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Predictors of intention to quit smoking in Hong Kong secondary school children

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ABSTRACT

Background Behavioral theories suggest that a past quit attempt influences psycho-social determinants to predict smokers' intention to quit, although no study has tested the hypothesis among youth smokers.

Methods A sample of 1561 Chinese secondary students, who were current smokers, were collected in a cross-sectional school-based survey in Hong Kong.

Results For the 943 students *with* past quit attempts, those with lower daily cigarette consumption; who perceived smoking would not elicit positive social responses from others; who had one parent/teacher who prohibited them to smoke; who were aware of the health hazards of smoking and being male smokers, were more likely to have an intention to quit smoking. For the 618 students *without* a past quit attempt, those who did not perceive any benefit from smoking; who had parents and teachers to prohibit them to smoke and who received social support to quit, were more likely to have an intention to quit smoking.

Conclusion Strengthening the prohibition of smoking and providing social support may help initiate the intention to quit among youth smokers *without* a past quit attempt, while de-normalizing social images of smoking, providing information about the health hazards of smoking and relieving nicotine addiction may sustain quitting intentions among youth smokers *with* past quit attempts.

Keywords intention to quit, quitting history, young people

Background

Smoking is one of the most preventable causes of death, and quitting at an early age can reduce smoking mortality and morbidity.[1] Unlike the relatively high smoking prevalence in Mainland China (35.8%) and the neighboring regions such as the Philippines (34.7%) and Korea (29.1%),[2] Hong Kong (a Special Administrative Region of China and a highly urbanized and developed city in the Asia-Pacific region) had a low smoking prevalence of 14% (daily smoking) in 2005, compared with 23% in 1982.[3] However, youth smoking remains a major concern in tobacco control.

Long before China ratified the Framework Convention on Tobacco Control in 2005,[4] Hong Kong enacted legislation and other measures to reduce smoking. Specifically, these efforts included increasing the tobacco tax, instituting a prohibition on tobacco sales to youth under 18 years of age, the prohibition of tobacco advertisements on the Internet, or in movies, radio/visual images or printed publications,[5] and beginning regular health education (in the form of health talks and other programs) in schools and community centers as well as launching publicity campaigns by the Hong Kong Council on Smoking and Health and the

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Government Tobacco Control Office.[6] Although smoking prevalence in the adult population has been decreasing, smoking prevalence among secondary students increased to 9.6% in 2003–04 in Hong Kong,[7] which was comparable to the median smoking prevalence of 9.5% among adolescents aged 13–15 in the world.[8] The Global Youth Tobacco Survey (GYTS) reported that in 1999–2001 68.4% of adolescents who smoked wanted to quit smoking, whereas 63.1% attempted to quit in the past year but failed.[9] Peer influence, craving and boredom seem to be the major reasons for relapse among secondary students who made a quit attempt in Hong Kong.[10,11]

Intention is an indication of a person's readiness to perform a behavior, and it is considered to be the immediate antecedent of behavior.[12] Intention is an important predictor of smoking cessation.[13] In order to motivate a person to have an intention to quit, understanding the factors associated with intention and designing relevant psychosocial interventions, could help youth smokers quit smoking.[14]

Research has demonstrated that youth and young adult smokers with fewer smoking friends,[15] higher self-efficacy/confidence to quit,[15] lower daily cigarette consumption,[16] lower perceptions that smoking can elicit positive social responses from others,[17] fewer perceived benefits from smoking[18] and those who do not have a drinking habit,[19] were more likely to have an intention to quit in the immediate future. In addition, the impact of social influences including the smoking behavior of others, perceptions of smoking prohibition, being persuaded to smoke by others and perceived social support to quit, could influence the intention to quit smoking.[12]

Previous studies considered past attempts to quit as a single predictor/independent variable to test the impact on youth's intention to quit smoking.[18] However, several psycho-sociologists discussed the potential to consider past quit attempts as a moderator in their behavioral models, whereas the direction and strength of psycho-social variables to predict the intention to quit could be different among groups.[20] For smokers with an intention to quit within 6 months, Diclemente *et al.*[21] considered those who had a quitting history in the past 12 months as in the preparation stage whereas others without a quitting history were classified to be in the contemplation stage in the *Trans*-theoretical model (TTM). They proposed that smokers with and without past quit attempts would require different assistance to move up the stages in the TTM and quit smoking. In the formulation of the Theory of Reasoned Action (TRA), Fishbein[22] also suggested that a past quitting history may influence psycho-social determinants indirectly and act as a moderator on the association between perceptions and quitting, rather than having a direct effect on quitting. Yzer and van de Putte[23] demonstrated associations among past quit attempts and attitudes, normative beliefs and self-efficacy of quitting in adult smokers, which suggested that a past quitting history had an indirect effect on the intention to quit smoking.

The present study examined the psycho-sociol factors that predicted an intention to quit among two groups of Chinese youth smokers, those *with* and those *without* a quitting history. We hypothesized that a past quitting history would influence the factors associated with quitting intentions.

Methods

Design

This study used the data set from a school-based cross-sectional survey that was primarily conducted to monitor the prevalence of smoking among secondary students in Hong Kong.[7] A two-stage cluster sample design was used to obtain a representative sample of schools in the region. The sampling frame consisted of all 502 public and private secondary schools (except international and special schools) with Form 1–5 students (equivalent to US Grade 7–11 students) in Hong Kong. In the first stage, 69 schools were sampled in proportion to enrollment size (we assigned heavier sampling weights to schools with larger enrollment size, so as to increase the sampling probability of these schools).[9] In addition, we included 64 schools that had participated in an earlier survey in 1999 based on the same sampling method.[24] Of a total of 133 schools sampled, 85 (36 of 69 newly sampled schools; 49 of 64 of the previously participating schools) agreed to participate in the survey. The second sampling stage consisted of classes within the participating schools. To fulfill one of the original objectives of the survey, which was to study the change of smoking behaviors among students who participated in the previous survey in 1999,[24] all classes in Form 4 or 5 (Grade 10 or 11) were surveyed in the 49 previously participating schools. For each of the 36 newly participating schools, we randomly selected and surveyed two classes in Forms 2–5 (Grades 8–11). In addition, all Form 1 (Grade 7) classes of the participating schools were surveyed. Because of the constraint of resources and the sufficient statistical power, we did not include all classes in Forms 2–5 from both groups of schools (see online supplementary data Appendix S1).

