A comprehensive study of smoking in primary school children in Hong Kong: implications for prevention

Jean Peters, Anthony Johnson Hedley, Tai-Hing Lam, Carol Lane Betson, Chit-Ming Wong

Abstract

***Study objective*—To identify factors associated with smoking behaviour in primary school children in Hong Kong.**

***Design*—A cross sectional survey in which both children and parents completed questionnaires. The main outcome measure was the smoking status of the children; and risk factors (knowledge of and attitude to smoking and demographic and socioeconomic background) were identified as predictors of ever/never smoking.**

***Setting and subjects*—Altogether 9598 primary school children, aged 8–13 years, and attending 27 schools from two districts in Hong Kong participated.**

***Main results*—The prevalence of ever-smoking was 12% (1119)—15% (760) in boys and 7% (359) in girls. It ranged from 3% in 8 year old girls to 52% in 13 year old boys. The factors associated with ever-smoking included the following: being a boy (adjusted odds ratio 2.21; 95% confidence interval 1.89, 2.59), increasing age per year (1.48; 1.40, 1.57), living in Kwai Tsing district (1.29; 1.10, 1.50), having one or more smokers at home (2.07; 1.78, 2.39), and having a father who was not working (1.41; 1.19, 1.67). Children who were ever-smokers had both seen and approved of their friends' smoking (8.79; 5.33, 14.50), had a more positive attitude towards smoking (3.35; 2.21, 5.09), and were more successful in recognising cigarette brand names and logos (1.67; 1.42, 1.96), but they lacked confidence (1.78; 1.32, 2.39).**

***Conclusions*—The influences on child smoking are multifactorial and programmes in Hong Kong are failing to curb them. The control of these risk factors must be incorporated in the smoking prevention policy of Hong Kong and supported by future enforced legislation.**

(*J Epidemiol Community Health* 1997;51:239–245)

Department of Community Medicine, The University of Hong Kong, Patrick Manson Building, South Wing, 7 Sassoon Road, Hong Kong
J Peters
A J Hedley
T-H Lam
C L Betson
C-M Wong

Correspondence to:
Professor A J Hedley..

Accepted for publication
September 1997

The overall prevalence of smoking in the Hong Kong population is relatively low at 29% for men and 3% for women,[1] but levels of smoking among young people,[1 2] and young women in particular,[3] are higher and increasing. Although the health risks of smoking, both active and passive, are well documented,[4 5] and smoking is the single most preventable cause of death in Hong Kong,[6] children do not seem to perceive future health risks as relevant to their current smoking behaviour.

With current targets[7] to reduce smoking in children unlikely to be met in England, for example, this may be an appropriate time to re-examine the multiple factors associated with smoking in children. It has long been recognised in the west and more recently in South East Asia that the smoking behaviour of children is influenced or even condoned in some instances, by other family members,[8–12] by friends,[7–13] and by aggressive marketing activities of the transnational tobacco companies.[13–18] The tobacco industry denies that its products are targeted at children, although in the Asia-Pacific rim marketing is aggressive,[19] especially pitched at young people, and includes the cartoon image of Joe Camel which has been successfully identified as a cigarette logo by children as young as 3 years of age.[20]

Public health authorities have little information on the knowledge of health risks, and attitude towards and practices of smoking in Hong Kong primary school children. In studies of secondary school children the smoking prevalence varied from 18%–33%.[12 21 22] In the only previous study of primary school children, 8% declared they had smoking experience.[23] This study aims to identify the social, demographic, and environmental factors among primary school children in Hong Kong that are associated with smoking experience and may contribute to the children's decision to become regular smokers. The applicability and acceptability of smoking prevention programmes in Hong Kong depends upon identifying these factors and then ensuring that they are addressed when smoking prevention policies are developed.

Methods

CHILDREN AND PARENTS

A four year study, commencing in 1989, was carried out to examine respiratory health and smoking behaviour in children attending primary classes three and four (aged 8–10 years) in 17 schools in two districts of Hong Kong. These districts were Kwai Tsing (a heavily industrialised and densely populated area) and Southern (predominantly residential). The original selection of districts was based on the differences in air quality. The principal criterion for selection of schools in Kwai Tsing was that they should be located in a subdistrict with poor air quality as rated by local officials and

the Government Environmental Protection Department. In Southern district, because of its better air quality, all schools were situated in areas of low air pollution. The initial decision to recruit from classes primary three and four was based on the requirement for children whose lungs would be responsive to respiratory insult but who were also capable of filling in a questionnaire with little help and were less likely to have smoked. Details of the initial study design, the selection of schools and classes in 1989, and any sociodemographic differences between the two districts have been reported elsewhere.[24–26] In the third year of the study, the original cohort, now in primary five and six (aged 11–13 years) were re-examined along with children currently in primary three and four. The study population was also extended with the recruitment of primary three and four children from an additional 10 schools situated in the same two districts and close to schools already participating in the study. This paper reports on the third year results.

