Hong Kong Police

Department of Community Medicine
The University of Hong Kong

THE HEALTH OF THE HONG KONG POLICE

Findings from a health survey in Traffic, Foot Patrol and Marine police, with special reference to respiratory health, smoking, exposure to environmental tobacco smoke and ambient air pollution

Report to the Traffic Police Department
Hong Kong Police: December 1997

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TABLE OF CONTENTS

SECTION 3: Perceptions of general health, stress and psychological wellbeing

SECTION 4: Health effects of passive smoking through exposure to environmental tobacco smoke at work and at home

SECTION 6: Symptoms, utilisation of health services and days off work

LIST OF TABLES

LIST OF FIGURES

Glossary of some terms used in the report (adapted from JM Last: Dictionary of Epidemiology)

Adjustment: This is a procedure in which differences in some aspects of the composition of the populations being compared are minimized by statistical methods; this allows a more valid comparison of the characteristic of special interest.

Association: When used in this report we mean that there is statistical dependence between two or more variables. An association is present in epidemiological terms if the probability of occurrence of an event or characteristic (such as a fall in a lung function measure or development of symptoms) depends on the occurrence of one or more other events (such as exposure to polluted outdoor air or smoking).
The presence of an association does not necessarily mean there is causal relationship between the two variables.

95% Confidence Interval (CI): The CI is the calculated interval, with a given probability eg 95%, that the *true* value of a measurement such as a mean (average) is contained within the interval.

Excess risk: A measure of the amount of the condition or disease associated with exposure to the suspected cause.

F ratio: The term used to denote the distribution of the ratio of two independent quantities, each of which is distributed like a variance in normally distributed samples. A P value can be found based on the F ratio.

Log-odd-ratio: The logarithm of the ratio of the odds of disease for the exposed versus the un-exposed.

Logistic modelling: This approach to the estimation of an individual's risk is used to adjust for the possible influence of several factors when the dependent variable can be dichotomised (eg present or absent). The risk of disease, or the protective effect of an exposure, can be estimated as a function of one or more quantitative factors.

Mean: The average of a set of measurements.

Median: The value which divides a series of measurements into two equal halves.

Odds Ratio (OR): This can be considered as a mathematical approximation to relative risk ratio (RR). RR is calculated as the ratio between the incidence of disease in those exposed to a risk factor and the incidence in those who are not. The odds are the ratio of the probability of an occurrence of an event to that of non-occurrence; eg if 60 out of 100 police officers who smoke develop a chronic cough and 40 do not, then the odds among smokers in favour of developing a cough are 60:40 or 1.5. We can also say that the probability that these smokers will develop a cough is 0.6 (60%). If the odds in non-smokers is 40:60 or 0.67, the odds ratio (ratio of two odds) is

$$1.5 \div 0.67\left(\frac{60}{40} \div \frac{40}{60}\right) = 2.25$$

P (probability) value: The probability that the result of a statistical test ("test statistic") would be as or more extreme than the one observed if the hypothesis of no difference, null hypothesis were true. The letter P may be followed by **ns** (not significant) or < (less than) and the probability value (eg 0.05; 0.01 or 0.001) and indicates the probability of the result having occurred by chance alone if the groups being compared were really alike.
When $P<0.05$, the difference or association observed is considered to be statisically significant, i.e., not likely to be due to chance because the probability is small (only a 1 in 2 chance). $P<0.001$ is considered to be statistically highly significant. (only a 1 in 1000 chance) of the result occurring by chance alone)

Percentiles: Hundredths

Predictor: A variable which when present or changing reliably predicts the magnitude or degree of change in another variable.

Prevalence: This is a ratio which describes the number of cases of a disease, symptom or other events, in a population at a given time or within a period of time.

Quantiles: These are divisions of a distribution into equal ordered groups.

Quintiles: Quintiles are fifths.

Standard error: The standard deviation of an estimate.

Tertile: Tertiles (or Terciles) are thirds.

