Title: **Smoking, disease and health service utilisation; the paradox**

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Abstract

Objectives: We compared need for and utilisation of health services among young, healthy smokers who did not want to quit ("the non-motivated"), and "motivated smokers", relative to never-smokers.

Methods: This cross-sectional study included 9,915 Hong Kong Police officers. We assessed smoking status, differentiating non-motivated from motivated smokers. Need was measured as number of respiratory symptoms and utilisation, as doctor consultations.

Results: All smokers had significantly higher need, but relatively lower utilisation. After adjusting for other factors, the odds ratio for utilisation was 0.77 (95% CI 0.64-0.93) for motivated smokers and 0.62 (95% CI 0.50–0.77) for non-motivated, relative to never-smokers (p for trend<0.001).

Conclusions: Young, relatively healthy smokers, particularly the non-motivated, utilise less health services relative to their need. This has implications for planning smoking cessation services.

Key words: *Smoking, health services, need and demand*

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Introduction

Smoking is well documented as a major cause of ischaemic heart disease, chronic lung disease and cancers (Wald and Hackshaw, 1996). However, relatively few studies have examined the relationship between smoking and health service utilisation relative to need.

Some studies have shown that smokers use more health services compared with those who have never smoked (Ashford, 1973; Gutzwiller, La Vecchia, Levi, Negri & Wietlisbach, 1989; Sippel, Pedula, Vollmer, Buist & Osborne, 1999; Jee, Kim & Suh, 1993). Other investigators have found the inverse relationship, that smokers are less likely to use health services (Oakes, Friedman, Seltzer, Siegelaub & Collen, 1974; Yamamoto, Masaki & Nakamura, 1996). Yet others have shown that whilst certain aspects of health care utilisation are increased, others, such as the use of preventive services (Osterberg, Lundgren Emilson, Sundh Birkhed & Steen, 1998), outpatient services (Vigt & Schweitzer, 1985; Kaplan, Wingard, McPhillips, Williams-Jones & Barrett-Connor, 1992; Izumi Y, 2001) or inpatient care (Weinkam, Rosenbaum & Sterling, 1987), are decreased in smokers.

It may be that smokers take little responsibility for their health and under-utilise appropriate services (Ashford, 1973; Jee, Kim et al, 1993). Justification for this view is the finding that smokers use preventive services less frequently than non-smokers (Krick & Sobal, 1990) and are more likely to engage in other unhealthy lifestyles (Castro, Newcomb, McCreary & Baezconde-Garbanati, 1989). Yet smokers are not a homogenous group. Prochaska and DiClemente (1983) developed a model proposing that they could be categorised according to their stages of change. This model identifies smokers who have not considered and do not plan to quit smoking (the precontemplation stage), and others who want to and have made some plans (contemplation stage) or actually taken some action to quit (stages of preparation and action). One study has shown that smokers differ in other health behaviours depending on their stage of smoking cessation (Unger, 1996). Pre-contemplators were found to be more likely to have sedentary lifestyles and to drink to excess compared with those in other stages. Thus among smokers, the stage of change may also be related to utilisation patterns.

Furthermore it is possible that these associations vary throughout a smoker's life and according to health status, with younger, relatively healthy smokers possibly exhibiting different behaviour from less healthy smokers.

We tested the hypothesis of association between stage of change and health behaviour within a large workforce, focusing primarily on relatively healthy working smokers. We first examined the relationship between need for health care, as measured by reported health, and utilisation of ambulatory and in-patient health services, among the smokers compared with those who had never smoked. Secondly we compared smokers who were not interested in quitting with others, in terms of need and utilisation.

Methods

The report is based on a study of officers in the Hong Kong Police force in 1995 and the detailed methods are explained elsewhere (Lam, Ho, Hedley, Adab, Fielding, McGhee & Aharonson-Daniel, 2000). All 11,038 officers working in the traffic, foot-patrol and marine divisions of the Hong Kong Police were asked to complete a structured health and lifestyle questionnaire under controlled conditions. The data presented in this paper come from sections of the questionnaire related to personal history, reported morbidity, smoking patterns, and health service utilisation.