QUESTIONNAIRES

Questionnaires written in Chinese were completed by both the children and their parents. Questions asking about the children's respiratory symptoms were taken and translated from internationally recognised standard questionnaires[27 28] and were repeated on both the parents' and children's questionnaires. In addition, the children's questionnaire included questions on smoking: their smoking practice; smoking by family members in the child's home; source of cigarettes; age at first smoking; and number of cigarettes smoked per day. Other questions examined knowledge of smoking and health; recognition of a selection of heavily advertised and popular brand names and logos, including tobacco brands,[29] and the child's attitude to smoking.

The parents' questionnaire contained questions on: their own smoking history and current smoking status; smoking practice of others living in the family home; their opinion on children smoking; own educational attainment; housing type and size; current employment status; and occupation, given a list of options compiled from Hong Kong census guidelines.[30]

Parents' questionnaires were sent home and returned to the school in a sealed envelope. Children's questionnaires were completed in the classroom, supervised by trained research workers with no teachers present. The questionnaires were checked by the research team before leaving the school and any ambiguities or missing answers were followed up with the child concerned.

KEY POINTS

- Recruitment of children to smoking is strongly associated with an environment in which the social acceptability of smoking is vigorously promoted.
- Tobacco advertising using images that young people find attractive is the most dominant factor overall.
- The tobacco industry is targeting children in Hong Kong and the Asia Pacific region and is funding campaigns to fight tobacco controls in both Hong Kong and mainland China.
- From a public health perspective enacting comprehensive legislation on advertising and sponsorship must be a priority for the new Special Administrative Region of Hong Kong.

ANALYSIS

The child's smoking status was determined from a positive answer to one of six questions as follows: have never smoked; tried smoking a few times; used to smoke, but do not now; smoke sometimes, but less than 1 cigarette per week; smoke 1–6 cigarettes per week; smoke more than 6 cigarettes per week? A positive answer to the first question defined a child as a never-smoker. All those who answered any of the other five questions positively were considered ever-smokers.

Eight new summary variables were compiled as aggregates of answers to groups of variables, the individual variable answers being treated as binary responses and coded as 1 for "correct" or "yes" and 0 for all alternatives.

Knowledge

Responses to eight questions on knowledge related to smoking and health, eg "smoking makes it difficult for you to breathe" (table 3). Answer options were "true", "false", and "don't know".

Attitude

Responses to eight statements on smoking; eg "smoking is fun" (table 3). Answer options were "yes", "no" , and "don't know".

Confidence

Responses to four questions on how confident children felt: in their school work, in sports, with friends, and in themselves. Answers were categorised from a five point scale into positive ("very confident", "confident" or "fairly confident") coded 0 and negative responses ("no" or "very poor confidence") coded 1 (table 3).

Family smoking

Responses to four questions relating to those who smoked and lived in the child's home, given as: mother, father, siblings, others. Responses were coded as the presence of "none", "one", or "two or more" of these smoker categories.

Parental influence

The sum of responses by the child (coded 1 for negative answers and 0 for positive) to the two questions "Would your mother (father) interfere if you smoked?" and dichotomised

Table 1 Population studied and smoking status in relation to age and sex in Hong Kong children

	Population studied		*Prevalence of ever-smokers*	
	Boys	*Girls*	*Boys*	*Girls*
Age (y)	*No (%)*	*No (%)*	*No (%)*	*No (%)*
8	810 (16)	825 (18)	59 (7)	28 (3)
9	1325 (27)	1414 (30)	115 (9)	71 (5)
10	1140 (23)	1129 (24)	158 (14)	67 (6)
11	976 (20)	800 (17)	202 (21)	73 (9)
12	524 (11)	417 (9)	148 (28)	52 (13)
≥13	150 (3)	88 (2)	78 (52)	18 (20)
Total	4925 (100)	4672 (100)	760 (15)	359 (7)

into 1 (two negative responses) compared with 0 (one or no negative responses).

Teacher influence

The sum of responses to the questions; "Do you think a teacher would interfere if you smoked?" (negative responses coded as 1, positive as 0) and; "Have you seen a teacher smoke?", "Do you consider it acceptable for a teacher to smoke?" (positive responses coded as 1, negative as 0). Answers were dichotomised into 1 (for a response total of 3) and 0 (for all other total response options).

Peer influence

The sum of responses (positive coded as 1, negative as 0) to the two questions; "Have you seen your classmates smoke?" and "Do you consider it acceptable for your classmates to smoke?" with the total dichotomised into 1 (two positive answers) and 0 (one or no positive answers).

Brand recognition

Successful recognition of 13 brand names and logos as one of four categories, given the following five options for answers: "food", "drink", "cigarettes", "other", and "don't know". The brand names and logos included in the questionnaire were as follows:

- *Food*: McDonald's (logo), Cadbury (name), Garden bakery (logo),
- *Drink*: Carlsberg (logo and name), Martell (name), Coca Cola (logo),
- *Cigarettes*: Salem (logo and name), Marlboro (logo and name),
- *Other*: Colgate (logo and name).[29]

All analyses were carried out using *SPSS/PC4.0*. The completion rate for all questions on the children's questionnaire was 99% or higher with the exception of the question relating to the recognition of the McDonald's logo. This question caused confusion in the children as it could be answered in three of the five categories and 5% gave no answer. Responses with missing data were excluded from relevant scores.

