Papers

Mortality and smoking in Hong Kong: case-control study of all adult deaths in 1998 Topic: 157;49;163;144

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Abstract

Objective To assess the mortality currently associated with smoking in Hong Kong, and, since cigarette consumption reached its peak 20 years earlier in Hong Kong than in mainland China, to predict mortality in China 20 years hence.
Design Case-control study. Past smoking habits of all Chinese adults in Hong Kong who died in 1998 (cases) were sought from those registering the death.
Setting All the death registries in Hong Kong.
Participants 27 507 dead cases (81% of all registered deaths) and 13 054 live controls aged ≥35 years.
Main outcome measures Mortality from all causes and from specific causes.
Results In men aged 35-69 the adjusted risk ratios (and 95% confidence intervals) comparing smokers with non-smokers were 1.92 (1.70 to 2.16) for all deaths, 2.22 (1.94 to 2.55) for neoplastic deaths, 2.60 (2.10 to 3.21) for respiratory deaths (including tuberculosis, risk ratio 2.54), and 1.68 (1.43 to 1.97) for vascular deaths (each $P < 0.0001$). In women aged 35-69 the corresponding risk ratios were 1.62 (1.40 to 1.88) for all deaths, 1.60 (1.33 to 1.93) for neoplastic deaths, 3.13 (2.21 to 4.44) for respiratory deaths, and 1.55 (1.20 to 1.99) for vascular deaths (each $P < 0.001$). If these associations with smoking are largely or wholly causal then, among all registered deaths at ages 35-69 in 1998, tobacco caused about 33% (2534/7588) of all male deaths and 5% (169/3341) of all female deaths (hence 25% of all deaths at these ages). At older ages tobacco seemed to be the cause of 15% (3017/20 420) of all deaths.
Conclusions Among middle aged men the proportion of deaths caused by smoking is more than twice as big in Hong Kong now (33%) as in mainland China 10 years earlier. This supports predictions of a large increase in tobacco attributable mortality in China as a whole.

Introduction

Tobacco related mortality needs to be assessed separately in many different populations, as it may differ substantially from one population to another in ways that are difficult to predict. Some of these differences involve poorly understood cofactors for neoplastic, respiratory, and vascular disease, and some involve differences in the type and amount of tobacco smoked during previous decades (because the full hazards of persistent smoking may take about half a century to emerge). In the United Kingdom and United States, for example, a large increase in cigarette consumption between 1910 and 1950 resulted in a large increase in tobacco related deaths between 1950 and 1990.[1]

China, with 20% of the world's population, now smokes 30% of the world's cigarettes,[1] and direct evidence is needed of the eventual effects of this on Chinese mortality. However, the main increase in cigarette consumption took place 40 years later in China than in the United States, so it is too early for the full hazards yet to be seen, and we cannot necessarily assume that the disease specific hazards in China will be similar to those documented in Western countries. Large case-control studies were therefore conducted in mainland China that assessed the hazard 10 years ago,[2] and large prospective studies have been set up that will eventually monitor the evolution of the Chinese epidemic of tobacco attributable mortality,[3] but it will be some decades before these prospective study results mature.

In the largely (95%) Chinese population of Hong Kong, however, the prevalence of cigarette smoking reached its peak about 20 years earlier than in mainland China (but about 20 years later than in the United States),[4 5] and the present case-control study assesses the mortality currently associated with smoking among them.

Subjects and methods

We undertook a large case-control study in which the cases were all ethnic Chinese people aged 35 or over whose deaths were registered in Hong Kong in about 1998 (mid-December 1997 to mid-January 1999). For each such death, information was sought from the registry about the medical cause of death and from the person reporting the death about the dead person's smoking habits 10 years earlier—that is, before there was much chance of the habits being changed by the disease that eventually caused death.

In Hong Kong death registration at one of four death registries is required by law and is usually done by one of the more educated relatives of the dead person. Chinese informants registering an adult death were given a standardised questionnaire about the dead person while waiting in the registry for the death

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certificate and were invited by trained interviewers to complete it or to let the interviewer complete it with them, recording smoking, drinking, employment, and housing type (each as they were "10 years ago, in about 1988") and age, sex, birthplace, and educational attainment. The questionnaire (available from THL on request) was about lifestyle in general, and no indication was given that smoking was of particular interest.