Range: The lowest and highest values in a set of measurements.

Regression analysis: If we have data on a dependent variable(y) (such as a test of lung function) and one or more independent variables (X_1, X_2 etc) (eg. age, height, police duties, smoking) then regression analysis involves finding the best mathematical model to describe y as a function of the X's, or to predict y from the X's.

Regression to the mean: This refers to the phenomenon that in serial measurements high values tend to decline and regress towards the mean value for the group.

χ^2 **(chi square):** A statistical test used to detect whether or not two or more population distributions (eg proportions of a characteristic, such as a symptom) differ from one another. So, in this survey, it could (eg) be used to test whether the distribution of smokers and non-smokers, in Traffic and Foot Patrol offices are different from one another in the prevalence of symptoms.

t test: A statistical test used to test for differences in mean values of a measurement eg such as Peak Expiratory Flow Rate.

Z score: A score expressed as a deviation from a mean value; used in analyzing continuous variables.

PREFACE

Hong Kong enjoys very good conventional health indices. However these cannot reflect recent and contemporary changes in exposures to risk, the outcome of which will not be seen in figures for hospital admissions or premature deaths for at least several years.

The protection of the future health of the Hong Kong population will critically depend on continuing economic development, the maintenance of high levels of employment, avoidance of economic deprivation in any sector of the community and the protection of the environment. Health protection will also depend on many life style factors; for example:

- *healthy eating patterns* (avoidance of high energy intake in relation to energy output and consumption of fresh fruit and vegetables which protect against common chronic cardiovascular and respiratory diseases and cancers)

- *lifetime exercise patterns* (affording substantial protection, including a reduction in risk of all cause mortality, heart disease, stroke, breast cancer in women and mental health problems)

- *tobacco smoking* (the cause of several common cancers in HK as well as coronary heart disease, respiratory disease and many other health problems. Apart from active smoking, other factors which contribute to the lifetime health effects include age at recruitment to smoking and pack-years of smoking experience, and exposure to environmental tobacco smoke and passive smoking)

- *environmental hazards* (exposures to air pollution, poor water quality and contamination of food by chemicals and infectious agents – which variously can increase the risk of infections, some chronic diseases and premature death in the sick and elderly).

Information on health status and health risk behaviour is relatively scarce in Hong Kong. A further problem is that average population data is misleading and may conceal important variations in health by age, gender and socioeconomic and occupational groups. When the rapidly changing social and physical environment of Hong Kong is considered we must acknowledge that we have far too little information about adverse health trends in different sectors of the population, particularly young adults in whom behaviour change can have a large impact on health.

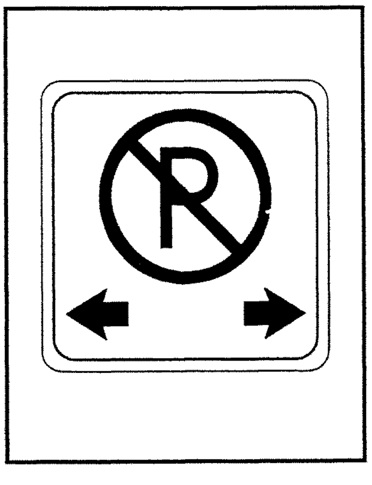
A workforce is, by definition, a relatively healthy section of the population and particularly a professional workforce with a career structure and opportunities for professional development and advancement. In a time of rapid lifestyle change, professional and other well-defined occupational groups can be used as sentinels to identify important trends in exposures and health outcomes. In the western world much of the early epidemiological evidence about risks for cardiovascular and respiratory disease came from studies of occupational groups.

Today we urgently need a new approach to needs assessment among different population groups in Hong Kong so that health promotion strategies can be better targeted.

The important decision by the Hong Kong Police to commission a health survey of the type described here has provided information of value to a much wider audience. The findings have clear implications for public health policy as well as occupational health directions within the force.