Crude prevalence ratios and 95% confidence intervals (CI) were calculated. Differences were examined between the children who were never and ever-smokers for demographic, social, and environmental factors and smoking behaviour using t tests and χ^2 tests as applicable. The association between potential independent factors and child smoking was examined by calculating the odds ratios (OR) with 95% CI. The scores from the eight computed variables were examined for association with smoking behaviour by inclusion in a logistic regression model together with age, sex, attained parental education level (no formal education compared with primary, lower, upper or post secondary), parental occupational status (not in work compared with working), housing type (public housing compared with all other) and district of residence (Kwai Tsing compared with Southern). The adjusted OR (95% CI) were determined for all these factors. The final logistic regression model included all variables significant at $p<0.05$.

Results

RESPONSE RATE AND DEMOGRAPHY

Responses from schools (100%) and parents (96%) were good. A total of 9657 children completed questionnaires-over 98% of the total study population. There were no refusals and the only questionnaires missing were from the 119 children absent from school on the day of the fieldwork. The final data set consisted of 9598 children who answered the question on their smoking status (table 1).

There were no differences between the two districts in gender mix ($\chi^2=1.27$, $p=0.26$) or age ($t=-1.22$, $p=0.22$). The children living in Southern district had a mean age of 10.3 years (95% CI 10.3, 10.4), and those in Kwai Tsing had a mean age of 10.4 years (10.3, 10.4). Boys (10.4 (10.4, 10.5) years) were slightly older than the girls (10.3 years (10.2, 10.3) ($t=-5.99$, $p<0.001$)).

SMOKING PRACTICE

Twelve per cent (1119) of the children—15% boys (760) and 7% girls (359)—declared they had smoking experience. Ever-smokers were on average older (mean age 11.1 (11.0, 11.2) years) than never smokers (10.2 (10.2, 10.3) years) ($t=-20.64$, $p<0.001$). Boys who smoked were older (mean age 11.2 (11.1, 11.3) years) than smoking girls (10.9 (10.7, 11.0) years) ($t=3.22$, $p<0.001$) and smoking prevalence increased with age (table 1).

Ever-smokers started smoking, on average, at 7.8 (7.6, 7.9) years, with no differences between girls and boys ($t=0.26$, $p=0.79$) and overall they had smoked 0.5 (0.4, 0.6) cigarettes in the last 24 hours. For those 230 children who claimed to have smoked at least one cigarette since yesterday, the mean number smoked was 2.1 (1.8, 2.5), with no differences between girls and boys.

The ever-smoking children bought their cigarettes from a number of outlets, mainly shops (table 2). There were no differences by sex for place of purchase with the exception of supermarkets (OR=1.61; 95% CI 1.17, 2.20). Other than purchase, these children obtained cigarettes from friends and family, with fathers being the biggest providers (table 2).

Table 2 Source of cigarettes for ever-smokers

Source	Boys (n=759) %	Girls (n=308) %	Total (n=1067) %
Purchased from:			
Shops	44	45	44
Supermarkets	30	21	27
Stalls	26	22	25
Others	27	23	25
Acquired from:			
Mother	3	6	4
Father	19	24	21
Elder siblings	6	8	7
Younger siblings	0	0	0
Grandparents	9	12	10
Relatives	17	19	17
Classmates	12	9	11
Friends	18	13	17
Others	15	11	14

Note: percentages do not add up to 100% as more than one answer may be given.

KNOWLEDGE, ATTITUDE, AND CONFIDENCE

Nine per cent (796) answered all eight knowledge questions correctly. The mean score was 5.5 (5.4, 5.5) with no differences between the ever and never-smoking children ($t=-0.32$, $p=0.75$). Responses to individual knowledge and attitude questions in relation to child smoking status are given in table 3 and show ever-smokers as having a more positive attitude towards smoking with the exception of "Smoking is a waste of money".

Ever-smokers had less confidence than never-smokers in their schoolwork, with friends, and in themselves but there were no differences for sport (table 3).

Differences in the children's level of knowledge of the health risks of smoking, attitude towards smoking, and lack of confidence in relation to age and sex are shown in table 4. Significant improvements in knowledge occur with increasing age in both sexes and there are considerable differences between boys and girls, with the boys having the better knowledge in every case except for smoking causing dandruff, where the girls were better informed. In general, the overall level of knowledge was good and the children were well aware of health risks such as smoking causes lung problems and cancer. In contrast, for attitude, there were fewer differences across the age groups. There was increased agreement with the view that smoking is "for showing off" and "a waste of money", and for the girls only, with increasing age, reduced numbers were of the opinion that smoking makes you "look tough", "feel grown-up" and "gives you confidence". For every statistically significant difference in response between the sexes in the attitude questions, a higher proportion of boys gave the answer "yes". Lack of confidence in schoolwork, sport, and with friends increased with age for the girls but not for the boys. Overall boys were less confident in their schoolwork and girls in sport.

Table 3 Knowledge of health risks, attitude to smoking, and confidence in relation to the smoking status of the child

Question	Ever-smoker (n=1056–1065) %	Never-smoker (n=8470–8517) %	OR (95% CI)	p
Knowledge: % answering correctly				
Smoking causes:				
Breathing difficulties	64	69	0.80 (0.70, 0.92)	0.001
Coughing	76	77	0.96 (0.83, 1.12)	0.64
Dandruff	64	66	0.92 (0.80. 1.05)	0.15
Lung problems	92	89	1.40 (1.11, 1.76)	0.004
Heart problems	58	57	1.05 (0.92, 1.19)	0.49
Cancers	82	80	1.17 (0.99, 1.38)	0.08
Colds	29	28	1.02 (0.88, 1.18)	0.82
Addiction	83	81	1.08 (0.92, 1.28)	0.38
Attitude: % answering yes				
Smoking:				
Is fun	6	2	4.23 (3.11, 5.76)	<0.001
Calms your nerves	14	8	2.19 (1.83, 2.62)	<0.001
Makes you look tough	7	4	1.95 (1.49, 2.53)	<0.001
Is a waste of money	86	86	1.02 (0.85, 1.22)	0.90
Makes you feel mature	8	3	2.41 (1.88, 3.10)	<0.001
Gives you confidence	5	2	2.53 (1.81, 3.52)	<0.001
Is for showing off	17	8	2.55 (1.83, 3.55)	<0.001
Makes you lose weight	4	2	2.49 (1.79, 3.47)	<0.001
Confidence: % answering no				
Have confidence:				
In schoolwork	13	6	2.45 (2.01, 2.99)	<0.001
In sports	7	6	1.16 (0.91, 1.49)	0.27
With friends	6	4	1.60 (1.22, 2.11)	<0.001
In self	9	4	2.27 (1.78. 2.88)	<0.001

SOCIAL AND ENVIRONMENTAL FACTORS

About 40% of the children, both the ever and never-smokers, lived in public housing with 55% (584) of the ever-smoking children living in Kwai Tsing and 45% (484) in Southern district.

The ever-smoking children tended to have mothers who were out of the house at work, but whose fathers were unemployed (table 5). There were also differences in the type of job done with a higher proportion of mothers of the ever-smoking children working in manufacturing and sales and fewer in professional and clerical jobs ($\chi^2=35.9$, $p<0.001$). For fathers, although there were differences in relation to occupation ($\chi^2=12.7$, $p<0.05$), the pattern was less clear cut.

Eighteen per cent of the ever-smoking children compared with 14% of the never-smokers had mothers who had received no formal education (table 5).

Thirty three per cent (3164) of the children lived in a family with one smoker category and 10% (922) with two or more. There were strong associations between the children's smoking experience and smoking by other household members: mother (OR=3.26; 95% CI 2.49, 4.26); father (1.70; 1.49, 1.93); siblings (4.92; 4.05, 5.98); others (1.53; 1.29, 1.82).

One per cent (79) of parents had no objection to their child smoking—this proportion was 3% in the smoking and 0.7% in the non-smoking parents (OR=3.86; 95% CI 2.43, 6.12). The ever-smoking children were more likely to believe that neither their parents or their teachers would interfere if they smoked and to have seen both their classmates and teachers smoke, and consider it acceptable for them to do so (table 5).

Differences related to the children's age and sex in these opinions reflect the different patterns of smoking seen in the two sexes. A higher proportion of boys claimed that their parents would not interfere if they smoked, that they had both seen their classmates and teachers smoke, and considered it acceptable for them to do so. Both sexes showed significant changes in opinion with age, with the exception of the girls' opinion that their parents would not interfere if they smoked (table 4).

Table 4 Percentage response to questions on knowledge, attitude, opinion, and confidence in relation to age and sex