The questionnaire had two sections asking the same questions, one for the dead person (case) and one for a living person—either the dead person's spouse or, if there was no surviving spouse, a person preferably aged at least 60 with whose habits 10 years ago the informant was most familiar (which generally yielded a relative of the dead person). We used the living person as a control, but only if that person was not the informant. Hence, for both cases and controls, information was obtained by proxy from the same informant and was related to habits in 1988. When the informant was the spouse, which was common, no control was obtained: hence, there are only half as many controls as cases. Indeed, as our methods tended to select female controls (since wives tend to survive husbands) there were only a quarter as many male controls as male cases (although for each particular cause of death there were more male controls than male cases). For comparability with other studies,[1–3] our mortality analyses are restricted to people aged 35 or above.

Interviewing was conducted from mid-December 1997 to mid-January 1999 and yielded complete infor-
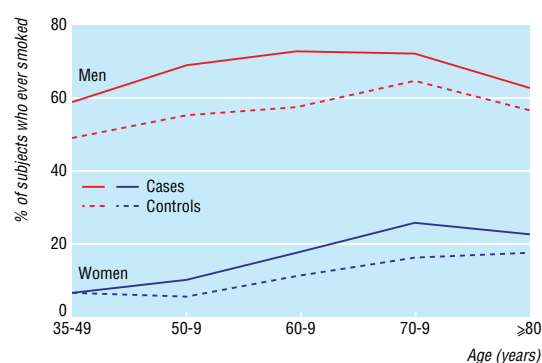
Reported smoking habits of 27 000 dead "cases" and 13 000 live controls in Hong Kong in 1998 stratified by age and sex

mation on 27 507 cases aged 35 or over (mean 2116 per month, which is 81% of the monthly number of death registrations at these ages during 1998 in the whole of Hong Kong) and on 13 054 controls. Of the deaths that were not included, a third were because of the informant's refusal or inability to provide complete information and the rest were either because the informant was not Chinese or, more commonly, because when one interview was in progress another informant might be missed. As a check on reliability, repeat interviews were conducted by telephone on a random sample of 235 cases and 212 controls: the agreement over whether people had ever smoked was 91.9% for cases and 92.0% for controls.

Causes of death were routinely coded according to the World Health Organisation's ninth international classification of diseases (ICD-9) by the governmental Department of Health. The main disease groupings used in the present analyses are those previously adopted by a large study[2] in mainland China, but with some extra subcategories added (colorectal cancer and injury and poisoning).

Statistical analysis

Unmatched logistic regression was used to estimate the risk ratio for smokers versus non-smokers adjusted for age (five year age groups) and education (four categories). If a proportion p of the study deaths involved smokers then the fraction attributed to smoking (calculated separately for men and women aged 35-69 and $\geqslant 70$) is $p \times (1-1/(\text{risk ratio}))$, and was multiplied by the corresponding number of deaths registered in all Hong Kong to get attributed numbers.

Results

The cases and controls had similar birthplaces, education, type of housing, and jobs (see table 1). The mean (SD) age of cases and controls was 70.7 (12.7) and 71.5 (10.3) for men but was 76.3 (13.2) and 67.3 (10.5), respectively, for women. These differences in age are controlled for automatically in the analyses. The proportion of people who had ever smoked was greater in cases than in controls both for men and for women, indicating higher death rates among smokers than among non-smokers at all ages (see figure: the apparent irregularity among women aged 35-49 is based on small numbers, and the upper 95% confidence limit for the corresponding risk ratio is 1.5).

Table 1 Demographic characteristics (%) of cases and controls

	Male cases (n=15 296)	Male controls (n=3918)	Female cases (n=12 211)	Female controls (n=9136)
Age (years):				
35-44	4	1	3	2
45-54	8	4	5	10
55-64	15	17	8	23
65-69	14	16	8	19
70-74	16	22	14	20
75-79	16	16	16	13
80-84	14	15	18	9
$\geqslant 85$	13	9	28	4
Birthplace:				
Hong Kong	17	13	16	15
Guangdong	71	75	72	74
Elsewhere	12	12	12	11
Education:				
No formal	26	24	61	50
Primary	47	49	27	36
Secondary	22	22	10	12
Tertiary and higher	5	4	2	2
Type of housing:				
Hut or shared	11	5	9	6
Public housing	47	50	44	48
Self owned	36	41	39	41
Quarter or other	6	4	8	5
Job:				
Full time	41	42	11	19
Retired	55	55	33	24
House work	0	0	50	49
Part time, jobless, or student	4	3	7	8
Smoking status:				
Ever smoked	69	60	21	13
Never smoked	31	40	79	87

