

## RESEARCH COMMUNICATION

# Mobile Phone Use does not Discourage Adolescent Smoking in Japan

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### Abstract

**Objective:** The possibility that smoking prevalence among junior and senior high school students may decrease with increasing mobile phone bill was reported by the mass media in Japan. We conducted a nationwide survey on adolescent smoking and mobile phone use in Japan in order to assess the hypothesis that mobile phone use has replaced smoking. **Methods:** A total of 70 junior high schools (response rate; 71%), and 69 high schools (90%) from all over Japan responded to 2005 survey. Students in the responding schools were asked to fill out an anonymous questionnaire about smoking behavior, mobile phone bill, and pocket money. Questionnaires were collected from 32,615 junior high school students and 48,707 senior high school students. **Results:** The smoking prevalence of students with high mobile phone bill was more likely to be high, and that of students who used mobile phones costing 10,000 yen and over per month was especially high. When “quitters” were defined as students who had tried smoking but were not smoking at the time of survey, the proportion of quitters decreased as the mobile phone bill increased. The proportion of students who had smoking friends increased with the increase in the mobile phone bill per month. **Conclusion:** The hypothesis that the decrease in smoking prevalence among Japanese adolescents that has been observed in recent years is due to a mobile phone use can be rejected.

**Keywords:** Mobile phone - cigarette smoking - adolescent - behavior - Japan

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### Introduction

Cigarette smoking increases the risk of many diseases. Given the difficulty of escaping nicotine dependence, prevention of smoking among adolescents has been identified as a major public health measure. The monitoring of smoking prevalence among adolescents is thus an important means of clarifying the characteristics of this problem, establishing countermeasures, and evaluating public health efforts to reduce smoking prevalence. Many articles describe associated factors or predictors of adolescent smoking (Sen & Basu, 2000, Ma et al., 2008; Villanti et al., 2011). Therefore, analyzing contributing factors is important for establishing appropriate countermeasures.

Mobile phones are used by the majority of adolescents as vital communication tool. There have been some reports of an association between mobile phone use and health-related behaviors among youth (Augner & Hacker, 2012).

In the 1990s, the prevalence of adolescent smoking decreased in European and North American countries. Since British researchers (Charlton & Bates, 2000) observed that the trend in adolescent smoking prevalence was inversely correlated with the prevalence of mobile

phone use in British study in 2000, they hypothesized that mobile phone use contributed to the decreasing in the smoking prevalence.

Some reports contradicting these hypotheses have subsequently been published. There was one report indicating that the prevalence of adolescent smoking had decreased earlier than the spread of mobile phones (Invernizzi, 2001). In addition, the prevalence of adolescent smoking actually increased in some of the countries where mobile phones has spread among the young people (Italian girls, Switzerland) (Invernizzi et al., 2001; Lee 2001). In other countries, researchers examined the association between smoking behavior and the possession of mobile phone directly (Koivusidfta et al., 2003; 2005; Sleggles & Jarvis, 2003). These studies found that the smoking prevalence was high in the young people who used their mobile phones frequently. These studies all indicate that the previously proposed hypothesis should be rejected. However, the hypothesis was not tested in Asian countries.

In Japan, we observed a dramatic reduction in the smoking prevalence among the junior and senior high school students in a nationwide surveys after 2000 (Osaki et al., 2008). The hypothesis that smoking prevalence

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among junior and senior high school students may have decreased due to increase in mobile phone bill was reported by the mass media in Japan.

We conducted a national survey in 2005 to examine whether the decrease in smoking prevalence was caused by increasing mobile telephone use in Japan. The decrease in the adolescent smoking prevalence is a favorable finding regardless of the reason for the decrease, however misunderstanding the reason for the reduction may lead to the promotion of incorrect counter-measures in the future.

## Materials and Methods

In order to confirm the decrease in smoking prevalence among high school students noted in the 2004 survey, a nationwide survey on smoking behavior among Japanese junior and senior high school students was conducted in 2005. The sampled schools in the 2005 survey were those that had responded in the 2000 survey, so a total of 99 junior high schools and 77 senior high schools were asked to participate in this survey. A total of 70 of these junior high schools (response rate; 71%), and 69 of these senior high schools (90%) responded to the 2005 survey. The schools sampled in the 2000 survey were selected randomly using a national school directory (Osaki et al., 2008).

The number of students who responded to the present survey was 32,615 junior high schools and 48,707 senior high schools (81,322 students in total).