Study instrument and measurements made

A Chinese translation of sections of the British Medical Research Council (MRC) respiratory health questionnaire (Florey & Leeder, 1982) was used to assess smoking status and respiratory health. The validity and reliability of this questionnaire have been established and it has been translated and used in studies world-wide. The questionnaire also assessed smoking status and health service utilisation. These questions were derived from the MRC respiratory health questionnaire and the Hong Kong General Household surveys (Census and Statistics Department, 1997a & b) respectively.

Assessment of smoking status

Participants were categorised as never-smokers, former smokers (if they had smoked as much as one cigarette a day for as long as six months, but were no longer smoking at the time of completing the questionnaire), or current-smokers. Current smokers were asked about their intentions to quit by enquiring whether they had ever tried to stop smoking cut down over the past year or wanted to quit. We labelled smokers who responded that they had never tried or don't want to stop smoking as "non-motivated" analogous to "precontemplators" in Prochaska's model: current smokers who are not considering quitting in the next six months. Those who had tried to stop or cut down were labelled as "motivated" and non-responders were excluded from the analysis. Some former smokers may have quit smoking due to illness. Their need and utilisation patterns may be different because of a confounding relationship between illness and quitting; the healthy worker effect (Arrighi & Hertz-Picciotto, 1994). We therefore analysed this group separately.

Assessment of health care need

Respondents were asked about the presence of four respiratory symptoms; namely chronic cough, chronic phlegm, dyspnoea and wheeze. Standard MRC definitions were used, that is, chronic cough or chronic phlegm is the presence of these symptoms first thing in the morning or at any time during the day or night, for as much as three months each year; dyspnoea was defined as the experience of shortness of breath when hurrying on level ground or walking up a slight hill, and wheeze was assessed by asking respondents if their chest ever sounded wheezing or whistling. Participants were also asked whether a doctor had ever diagnosed them with respiratory diseases, namely acute bronchitis, chronic bronchitis or pneumonia.

We defined n*eed* for health care as reporting any of the four respiratory symptoms. A *need score* was constructed based on the number of symptoms reported, ranging from none to three or more. In order to validate reported morbidity and need for health care, participants were asked about work absenteeism due to illness and injury over the previous 6 months.

Assessment of health service utilisation

Officers were asked whether they had any doctor consultation in the previous two weeks (ambulatory care), and if they had been admitted to hospital over the previous 6 months (in-patient care). Those who had a doctor consultation were asked the reason for consultation and the number of consultations over the 2-week period. We defined health service *utilisation* as having a doctor consultation for respiratory disease (including cold, flu, bronchitis and other respiratory problems), or hospitalisation for any reason. Assessment of utilisation using these time periods is standard in the General Household Survey and allows the study population to be compared with the general population. Officers who reported more than 5 consultations in 14 days (n = 42) were excluded from the analysis as outliers.

Assessment of unmet need

The presence of chronic bronchitis (COAD) was assessed in two ways. We categorised those who responded affirmatively to the question about a doctor ever telling them they had chronic bronchitis as having *diagnosed COAD*. We classified those who reported chronic cough and chronic phlegm on most days for at least three months per year as having *symptomatic COAD*. We defined undiagnosed disease as the proportion of responders with symptomatic COAD who did not report diagnosed COAD. This was used as an indication of unmet need.