Table 2 Numbers of subjects who ever smoked or never smoked and adjusted risk ratios† for smoking and mortality from neoplastic, respiratory, vascular, and other causes among 27 507 dead "cases" and 13 054 live controls in Hong Kong, 1998

	Age 35-69 years		Age ≥70 years	
Cause of death	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)
Cases				
Lung cancer:				
Men	789/128	4.99 (4.00 to 6.22)*	887/107	4.90 (3.93 to 6.10)*
Women	72/242	3.06 (2.30 to 4.07)*	303/367	4.10 (3.43 to 4.91)*
Any malignant neoplastic:				
Men	2228/889	2.22 (1.94 to 2.55)*	2120/693	1.84 (1.63 to 2.08)*
Women	193/1386	1.60 (1.33 to 1.93)*	634/1580	2.00 (1.76 to 2.28)*
Respiratory:				
Men	532/152	2.60 (2.10 to 3.21)*	1763/668	1.82 (1.60 to 2.07)*
Women	47/145	3.13 (2.21 to 4.44)*	640/1544	2.54 (2.19 to 2.94)*
Vascular:				
Men	872/404	1.68 (1.43 to 1.97)*	1508/913	1.06 (0.94 to 1.19)
Women	86/521	1.55 (1.20 to 1.99)*	586/2456	1.29 (1.13 to 1.48)*
Other cause:				
Men	692/439	1.27 (1.07 to 1.51)*	778/538	0.93 (0.80 to 1.07)
Women	64/523	1.16 (0.87 to 1.55)	332/1403	1.18 (1.01 to 1.38)*
All deaths:				
Men	4343/1892	1.92 (1.70 to 2.16)*	6185/2818	1.41 (1.28 to 1.55)*
Women	394/2583	1.62 (1.40 to 1.88)*	2196/7008	1.68 (1.52 to 1.86)*
Live controls				
Men	841/639	1.00	1502/923	1.00
Women	457/4473	1.00	692/3491	1.00

*Statistically significant. †Adjusted for 5 year age groups and education.

Table 2 shows the main results for men and for women in middle age (35-69 years) and in old age (≥70). For deaths from all causes, the risk ratio (smokers versus non-smokers standardised for age and education) was significantly elevated in middle aged men (1.92), elderly men (1.41), middle aged women (1.62), and elderly women (1.68), each P<0.0001. When the causes of death were classified into four broad categories, we found significantly elevated risk ratios for malignant neoplasms and for respiratory disease in all four groups (middle aged men, elderly men, middle aged women, and elderly women). For vascular disease, the risk ratio was non-significant only in elderly men. For lung cancer, high risk ratios were found in all four

Table 3 Numbers of subjects who ever smoked or never smoked and adjusted risk ratios† for smoking and mortality from selected causes among middle aged men and women in Hong Kong, 1998

	Men aged 35-69 years		Women aged 35-69 years	
Cause of death	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)
Cases				
Malignant neoplastic:				
Lung cancer	789/128	4.99 (4.00 to 6.22)*	72/242	3.06 (2.30 to 4.07)*
Oesophageal cancer	145/15	7.89 (4.49 to 13.88)*	3/19	1.60 (0.47 to 5.49)
Stomach cancer	132/64	1.72 (1.24 to 2.38)*	5/77	0.69 (0.28 to 1.73)
Liver cancer	392/215	1.56 (1.26 to 1.92)*	17/126	1.41 (0.84 to 2.38)
Five minor sites‡	303/145	1.94 (1.52 to 2.48)*	14/105	1.48 (0.83 to 2.63)
Other malignancy§	467/322	1.25 (1.04 to 1.51)*	82/817	1.14 (0.88 to 1.48)
Colorectal cancer	142/139	0.84 (0.64 to 1.09)	18/186	1.03 (0.62 to 1.70)
Respiratory:				
COPD¶	217/40	3.68 (2.58 to 5.26)*	27/18	13.27 (7.19 to 24.49)*
Respiratory tuberculosis	36/11	2.54 (1.24 to 5.22)*	1/8	1.49 (0.18 to 12.57)
Other respiratory	279/101	2.15 (1.66 to 2.79)*	19/119	1.54 (0.93 to 2.53)
Vascular:				
Stroke	315/140	1.75 (1.39 to 2.20)*	31/235	1.28 (0.87 to 1.89)
Ischaemic heart disease	339/170	1.58 (1.27 to 1.97)*	31/138	1.96 (1.30 to 2.96)*
Other vascular	218/94	1.78 (1.36 to 2.33)*	24/148	1.52 (0.97 to 2.40)
Other causes:				
Other medical	465/292	1.29 (1.07 to 1.55)*	43/375	1.04 (0.75 to 1.46)
Injury and poisoning	227/147	1.23 (0.93 to 1.63)	21/148	1.49 (0.90 to 2.47)
Controls				
	841/639	1.00	457/4473	1.00

*Statistically significant. †Adjusted for 5 year age groups and education. ‡Cancer of the mouth, pharynx, larynx, pancreas, or bladder. §Includes colorectal cancer. ¶Chronic obstructive pulmonary disease (or pulmonary heart disease).

Table 4 Numbers of subjects who ever smoked or never smoked and adjusted risk ratios† for smoking and mortality from selected causes among elderly men and women in Hong Kong, 1998

Cause of death	Men aged ⩾70 years		Women aged ⩾70 years	
	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)	No of subjects ever smoked/ never smoked	Risk ratio (95% CI)
Cases				
Malignant neoplastic:				
Lung cancer	887/107	4.90 (3.93 to 6.10)*	303/367	4.10 (3.43 to 4.91)*
Oesophageal cancer	77/18	2.17 (1.28 to 3.66)*	12/23	2.67 (1.30 to 5.51)*
Stomach cancer	129/65	1.14 (0.83 to 1.56)	21/113	0.95 (0.59 to 1.54)
Liver cancer	204/104	1.17 (0.91 to 1.52)	35/120	1.35 (0.91 to 2.01)
Five minor sites‡	223/83	1.68 (1.28 to 2.20)*	36/121	1.48 (1.00 to 2.18)*
Other malignancy§	600/316	1.19 (1.01 to 1.40)*	227/836	1.36 (1.14 to 1.61)*
Colorectal cancer	234/121	1.16 (0.91 to 1.48)	64/295	1.07 (0.80 to 1.44)
Respiratory:				
COPD¶	742/122	3.81 (3.08 to 4.71)*	272/177	7.81 (6.25 to 9.78)*
Respiratory tuberculosis	63/25	1.63 (1.01 to 2.64)*	9/44	1.03 (0.49 to 2.15)
Other respiratory	958/521	1.28 (1.11 to 1.48)*	359/1323	1.52 (1.28 to 1.81)*
Vascular:				
Stroke	556/339	1.04 (0.89 to 1.23)	236/1070	1.14 (0.96 to 1.37)
Ischaemic heart disease	589/379	1.02 (0.87 to 1.20)	217/835	1.39 (1.15 to 1.67)*
Other vascular	363/195	1.16 (0.96 to 1.42)	133/551	1.25 (0.99 to 1.56)
Other causes:				
Other medical	684/466	0.94 (0.81 to 1.10)	300/1286	1.17 (0.99 to 1.38)
Injury and poisoning	94/72	0.82 (0.59 to 1.13)	32/117	1.31 (0.86 to 1.98)
Controls				
	1502/923	1.00	692/3491	1.00

*Statistically significant. †Adjusted for 5 year age groups and education. ‡Cancer of the mouth, pharynx, larynx, pancreas, or bladder. §Includes colorectal cancer. ¶Chronic obstructive pulmonary disease (or pulmonary heart disease).

groups, ranging from 3.06 in middle aged women to 4.99 in middle aged men.