	Boys						*Girls*						
Age (y)	*8*	*9*	*10*	*11*	*12*	*p (age)*	*8*	*9*	*10*	*11*	*12*	*p (age)*	*p (sex)*
Knowledge: % answering correctly to smoking causes:													
Breathing difficulties	67.3	68.1	70.6	71.8	69.0	0.028	63.6	64.8	68.3	69.2	69.2	0.004	0.009
Coughing	69.2	75.6	77.7	80.7	76.0	<0.001	70.3	73.1	79.5	81.9	83.5	<0.001	NS
Dandruff	68.1	67.5	64.1	60.5	57.3	<0.001	66.5	68.4	66.5	66.2	70.0	0.005	<0.001
Lung problems	84.7	88.2	91.9	94.3	92.4	<0.001	81.2	85.2	89.3	94.1	93.5	<0.001	<0.001
Heart problems	58.8	55.5	59.4	65.7	67.2	<0.001	53.2	49.9	48.6	61.5	67.0	<0.001	<0.001
Cancer	73.4	80.0	85.5	88.3	89.6	<0.001	66.1	71.7	79.4	86.1	88.6	<0.001	<0.001
Colds	33.0	33.3	28.4	26.9	27.9	0.003	31.5	25.7	26.6	23.8	24.5	0.005	<0.001
Addiction	76.8	82.2	84.0	86.7	84.0	<0.001	70.9	76.5	84.2	87.9	85.6	<0.001	<0.005
Attitude: % saying "yes" to smoking:													
Is fun	2.3	2.5	2.7	1.7	1.9	NS	2.7	1.7	1.0	0.9	1.4	<0.001	0.013
Calms your nerves	11.3	11.4	10.9	11.3	10.9	NS	7.6	5.8	5.2	7.1	8.4	NS	<0.001
Makes you look tough	5.4	4.5	3.8	3.9	4.6	NS	4.5	5.0	2.4	2.6	2.9	0.004	NS
Is a waste of money	81.9	85.8	87.2	90.9	89.0	<0.001	76.4	81.0	90.5	91.7	89.7	<0.001	0.017
Makes you feel mature	5.9	4.4	4.4	4.2	3.4	NS	5.6	2.9	3.1	2.2	2.9	0.004	0.002
Gives you confidence	2.1	3.0	2.5	1.7	2.5	NS	3.6	2.0	1.3	1.0	1.4	0.002	NS
For showing off	6.0	9.1	9.4	14.6	14.1	<0.001	3.4	4.9	8.6	13.0	13.9	<0.001	<0.001
Makes you lose weight	2.1	2.3	3.4	3.0	2.1	NS	2.5	1.1	1.4	1.5	1.2	NS	<0.001
Opinion: % saying for smoking:													
Father interfere (n)	5.1	3.6	2.4	1.5	2.3	<0.001	1.8	2.6	1.3	1.6	1.4	NS	<0.001
Mother interfere (n)	4.2	2.8	1.7	1.4	1.7	<0.001	2.3	1.8	1.1	1.1	0.5	NS	0.002
Teacher interfere (n)	6.6	4.8	3.6	3.1	3.2	0.003	5.7	3.9	2.7	2.4	2.9	0.003	NS
Seen teachers (y)	2.7	4.8	7.0	11.1	12.4	<0.001	2.4	4.7	5.2	9.0	11.3	<0.001	0.007
Seen classmates (y)	1.5	3.5	7.5	16.5	27.9	<0.001	0.7	1.0	3.3	9.4	16.3	<0.001	<0.001
OK for teacher (y)	6.6	12.9	17.1	21.0	27.0	<0.001	5.9	7.7	9.4	14.1	17.2	<0.001	<0.001
OK for classmates (y)	1.5	2.2	5.1	8.2	10.6	<0.001	1.1	1.7	2.2	3.0	5.7	<0.001	<0.001
Confidence: % answering no confidence:													
In schoolwork	6.1	6.9	8.7	7.7	8.7	NS	4.6	5.0	5.6	6.7	7.9	0.043	<0.001
In sports	6.0	4.3	5.7	6.9	6.5	NS	4.4	5.9	7.1	9.2	11.0	<0.001	0.009
With friends	4.9	4.6	4.1	3.9	3.8	NS	2.5	3.4	4.7	4.0	6.0	0.019	NS
In self	5.3	5.1	4.5	4.2	4.8	NS	3.8	4.7	3.9	4.1	4.6	NS	NS

Note: children aged 13 and over excluded from the table because of small subject numbers but not from the statistical analysis; (n)=no, (y)=yes, ns=not significant=p>0.05.

Table 5 Factors associated with smoking behaviour

Factor		*Ever-smoker (n=1022–1068) %*	*Never-smoker (n=8021–8530) %*	*Crude OR (95% CI)*	*Adjusted OR (95% CI)*
Sex	Being a boy	71	49	2.58 (2.25, 2.97)	2.21 (1.89, 2.59)
Age	Per year				1.48 (1.40, 1.57)
Knowledge	≥50%	76	76	1.00 (0.86, 1.16)	
Correct attitude	≥50% yes	3	0.4	7.05 (4.31, 11.5)	3.35 (2.21, 5.09)
Confidence	>50% say no	25	14	2.03 (1.74, 2.37)	1.78 (1.32, 2.39)
District	Kwai Tsing	55	48	1.31 (1.15, 1.49)	1.29 (1.10, 1.50)
Housing	Public	39	38	0.96 (0.84, 1.10)	
No employment					
	Mother	50	57	0.85 (0.73, 0.98)	
	Father	13	8	1.64 (1.25, 2.14)	1.41 (1.19, 1.67)
No formal education					
	Mother	18	14	1.27 (1.06, 1.52)	
	Father	10	9	1.13 (0.90, 1.41)	
Family smoking	≥1 smokers	60	40	2.26 (1.98, 2.58)	2.07 (1.78, 2.39)
Parental	+ve influence	20	15	1.37 (1.16, 1.61)	
Teacher	+ve influence	60	46	1.71 (1.50, 1.94)	
Peer	+ve influence	31	7	5.80 (4.98, 6.77)	8.79 (5.33, 14.50)
Brand	100% correct				
	Food	72	73	0.94 (0.81, 1.08)	
	Drink	63	57	1.31 (1.15, 1.50)	
	Cigarettes	64	41	2.48 (2.17, 2.83)	1.67 (1.42, 1.96)
	Toothpaste	71	67	1.23 (1.07, 1.42)	

BRAND RECOGNITION

The ever-smoking children were more successful in recognising cigarette brand names and logos than the never-smokers (table 5). Twenty eight per cent of 8 year old children recognised all four tobacco-related names and logos correctly, and success increased with age to 72% in 13 year olds. Out of all the 13 brand names and logos given, the two most successfully identified (both 95% correct) were the Salem logo and Marlboro name.