The data from the survey will continue to be reviewed, the analyses refined and subjected to international peer review. However the conclusions and recommendations presented in this report are considered to be valid, important and a basis for immediate action to protect the health of the force.

AJ Hedley
May 1998



SECTION 1

Summary of the health survey enquiries and procedures

Basic characteristics of the survey population

Alison Lamb
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ABSTRACT

Background

In 1993 a health survey was proposed for officers serving in the Hong Kong Police following expression of concerns that the outdoor working environment of many officers may have an adverse effect on their health.

Study population and methods

The survey began in 1995 and include completion of a comprehensive health enquiry by approximately 10,000 officers followed by lung function tests in selected groups totalling approximately 400 officers.

The survey questionnaire was developed from reference to 11 other validated instruments, from local knowledge and information obtained from the senior officers collaborating with the survey team.

Lung function testing was carried out using portable Wright mini-peak flow meters (for peak expiratory flow rate), Vitalograph spirometers were used to measure Forced Expiratory Volume in 1 second (FEV_1) and Forced Vital Capacity (FVC). Bedfont smokerlyzer was used to measure expired air carbon monoxide levels and validate smoking histories.

In August 1996 a group of officers who underwent lung function tests in earlier phases of the study took part in a randomized controlled trial of three mask filters, including a particulate exclusion filter, a gaseous exclusion filter and a dummy. The trial ran for three weeks using a Latin square design in which three groups of officers began with different filters and then received the remaining filters in different orders. During the trial officers recorded PEFR measurements, environmental conditions were recorded and the general perceived utility of the mask was assessed.

Response to the survey

A total of 11038 offices were invited to join the survey. Overall response rates were high ranging from 90% (for Regional Traffic Police, District/Divisional Patrol Subunits and Marine Police) up to 95% (for District Traffic Teams).

The majority of officers in the survey were constables (71%), sergeants or senior sergeants (23%), inspectors/senior inspectors (4%), chief inspectors (1.3%) and superintendents/senior superintendents (1%).

Officers were recruited to the survey across six regions/formations, including the Hong Kong Island, Kowloon West, Kowloon East, New Territories South, New Territories North and Marine.

Overall assessment of the survey

As would be expected in an exercise of this type many operational problems were encountered. Most of these were resolved and provided valuable guidance for future health enquiries in the force.

Many of the problems were related to communication between the survey team and the force, shortages of research personnel and other resources.

There was a continuing problem about the officers perception of the purpose of the survey, anxiety about confidentiality and psychological fatigue with repeated testing. This was fatigue with repeated testing. This was understandable given the additional imposition on their routine and the need to follow precise guidelines on multiple occasions. However variation in adherence to the study protocol did lead to incompleteness of data and degradation of some tests.

Overall we rate the outcome of the survey procedures as a acceptable and at a standard which allows important inferences and recommendations to be made on the data obtained.

1.1 Background to the Hong Kong Police Health Survey

In mid 1993 it was suggested that surveys of the health of officers in the Hong Kong Police would provide useful information about the effects of the working environment particularly on respiratory health. Concern had been expressed by commanders of Regional Traffic Police Formations that their outdoor working environment may have an adverse effect on their health in both the short and long term.

The force initially sought assistance from the Hong Kong Environmental Protection Department, who provided background information on air quality monitoring procedures and the air quality index in Hong Kong.

The Environmental Protection Department suggested that the force should seek further information about the proposed study from The Department of Community Medicine at The University of Hong Kong.

An investigation into the effects of the working environment on the health of police officers, particularly Regional Traffic officers started in the later half of 1995.

1.2 Hong Kong Police Health Survey study population

Officers were selected after extensive consultation between the Department of Community Medicine and RHKP Regional Traffic Headquarters (through SSP Eric Crowter and CIP Patrick Yew) according to the nature of their working environment and the duties of the police officers.

Since the enquiry had been initiated by the regional formations of Traffic Police, their officers were selected as the index group to be studied. The five regional formations include Hong Kong Island, Kowloon West, