. Even in face-to-face settings, it is easy for Japanese adolescents to purchase cigarettes. One recent study showed that Japanese students had no difficulty in purchasing cigarettes even when wearing a school uniform.³⁴ These findings suggest that part of the difference between total sales and adult consumption may be accounted for by adolescent smoking.

What this paper adds

Smoking behaviour and cigarette brand preference among adolescents were periodically surveyed in Western countries. The results have been utilised for developing smoking control measures directed at minors. The brand preference is different from that among adults, and varies by ethnicity.

The current findings demonstrate that the main source of cigarettes among high school smokers in Japan is vending machines. The proportion of smokers who usually purchased cigarettes from vending machines increased in 2000, in spite of the introduction of restrictions on night-time operations in 1998. Japanese adolescents were more likely than adults to smoke American cigarette brands, and the adolescent market share of American brands has increased rapidly, especially for menthol brands.

With regard to brand preference, the many surveys conducted in the United States^{35–40} have revealed that the brand preferences of adolescent smokers differ from those of adults. The top brand among adolescent smokers is Marlboro, with a 60% share, and together with Newport and Camel this brand accounts for a 90% share. American adolescent smokers are more likely to select from among a smaller range of brand families, and the popularity of brands differs by ethnicity.³⁵

In contrast to this abundance of data in the United States, the present study was the first survey on cigarette brand preferences among Japanese adolescent smokers.⁴¹ Comparison of the 1996 and 2000 surveys shows that popularity has tended to concentrate in three major brands up to 2000, which together represented about 80% of the market in that year. On the other hand, the overall market share of the top three brands was 31.8% in 1995 and 27.5% in 2000. Surprisingly, brand popularity showed a dramatic change between 1996 and 2000, with Marlboro becoming the number 1 brand among both sexes. The specific characteristic of this change was the rapid increase in American brands and menthol brands, possibly reflecting successful marketing by American tobacco companies.⁴² This result indicates that cigarette brand preferences among adolescent smokers are more easily changed than among adults. Given the finding that menthol cigarettes may play a role as a starter product for minor smoking, especially for girls,⁴³ the government should regulate tobacco product categories to prevent the initiation of smoking among minors. An indirect association of American cigarette advertising and cigarette consumption in Japan had been reported,⁴⁴ but there is no evidence of a direct association between advertising and adolescent smoking. Brands that give the appearance of being harmless through use of the words "Lights", "Mild" or "Pianissimo" in their name are popular among adolescent smokers. Such branding does not mean that these brands are less harmful because the amount of toxic substances in their smoke is no different to that of other brands.⁴⁵ The use of these names should be banned to help prevent adolescent smoking. Following from the initial indication of this association via cohort^{16 46} and cross-sectional studies,¹⁷ further study on the association between adolescent brand preferences and brand marketing in Japan is required.

In 2004, the Japanese government ratified the Framework Convention on Tobacco Control, which came into effect on 27 February 2005. Numerous measures to reduce adolescent smoking are available to the government,^{47–52} but concrete efforts to date have been half-hearted and, as this paper shows, ineffectual. Were the government to choose to fulfil

its obligations under the Framework and implement effective measures, the scourge of adolescent smoking might be considerably alleviated.

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