Table 3 shows the risk ratios for several specific causes of death in middle aged men and women, and table 4 shows the corresponding results for elderly men and women. The most extreme risk ratio in the middle aged men was that for death from cancer of the oesophagus (7.9, 95% confidence interval 4.5 to 13.9), but this result may have been inflated by chance, especially since the risk ratios for oesophageal cancer in the three other groups were substantially smaller. In middle aged men the risk ratio was 1.72 for stomach cancer and 1.56 for liver cancer (but only 0.84 for colorectal cancer) and was 1.94 for a pre-specified group of five types of cancer (mouth, pharynx, larynx, pancreas, and bladder) that have been found to be associated with smoking in other studies.[2] For respiratory diseases, the risk ratios were 3.68 for chronic obstructive pulmonary disease and 2.54 for respiratory tuberculosis, while, for vascular diseases, the risk ratios were 1.75 for stroke and 1.58 for ischaemic heart disease: all of these risk ratios were highly significant (P < 0.001) and involve diseases that might be caused or aggravated by smoking.

Table 5 shows the risk ratios for the four broad categories of disease and for the selected causes in middle aged men and women who smoked 1-14, 15-24, or ⩾25 cigarettes a day. Among the men, for each of the four broad categories of disease, there was a significantly positive dose-response relation (although it is fairly shallow for vascular mortality). For death from all causes, the risk ratios were 1.51, 2.01, and 3.31, indicating a highly significant trend of increasing mortality with increasing cigarette consumption.

The corresponding dose-response relations for elderly men and women are given in table 6 . Both in

middle age and old age the death rates were significantly higher in smokers than in non-smokers. If this excess is largely or wholly causal then in Hong Kong in 1998 the numbers of deaths attributable to smoking were about 2534/7588 (33.4%) in middle aged men, 2019/10 107 (20.0%) in elderly men, 169/3341 (5.1%) in middle aged women, and 998/10 313 (9.7%) in elderly women. This indicates that the total number of deaths attributable to tobacco among people aged ⩾35 was 5720 (18.2% of 31 349) and that tobacco was a cause of 25% (2703/10 929) and 15% (3017/20 420) of all deaths in middle aged and elderly people, respectively, in Hong Kong in 1998.

Discussion

Our study is the first to assess the hazards in a Chinese population that is at a fairly advanced stage of the epidemic of tobacco deaths among middle aged men, so it may well foreshadow what will happen among men throughout mainland China (and in other developing countries) over the next few decades. To help monitor the evolution of this epidemic, the methods of the present study could be used to assess tobacco related mortality in any other populations where death registration is organised centrally. Because interviewing was done in death registries, the coverage was high (81% of all deaths at ages ⩾35) and the time interval between death and interview was short, limiting recall error. As information was derived from the same proxy informant for both cases and controls, reporting bias should be minimal, at least for whether people ever smoked. In support of this, the risk ratios for colorectal cancer (which is largely unrelated to smoking in Western studies) were close to unity and the age-specific

Table 5 Adjusted risk ratios† for mortality from selected causes or groups of causes by daily cigarette consumption among middle aged men and women in Hong Kong, 1998

	Men aged 35-69 years				Women aged 35-69 years			
	No of cigarettes smoked/day			Test for trend (P value)	No of cigarettes smoked/day			Test for trend (P value)
Cause of death	1-14	15-24	≥25		1-14	15-24	≥25	
Groups of causes								
Malignant neoplastic	1.64*	2.44*	4.10*	<0.001	1.48*	1.68*	2.60*	<0.001
Respiratory	1.87*	2.74*	5.05*	<0.001	2.34*	3.92*	10.54*	<0.001
Vascular	1.59*	1.57*	2.34*	<0.001	1.43*	1.98*	2.03	<0.001
Other cause	1.06	1.31*	1.93*	<0.001	1.14	1.21	1.11	<0.05
All deaths (No of cases, No of controls)	1.51* (1571, 386)	2.01* (1798, 331)	3.31* (768, 86)	<0.001	1.47* (243, 309)	1.84* (106, 108)	2.63* (33, 25)	<0.001
Selected causes								
Lung cancer	2.82*	5.56*	12.72*	<0.001	2.41*	4.19*	7.53*	<0.001
Oesophageal cancer	4.58*	10.22*	13.78*	<0.001	0.78	4.51*	NS	0.25
Stomach cancer	1.69*	1.77*	1.79	<0.01	0.59	NS	NS	0.12
Liver cancer	1.39*	1.67*	1.82*	<0.001	1.58	0.70	1.56	0.47
Cancer at five minor sites‡	1.63*	2.19*	2.54*	<0.001	0.93	2.20	6.91*	<0.01
Other malignancy§	1.11	1.22	1.94*	<0.001	1.22	0.91	0.88	0.69
Colorectal cancer	0.89	0.66	1.20	0.29	1.09	0.46	2.48	0.98
COPD¶	2.65*	3.93*	8.62*	<0.001	7.93*	23.23*	37.23*	<0.001
Respiratory tuberculosis	1.02	2.93*	6.62*	<0.001	2.37	NS	NS	0.99
Other respiratory	1.62*	2.26*	3.46*	<0.001	1.43	1.01	6.21*	<0.05
Stroke	1.58*	1.79*	2.20*	<0.001	1.16	1.75	1.48	0.10
Ischaemic heart disease	1.55*	1.32*	2.53*	<0.001	1.85*	2.45*	2.38	<0.001
Other vascular	1.69*	1.72*	2.07*	<0.001	1.38	1.87	2.50	<0.05
Other medical	1.05	1.30*	2.17*	<0.001	1.04	1.02	0.90	0.95
Injury or poisoning	1.18	1.30	1.22	0.16	1.36	1.89	2.31	0.07