Data Analysis

The demographic characteristics (age, sex, rank, educational level, marital status and ethnicity) and smoking history (age of starting to smoke and amount smoked) of the non-motivated were compared with motivated smokers. Each of the need (symptoms, respiratory diseases and work absenteeism) and utilisation (doctor consultation and hospital admission) variables was compared among never-smokers, the non-motivated and the motivated smokers. We identified potential confounding factors, including age, gender, marital status and educational level from bivariate analyses. As employees working in a government sector workforce, police officers are paid a salary according to their rank, and this was therefore used as a proxy for income (another potential confounding factor). Using

utilisation as the dependent variable, we ran logistic regression analyses (using the enter method) to obtain adjusted odds ratios (OR) and 95% confidence intervals (CI) for the non-motivated and motivated smokers relative to never-smokers. Analysis of covariance (ANCOVA) was used to estimate the adjusted mean number of doctor consultations for each group, relative to need scores. The number of doctor consultations for respiratory disease was examined relative to need, using ANCOVA. Age, gender, marital status, rank and level of education were used as covariates. The mean number of consultations per year was predicted based on the two-week reported estimates to provide more meaningful results.

All data was double entered and checked for inconsistencies. Statistical analysis was performed using the SPSS 8.0 statistical package.

Results

General characteristics

There was a response rate of 90% (9,915 responders). We excluded 562 responders (5.7%) who did not provide sufficient information on their smoking habit to allow them to be used in the analysis. Among the remainder, the mean age was 33 years (range 18 – 58), and 91% were male. The prevalence of current smoking was 46.6% (3,842 officers) for men and 11.9% (98 officers) for women, and there were 262 (2.9%) former smokers. About one third of current smokers (1,391 people) were in the non-motivated group. Compared with motivated smokers, they tended to smoke more cigarettes per day (mean difference 1.7 cigarettes per day, 95% CI 0.9 to 2.5) and to have started the habit earlier (mean difference 5.5 months, 95% CI 2.5 to 8.5). However there was no difference between these two groups of smokers in terms of socio-demographic factors (table 1).

Ill health, disease and work absenteeism

There were 3,421 respondents (37.6%) who reported at least one respiratory symptom, 1,717 (18.9%) who reported at least one of the diagnosed medical conditions and 3,148 (34.1%) who had taken time

off due to illness or injury in the previous six months. Current smokers were consistently more likely than never smokers to report all of the above measures of morbidity (table 2). There was no significant difference in symptom reporting, doctor diagnosis of acute bronchitis or pneumonia, or work absenteeism between the non-motivated and motivated smokers. However the non-motivated were less likely to report diagnosed chronic bronchitis. Former smokers appeared more likely to report symptoms than never smokers, but less so than current smokers; however, they reported more diagnosed respiratory disease than other groups.

Health service utilisation

Over a quarter of respondents (n = 2580, 28.4%) reported at least one doctor consultation, of which 82.5% (n = 2128) were related to respiratory disease. There were 646 officers (7.1%) reporting an in-patient episode over the previous six months.

After adjusting for the need score, age, gender, marital status, education level and rank, both the non-motivated and motivated smokers were *less* likely to have used ambulatory care relative to never smokers although the motivated smokers' result is only marginally significant (table 3). Doctor consultation was lowest in the non-motivated smokers compared with motivated and never smokers (p for trend < 0.001). A similar trend was seen in use of in-patient services (OR 0.51 [95% CI 0.38, 0.68]; 0.68 [95% CI 0.55, 0.83] and 1.00 respectively, p for trend < 0.001). Other factors associated with higher levels of doctor consultation and hospital admission were being female, being married and having more symptoms.

Doctor consultation and inpatient admission were lower for the ex-smokers compared with never smokers, but not significantly so (OR 0.78 [95% CI 0.54, 1.13] and OR <0.01 [95% CI <0.01, 9.65] respectively).

For all groups, the average number of doctor consultations was similar when there were no symptoms and increased with increasing numbers of symptoms (table 4). Utilisation increased at a lower rate among the non-motivated than among motivated smokers, who in turn had a lower rate of increase

compared with never smokers. Former smokers had higher rates of consultation with increasing numbers of symptoms.

Unmet need

There were 824 respondents (9.1% of the sample) who did not provide sufficient information for them to be used in this part of the analysis. The proportion with undiagnosed but symptomatic COAD was greatest among smokers, particularly the non-motivated (24.1%, 20.6% and 11.6% for non-motivated, motivated and never smokers respectively, p for trend <0.001). After adjusting for other factors, there was a significant decreasing trend from the non-motivated, to motivated smokers, to never smokers, in the likelihood of being undiagnosed but symptomatic (adjusted OR 2.36 [95% CI 1.48–3.78], 1.78 [95% CI 1.19-2.64] and 1.00 respectively).

