

## Relationship between Smoking History and Annual Medical Checkup Attendance in Undergraduates

Hisako Sasahara<sup>1)</sup>, Atsushi Shimazu<sup>1)</sup>, Kenryo Hiramoto<sup>2)</sup>, Kazumasa Yanagawa<sup>2)</sup>, Hiroki Nikawa<sup>1)</sup>

<sup>1)</sup>*Integrated Health Sciences, Institute of Biomedical & Health Sciences, Hiroshima University*

<sup>2)</sup>*Office of Student Affairs, Hiroshima University of Economics, Japan*

### Abstract

Even though smoking is closely related to drinking and other negative health behaviors, there are few papers on the relationship between smoking and checkup attendance. We investigated whether smoking histories related to differences in annual checkup attendance.

We obtained undergraduate students' smoking histories at annual medical checkups at a mid-sized private university in Japan. We examined a dataset containing the data for all 17,831 male and 2,740 female undergraduates from a typical Japanese university's regular spring medical checkups for every year from 2008 to 2013; it included whether an undergraduate had attended the checkup and had ever smoked. We investigated the number of times undergraduates attended the checkup by gender, survey year, student's year of study, and smoking history.

Compared to undergraduates who had never smoked, those who currently or historically smoked attended significantly fewer annual checkups. The difference was more remarkable among men.

The results suggested that more could be done to encourage undergraduates who smoke to have checkups, which could provide an opportunity for smoking cessation advice and treatment.

**Key words:** Smoking, checkup, attendance, undergraduates, friendships

### ❖ Introduction

Regular checkup rates are high for Japanese children and students but low for adults<sup>1)</sup>.

Specifically, the rates for the early childhood exams are quite high, at 90%<sup>2,3)</sup>. School checkups from kindergarten through high school are part of the school curriculum, so almost all students have the checkup. The checkup rate at universities is quite high, but not as high as the almost 100% rate for school checkups through high school<sup>4)</sup>. Most of the university checkups occur during the orientation period at the beginning of the school year. However, because undergraduates are free to choose a time convenient for them, it is also pos-

sible to avoid a checkup completely.

The checkup rate for homemakers and self-employed people is only 34.3%<sup>5)</sup>. On average, the checkup rate for workers at their places of employment is 88.5%, but rates vary widely by company<sup>6)</sup>. In addition, the rates for cancer screenings are low<sup>7,8)</sup>.

Meanwhile, regarding tobacco use in Japan, in 1966, 83.7% of men and 18.0% of women smoked<sup>9)</sup>. In 2014, the same survey showed rates of 30.3% for men and 9.8% for women—in 50 years, the rates declined drastically<sup>9)</sup>. Smoking may be closely linked with other negative health behaviors<sup>10,11)</sup>. There are a few papers on the relationship between smoking and checkup attendance for elderly people<sup>12,13)</sup>. However, we could not find studies on young people.

In summary, checkup rates vary, smoking rates decreased considerably, and many factors are related to smoking. Thus, in this study performed at a mid-sized private Japanese university, we used data spanning six years from the university's annual medical checkups assessing whether undergraduates had ever been smok-

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Address: Hisako Sasahara, Integrated Health Sciences, Institute of Biomedical & Health Sciences, Hiroshima University, 1-2-3 Kasumi, Minami-ku, Hiroshima 734-8553, Japan.

Email: his-his-kes@hiroshima-u.ac.jp, Tel and Fax: +84-82-257-5797

ers. In a previous study, using the same dataset<sup>14)</sup>, we showed that undergraduates who did not graduate within 4 years had higher smoking rates in the fourth year than those who did graduate within 4 years. In this study, we empirically investigated whether differences in undergraduates' annual medical checkup attendance related to their smoking histories.

## ❖ Methods

### 1. Study site

The school that participated in the study is a four-year private university in Hiroshima Prefecture, although undergraduates can be enrolled for up to eight years. The university has only the department of economics, and is a typical middle-sized university in Japanese provincial cities.

### 2. Annual medical checkups

Every year, this university hires a specialist company to provide medical checkups at the beginning of every school year (April). Just before the checkups, undergraduates have to respond to a medical history questionnaire composed of smoking and drinking history, medical history, and 30 subjective symptom items.

The school's internet bulletin board, posters, and individual emails encourage undergraduates to attend the checkups. All undergraduates can take the checkups once a year.