The anonymous questionnaire included questions about smoking status, the monthly mobile telephone bill, friends' smoking habits, and their monthly amount of pocket money in order to investigate the reasons for the decrease in smoking prevalence. Experimenting smokers, current smokers and daily smokers were defined as those who had tried smoking at least once, those who had smoked at least once during the previous 30 days, and those who had smoked every day during the previous 30 days, respectively. The quitters were defined as students who had tried smoking, but did not smoke at the time of the survey. The mobile phone bill per month was assessed for 8 categories, namely no use, <1000 Japanese yen, <2000 yen, <3000 yen, <5000 yen, <10000 yen, <20000yen, and 20000 yen and over. The mobile phone bills were then divided into 5 categories, no use, <3000 yen, <5000 yen, <10000 yen, and 10000 yen and over for the statistical analyses because of the small number of subjects in some categories. The smoking status was calculated for each of the categories of mobile phone use.

The Cochran-Armitage test was used to evaluate for trends in proportions. In addition, a multiple logistic regression analysis was applied to calculate the odds ratios of each category of mobile phone bill using the "no use" group as a reference group to smoking status. The current smoking was used as an independent variable in the statistical model. The odds ratios were calculated with current smoking used as the independent variable and explanatory variables including sex, age, and the mobile phone bill. The data were analyzed using the SPSS for Windows (version 18.0) software program (SPSS Inc.; IL, USA).

## Results

A decrease in the smoking rate was found in 2005 in both males and females, and for both junior and senior high school students compared with the 2000 survey. The experimental smoking rate, current smoking rate, and daily smoking rate for males were 43.5%, 22.0%, and 12.2% in 2000, and were 24.7%, 10.4%, 5.0%, respectively in 2005. The rates for females were 28.4%, 10.0%, 3.6% in 2000, and 17.0%, 5.7%, 1.9% in 2005. The reduction in smoking prevalence among junior and senior high school students was reviewed similar to the results in the 2004 nationwide survey. The proportion of students who did not use a mobile phone was 56.1% for junior high school males, 42.3% for junior high school females, whereas the figures decreased in senior high school students to 10.0% for males and 4.0% for females. That indicates that the vast majority of senior high school students use a mobile phone.

Among the mobile phone users within the senior high school student population, more than half of the students spent 5,000 yen a month or more. The smoking prevalence was higher for students spending 5,000 yen or more for their monthly mobile phone bill, and the prevalence was much higher for students spending 10,000 yen or more. This was the case for both sexes and for both junior and senior high school student (Table 1). We investigated the proportion of students who quit smoking among the experimenters in the 2005 survey. The prevalence of quitters among all respondents was 4.8% for junior high school males, 3.3% for females, 7.8% for senior high school males, and 5.4% for females. When the number of experimenters' students was used as a denominator, the proportion of quitters was 39.3% for junior high school males, and 32.5% for females, and was 27.8% for senior high school males, and 30.2% for females. When we examined the proportion of the quitters (among experimenters) according to mobile phone bill per month, we found that the proportion of students tended to be lower for those with high mobile phone bills (Table 1).

In order to assess the association between the mobile phone bill and smoking status among students, a multiple logistic regression analysis was applied to adjust for differences in gender and age. The mobile phone bill was divided into 5 categories (no use, <3000 yen, <5000 yen, <10000 yen, and ≥10000 yen) and 'no use' was used as the reference group for the other categories. Compared with students who did not use a mobile phone, the relative risks of the other 4 categories for current smoking was 1.1 (95% Confidence Interval; 0.9-1.4), 0.9 (0.8-1.0), 2.4 (2.1-2.6) and 8.1(7.3-9.0), indicating that students who have expensive mobile phone bill are more likely to be smokers. This association remained after entering variables related to parental and siblings smoking into the statistical model.

When an analysis was performed using smoking cessation among the smoking experimenters as a independent variable and with the mobile phone bill as covariates, compared with students who did not use a mobile phone, the relative risks of other 4 categories were 1.0 (0.7-1.3), 1.1 (1.0-1.3), 1.0 (0.9-1.1), and 0.8 (0.7-0.9). Therefore, smokers with the highest mobile phone bills are