ESTIMATED ADJUSTED ODDS RATIOS

Logistic regression analysis resulted in nine factors remaining as significant predictors of smoking behaviour with correct prediction of 89% of these children as ever or never-smokers. Compared with the never-smokers, the ever-smokers tended to be boys and to live in a smoking family. They had, and approved of, friends who smoked, had a positive attitude to smoking, and could recognise cigarette brands more successfully, although they were equally successful at recognising other brands. These ever-smokers, although more likely to be older, had less confidence, lived in the mixed industrial residential urban area of Kwai Tsing, and had a father currently unemployed. The adjusted OR and 95% CI for these nine risk factors are given in table 5. In terms of the relative importance of the background factors, likelihood ratio tests for each variable included and not included in the logistic model showed that district ($\chi^2=12.18$, df=1, $p<0.001$), father not working ($\chi^2=16.29$, df=1, $p<0.001$) and to lesser extent, mother working ($\chi^2=3.97$, df=1, $p<0.05$) made a significant impact on

the prediction of a child as an ever-smoker but parental education and housing seemed less important and were non-significant ($p>0.05$).

Discussion

Factors associated with childhood experimentation with smoking, although well documented in the west have not been fully explored in Hong Kong and other areas of the Asia Pacific region. This study, the first in Hong Kong to model such a comprehensive range of potentially influencing factors, indicates that Hong Kong children are experimenting with smoking from a very early age. By the age of 12, one in five has tried smoking, and a clear increasing trend in ever-smoking prevalence is evident in Hong Kong primary school children aged 8 through to secondary school children aged 15.[12 21 22]

Although these responses have not been validated with cotinine studies, validity can be inferred from the consistency found in the estimated excess risks in child smokers, of cough, wheeze, and phlegm over the four years of this study,[24–26] and the high level of agreement between parental and children's responses on questions relating to smoking practice. Personal reporting of smoking behaviour has also been shown to be reliable.[31]

While socioeconomic factors, measured by housing type, education and occupation, appear to have less of an influence in Hong Kong than in other countries[9 10 32] these ever-smoking children were more likely to have an unemployed father in a territory where, at the time of the survey, employment was higher than 98%.[33] Family influence remains important in Hong Kong[11 12] as in other countries.[8–10 13] These children were found to be twice as likely to smoke if they lived in a home where one or more members of the family household smoked and, in some instances, family members were prepared to provide them with the cigarettes. Fathers gave cigarettes to one fifth of the child smokers in this study. Outside of the family, peer pressure was found to be a major influential factor in this study as elsewhere.[8–14] Evidence of an influential role by teachers is limited,[34] and we found no association between the child's opinions of their teachers smoking and their own practice after adjustment for other influential factors. However, as role models with credibility from a child's viewpoint, parents and teachers both have an opportunity to influence acceptance of the "no smoking" message by not smoking themselves. Such action would not only provide a healthy role model but also lead to a reduction in passive smoking, a health hazard in its own right[5] and a greater risk for children's respiratory problems in the Territory than ambient air pollution.[24–26] It is essential that initiatives to tackle child smoking include promotion of negative attitudes to smoking in adults.

The ever-smoking children in this study, as elsewhere,[8 10] believe that smoking is fun and makes you look grown up, images which some children perceive as portrayed by cigarette advertisements.[15] Even though ever-smoking children are more successful in identifying advertised tobacco brand names and logos, non-smokers are not unsuccessful.[29 35] In Hong Kong the tobacco industry continues to use advertisements targeted at children[17 20] and sponsorship of sports and cultural events regarded as exciting and glamorous by young children; this is a major obstacle for smoking prevention programmes to overcome. Despite a partial ban on tobacco advertising, children's exposure to tobacco advertisements in Hong Kong, as elsewhere, is not prevented nor is their subsequent ability to recall them limited.[20 36] A total ban on advertising is needed, including sponsorship by the tobacco industry of cultural and sporting events. There is evidence that such bans can work,[37] and Hong Kong residents, including smokers, have consistently expressed support for such bans over the last seven years.[38–40] Fiscal measures, such as hypothecated taxes, which have been successfully implemented in Australia,[41] are unlikely to directly dissuade children from smoking. But the use of such revenue, not only to fund health care services and health promotion but also sponsorship of sports and cultural events, at least removes the tobacco industry's advertising impact from such events. Legislation introduced since this survey was completed has banned sales of tobacco products to those below 18 years but rigorous enforcement will be necessary as children in this study aged 8–12 years were able to purchase cigarettes.