### 3. Study subjects

Table 1 shows the demographic information of all registered undergraduates (23,402: 20,466 men, 2,936 women) at the university by survey year, gender, and year of study.

The subjects were 20,571 undergraduates (17,831 men, 2,740 women) who participated in the annual checkups from the beginning of the school year 2008 through May 30, 2013. We obtained student's year of study, gender, survey year, and answer to the question on whether the undergraduate had ever been a smoker. We did not obtain the detailed academic record of each undergraduate for the study.

### 4. Smoking history

The checkup questionnaire included a question on whether the undergraduate had ever been a smoker. Undergraduates were instructed to indicate whether they "never smoked," "used to smoke," or "currently smoke." Then, for the analysis, "used to smoke" and

Table 1 Demographic information of all registered undergraduates at the university

Year of study	Survey year						Total
	2008	2009	2010	2011	2012	2013	
<b>Men</b>							
1 <sup>st</sup> Year	851	923	905	767	763	674	4,883
2 <sup>nd</sup>	808	830	913	882	758	740	4,931
3 <sup>rd</sup>	807	789	807	880	851	737	4,871
4 <sup>th</sup>	787	790	769	773	849	820	4,788
5 <sup>th</sup>	96	98	102	112	124	150	682
6 <sup>th</sup>	24	31	36	36	42	35	204
7 <sup>th</sup>	13	13	14	15	14	13	82
8 <sup>th</sup>	3	4	7	2	4	5	25
<b>Total</b>	<b>3,389</b>	<b>3,478</b>	<b>3,553</b>	<b>3,467</b>	<b>3,405</b>	<b>,3174</b>	<b>20,466</b>
<b>Women</b>							
1 <sup>st</sup> Year	118	139	131	115	131	105	739
2 <sup>nd</sup>	122	113	137	127	114	124	737
3 <sup>rd</sup>	118	121	111	133	119	113	715
4 <sup>th</sup>	121	116	116	109	131	115	708
5 <sup>th</sup>	3	5	1	4	10	11	34
6 <sup>th</sup>	1	0	0	1	0	1	3
<b>Total</b>	<b>483</b>	<b>494</b>	<b>496</b>	<b>489</b>	<b>505</b>	<b>469</b>	<b>2,936</b>

“currently smoke” were counted as “smoking history: yes” and “never smoked” as “smoking history: no.”

## 5. Statistical analyses

### 5.1 Checkup attendance rates

We calculated checkup attendance rates by comparing the data of all registered undergraduates by gender, survey year, and year of study. The rates of checkup attendance times were objective, because they were counted from the checkups company’s data.

### 5.2 Smoking and checkup attendance

We divided data by gender, survey year, year of study, and history of smoking. We counted the number of undergraduates having the maximum number of checkups and the number who had fewer than the maximum. We then performed chi-square tests. Specifically, we used the following procedure.

- Undergraduate data records were divided into groups by gender.
- These were then divided into groups by survey year.
- The maximum length of time an undergraduate could be enrolled at the university was eight years. We divided the undergraduates by year of study and smoking history (Y/N); for each group, we counted the undergraduates who had the maximum number of checkups and those who did not.

Finally,  $2 \times 2$  contingency tables were completed. For example, for third-year undergraduates who enrolled in 2010, the results included data for their first to third years of study. The maximum number of checkups they could have had was three. They were divided into groups having had the maximum three checkups and those who only had a checkup one or two times.

- The  $2 \times 2$  contingency tables of second-year undergraduates and above were combined into one by survey year (2009~2013). For undergraduates in 2008 and first-year undergraduates in every survey year, the results included only the first data.
- Chi-square tests were used to determine a relationship between smoking history (Y/N) and whether those undergraduates had the maximum number of checkups. The statistical functions of Microsoft Excel 2010 were used for the analyses. However, Fisher’s exact tests of SPSS were performed when expectations were less than five.

## 6. Institutional review board approval

This study was approved by the Hiroshima Univer-

sity Epidemiology Research Ethical Review Committee (Daieki-748 July 28, 2014).

## ❖ Results

### 1. Checkup rates by gender, survey year and year of study

The annual checkup rate for the entire six years was 87.1% for men and 93.3% for women.

Figure 1 shows the changes in the male medical checkup attendance rates by student’s year of study over the study’s six survey years. Because of the small numbers of men in the seventh and eighth years of study (Table 1), there were wide variations in rates; those results were deleted. The rate for men in their first year was consistently near 100% over the years studied. However, for other years of study, the rates declined, with 2009 being the highest. By year of study, rates for the men in their second and third years declined, but in their fourth year, the rate rose, although not quite as high as for men in their first year. However, for men in their fifth and sixth years, the rate declined to less than 50%.

Figure 2 shows the same data for the women, although there were no seventh or eighth year women; because there were very few fifth and sixth year women (Table 1), those data were deleted. Compared to the men, the women’s checkup attendance rates were higher overall, but by year of study the rates were similar.

### 2. Smoking history and annual checkup attendance for men

Table 2 shows the  $2 \times 2$  contingency tables of the relationship between smoking history and the number of checkups by survey year and student’s year of study for the men. The total was 17,788 rather than 17,831 because 43 men did not answer the question on smoking. Of those, 4,779 (26.9%) men had smoking history and 13,009 (63.1%) had never smoked.

Undergraduates in 2008 and first-year undergraduates in every survey year could have had only one checkup. For second-year undergraduates and above in 2009, there were data for both their first and second checkups. Some undergraduates had two checkups and some had one. The rest of Table 2 similarly shows the number of men with and without a history of smoking and whether they attended all or some of the medical checkups.

The  $2 \times 2$  contingency tables of second-year under-

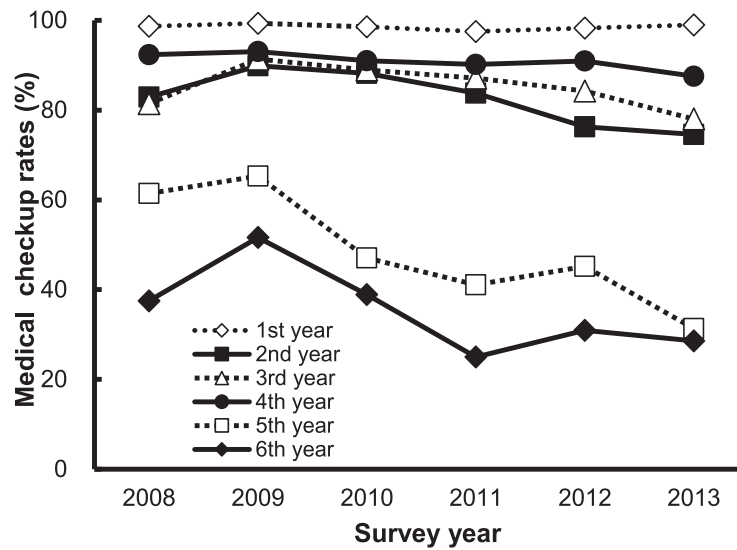


Figure 1 Medical checkup rates of men

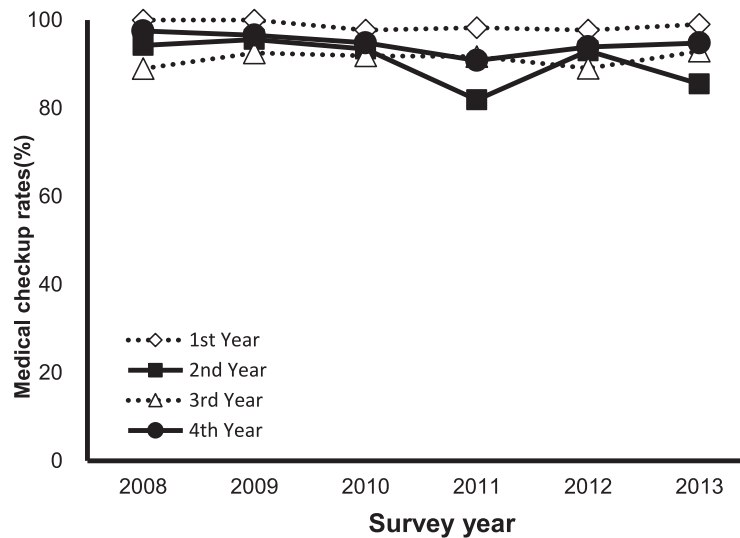


Figure 2 Medical checkup rates for women

graduates and above were combined into one by survey year (2009~2013), and chi-square tests were performed (Figure 3). The number of checkups attended was smaller for those with a history of smoking than for those without (All survey years:  $p < 0.001$ ).

### 3. Smoking history and annual checkup attendance for women

Table 3 shows 2x2 contingency tables of the relationships between smoking history and number of checkups attended by survey year and student's year of study for the women. The total number of women was 2,726 because 14 women did not answer the question on smoking. The number with a history of smoking was small (9.9%). The checkup attendance rates declined,

with 2009 being the highest.

The 2x2 contingency tables of second-year undergraduates and above were combined into one by survey year (2009~2013; Figure 4). The numbers of checkups differed significantly between women with a history of smoking and those without in 2011 ( $p < 0.05$ ) and 2012 ( $p < 0.01$ ).

### Discussion

For the six years of the study overall, the rate at which men at this university attended the school's annual medical checkups was 87.1% and for women the rate was 93.3%. These rates are close to those of other Japanese universities<sup>4)</sup> This study showed that each

Table 2 Relationships between smoking history and annual checkup attendance by survey year and student's year of study (Men)

Survey year	2008		2009		2010		2011		2012		2013		Total							
Year of study	Checkups		Checkups		Checkups		Checkups		Checkups		Checkups		Checkups							
	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y						
1 <sup>st</sup> year	1x	699	141	1x	784	132	1x	785	103	1x	706	40	1x	702	48	1x	628	39	4,304	503
2 <sup>nd</sup>	1x	485	185	2x	548	195	2x	601	201	2x	605	117	2x	486	80	2x	502	46	3,227	824
3 <sup>rd</sup>	1x	401	255	1x	44	47	1-2x	19	17	1-2x	24	23	1-2x	37	31	1-2x	38	48	162	166
4 <sup>th</sup>	1x	391	332	2x	363	273	3x	338	256	4x	398	235	4x	449	236	4x	417	173	2,356	1,505
5 <sup>th</sup>	1x	26	33	2x	20	25	3x	20	13	4x	14	15	5x	21	18	5x	21	15	122	119
6 <sup>th</sup>	1x	1	8	2x	4	8	3x	7	2	4x	3	1	5x	2	1	6x	6	2	23	22
7 <sup>th</sup>	1x	1	3	2x	0	3	3x	0	1	4x	2	0	5x	1	0	6x	0	0	4	7
8 <sup>th</sup>	1x	0	0	2x	0	0	3x	0	1	4x	0	0	5x	1	0	6x	1	0	2	1
Subtotal	2,004	957	2,191	1,012	2,265	910	2,290	714	2,222	652	2,037	534	13,009	4,779						
Total	2,961	3,203	3,175	3,004	2,874	2,571	17,788													
Participants in the annual checkups	2,967	3,204	3,183	3,013	2,890	2,574	17,831													
Checkup rate	87.5%	92.1%	89.6%	86.9%	84.9%	81.1%	87.1%													
No answer to the question on smoking	6	1	8	9	16	3	43													

Table 3 Relationships between smoking history and annual checkup attendance by student's survey year and year of study (Momen)

Survey year	2008	2009	2010	2011	2012	2013	Total													
Year of study	Smoking history						Total													
	Checkups	N	Y	Checkups	N	Y		Checkups	N	Y	N	Y								
1 <sup>st</sup> year	1x	105	13	1x	131	7	1x	125	1	1x	109	4	1x	126	2	1x	104	0	700	27
2 <sup>nd</sup>	1x	107	8	2x	93	15	2x	117	11	2x	96	4	2x	98	3	2x	104	2	615	43
				1x	0	0	1x	0	0	1x	4	0	1x	0	1	1x	0	0	4	1
3 <sup>rd</sup>	1x	90	15	2x	97	10	3x	82	17	3x	107	10	3x	84	8	3x	91	10	551	70
				1x	5	0	1-2x	2	1	1-2x	3	2	1-2x	7	3	1-2x	3	1	20	7
4 <sup>th</sup>	1x	105	13	2x	88	13	3x	90	13	4x	75	19	4x	100	12	4x	80	12	538	82
				1x	8	2	1-2x	6	1	1-3x	2	3	1-3x	7	2	1-3x	15	2	38	10
5 <sup>th</sup>	1x	2	0	2x	1	2	3x	0	0	4x	1	0	5x	1	1	5x	4	1	9	4
				1x	0	1	1-2x	0	0	1-3x	0	0	1-4x	3	1	1-4x	1	0	4	2
6 <sup>th</sup>	1x	0	0	2x	0	0	3x	0	0	4x	0	0	5x	0	0	6x	0	0	0	0
				1x	0	0	1-2x	0	0	1-3x	1	0	1-4x	0	0	1-5x	0	0	1	0
Subtotal	409	49	423	50	422	44	398	42	426	33	402	28	2,480	246						
Total	458	473	466	440	459	430	2,726													
Participants in the annual checkups	458	475	468	440	469	430	2,740													
Checkup rate	94.8%	96.2%	94.4%	90.0%	92.9%	91.7%	93.3%													
No answer to the question on smoking	0	2	2	0	10	0	14													

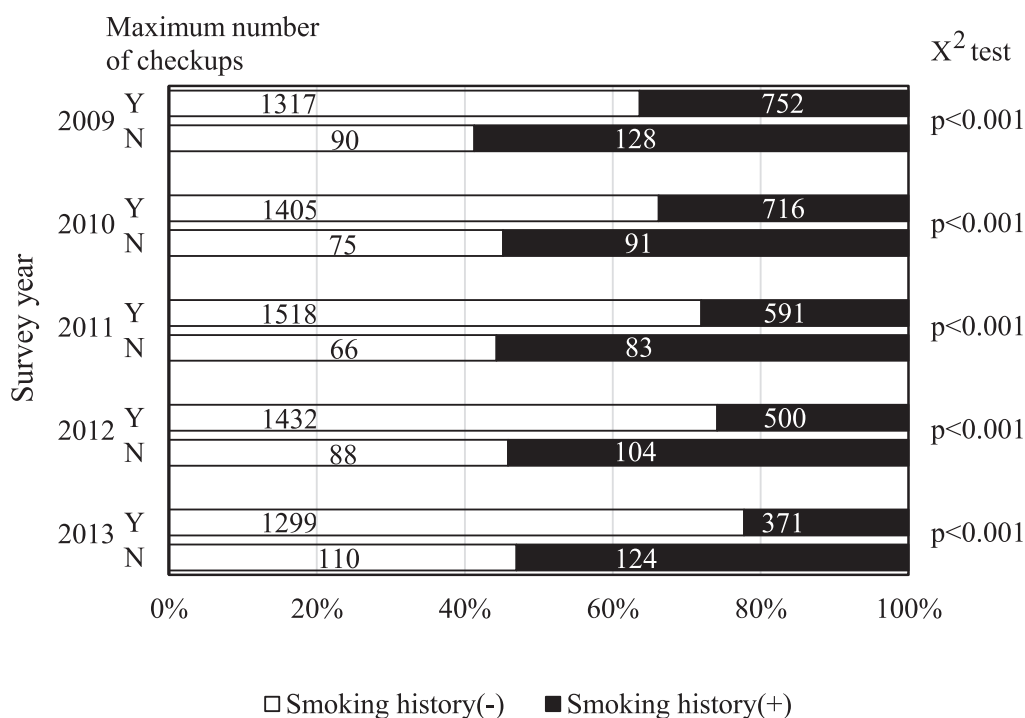


Figure 3 Smoking history and annual checkup attendance (Men)

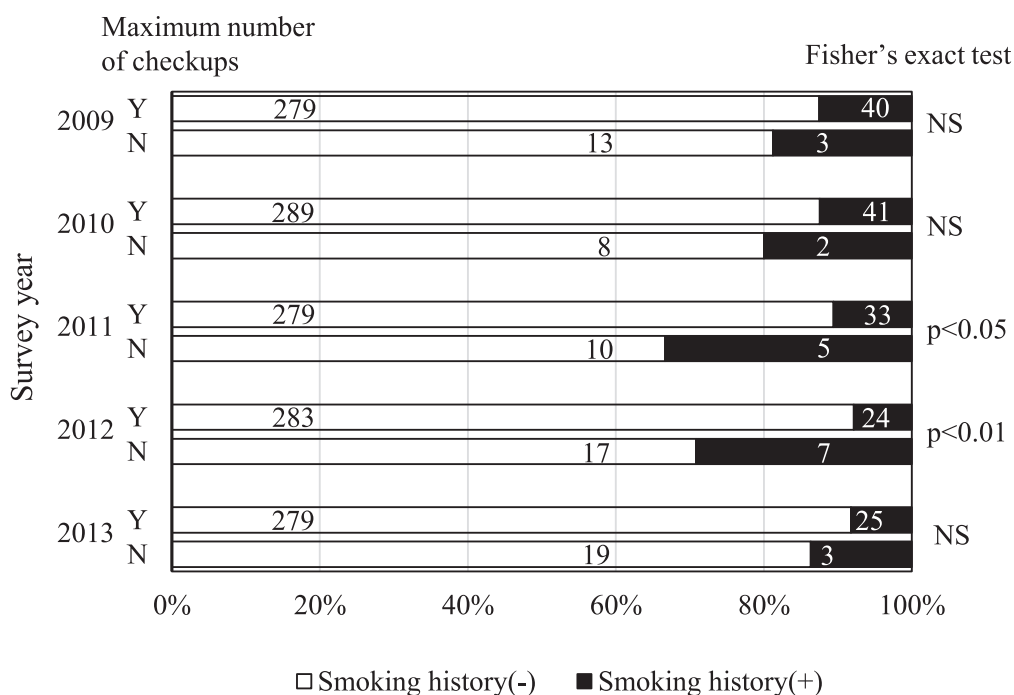


Figure 4 Smoking history and annual checkup attendance (Women)

year of school had its pattern. First-year undergraduates had just started school and acted on the recommendation to attend a checkup. Second- and third-year undergraduates used their own discretion in deciding whether to go, resulting in lower attendance rates. Fourth-year undergraduates were motivated to go for their checkup

because they are asked for the checkup results when they apply for jobs. In Japan, the number of undergraduates who need to spend more than four years getting their degree is small. That was the case in this study as well. The checkup attendance rate for this group was extremely low, suggesting underlying issues such as



mistake of major choice, human relations at the university, etc.

In this study, 26.9% of men and 9.9% of woman had smoking history. Compared to undergraduates with no history of smoking, those with a history of smoking attended fewer of the annual medical checkups. The difference was more remarkable among men. Undergraduates might not disclose their complete smoking history at medical checkups. Minors in particular may be more apt not to disclose such history. Considering this reporting bias, there may be an under-reporting of smoking history among undergraduates and this bias might affect the statistically significant differences found in our analysis. However, when we analyzed the data from undergraduates who were not minors (those in their third to eighth years), the results were similar, showing that undergraduates with self-reported smoking history had fewer medical checkups (men:  $p < 0.00001$  in all survey years, women:  $p < 0.05$  in 2011 and 2012). Therefore, any reporting bias is likely to have a small impact on the findings.

Elderly smokers were less likely to participate in general medical checkup or cancer screening<sup>12,13</sup>) and this study of young people had similar results. Reasons for smoking have suggested many variables such as socio-economic status or family history of smoking<sup>15-17</sup>). Our data for analysis did not contain other potential confounders. However, it is difficult for the universities to intervene in them.

Honjo et al.<sup>18</sup>) reported that more smokers were able to quit smoking when they received regular checkups than when they did not. The medical checkup site at the university provides undergraduates with the opportunity to learn more about not only smoking cessation programs but also other diseases. Having regular medical checkups is a first step in taking interest in one's health. In addition, it might be possible for universities to improve undergraduates' attendance of the medical checkup.

Because the undergraduate population is of an age group that is relatively healthy and generally experiences low rates of disease and robust physical health, it may be difficult for undergraduates to recognize the importance of attending regular medical checkups, smoking cessation, and other health-fostering behaviors. Most of the population in this age group perceive their health as good or excellent and do not consider the possibility of a decline in health in the future. In addition, although smokers are far more likely to develop lung

cancer than non-smokers are, not all smokers experience lung cancer. Such uncertainty about perceived risk might lead to individual differences in health investment<sup>19</sup>). If undergraduates spend time in proximity to healthy middle-aged smokers, they might further underestimate future loss of health due to smoking and have a lesser likelihood of investing resources in healthy behaviors. We must educate this population regarding the importance of investing time and energy in a healthy lifestyle and preventive medical care in order to maintain health and well-being.

Historically, information regarding the annual medical checkup has been communicated via the school's internet bulletin board, posters, or individual emails. As for other ways to increase checkup attendance, Japanese undergraduates show a strong preference for forming groups to coordinate their activities<sup>20,21</sup>). As a result, they frequently engage in activities based on friendships made, for example, in school club activities or classes. It could be important to ask club advisors and undergraduate representatives or teaching faculty to pass on the information. Before they graduate and have to begin deciding on their own whether to have regular medical checkups, guidance is important to encourage habit formation.

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