Overestimation of peer smoking prevalence predicts smoking initiation among primary school students in Hong Kong

Man Ping Wang, MPhil; Sai Yin Ho, PhD; Wing Sze Lo, PhD; Tai Hing Lam, MD

School of Public Health, The University of Hong Kong.

All correspondence: Dr. Sai Yin Ho
School of Public Health
The University of Hong Kong,
21 Sassoon Road, Pokfulam, Hong Kong.
Tel: (852) 2819 9883, Fax: (852) 2855 9528
Email: syho@hku.hk

Acknowledgements: We thank Dr. Janice M. Johnston for language editing and Mr. KK Mak for his help in baseline survey management.

Funding: The Hong Kong Council on Smoking and Health.

Declarations of interest: None.

Abstract

Purpose: To investigate the relation between perceived smoking prevalence and smoking initiation among Hong Kong primary (grade) 2-4 students.

Methods: A cohort of 2171 students were surveyed in 2006 and again in 2008. Students who perceived peer ever-smoking prevalence as "none" or "some" were considered correct (reference group), and those who perceived "half" (overestimation) or "most/all" (gross overestimation) incorrect.

Results: At baseline, overestimation was cross-sectionally associated with ever-smoking (P<0.01). At follow-up, 7.2% of never smoking students with incorrect estimation at baseline had started smoking, which was 79%(95% CI: 3%-213%) greater than that of 3.7% for those with correct estimation. Among never smoking students with incorrect estimation, subsequent correct estimation was associated with 70%(95% CI: 47%-83%) lower risk of smoking initiation compared with persistent incorrect estimation.

Conclusions: Overestimation of peer smoking prevalence predicted smoking initiation among children. Interventions should evaluate whether correcting children's overestimation of peer smoking could reduce smoking initiation.

(150 words)

Keywords: Children, perceived smoking prevalence, smoking, Chinese, Hong Kong

Introduction

Smoking experimentation in childhood predicts regular smoking in adolescence and young adulthood [1]. The Theory of Planned Behaviour posits that intentions and actions are influenced by subjective normative beliefs [2]. As a measure of norms, the perceived prevalence of peer smoking is positively associated with smoking in adolescents [3,4], but data are scarce in younger children. Such an association in young children may have important implications on how smoking in young people should be portrayed in smoking prevention campaign and in the media. We therefore investigated whether overestiming peer smoking was associated with smoking among primary school students in Hong Kong in cross-sectional and prospective analyses.

Methods

A school-based prospective study was conducted among primary 2-4 students (P2-4, equivalent to US grades 2-4) from 19 randomly selected schools in 2006, 14 of which were successfully followed in 2008. Invitation letters were sent to parents for passive consent where only declining parents were required to return a signed reply form. Even with parental consent, student participation was totally voluntary. Ethics approval was obtained, and detailed sampling methods were reported elsewhere [5].

Among 3508 students surveyed at baseline, 2171 (61.9%) were successfully followed. Students who were followed and those lost to follow-up were similar in baseline demographic characteristics (age and sex), parental smoking status, secondhand smoke exposure, smoking status and perceived smoking prevalence (all $P>0.05$), suggesting that any non-response bias should be small.

Anonymous and self-administered questionnaires were used to collect information about demographic characteristics, smoking, secondhand smoke exposure in the past 7 days, perceived smoking prevalence among children, and parental smoking. Similar questionnaires were used at baseline and follow-up, with individual data matched by demographic and partial identification information.

Smoking status was defined using 6 response options [6]. Students who chose "I have never smoked" were classified as never smokers. Students who chose other options from "I have smoked only once or a few times" to "I smoke 7+ cigarettes/week" were classified as ever smokers (including former smokers). Smoking initiation was defined as never smoking at baseline but ever-smoking at follow-up.

Perceived smoking prevalence was assessed by the question "What proportion of primary schoolchildren in Hong Kong do you think have ever smoked a few cigarettes?" [4]. Five options from none to all were provided. Responses of "none" or "some" were categorised as correct (reference group), "half" as overestimation, and "majority" or "all" as gross overestimation. Overestimation and gross overestimation were also combined as incorrect estimation. A change in estimation from being correct at baseline to incorrect at follow-up was categorised as "becoming incorrect", while a change from being incorrect at baseline to correct at follow-up was categorised as "becoming correct".

Baseline cross-sectional relation between overestimation and ever-smoking was examined. For prospective associations, two approaches were used. First, baseline perceived smoking prevalence was used to predict smoking initiation at follow-up. Second, the effects of becoming correct and becoming incorrect on smoking initiation were investigated in two

separate models. Logistic regression yielded odds ratios (OR) for smoking adjusting for potential confounders [7] and school effects in cross-sectional and prospective analyses.

Results

Among 2171 students (mean age 8 years, 52% boys), 4.4% at baseline and 5.5% at follow-up had ever smoked. Most students correctly estimated smoking prevalence (75%), but substantial proportions overestimated (15.2%) and grossly overestimated (9.8%) smoking prevalence.

Table 1 shows that at baseline, the ORs(95% confidence interval) of ever-smoking increased linearly from 1.98(1.29-3.02) for overestimation to 2.31(1.26-4.24) for gross overestimation. Overestimation of smoking prevalence significantly predicted smoking initiation with an OR of 1.79(1.03-3.13) compared with correct estimation. However, gross overestimation was not significantly associated with smoking initiation.

Table 2 shows that compared with persistent correct estimation of smoking prevalence, becoming incorrect was associated with an OR of 3.46(2.15-5.56) for smoking initiation. Compared with persistent incorrect estimation, becoming correct reduced the odds of smoking initiation by 70%(OR: 0.30, 95%CI: 0.17-0.53).

Discussion

Our study provided the first evidence that overestimation of peer smoking prevalence was cross-sectionally and prospectively associated with smoking among primary school students. These results were consistent with previous research in adolescents [3,4]. In adolescents, overestimation of smoking prevalence is a modifiable risk factor [8]. Although a

comprehensive smoking prevention trial that included normative education failed to prevent smoking among children and adolescents [9], no interventions focusing solely on normative education have been reported.

The temporality of the cross-sectional associations observed is uncertain because smokers tend to mix with smokers to form high smoking prevalence groups; they may also normalize their unacceptable behaviour of smoking with deliberate overestimation. However, overestimation of smoking prevalence clearly preceded smoking initiation in our prospective analyses. The insignificant prospective effect of gross overestimation on smoking initiation might be due to the small size of this group.

We have adjusted for demographic differences, parental smoking and exposure to secondhand smoke, although residual confounding cannot be ruled out. In addition, we were unable to adjust for peer smoking. Nevertheless, the risk estimates were stable across different models, suggesting that the associations were robust. Among students who overestimated smoking at baseline, becoming correct at follow-up predicted a lower risk of smoking initiation, therefore satisfying the reversibility criterion of causality.

As precise estimates of smoking prevalence used in adolescent studies [4] are difficult for young children, we used crude descriptive responses as adopted in other similar research with young children [10]. The positive correlation observed between the perceived and actual smoking prevalence at the school level supported the validity of simple measures of perceived smoking prevalence (Pearson coefficient=0.43).

To encourage candid reporting of smoking, confidentiality was assured in this anonymous survey. Items on smoking were asked towards the end of the questionnaire to minimise the chance of the answers being seen by others. Students answered all questionnaire items regardless of smoking habits. Completed questionnaires were collected immediately in an opaque envelope by research staff without being handled by teachers. The association between parental and student smoking (P for Chi-square<0.01) also gave support for the validity of self-reported smoking behaviour. Biological markers should be used in future studies to validate self-reported smoking behaviours.