Changing intentions to smoke needs to start in the classroom with specifically trained teachers and a spiral curriculum suitably structured to cater for the significant development seen in children's knowledge, attitude, opinions, and confidence with increasing age and the wide diversity occurring in some instances between the sexes, as demonstrated in this study. Education programmes need to focus on encouraging a sense of internal control in the children, rather than external prohibition, as this is more effective in helping children to resist temptations. Improving knowledge levels alone is not enough as we found these to be reasonable in both our never and ever-smoking children. Programmes need to include "inoculation" against tobacco advertising, the boosting of self confidence, and development of refusal skills for children to resist the influence and pressure, real or apparent, of peers and family. Resistance to temptation to smoke can be increased in children by labelling them as "able" in resisting temptation,[42] thereby contributing to their greater sense of self efficacy.[43] Evidence shows that smokers rate smoking benefits as greater, and costs as less, than non-smokers.[44] The intention to smoke is, therefore, amongst other things, a function of the person's positive or negative evaluation of smoking and their perception of whether any referents, such as peers (as is demonstrated very clearly in this study), approve or disapprove of smoking.[44] So anti-smoking education programmes need to focus on attitudes towards smoking. More particularly, concentrating on increasing the children's sense of their own effectiveness, both in being socially effective without cigarettes and

in resisting temptation to adopt indulgent behaviours generally, and towards tobacco, specifically. Tobacco advertising can increase social discontent among young people by generating or strengthening desires for promoted products,[43] so sustained media campaigns to deglamourise smoking behaviour need to be run in tandem with anti-smoking promotions in schools and elsewhere. Such programmes must begin at primary school level as children with a smoking history by 9 years of age are more likely to still be smokers at 13.[46]

The problem is not unique to Hong Kong and the Hong Kong Government needs to learn from the efforts of other countries. It needs to set targets, as in other countries,[7] for a reduction in smoking prevalence with special attention to specific high risk groups, such as children. In conjunction with this it needs to provide an adequately resourced united approach through legislation, education, ongoing monitoring, and evaluation. This study indicates that smoking is a paediatric problem in Hong Kong and that in primary school children it is associated with marked respiratory ill health effects.[24–26] There is a need to act now if we wish to reduce, or even contain, the predicted levels of mortality and morbidity from tobacco related diseases into the next century.[4]

We thank Dr R Fielding for his helpful comments and advice on health education, all the schools, teachers, parents, and children who took part in this study, and members of the research team.

Funding: the authors gratefully acknowledge financial support from the Environmental Protection Department, Hong Kong Government, the Hong Kong Jockey Club (Charities) Ltd, Kwai Tsing District Board, Glaxo Hong Kong Ltd, the Mary-Sun Medical Scholarship Fund (Hong Kong-Cambridge Link), and the University of Hong Kong Conference and Research Grants Committee.
Conflicts of interest: none.