Discussion

The results of the study are in keeping with the prior hypothesis that, in a healthy working population, smokers under-utilise health services relative to need as identified by the number of respiratory symptoms. This study focuses only on a working and therefore relatively healthy population and so the results may not be applicable to a less healthy smoking population.

Limitations and strengths

One limitation of the study is the cross-sectional design which means that smoking and health service utilisation were both assessed at the same point in time and that we may have missed longer term variations. All of the data on smoking status and health service utilisation were self-reported However, other studies have shown that self-reports of smoking prevalence are reasonably accurate in survey settings (Patrick, Cheadle, Thomson, Diehr, Koepsell & Kinne, 1994) and this was also confirmed on a sample of participants in this study (McGhee, Adab, Hedley, Lam, Ho, Fielding & Wong, 2000). The few studies of self-reports of health service utilisation suggest that these are also reasonably accurate (Reijneveld, 2000). On the other hand, the large sample size allowed sufficient

numbers of people to be included in the subgroups under study and the high response rate almost eliminates non-response bias.

Comparison of findings with other studies

The relationship between utilisation and most well established factors were confirmed in this study, strengthening the validity of the results. The lack of significant association between age and rank (as a proxy for income), and utilisation, is probably due to the relative homogeneity of the study group. The reported level of ambulatory care utilisation is in keeping with that in the Hong Kong general population (Census and Statistics Department 1999a), though our study population reported higher in-patient utilisation (Census and Statistics Department 1999b).

The study was done in a working population, which by definition is relatively healthy. Smokers who had left the workforce or were absent during the study period due to illness would be excluded. Therefore the healthy worker phenomenon may explain some of the differences in utilisation patterns. In other words, the smokers included in the study may over-represent "survivors" or those who have not yet developed serious illness. Utilisation patterns may also be different in older or unemployed populations. Nevertheless, despite their relative youth, and consistent with previous studies, we found that smokers in this study reported a higher level of respiratory symptoms (Brown, Woodward & Tunstall-Pedoe, 1993) and acute and chronic disease (Gutzwiller, La Vecchia et al, 1989) than never smokers. This suggests that, even among this working population, smokers have higher levels of morbidity and therefore a greater need for healthcare. This is supported by the greater reporting of sick leave among smokers, again confirming previous findings (Ryan, Zwerling & Orav, 1992). Thus the healthy worker effect cannot provide the full explanation for lower utilisation exhibited by smokers. Despite the greater reporting of respiratory symptoms and disease among smokers, we found that they were consistently less likely to use both ambulatory and in-patient health services compared with never-smokers. This difference persisted even after adjusting for the other factors related to utilisation. Previous studies have had mixed results. The UK national morbidity study in general practice showed that smokers had lower consultation rates compared with non-smokers (ONS, 1992). A 7-year study of

utilisation patterns among members of a health maintenance organisation in Oregon showed that smokers were no more likely to use ambulatory services than never smokers, but that they were more likely to be hospitalised Vogt & Schweitzer, 1985). Another study in California found that female smokers tended to have fewer doctor visits but higher hospitalisation rates than non-smokers (Oakes, Friedman et al, 1974) and similar results were shown by a prospective study of older Americans of both sexes (Kaplan, Wingard et al, 1992). Conversely, a US national population survey found that older smokers made less use of hospital services than those who had never smoked (Weinkam, Rosenbaum & Sterling, 1987). While a large prospective cohort study of older adults in a Japanese community found that physician visits were lower for smokers compared with non-smokers (Izumi, 2001).

These previous studies did not compare smokers' and non-smokers' utilisation according to their level of need or in relation to smokers' intentions and attempts to quit, and did not focus on relatively healthy working smokers. We have found that in relation to number of respiratory symptoms, smokers were less likely than never smokers to report health service use and non-motivated smokers were even less likely than those motivated to quit.