The main outcome measure of this study was intention to quit smoking, and a number of additional variables

(current smoking behavior; attitudes toward smoking; social influences; perceptions on the health hazards of smoking; current drinking behavior; self-efficacy to quit [measured by a single question 'Do you think that you are capable to quit smoking if you wish?' as a proxy]; sex and grade of study) were measured based on the core questions of GYTS[25] and additional questions in the previous survey in 1999 (see online supplementary data Appendix S2).[24] The variables were selected since they were significant in previous studies related to youth's quitting intention.[12,15–19]

The survey was conducted during February 2003 to April 2004. A letter of invitation was sent to the sampled schools, and trained university students went to the sampled classrooms and monitored the survey during a lesson as arranged by the participating schools. To assure data privacy, school teachers had to leave the classroom during the survey period, and the participating students put their completed answer sheet into a large opaque envelope on completion of the survey.

Subjects

Using the WHO guidelines in the GYTS, current smoking for youth was defined as having smoked on one or more days in the 30 days preceding the survey.[8] A total of 37 330 students were surveyed and 36 612 (response rate = 98%) responded to the questionnaire. Among the participating students (Form 1–5 students, equivalent to US Grades 7–11) sampled in the survey, 3080 smoked at least 1 day in the 30 days preceding the survey. We excluded 745 students who smoked only a few puffs (i.e. less than 1 cigarette), 390 students who did not smoke now, 328 students who provided inconsistent responses throughout the questionnaire (e.g. some responded that they smoked before but perceived as 'tiers' or 'experimenters'. They did not identified themselves as smokers instead in the later questions) and 56 students who did not report their intention to quit smoking and/or any quit attempt in the past 12 months. As a result, the present analysis included 1561 students. Compared with the 1561 student smokers included in this study, the excluded student smokers were younger, had a lower proportion of females, smoked fewer days as well as fewer cigarette consumptions in the past month, and had a higher proportion who consumed alcohol regularly (see online supplementary data Appendix S3). Among the sampled participants, 59% of student smokers were male; 14% aged 13 years or below; 51% were in Grades 7–9 (junior secondary). In comparison, 51% of overall students (both smokers and non-smokers, $n = 36\,612$) in the main survey were male; 31% aged 13 years or below; 61% were in Grades 7–9 (junior secondary).

Statistical analysis

Due to the sampling design, the main survey results ($n = 36\,612$) were over-representative for Grade 7 and Grades 10–11 students. We weighted the sample by sex, age, grade of study and school districts in order to approximate the student population in Hong Kong (see online supplementary data Appendix S4). Due to the different timing of conducting the survey (the student population was surveyed at the beginning of an academic year, while the participating schools conducted our survey at different time points throughout the academic year), the age of students being surveyed was half to 1 year older than that of the overall student population in Hong Kong. Taking into account the two-stage sample cluster design, we used a generalized estimating equation (GEE) to investigate the moderating effect of a past quit attempt on the predicting variables. Since the outcome measure (intention to quit) was in a dichotomous scale, a logit link was applied in the model. The tolerance values of the predicting variables were measured to check if the model had a multicollinearity problem. A tolerance value of 0.1 or below suggests the presence of multicollinearity in the model.[26] We considered past quit attempts as a dummy variable (1 = with past quit attempt; 0 = no past quit attempt) and included the interaction terms (between past quit attempts and other predicting variables) in the model. We further stratified smokers with and without past quit attempts to perform sub-group analysis.

Data were managed by SPSS 11.5 and SAS 9.1. SAS-callable SUDAAN (version 9, Research Triangle Institute, Research Triangle Park, North CA, USA), a software package for statistical analysis of cluster correlated data was used to calculate the weighted prevalence estimates and 95% confidence intervals.[27] Chi-square tests or independent two-sample t-tests were used to compare the differences between students with and without a past quit attempt in univariate analyses; Student t-tests were used to test the significance of coefficients in the GEE model. All tests were two-tailed and those with a P-value < 0.05 were considered to be statistically significant.

Ethical considerations

This study was approved by the Information and Research Committee of the Hong Kong Council on Smoking and Health and the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster. Informed consent was obtained from the

schools, which acted *in loco parentis* for the students. Since participating in the survey would not lead to any adverse consequences to the students, and the results would probably be biased by socially desirable responses if parents were informed about the survey, the independent ethical committees approved that informed consent was exempted for parents, which was a common practice for similar surveys in Hong Kong. Students' participation was voluntary under the reassurance of confidentiality, and they could return blank questionnaires if they chose not to participate. Students were assured that only group results would be reported and no individual data would be given to their teachers or parents.

Results

Few current smoking students smoked daily (26%), and the majority (61%) smoking 5 or less cigarettes on the day of smoking. Approximately half (51%) had an intention to quit smoking now, whereas 60% had a quitting history in the past 12 months (Table 1). For student smokers with a quitting history, fewer of them smoked daily (with quitting history = 20% versus those students without a quitting history = 35%; $P < 0.001$); a higher proportion of them smoked 5 or less cigarettes per smoking day (with quitting history = 66% versus without quitting history = 53%; $P < 0.001$) and a higher proportion of them had an intention to quit smoking now (with quitting history = 71% versus without quitting history = 20%; $P < 0.001$).