*Statistically significant risk ratios. †Adjusted for 5 year age groups and education. ‡Cancer of the mouth, pharynx, larynx, pancreas, or bladder. §Includes colorectal cancer. ¶Chronic obstructive pulmonary disease (or pulmonary heart disease). NS=Not shown. Risk ratios unreliable because of insufficient number of smokers.

prevalence of smoking among controls approximately matches that in other surveys.[6]

If the excess mortality among smokers in table 2 (which depends only on whether subjects ever smoked) is accurately estimated and is largely or wholly causal

then about half (48%) of the deaths of male smokers in middle age are due to tobacco. If, furthermore, the dose-response relationship in table 5 is roughly correct then among men who were light, moderate, and heavy smokers the respective proportions of deaths in middle age

Table 6 Adjusted risk ratios† for mortality from selected causes or groups of causes by daily cigarette consumption among elderly men and women in Hong Kong, 1998

	Men aged ≥70 years				Women aged ≥70 years			
	No of cigarettes smoked/day			Test for trend (P value)	No of cigarettes smoked/day			Test for trend (P value)
Cause of death	1-14	15-24	≥25		1-14	15-24	≥25	
Groups of causes								
Malignant neoplastic	1.44*	2.26*	2.50*	<0.001	1.82*	2.50*	2.47*	<0.001
Respiratory	1.53*	1.95*	2.90*	<0.001	2.07*	3.21*	4.72*	<0.001
Vascular	0.99	1.04	1.30*	0.10	1.26*	1.10	1.58	<0.01
Other cause	0.88	0.98	1.02	0.96	1.18	1.12	1.54	<0.05
All deaths	1.20*	1.57*	1.92*	<0.001	1.54*	1.87*	2.20*	<0.001
Selected causes								
Lung cancer	3.37*	6.51*	7.29*	<0.001	3.35*	6.20*	5.34*	<0.001
Oesophageal cancer	1.60	2.15*	4.16*	<0.001	3.69*	0.87	NS	0.08
Stomach cancer	1.05	1.15	1.42	0.25	1.004	0.96	0.93	0.94
Liver cancer	1.03	1.46*	0.99	0.11	1.57*	0.87	1.62	0.25
Cancer at five minor sites‡	1.33	2.21*	1.69*	<0.001	1.14	2.47*	1.88	<0.01
Other malignancy§	1.01	1.33*	1.65*	<0.001	1.35*	1.24	1.91*	<0.01
Colorectal cancer	1.05	1.15	1.68	<0.05	1.13	0.94	1.32	0.63
COPD¶	2.85*	4.36*	6.44*	<0.001	5.97*	10.00*	18.16*	<0.001
Respiratory tuberculosis	1.31	1.42	3.26*	<0.01	1.03	NS	5.22*	0.87
Other respiratory	1.17	1.30*	1.87*	<0.001	1.36*	1.82*	2.13*	<0.001
Stroke	0.99	1.05	1.33	0.17	1.21	0.79	1.47	0.44
Ischaemic heart disease	0.92	0.98	1.40*	0.23	1.34*	1.09	1.81	<0.05
Other vascular	1.16	1.14	1.08	0.38	1.07	1.47	1.71	0.07
Other medical	0.89	1.03	1.02	0.83	1.18	1.06	1.58	0.07
Injury or poisoning	0.86	0.71	1.07	0.39	1.19	1.60	1.05	0.22