Implications

Theories of behaviour, such as Festinger's (1975) concept of cognitive dissonance , would predict that smokers are more likely to disregard symptoms as a sign of ill health and be less likely to seek medical care. This theory could explain why smokers, particularly non-motivated smokers, seem to have a higher tolerance for symptoms before seeking medical services. A recent UK study found that, among children with asthma, those with higher exposure to parental smoking, were less likely to have health service contacts (Crombie, Wright, Irvine, Clark & Slane, 2001) again suggesting that smokers utilise services less, even for their children.

Alternatively, lower doctor consultation rates for whatever reason, may mean that these individuals are not aware of the significance of their symptoms and have had less opportunity to discuss their smoking habits and to consider quitting, that is, continuing to smoke could be the cause or the result of lower

utilisation. A qualitative study in primary care in the UK suggested that some smokers are deterred from consultating doctors as a consequence of the anticipated response to their smoking behaviour (Butler, Pill & Stott, 1998).

Smokers were more likely to report undiagnosed COAD, that is, they reported the symptoms but not that they had been diagnosed. Other reports indicate that less than 50% of symptomatic patients do not receive a diagnostic label of COAD (Crombie, Wright et al, 2001) and that smokers are more likely to be undiagnosed (Butler, Pill & Stott, 1998). Yet, early identification is an important factor in reducing the associated morbidity and mortality (Crombie, Wright et al, 2001), in smokers as well as non-smokers.

These findings have several important implications. For research purposes, health care utilisation is clearly not an appropriate proxy measure of morbidity in a population that includes smokers. In relation to theory, the study confirms that smokers who have not considered quitting are distinct and behave differently from those smokers who wish to quit, providing additional support for the stages of change model of behaviour. In policy terms, if non-motivated smokers have less contact with the health service, they are less likely to receive smoking cessation advice and interventions in an opportunistic fashion making a targeted approach necessary. In addition, non-motivated smokers have less opportunity to have medical problems diagnosed early and to receive suitable care. Other means for reaching smokers and providing health advice, such as use of workplaces or the media, must be considered. In order to inform policy intervention, the reasons for under-utilisation need to be clarified, distinguishing between low accessibility and low demand for services. Furthermore, we need to know whether lower utilisation is a result of smokers' attitudes towards symptoms and quitting, or whether these attitudes are maintained because of the lower level of health service contact.

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Acknowledgements:

Table 1: Comparison of the non-motivated with motivated smokers

	Non-motivated (n = 1,391)	Motivated (n = 2,556)	Test of significance
Mean age (years)	31.7	31.5	t = 0.92, p = 0.36
Gender (% male)	97.3	97.6	χ2 = 0.28, p = 0.60
Police rank (%)			
Police Constable	81.0	80.9	χ2 for trend = 0.07
Sergeant	16.2	16.2	p = 0.80
Inspector	2.6	2.5	
Superintendent	0.3	0.3	
Level of education (%)			
Below form 5	20.7	20.5	χ2 for trend = 0.02
Form 5	73.8	74.8	p = 0.89
Form 6 or 7	3.2	4.4	
Tertiary (non-degree or degree)	1.5	1.1	
Marital status (%)			
Single	45.1	45.7	χ2 = 2.94
Married	50.3	50.7	p = 0.23
Widow, divorced, separated	4.7	3.6	
Ethnicity			
Chinese	99.5	99.4	χ2 = 3.04
Caucasian	0.4	0.3	p = 0.39
Other Asian	0.1	0.1	
Mean no. cigarettes / day	20.0	18.3	t = 3.95, p <0.01
Age of starting to smoke	18.8	19.3	t = 3.64, p <0.01