Psycho-social determinants of smoking

In general, student smokers disagreed that smoking can elicit positive social responses from others (mean = −0.26; SE = 0.05); over one-third (36%) did not perceive any benefit from smoking and 76% perceived their parent(s) and school teachers would prohibit them from smoking. Over half had smoking parent(s) (58%) whereas the majority of their friends were not smoking (58%). Sixty-two percent had been persuaded by others to smoke in the past month; and approximately half (52%) had received support to quit smoking. The majority perceived smoking is hazardous to health (60%); and 63% had self-efficacy to quit smoking. A few student smokers (8%) were regular drinkers (Table 2).

Compared with those without a quit attempt in the past 12 months, student smokers with a quitting history disagreed more that smoking can elicit positive social responses from others (mean = −0.41 versus mean = −0.04; $P < 0.001$); and more perceived smoking as being prohibited by both parents and teachers (56% versus 38%; $P < 0.001$); more had the majority of friends who were non-smokers (55% versus 49%; $P < 0.001$); more had received support to quit smoking (61% versus 39%; $P < 0.001$); more were aware of the health hazards of smoking (65% versus 53%;

Table 1 Smoking behavior, intention to quit and past quit attempt of youth smokers (%)[a]

	Total, % (n = 1561)	*With quitting history, % (n = 943, 60.0%[a])*	*No quitting history, % (n = 618, 40.0%[a])*	*P-value[b]*
Number of days smoked in the past 30 days				
1–2	8.3	8.9	7.3	<0.001***
3–5	10.6	12.1	8.3	
6–9	9.9	10.4	9.0	
10–19	18.7	20.3	16.3	
20–29	26.9	28.7	24.2	
30	25.7	19.7	34.8	
Average daily cigarette consumption for smoking days				
1–5	60.9	66.4	52.6	<0.001***
6–10	25.0	23.6	27.2	
11–20	8.9	7.1	11.6	
>20	5.2	2.9	8.6	
Intention to quit now	50.6	70.5	20.4	<0.001***

[a]Percent was adjusted by sampling weights.

[b]*P*-value of χ^2 test.

***$P < 0.001$.

Table 2 Attitudes, social influences, knowledge, self-efficacy on smoking/quitting and other problematic behavior of youth smokers

Percent[a]	*Total (n = 1561)*	*With quitting history, % (n = 943)*	*Without quitting history, % (n = 618)*	*P-value*[b]
Attitudes				
Perceived smoking can elicit positive social responses from others[c]	Mean = −0.26[a]; SE = 0.05[a]	Mean = −0.41[a]; SE = 0.06[a]	Mean = −0.04[a]; SE = 0.09[a]	<0.001***
Perceived number of benefits from smoking				
None	36.0	36.7	35.0	0.60
One	27.6	27.7	27.5	
Two	23.0	23.2	22.7	
Three	13.4	12.4	14.9	
Social influences				
Father/mother/school teachers prohibited smoking				
None	9.1	5.3	14.9	<0.001***
One	15.4	12.8	19.4	
Two	26.6	26.0	27.5	
Three	49.0	56.0	38.2	
With smoking parent(s)	58.2	59.3	56.6	0.27
Most friends were non-smokers	58.0	55.1	49.4	<0.001***
Others persuaded you to smoke in the past month	61.9	60.7	63.7	0.21
Received support to quit smoking	52.1	60.6	39.2	<0.001***
Perceived smoking is hazardous to health	60.2	64.6	53.4	<0.001***
Self-efficacy[d]	63.1	68.0	55.7	<0.001***
Being a regular drinker[e]	7.7	4.1	13.1	<0.001***

[a]Adjusted by sampling weights.

[b]*P*-value of two-sampled *t*-test was used to compare mean difference; *P*-values of χ^2 test was reported to compare the percentage between two groups.

[c]Ranged from −5 (strongly disagree) to 5 (strongly agree).

[d]Self-efficacy was measured by the perceived capable to stop smoking if want to quit.

[e]Regular drinker was defined as drinking alcohol for 3 days or more per week.

***$P < 0.001$.

$P < 0.001$); and more perceived that they were capable of stopping smoking (68% versus 56%; $P < 0.001$). In contrast, more student smokers without a quitting history were regular drinkers and drank at least 3 days per week, when compared with students with a past quitting history (13% versus 4%; $P < 0.001$) (Table 2).

Moderating effect of past quit attempt

Table 3 shows the factors associated with an intention to quit smoking. The presence of past quit attempts was positively associated with having an intention to quit smoking (adjusted OR = 4.26, $P < 0.001$). The model also indicated significant interaction effects, which suggested that current student smokers with and without past quit attempts had different associations of attitudes and social influences on their intention to quit smoking (Table 3). The tolerance values of the predicting variables ranged from 0.71 to 0.96, which suggested the model was free from the problem of multicollinearity.

Current smoking students *with* and *without* prior quit attempts in the past 12 months were stratified in Table 4 to perform sub-group analysis. For students *with* a past quit attempt, light smokers (those who smoked 10 or less cigarettes on the smoking days) (adjusted OR = 2.50, $P <$

Table 3 Analysis of factors associated with intention to quit smoking by the GEEs

Main effects	*Adjusted OR (95% CI)*[a]	*P-value*[b]
Current smoking behavior		
Average daily cigarette consumption		
10 or less	1.10 (0.52, 2.34)	0.79
Over 10	1	
Number of days smoked in the past 30 days		
1–5	0.83 (0.51, 1.34)	0.44
6–10	0.88 (0.59, 1.33)	0.56
20–29	0.75 (0.49, 1.14)	0.17
30	1	
Attitudes		
Perceived smoking can elicit positive social responses from others	1.03 (0.85, 1.25)	0.73
(−5 = strongly disagree; 5 = strongly agree)		
Perceived number of benefits from smoking (0 = none; 3 = all)		
None	1	
One	0.64 (0.34, 1.22)	0.17
Two	0.61 (0.29, 1.29)	0.20
All	0.38 (0.16, 0.88)	0.02*
Social influences		
Father/mother/school teachers prohibited smoking (0 = none; 3 = all)		
None	1	
One	2.20 (1.29, 3.75)	<0.01**
Two	1.59 (0.91, 2.77)	0.10
All	1.73 (1.04, 2.90)	0.04*
Lived with smoking parent(s)	0.89 (0.68, 1.16)	0.40
Most friends were non-smokers	1.03 (0.73, 1.45)	0.86
Others persuaded you to smoke in the past month	1.01 (0.74, 1.39)	0.94
Received support to quit smoking	1.94 (1.15, 3.27)	0.013*
Perceived smoking is hazardous to health	1.52 (1.18, 1.96)	<0.01**
Being a regular drinker (drank at least 3 days per week)	0.51 (0.24, 1.11)	0.09#
Self-efficacy (perceived capable to stop smoking if want to quit)	1.07 (0.77, 1.50)	0.68
Previous quit attempt during the past 12 months	4.26 (1.56, 11.59)	<0.01**
Demographics		
Male sex	1.34 (1.00, 1.80)	0.049*
Grade of study		
Form 1 (equivalent to grade 7)	0.81 (0.46, 1.43)	0.47
Form 2	0.46 (0.30, 0.72)	<0.001***
Form 3	0.94 (0.65, 1.36)	0.75
Form 4	1.00 (0.66, 1.50)	0.98
Form 5 (equivalent to grade 11)	1	
Interactions[a]		
Past quit attempt × averaged daily cigarette consumption (10 or less)	2.17 (0.86, 5.44)	0.10#
Past quit attempt × perceived smoking can elicit positive social responses from others	0.78 (0.63, 0.97)	0.03*
Past quit attempt × perceived number of benefits from smoking		
Perceived no benefit from smoking (with past quit attempt)	1	
Perceived one benefit from smoking (with past quit attempt)	1.71 (0.76, 3.84)	0.19
Perceived two benefit from smoking (with past quit attempt)	1.21 (0.49, 3.02)	0.68

Continued

Table 3 Continued

Main effects	*Adjusted OR (95% CI)*[a]	*P-value*[b]
Perceived three benefit from smoking (with past quit attempt)	2.29 (0.86, 6.10)	0.10[#]
Past quit attempt × received support to quit smoking	0.54 (0.29, 1.00)	0.05*

CI, confidence interval.

[a]Excluded insignificant interactions between past quit attempts and other variables.

[b]*P*-values of *t*-test.

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; [#]$P < 0.10$.

0.01); those who had one parent/teacher who prohibited them from smoking (adjusted OR = 3.19, $P < 0.01$); those who perceived smoking is hazardous to health (adjusted OR = 1.43, $P = 0.03$) and male smokers (adjusted OR = 1.50, $P = 0.02$) were more likely to have an intention to quit smoking as opposed to others. On the other hand, those who perceived smoking could elicit positive social responses from others were less likely to have an intention to quit than other student smokers who did not have such perceptions (adjusted OR = 0.80, $P < 0.001$).

For students who had *no* past quit attempts, those who perceived that both parents and school teachers prohibited them from smoking (adjusted OR = 3.01, $P = 0.02$), and who received social support to quit (adjusted OR = 1.82, $P = 0.02$) were more likely to have an intention to quit smoking as opposed to others. On the other hand, those who perceived more benefits from smoking were less likely to have an intention to quit than other student smokers who perceived less benefits from smoking (adjusted OR = 0.28, $P < 0.01$). Perceptions on the health hazards of smoking (adjusted OR = 1.69, $P = 0.06$) marginally predicted quitting intention, whereas living with smoking parent(s) (adjusted OR = 0.61, $P = 0.07$) and being a regular drinker marginally hindered quitting intention (adjusted OR = 0.40, $P = 0.053$) (Table 4).

Discussion

Main findings of this study

This study shows that Chinese student smokers *with* a past quitting history were more likely to have an intention to quit smoking. The findings support the discussion in the previous literature on student[28] and adult smokers,[23] that the quitting experience regulates the determinants (e.g. attitudes and beliefs) of a quitting intention. In fact, our youth smokers *with* a past quitting history had more negative attitudes toward smoking, received more social influences toward quitting and had a higher self-efficacy to quit than others *without* a past quitting history in this study. While the TRA and Theory of Planned Behavior does not mention how would a past behavior influence a future behavior,[29] one would consider that the momentum which has initiated previous quit attempts (e.g. reasons to quit smoking) may be temporally persistent among youth smokers (in the absence of other interfering events), and continues to increase their current quitting intentions.[29] Under the TTM, the classification of stages depends on the presence of past quitting history, and smokers at different stages have varying time points in the process of changing their smoking behavior.[21] Thus, a past quitting history has an indirect impact on predicting quitting intention.

Policies and measures that de-normalize the social image of smoking are important to motivate quitting intentions in youth smokers who *had* a past quit attempt. As early as 1995, the Hong Kong Government prohibited tobacco sales to youth under 18 years of age, and beginning in 1990 and continuing to the present tobacco advertisements were gradually prohibited in movies, the radio and in visual images, printed publications and on the internet.[5] To further promote the non-smoking lifestyle to citizens, Hong Kong recently implemented new smoke-free legislation whereby smoking is prohibited in the vast majority of indoor areas including workplaces and public places including restaurants and bars,[30] and the tax on cigarettes was increased by 50% in 2009. Although the public more or less complied with the smoke-free legislation, household smoking prevalence increased. This implies that many smokers have not ceased to smoke, but they are smoking in their homes rather than in public areas. The implementation of household smoking bans by family members would further promote anti-smoking attitudes among youth by increasing perceptions of smoking prohibition[31] as well as reducing social acceptability to smoke.[32] While it is difficult to enact and enforce household bans on smoking, actions such as educating smokers about the health hazards of passive smoking might facilitate a smoking ban at home.[33] Other solutions to encourage

Table 4 Predicting factors on intention to quit: sub-group analysis by past quit attempt

	With past quit attempt		*No past quit attempt*	
	Adjusted OR (95% CI)	*P-value*[a]	*Adjusted OR (95% CI)*	*P-value*[a]
Current smoking behavior				
Average daily cigarette consumption				
10 or less	2.50 (1.35, 4.64)	<0.01**	1.35 (0.59, 3.09)	0.48
Over 10	1		1	
Number of days smoked in the past 30 days				
1–5	0.98 (0.52, 1.85)	0.96	0.56 (0.23, 1.36)	0.20
6–10	1.08 (0.62, 1.88)	0.79	0.62 (0.29, 1.33)	0.22
20–29	0.80 (0.47, 1.36)	0.40	0.75 (0.36, 1.55)	0.44
30	1		1	
Attitudes				
Perceived smoking can elicit positive social responses from others (−5 = strongly disagree; 5 = strongly agree)	0.80 (0.71, 0.91)	<0.001***	1.05 (0.87, 1.28)	0.61
Perceived number of benefits from smoking (0 = none; 3 = all)				
None	1		1	
One	1.16 (0.72, 1.86)	0.54	0.57 (0.30, 1.08)	0.08#
Two	0.76 (0.47, 1.22)	0.26	0.47 (0.21, 1.01)	0.054#
All	0.94 (0.55, 1.59)	0.82	0.28 (0.12, 0.67)	<0.01**
Social influences				
Father/mother/school teachers prohibited smoking (0 = none; 3 = all)				
None	1		1	
One	3.19 (1.41, 7.21)	<0.01**	1.74 (0.63, 4.84)	0.29
Two	1.40 (0.65, 3.03)	0.39	2.23 (0.87, 5.68)	0.09#
All	1.44 (0.71, 2.92)	0.31	3.01 (1.21, 7.49)	0.02*
Lived with smoking parent(s)	1.02 (0.72, 1.43)	0.91	0.61 (0.36, 1.05)	0.07#
Most friends were non-smokers	0.97 (0.66, 1.44)	0.90	1.17 (0.64, 2.15)	0.61
Others persuaded you to smoke in the past month	1.05 (0.69, 1.58)	0.83	1.00 (0.57, 1.76)	0.99
Received support to quit smoking	1.04 (0.72, 1.49)	0.84	1.82 (1.08, 3.08)	0.02*
Perceived smoking is hazardous to health	1.43 (1.03, 1.96)	0.03*	1.69 (0.98, 2.90)	0.06#
Being a regular drinker (drank at least 3 days per week)	0.57 (0.16, 2.02)	0.39	0.40 (0.16, 1.01)	0.053#
Self-efficacy (perceived capable to stop smoking if want to quit)	1.13 (0.77, 1.67)	0.53	0.88 (0.51, 1.53)	0.66
Demographics				
Male sex	1.50 (1.06, 2.11)	0.02*	1.04 (0.61, 1.77)	0.88
Grade of study				
Form 1 (equivalent to grade 7)	0.90 (0.46, 1.76)	0.76	0.57 (0.22, 1.46)	0.24
Form 2	0.48 (0.28, 0.82)	<0.01**	0.43 (0.19, 0.97)	0.04*
Form 3	1.32 (0.78, 2.24)	0.29	0.47 (0.23, 0.96)	0.04*
Form 4	1.01 (0.62, 1.65)	0.97	0.89 (0.44, 1.80)	0.74
Form 5 (equivalent to grade 11)	1		1	

CI, confidence interval.

[a]*P*-values of *t*-test.

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; #$P < 0.10$.

smoke-free households include asking non-smoking family members to enforce household smoking bans,[34] placing a no smoking sign at the front entry, removing ashtrays and prohibiting visitors from smoking in the home.[35]

The findings of this study also indicated that a higher daily cigarette consumption prevents youth smokers (*with* past quit attempts) from having an intention to quit smoking. Youth smokers with a higher daily cigarette

consumption are more likely to experience withdrawal symptoms during their previous quit attempts, which may defer them from quitting. Although smoking cessation counseling assists smokers to tackle nicotine addiction, most youth smokers are unaware of such services, and they appear less interested in seeking help, except for pharmacological treatments such as nicotine replacement therapy.[36] Currently, several smoking cessation services are available for student smokers including face-to-face counseling by experienced nurse counsellors (one smoking cessation and counseling center was established by the University, over 20 smoking cessation clinics are provided by the Hospital Authority, Department of Health, Tung Wah Group of Hospitals and private hospitals); with telephone counseling and websites also provided by the organizations above. Student smokers can also choose to buy medications related to nicotine replacement therapy in retail pharmaceutical stores and receive pharmacists' advice. However, almost all smoking cessation services currently target adult smokers, and few student smokers utilize such services (except the use of a youth-oriented telephone hotline that was implemented in 2005[37]). The enactment of smoke-free legislation should be coupled with the provision of cessation aids including those that are specially designed for youth. This assistance should be expanded to the community level, so that quitting assistance is perceived as being easily accessible and affordable to help smokers overcome nicotine addiction, and to promote strong motivation to quit.

Among those who had a past quit attempt, we found that males were more likely to have a quitting intention. The finding was contrary to previous Western surveys, that showed either no association between gender and intention to quit,[38,39] or males were less likely to have a quitting intention,[15] while females are more likely to associate psychological problems with smoking,[40] those who cannot cope with such problems may end up with a failed quit attempt, which subsequently will hinder their new quitting intentions. Unfortunately, we did not measure any psychological aspect in this study. Therefore, we encourage future studies to take account of the psychological factors (e.g. stress, depression, etc.) in examining gender and smoking cessation.

A high percentage of students who were aware of smoking-related health hazards stated that they intended to quit smoking. Concern for one's health (either current or future health) has historically been a frequent reason for youth smokers to have quitting intentions in local and Western studies.[11,13,41,42] According to the Health Belief Model, the awareness of health hazards related to smoking together with the perceived susceptibility (vulnerability) to the health threat of smoking can trigger quitting intentions among youth smokers. In Hong Kong, the Government enacted the Smoking (Public Health) Ordinance in July 1982 with compulsory health warnings in Chinese and English,[43] and provided regular health education (in the form of health talks and other kinds of programs) in schools and community centers and other venues. Mass media campaigns have been launched widely. Currently, while most youth know that smoking is somewhat harmful, few are aware of all of the health risks of tobacco use and even medical and nursing undergraduates grossly underestimated the smoking-induced mortality risk.[44,45] To enhance the effectiveness of health education and attract the youth's attention, culturally appropriate anti-smoking advertisements should be produced and disseminated regularly. The recent amendment of the Smoking (Public Health) Ordinance, which mandates that cigarette packages must contain both pictorial and text health warning messages on the cover,[46] could help increase the awareness of youth smokers about the risk of smoking.

Our smokers *without* a past quit attempt were more likely to initiate a quitting intention if they perceived fewer benefits from smoking, perceived smoking as being prohibited by parents and teachers and received social support to quit smoking. The presence of smoking parents marginally prevented a youth-quitting intention. Social influences (smoking prohibition and support) from closely connected people (family members, school teachers, classmates and friends) are especially important to help motivate youth smokers to initiate their first quitting intentions.[41,47] Parents, no matter if they smoke or not, should encourage and support their children to quit smoking. Social influences did not show a great impact to predict the intention to quit for our youth smokers *with* a past quit attempt (except that those who had one parent/teacher disapproved smoking were more likely to have a quitting intention than others who did not perceive smoking prohibition from parents/teachers). Regardless of whether they had an intention to quit or not, this group of student smokers perceived more people (parents and/or teachers) prohibited them from smoking, and more of them received support to quit smoking. We realize most youth smokers are susceptible to persistent social influences once they began their first quit attempt, no matter whether it is successful or not.

Western studies have demonstrated the association between youth alcohol use and persistent smoking.[19,48] When we analyzed student smokers *without* a past quit attempt, the results revealed that those who drank alcohol were less likely to have a quitting intention than others who did not drink alcohol. These results may help us understand why smokers with alcohol problems appear to be less likely

to quit in the lifetime as opposed to other smokers without smoking problems.[49] On the other hand, alcoholic drinking did not affect quitting intentions among our student smokers *with* a past quit attempt, since they may have learned skills in resolving their alcoholic problems before or during the previous quitting process.[49]

The current study found no association between self-efficacy (perceived capability of stopping smoking if the person wanted to quit) and an intention to quit. While the literature suggested a positive association between self-efficacy and intention to quit smoking among youth[15] and adults,[23] some youth smokers perceived they were not addicted to smoking and they believed they had the power to control their smoking behavior,[10] even though they may have experienced withdrawal symptoms.[50] Youth smokers may overestimate their ability and perceive they can quit smoking if they choose to do so. Although the previous literature suggested that daily youth smokers may think they are addicted and would have a higher intention to quit smoking,[51] our study does not support that argument when we have included other variables in the model. Nevertheless, our study measured self-efficacy based on a single-item question, and we recommended using a validated scale to measure the self-efficacy and further examine the impact on intention to quit in future studies.

What is already known on this topic?

Our results support the previous literature on adolescent smoking that a past quitting history,[13,52] social influences from closely associated people,[12] instrumental value of smoking (i.e. the extent to which the student perceived smoking can elicit positive social responses from others),[17] daily cigarette consumption,[16] health-related concerns[11,13,51] and drinking habits[48] are associated with an intention to quit smoking. There is disagreement about whether self-efficacy predicts an intention to quit smoking among youth smokers. Some studies supported the association between self-efficacy and intention to quit,[15,23] other studies, including our study, did not.[18,53]

What this study adds?

Our study, based on a territory-wide, school-based survey, confirmed that youth smokers with and without a quitting history had *different* psycho-sociol predictors that trigger their quitting intentions. Educating youth about the myths on the benefits of smoking, explaining the health hazards of smoking, strengthening the prohibition about smoking and providing social support are important factors that may motivate youth smokers to initiate quitting intentions. De-normalizing the social image of smoking, explaining the health hazards of smoking and relieving nicotine addiction are additional factors for sustaining the quitting intentions in youth smokers *with* past quit attempts. Understanding the different psycho-social factors and the quitting history that predicts a smoking intention is important for public health professionals who want to develop acceptable and appropriate strategies to promote smoking cessation among youth smokers. Our findings provide valuable information for policy-makers to review the current tobacco control policy on adolescents and to prepare appropriate future directions toward smoking cessation. Further studies in other communities/countries are needed to compare the effect of different smoking cultures on youth smoking and quitting.

Limitations of this study

This study had several limitations. First, since this was a cross-sectional survey, we had no proof of temporal sequence. A prospective follow-up study is needed to examine the causal relationships between psycho-social determinants and intention to quit over time. Second, the school participation rate was low. In comparison, 146/151 participating sites of the GYTS during 2000–2007 reported school response rates above 80%.[8] In Hong Kong, smoking is prohibited in secondary schools, and the general public would consider that a school has a bad reputation if the school has students who smoke. Therefore, acknowledging that students smoked may hinder schools from participating in the study. The timing of the survey, which was close to the school examinations, may be another reason for non-participation. Nevertheless, the survey covered 17% of all local schools, with a total of 9.1% students in the targeted age participating in the survey. No significant difference was found in the enrollment size and location between the participating and non-participating schools. Third, we did not measure the duration and recency of past quit attempts, which has been suggested as an indirect factor for predicting intention to quit.[23] With reference to previous studies,[15] we used a single question to measure self-efficacy. A validated scale that evaluates self-efficacy[54] may be more informative to measure the association between quitting intentions and self-efficacy in future studies. Fourth, although we tried to be as clear as possible in our instructions, some youth smokers may consider quitting as 'not smoking for a while'.[55] Such a misinterpretation might have affected the classification of youth smokers by intention to quit and past quit attempts for group comparisons. Also, the survey only targeted secondary school students studying Forms 1–5

(Grades 7–11). Since Hong Kong provides a 9-year compulsory education up to Form 3 (Grade 9), the results may not be generalizable to the older youth smokers who have left school instead of continuing their education. Finally, Hong Kong has a relatively low smoking prevalence, which is similar to a few neighboring countries/regions in Asia such as Singapore, Taiwan and Thailand, but it may be quite different from other countries/regions that have a different socio-cultural environment and social circumstances toward smoking. The impact of the smoking atmosphere might have different effects on quitting and the related factors.

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

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References

1 Doll R, Peto R, Boreham J *et al*. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ* 2004;**328**:1519.

2 World Health Organization. *WHO Report on the Global Tobacco Epidemic, 2008: The MPOWER Package*. Geneva: World Health Organization, 2008.

3 Census and Statistics Department. Hong Kong SAR Government, Hong Kong, China, 2006. Thematic Household Survey: Report No. 26.

4 World Health Organization. *Parties to the WHO Framework Convention on Tobacco Control*. http://www.who.int/fctc/signatories_parties/en/print.html (20 July 2009, date last accessed).

5 Tobacco Control Office, Department of Health, Hong Kong SAR Government. *Tobacco Control Legislation: Smoking (Public Health) Ordinance*. http://www.tco.gov.hk/english/legislation/legislation_so.html (20 July 2009, date last accessed).

6 Tobacco Control Office, Department of Health, Hong Kong SAR Government. *Introduction*. http://www.tco.gov.hk/english/about/about_intro.html (20 July 2009, date last accessed).

7 Ho SY, Lai MK, Lam TH. Youth smoking survey 2003/04. Report on the cross-sectional and prospective study. Hong Kong: Department of Community Medicine and School of Public Health, the University of Hong Kong, 2005.

8 Warren CW, Jones NR, Peruga A *et al*. Global youth tobacco surveillance, 2000–2007. *MMWR* 2008;**57**:1–28.

9 The Global Youth Tobacco Survey Collaborative Group. Tobacco use among youth: a cross country comparison. *Tob Control* 2002;**11**:252–70.

10 Abdullah ASM, Ho WWN. What Chinese adolescents think about quitting smoking: a qualitative study. *Substance Use Misuse* 2006;**41**:1735–43.

11 Chan S, Wong D, Leung A *et al*. Initiative to support young female smokers in Hong Kong: using gender-specific strategies in the Youth Quitline. *The Net*. International Network of Women Against Tobacco, 2008, December/2009, March, 12–4.

12 Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Processes* 1991;**50**:179–211.

13 Sussman S, Dent CW, Severson H *et al*. Self-initiated quitting among adolescent smokers. *Prev Med* 1998;**27**:A19–A28.

14 Grimshaw GM, Stanton A. Tobacco cessation interventions for young people. *Cochrane Database Syst Rev* 2006;**18**:CD003289.

15 Leatherdale ST. What modifiable factors are associated with cessation intentions among smoking youth? *Addict Behav* 2008;**33**:217–23.

16 Fagan P, Augustson E, Backinger CL. Quit attempts and intention to quit cigarette smoking among youth adults in the United States. *Am J Public Health* 2007;**97**:1412–20.

17 Tyc VL, Hadley W, Allen D *et al*. Predictors of smoking intentions and smoking status among nonsmoking and smoking adolescents. *Addict Behav* 2004;**29**:1143–7.

18 Woodruff SI, Joann L, Conway TL. Smoking and quitting history correlates of readiness to quit in multiethnic adolescents. *Am J Health Behav* 2006;**30**:663–74.

19 Myers MG, Doran NM, Brown SA. Is cigarette smoking related to alcohol use during the 8 years following treatment for adolescent alcohol and other drug abuse? *Alcohol Alcohol* 2007;**42**:226–33.

20 Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986;**51**:1173–82.

21 Diclemente CC, Prochaska JO, Farihurst SK *et al*. The process of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *J Consult Clin Psychol* 1991;**59**:295–304.

22 Fishbein M. A theory of reasoned action: some applications and implications. In: Howe H, Page M (eds). *1979 Nebraska Symposium on Motivation*. Lincoln, NE: University of Nebraska Press, 1980,65–116.

23 Yzer MC, van de Putte B. Understanding smoking cessation: the role of smokers' quit history. *Psychol Addict Behav* 2006;**20**: 356–61.

24 Lai MK, Ho SY, Lam TH. Perceived peer smoking prevalence and its association with smoking behaviours and intentions in Hong Kong Chinese adolescents. *Addiction* 2004;**99**:1195–205.

25 The Global Youth Tobacco Survey Collaborative Group. *Global Youth Tobacco Survey: Core Questions*. http://www.wpro.who.int/NR/rdonlyres/DD135DA4-448E-48D3-ACF7-7091240A41BC/0/CoreQuestionnaire.pdf (17 July 2009, date last accessed).

26 Hair JF Jr, Anderson RE, Tatham RL *et al*. *Multivariate data analysis*. 5th ed. Upper Saddle River, N.J: Prentice Hall, 1998c, 188–93.

27 Shah BV, Barnwell BG, Bieler GS. *Software for the Statistical Analysis of Correlated Data (SUDAAN): User's Manual. Release 7.5. 1997 (software documentation)*. Research Triangle Park, NC: Research Triangle Institute, 1997.

28 Engels RCMC, Knibbe RA, de Vries H *et al*. Antecedents of smoking cessation among adolescents: who is motivated to change? *Prec Med* 1998;**27**:348–57.

29 Ajzen I. *Attitudes, Personality and Behavior*. 2nd edn. Maidenhead, Berkshire, England, New York: Open University Press, 2005,88–91.

30 Hong Kong SAR Government. *The Government of the Hong Kong special Administrative Region Gazette. Smoking (Public Health) (Amendment) Ordinance 2006. (Ord. No. 21 of 2006)*. http://www.gld.gov.hk/cgi-bin/gld/egazette/gazettefiles.cgi?lang=e&year=2006&month=10&day=27&vol=10&no=43&gn=21&header=1&acurrentpage=12&df=1&nt=s1&agree=1&gaz_type=ls1&part=1&newfile=1&pid= (25 March 2009, date last accessed).

31 Thomson CC, Hamilton WL, Siegel MB *et al*. Effect of local youth-access regulations on progression to established smoking among youths in Massachusetts. *Tob Control* 2007;**16**:119–26.

32 Albers AB, Biener L, Siegel M *et al*. Household smoking bans and adolescent antismoking attitudes and smoking initiation: findings from a longitudinal study of a Massachusetts youth cohort. *Am J Public Health* 2008;**98**:1886–93.

33 Shelley D, Fahs MC, Yerneni R *et al*. Correlates of household smoking bans among Chinese Americans. *Nicotine Tob Res* 2006;**8**:103–12.

34 Chan SSC, Lam TH. Protecting sick children from exposure to passive smoking through mothers' actions: a randomized controlled trial of a nursing intervention. *J Adv Nurs* 2006;**54**:440–9.

35 Escoffery C, Kegler MC, Butler S. Formative research on creating smoke-free homes in rural communities. *Health Educ Res* 2009;**24**:76–86.

36 Leatherdale ST, McDonald PW. Youth smokers' beliefs about different cessation approaches: are we providing cessation interventions they never intend to use? *Cancer Causes Control* 2007;**18**:783–91.

37 Chan SSC, Wong DCN, Fong DYT *et al*. The establishment and promotion of the first youth quitline in Hong Kong: challenges and opportunities. *Eval Health Prof* 2008;**31**:258–71.

38 Sussman S, Dent CW, Nezami E *et al*. Reasons for quitting and smoking temptation among adolescent smokers: gender differences. *Subst Use Misuse* 1998;**33**:2703–20.

39 Haddad LG, Petro-Nusras W. Predictors of intention to quit smoking among Jordanian university students. *Can J Public Health* 2006;**97**:9–13.

40 Reid RD, Pipe AL, Riley DL *et al*. Sex differences in attitudes and experiences concerning smoking and cessation: results from an international survey. *Patient Educ Couns* 2009;**76**:99–105.

41 Aung AT, Hickman NJ III, Moolchan ET. Health and performance related reasons for wanting to quit: gender differences among teen smokers. *Subst Use Misuse* 2003;**38**:1095–7.

42 Luther EJ, Bagot KS, Franken FH *et al*. Reasons for wanting to quit: ethnic differences among cessation-seeking adolescent smokers. *Ethn Dis* 2006;**16**:739–43.

43 Mackay JM, Barnes GT. Effects of strong government measures against tobacco in Hong Kong. *BMJ* 1986;**292**:1435–7.

44 Chan SSC, So WKW, Wong DCN *et al*. Building an Integrated Model of Tobacco Control Education in the Nursing Curriculum: findings of a Students' Survey. *J Nurs Educ* 2008;**47**:223–6.

45 Raupach T, Shabah L, Baetzing S *et al*. Medical students lack basic knowledge about smoking: findings from two European medical schools. *Nicotine Tob Res* 2009;**11**:92–8.

46 Hong Kong Council on Smoking and Health. *Pictorial Health Warning*. http://www.smokefree.hk/cosh/ccs/detail.xml?lang=en&fldrid=378 (20 July 2009, date last accessed.

47 Ditre JW, Coraggio JT, Herzog TA. Associations between parental smoking restrictions and adolescent smoking. *Nicotine Tob Res* 2008;**10**:975–83.

48 Stevens SL, Colwell B, Smith DW *et al*. An exploration of self-reported negative affect by adolescents as a reason for smoking: implication for tobacco prevention and intervention programs. *Prev Med* 2005;**41**:589–96.

49 Hughes JR, Kalman D. Do smokers with alcohol problems have more difficulty quitting? *Drug Alcohol Depend* 2006;**82**:91–102.

50 Panday S, Reddy SP, Bergstrom E. A qualitative study on the determinants of smoking behaviour among adolescents in South Africa. *Scand J Public Health* 2003;**31**:204–10.

51 Stone SL, Kristeller JL. Attitudes of adolescents toward smoking cessation. *Am J Prev Med* 1992;**8**:221–5.

52 Rise J, Kovac V, Kraft P *et al*. Predicting the intention to quit smoking and quitting behaviour: extending the theory of planned behaviour. *Br J Health Psychol* 2008;**13**:291–310.

53 Erol S, Erdogan S. Application of a stage based motivational interviewing approach to adolescent smoking cessation: the transtheoretical model-based study. *Patient Educ Couns* 2008;**72**:42–8.

54 Lawrance L, Rubinson L. Self-efficacy as a predictor of smoking behavior in young adolescents. *Addictive Behaviors* 1986;**11**:367–82.

55 MacPherson L, Myers MG, Johnson M. Adolescent definitions of change in smoking behavior: an investigation. *Nicotine Tob Res* 2006;**8**:683–7.