Conclusions

Overestimation of peer smoking prevalence among primary school students in Hong Kong predicted smoking initiation. Interventions should evaluate whether correcting children's overestimation of peer smoking could reduce smoking initiation.

(1033 words)

References:

1. Wilson N, Battistich V, Syme SL, Boyce WT. Does elementary school alcohol, tobacco, and marijuana use increase middle school risk? J Adolesc Health 2002; 30: 442-7.

2. Azjen I, Fishbein M. Understanding attitudes and predicting social Behavior. Englewood Cliffs, NJ: Prentice-Hall International Inc.; 1980.

3. Otten R, Engels R, Prinstein MJ. A prospective study of perception in adolescent smoking. J Adolesc Health 2009; 44: 478-84.

4. 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.

5. Ho SY, Wang MP, Lo WS, et al. Comprehensive smokefree legislation and displacement of smoking into the homes of young children in Hong Kong. Tob Control 2010; 19: 129-33.

6. Chen PL, Chiou HY, Chen YH. Chinese version of the Global Youth Tobacco Survey: cross-cultural instrument adaptation. *BMC Public Health* 2008; 8: 144.

7. Milton B, Cook PA, Dugdill L, Porcellato L, Springett J, Woods S.E. Why do primary school children smoke? A longitudinal analysis of predictors of smoking uptake during pre-adolescence. Public Health 2004; 118: 247-55.

8. Davis KC, Nonnemaker JM, Farrelly MC. Association between national prevention campaigns and perceived smoking prevalence among youth in the United States. J Adolesc Health 2007; 41: 430-6.

9. Peterson AV, Kealey Ka, Mann SL, Marek PM, Sarason, IG. Hutchinson smoking prevention project: Long-term randomized trial in school-based tobacco use prevention – results on smoking. J Natl Cancer Inst 2000; 92: 1979-91.

10. Hampson SE, Andrews JA, Barckley M. Predictors of development of elementary-school children's intentions to smoke cigarette: Hostility, prototypes, and subjective norms. Nicotine & Tob Res 2007; 9: 751-60.

Table 1. Cross-sectional and prospective relations between ever-smoking and perceived smoking prevalence

	Ever-smoking %	Odds ratios (95%CI)	
		Crude	Adjusted[a]
Cross-sectional analysis			
Correct estimation	3.2	1	1
Incorrect estimation	7.7	2.50(1.63-3.83)***	2.12(1.40-3.21)***
Overestimation	7.1	2.26(1.35-3.79)**	1.98(1.29-3.02)**
Gross overestimation	8.8	2.87(1.64-5.02)***	2.31(1.26-4.24)**
P for trend		<0.001	<0.001
Prospective analysis			
Correct estimation	3.7	1	1
Incorrect estimation	7.2	2.04(1.31-3.17)***	1.79(1.03-3.13)*
Overestimation	8.0	2.29(1.38-3.79)***	2.15(1.31-3.54)**
Gross overestimation	5.9	1.65(0.85-2.22)	1.30(0.56-3.02)
P for trend		0.01	0.15

*P<0.05, **P<0.01, ***P<0.001.

[a]Adjusting for sex, age, place of birth, clustering effect of schools, and baseline characteristics of parental smoking status and secondhand smoke exposure at home.

Table 2. Effects of changes in perceived smoking prevalence on smoking initiation at follow-up

	Smoking initiation %	Odds ratios (95%CI)	
		Crude	Adjusted[a]
Persistently correct	2.3	1	1
Becoming incorrect	8.4	3.85(2.24-6.63)***	3.46(2.15-5.56)***
Persistently incorrect	14.3	1	1
Becoming correct	3.9	0.24(0.12-0.50)***	0.30(0.17-0.53)***

***P<0.001.

[a]Adjusting for sex, place of birth, clustering effect of schools, and baseline characteristics of age, parental smoking status and secondhand smoke exposure at home.