Table 2: Proportion of workers with respiratory symptoms, diagnosed medical conditions or work absenteeism, and adjusted odds ratio of reporting these for smokers compared with never-smokers

| | Number (%) reporting symptom / diagnosis | | | | Adjusted OR[#] [95% CI] |
| | Current-smokers | | Former smokers | Never-smokers | |
	Non-motivated	Motivated			
Symptoms					
Chronic cough	98 (**7.1**)	185 (**7.3**)	14 (**5.4**)	203 (**4.0**)	1.8 [1.4 to 2.1]***
Chronic phlegm	163 (**11.9**)	328 (**13.0**)	25 (**9.6**)	299 (**5.9**)	2.4 [2.0 to 2.8]***
Breathlessness	446 (**32.6**)	870 (**34.6**)	76 (**29.5**)	1,251 (**24.6**)	1.7 [1.5 to 1.9]***
Wheeze	160 (**11.7**)	331 (**13.1**)	34 (**13.2**)	423 (**8.3**)	1.4 [1.2 to 1.7]***
Doctor diagnosis					
Acute bronchitis	57 (**4.1**)	105 (**4.2**)	19 (**7.3**)	163 (**3.2**)	1.3 [1.0 to 1.6]*
Chronic bronchitis	133 (**9.6**)	308 (**12.2**)	31 (**11.9**)	419 (**8.2**)	1.5 [1.3 to 1.7]***
Pneumonia	32 (**2.3**)	75 (**3.0**)	10 (**3.8**)	106 (**2.1**)	1.4 [1.1 to 1.9]*
Work absenteeism					
Injury absence	213 (**16.1**)	401 (**16.4**)	32 (**12.7**)	555 (**11.5**)	1.3 [1.1 to 1.5]***
Illness absence	443 (**33.2**)	883 (**36.0**)	68 (**26.9**)	1,434 (**29.5**)	1.3 [1.1 to 1.4]***

[#] *Ever smokers compared with never-smokers Adjusted for age, gender, rank and educational level*

*Level of significance: * $p < 0.05$,   ** $p < 0.01$,   *** $p < 0.001$*

Table 3: Logistic regression model for ambulatory care use

Variable	Categories	Odds Ratio [95% C.I.]	
Need score (Number of respiratory symptoms)	0	1.00	
	1	1.65	(1.46 - 1.87)***
	2	2.08	(1.71 - 2.52)***
	3	3.27	(2.50 - 4.26)***
Smoking status	Never smokers	1.00	
	Former smokers	*0.78*	*(0.54- 1.13)*
	Motivated smokers	0.88	(0.77- 1.00)
	The non-motivated	0.74	(0.63 - 0.88)**
Gender	Male	1.00	
	Female	1.43	(1.19- 1.72)***
Marital status	Single	1.00	
	Married	1.28	(1.11 - 1.49)**
	Widow, divorced, separated	1.31	(0.94 - 1.84)
Level of education	Per increasing level (from below form 5 to tertiary level)	0.92	(0.83- 1.04)
Age	Per increasing year	1.01	(1.00 - 1.02)
Police rank	Per increasing rank (from Police Constable to Superintendent)	0.91	(0.81- 1.03)

*Level of significance: *p < 0.05,   **p < 0.01,   ***p < 0.001*

Table 4: Estimated mean number of doctor visits per year (95% CI) by smoking status, according to need (based on ANCOVA)

		Need score			
		0	**1**	**2**	**3**
-	Never smoker	5.8 (5.2 - 6.4)	9.3 (8.3 - 10.4)	13.6 (11.6 - 15.7)	18.5 (14.7 - 22.2)
-	*Former smokers*	*5.2 (2.1 - 8.3)*	*6.4 (2.0 - 10.8)*	*15.8 (8.1 - 23.4)*	*31.9 (16.5 - 47.3)*
-	Motivated smoker	5.1 (4.1 - 6.1)	8.6 (7.3 - 9.8)	11.8 (9.5 - 14.1)	15.4 (12.1 – 18.6)
-	Non-motivated	5.5 (4.2 - 6.8)	6.5 (4.7 - 8.3)	10.0 (6.8 - 13.2)	9.8 (5.5 - 14.1)

Covariates are: age, gender, rank, marital status and level of education