1 Census and Statistics Department, Hong Kong Government. *Special topics report VII. General household survey 1990.* Hong Kong: Government Printer 1991.
2 Census and Statistics Department, Hong Kong Government. *Special topics report I. General household survey 1982.* Hong Kong: Government Printer 1983.
3 Li C, Fielding R, Marcoolyn G, Wong CM, Hedley AJ. Health beliefs, expectations and perceived benefits of smoking in Asian women. *Tobacco Control* 1994;**3**:21–9.
4 Peto R, Lopez AD, Boreham J, Thun M, Heath C. *Mortality from smoking in developed countries 1950–2000.* Oxford: Oxford University Press 1994:553.
5 Environmental Protection Agency. *Respiratory health effects of passive smoking: lung cancer and other disorders.* EPA/600/6-90/006F Washington DC: EPA, 1992:1–1.
6 Department of Health, Hong Kong. *Public health report no 1. A new approach to the public health report. Coronary heart disease and lung cancer.* Hong Kong: Government Printer 1994:52.
7 Secretary of State for Health. *The health of the nation: a strategy for health in England.* Cm 1986. London: HMSO 1992.
8 Bewley BR, Bland JM, Harris R. Factors associated with the starting of cigarette smoking by primary school children. *Br J Prev Soc Med* 1974;**28**:37–44.
9 O'Connell DL, Alexander HM, Dobson AJ, *et al.* Cigarette smoking and drug use in schoolchildren. II Factors associated with smoking. *Int J Epidemiol* 1981;**10**:223–31.
10 Murray M, Swan AV, Johnson RD, Bewley BR. Some factors associated with increased risk of smoking by children. *J Child Psychol Psychiatry* 1983;**24**:223–32.
11 Chung J, Mackay J, Munro C, Tse MR. Smoking in Chinese secondary school children in Hong Kong II Attitudes and knowledge. *Hong Kong Practitioner* 1989;**11**:159–69.
12 Hertz AZ. *Smoking among junior secondary school children in Hong Kong in 1990. A report to The Hong Kong Council on Smoking and Health.* Hong Kong: Hong Kong Council on Smoking and Health, 1990:1–22.
13 Armstrong BK, de Klerk NH, Shean RE, Dunn DA, Dolin PJ. Influence of education and advertising on the uptake of smoking by children. *Med J Aust* 1990;**152**:117–24.
14 Botvin GJ, Goldberg CJ, Botvin EM, Dusenbury L. Smoking behaviour of adolescents exposed to cigarette advertising. *Public Health Rep* 1993;**108**:217–24.
15 Potts H, Gillies P, Herbert M. Adolescent smoking and opinion of cigarette advertisements. *Health Education Research* 1986;**1**:195–201.
16 Pierce JP, Gilpin E, Burns DM, *et al.* Does tobacco advertising target young people to start smoking? Evidence from California. *JAMA* 1991;**266**:3154–8.
17 Di Franza JR, Richards JW, Paulman PM, *et al.* RJR Nabisco's cartoon camel promotes Camel cigarettes to children. *JAMA* 1991;**266**:3149–53.
18 Pierce J, Lee L, Gilpin EA. Smoking initiation by adolescent girls, 1944 through 1988. An association with targeted advertising. *JAMA* 1994;**271**:608–11.
19 Mackay JL. The fight against tobacco in developing countries. *Tuber Lung Dis* 1994;**75**:8–24.
20 Fischer PM, Schwartz MP, Richards JW, Goldstein AO, Rojas TH. Brand logo recognition by children aged 3 to 6 years. *JAMA* 1991;**266**:3145–8.
21 Chung J, Mackay J, Munro C, Tse M. Smoking in Chinese secondary school children in Hong Kong I Prevalence. *Hong Kong Practitioner* 1989;**11**:91–99.
22 Lam TH, Chung SF, Wong CM, Hedley AJ, Betson CL. *Youth smoking, health and tobacco promotion. The Youth Smoking and Health Survey.* Hong Kong: Council on Smoking and Health. 1994:6.
23 Peters J, Hedley AJ, Lam TH, Liu J, Wong CM, Ong SG. Factors influencing smoking behaviour in Hong Kong primary schoolchildren: targets for prevention. *Asia Pacific Journal of Public Health* 1995;**8**:102–8.
24 Ong SG, Liu J, Wong CM, *et al.* Studies on the respiratory health of primary school children in urban communities of Hong Kong. *The Science of the Total Environment* 1991; **106**:121–35.
25 Hedley AJ, Peters J, Lam TH, *et al. Air pollution and respiratory health in primary school children, 1989–1992.* Report to the Environmental Protection Department, Hong Kong Government. Hong Kong: Department of Community Medicine, The University of Hong Kong. 1993:311.
26 Peters J, Hedley AJ, Wong CM, Lam TH, Ong SG, Liu J, Spiegelhalter DJ. Effects of an ambient air pollution intervention and environmental tobacco smoke on children's respiratory health in Hong Kong. *Int J Epidemiol.* 1996;**25**:821–28.
27 Medical Research Council. *Questionnaire on respiratory symptoms, 1960.* London: MRC.
28 Florey C du V, Leeder SR. *Methods for cohort studies of chronic airflow limitation.* Copenhagen:WHO, 1982. WHO Regional Publications, European Series No 12.
29 Peters J, Betson CL, Hedley AJ, *et al.* Recognition of cigarette brand names and logos in young children in Hong Kong. *Tobacco Control* 1995;**4**:150–5
30 *Hong Kong 1991 population census.* Hong Kong: Government Printer, 1991.
31 Barnea Z, Rahav G, Teichman M. The reliability and consistency of self-reports on substance use in a longitudinal study. *Br J Addiction* 1987;**82**:891–98.
32 Bellew B, Wayne D. Prevention of smoking among schoolchildren: a review of research and recommendations. *Health Educ J* 1991;**50**:3–8.
33 *Hong Kong 1993. A review of 1992.* Hong Kong: Government Printer, 1993:97.
34 Bewley BR, Johnson MRD, Banks MH. Teachers' smoking. *J Epidemiol Community Health* 1979;**33**:219–22.
35 Charlton A. Children's advertisement-awareness related to their views on smoking. *Health Educ J* 1986;**45**:75–8.
36 Nelson E, Charlton A. Children and advertising: does the Voluntary Agreement work? *Health Educ J* 1991;**50**:12–5.
37 Smee C. *Effect of tobacco advertising on tobacco consumption: a discussion document reviewing the evidence.* London: Economics and Operational Research Division, Department of Health, 1992.
38 Lam TH, Donnan SPB, Cheng KK, Chan NF. A public opinion survey on proposed legislative changes on smoking control. In: Durstan B, Jamrozik K. eds. *Tobacco and health 1990 the global war.* Proceedings of the Seventh World Conference on Tobacco and Health, 1990:726–28.
39 Cheng KK, Hedley AJ, Bacon-Shone J, Lam TH, Peters J, Chan A. *A Public opinion survey on measures related to the control of smoking in Hong Kong.* Hong Kong: Department of Community Medicine and Social Sciences Research Centre, The University of Hong Kong. 1993:12.
40 Lam TH, Chung SF, Hedley AJ, Sum SM. *Public opinion on banning of tobacco advertisements and sponsorship 1995.* Hong Kong: Council on Smoking and Health 1996:4.
41 *Vic Health Annual Report 1994.* Victoria, NSW: Victoria Health Promotion Foundation, 1994:92.
42 Miller RL, Brickman P, Bolen D. Attribution versus persuasion as a means for modifying behaviour. *J Pers Soc Psychol* 1975;**31**:430–41.
43 Bandura A. *Social foundations of thought and action: a social cognitive theory.* New Jersey: Prentice Hall Inc; 1986.
44 Li C, Fielding R, Hedley AJ. Survey of knowledge, perceptions and behaviour related to smoking in young Asian women airline cabin crew. *Health Educ J* 1996;**55**:92–100.
45 Ajzen I. *Attitudes, personality and behaviour.* Milton Keynes: OUP, 1988.
46 McGee R, Stanton WR. A longitudinal study of reasons for smoking in adolescence. *Addiction* 1993;**88**:265–71.