**Table 1. Smoking Status By Mobile Phone Bill Per Month**

	Boys			Girls				
	No. of students	current smoker % (95% CI)	quitter % (95% CI)	have smoking friends % (95% CI)	No. of students	current smoker % (95% CI)	quitters % (95% CI)	have smoking friends % (95% CI)
Junior high school:								
no use	9593	2 ( 2.1- 2.7)	45 (41.9-49.0)	16 (15.4-16.9)	6565	1 ( 1.1- 1.6)	38 (32.4-43.1)	12 (11.6-13.2)
<3000 yen	1809	4 ( 2.9- 4.5)	46 (38.4-52.8)	17 (15.6-19.0)	2082	2 ( 1.1- 2.2)	37 (27.4-47.3)	14 (12.9-15.9)
<5000 yen	1963	3 ( 2.6- 4.2)	39 (32.2-46.1)	25 (22.7-26.5)	2515	2 ( 1.5- 2.6)	40 (33.0-47.7)	19 (17.0-20.0)
<10000 yen	2660	8 ( 6.6- 8.6)	35 (30.4-38.8)	35 (32.9-36.5)	2952	4 ( 3.5- 4.9)	36 (31.4-40.6)	30 (28.6-31.9)
≥10000yen	1080	20 (17.3-22.0)	30 (25.0-34.6)	38 (35.4-41.2)	1396	13 (11.6-15.2)	33 (27.7-37.3)	42 (39.2-44.3)
test for trend		p<0.01	p<0.01	p<0.01		p<0.01	p=0.10	p<0.01
Senior high school:								
no use	2474	8 ( 7.3- 9.5)	32 (27.1-37.2)	30 (28.6-32.2)	957	5 ( 3.9- 6.8)	30 (20.8-39.0)	25 (22.5-28.0)
<3000 yen	2576	6 ( 5.1- 6.9)	34 (29.2-39.6)	42 (40.2-44.0)	2069	3 ( 2.4- 3.9)	32 (24.7-39.4)	27 (25.0-28.8)
<5000 yen	4828	6 ( 5.3- 6.6)	36 (32.8-39.5)	54 (52.3-55.1)	5217	2 ( 1.2- 1.9)	36 (31.3-41.2)	34 (33.0-35.6)
<10000 yen	11064	15 (14.1-15.4)	29 (27.5-30.6)	66 (64.8-66.5)	10986	6 ( 5.3- 6.2)	33 (30.3-34.6)	51 (50.5-52.3)
≥10000yen	3691	36 (34.1-37.2)	20 (18.2-21.9)	74 (72.1-75.0)	4845	20 (18.7-20.9)	26 (24.3-28.4)	69 (67.9-70.5)
test for trend		p<0.01	p<0.01	p<0.01		p<0.01	p<0.01	p<0.01

\* 'Quitter: students who tried smoking but do not smoke currently

less likely to quit smoking. Moreover, when an analysis was performed in order to assess the association between the mobile phone bill and having smoking friends, the proportion of students who had friends who smoked increased as the mobile phone bill increased for both sexes and for both junior and senior high school students.

## Discussion

The present study revealed that students who reported a higher mobile phone bill were more likely to smoke cigarettes, less likely to quit smoking, and more likely to have friends who smoke. Therefore, the hypothesis (Charlton & Bates, 2000) that the decrease in smoking prevalence among adolescents during recent years is due to mobile phone use can be rejected. This result was similar to previous studies conducted in European countries (Koivusilta et al., 2003; 2005; Steggles & Jarvis, 2003). The mobile phone is an important item for adolescents, and is a symbol of their human relationships. The use of mobile phone, which can lead to activities, such as part-time jobs top at the mobile phone bill, are also linked to experience with smoking or alcohol use, and are influence by friendship.

Smoking and alcohol use among adolescents is also closely related to pocket money or spending money (Zhang et al., 2007). The present survey also observed associations among the mobile phone bill, pocket money and smoking among adolescents in Japan. Since using a mobile phone is not a reason responsible for the decline in the smoking prevalence among adolescents, an additional spread of mobile phone use among adolescents in the near future will be unlikely to lead to a further decrease in smoking prevalence.

Because the present study was a cross-sectional study, we cannot determine which was the preceding factor among smoking, alcohol use, mobile phone use, and human relationship. However, the present study showed a strong relationship among these factors. Since we can conclude that students who use mobile phones frequently

are an important high risk group for adolescent smoking, a health education program employing mobile phone applications may be useful for providing information to these high risk groups. A dramatic increase in cigarette prices will likely be necessary before adolescent smokers give up their smoking habit.

In conclusions, we conducted a nationwide survey on adolescent smoking and mobile phone use in Japan in order to assess the hypothesis that mobile phone use has replaced smoking. We revealed that students who reported a higher mobile phone bill were more likely to smoke cigarettes, less likely to quit smoking, and more likely to have friends who smoke. Therefore, the hypothesis that the decrease in smoking prevalence among adolescents during recent years is due to mobile phone use can be rejected.

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