*Statistically significant risk ratios. †Adjusted for 5 year age groups and education. ‡Cancer of the mouth, pharynx, larynx, pancreas, or bladder. §Includes colorectal cancer. ¶Chronic obstructive pulmonary disease (or pulmonary heart disease). NS=Not shown. Risk ratios unreliable because of insufficient number of smokers.

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that were attributable to tobacco were about 34%, 50%, and 70% (that is, even among "light" smokers about a third of all premature deaths were due to tobacco).

In our study most of the risk ratios among middle aged men (smokers *v* non-smokers) were substantially greater than those seen in 1988 in urban Chinese on the mainland,[2] even though the tar yields of the (predominantly Western) cigarettes that have been sold in Hong Kong for many years are lower than those of the domestically produced brands that predominated on the mainland. For death from all causes, our risk ratio of 1.92 was greater than that of 1.29 in mainland China[2] and approaches the risk ratios seen in the United States and Britain.[7 8] If this roughly twofold risk ratio persists when those now in middle age reach old age, it suggests that about half of the persistent cigarette smokers among Hong Kong Chinese will, like their counterparts in the West, eventually be killed by tobacco. Most of the excess mortality among smokers involved neoplastic, vascular, or respiratory diseases, which studies elsewhere have shown can be caused by smoking. One noteworthy finding is that for respiratory tuberculosis the risk ratio was 2.54 (95% confidence interval 1.24 to 5.22), which is greater than the risk ratio of 1.42 found in mainland China.[2] A dose-response relation between smoking and death from tuberculosis was observed in both studies.

In the United Sates the mean cigarette consumption rates per adult were 1, 4, and 10 a day in 1910, 1930, and 1950; these rates were repeated in mainland Chinese men 40 years later (in 1952, 1972, and 1992, respectively).[1] In Hong Kong, however, cigarette consumption in men had already reached 10 a day by the early 1970s,[4 5] which, although 20 years later than the United States, was 20 years ahead of mainland China. In 1955 about 21% of all US male deaths in middle age and 5% of those at older ages were attributable to smoking.[7] By 1975, these attributable proportions had increased to 34% in middle age and 17% among older US men.[7] Among Hong Kong men in 1998 about 33% of the deaths in middle age and 20% of those at older ages were attributable to smoking. These proportions are consistent with the hypothesis that the US pattern of overall mortality eventually attributable to smoking in men is being repeated in Hong Kong about two or three decades later.

Hong Kong has for the past few decades been the most urbanised and Westernised Chinese city. Although only a moderate hazard from smoking was found at an early phase of the growing epidemic of deaths from tobacco in mainland China,[2] our study in Hong Kong shows a larger hazard at a later phase of the epidemic. The proportion of deaths attributed to smoking is more than twice as big in Hong Kong in 1998 as it was in mainland China 10 years earlier,[2] which is consistent with the prediction of a large increase in mortality attributable to tobacco in China over the next few decades,[1] unless there is widespread cessation by adults who already smoke.[9 10]

What is already known on this topic

China, with 20% of the world's population, smokes 30% of the world's cigarettes. Men smoke most, and the proportion of male deaths at ages 35-69 attributable to tobacco has been predicted to rise over the next few decades from 13% (in 1988) to about 33%

In Hong Kong cigarette consumption reached its peak 20 years earlier than in mainland China, so the epidemic of male deaths from tobacco should now be at a more advanced stage

What this study adds

In the general population of Hong Kong in 1998 tobacco caused about 33% of all male deaths at ages 35-69 plus 5% of all female deaths, and hence 25% of all deaths at these ages

In the male smokers tobacco caused about half of all deaths at ages 35-69

The hazards now seen in Hong Kong foreshadow a substantial increase in tobacco deaths among middle aged men in mainland China over the next few decades if current smoking patterns persist

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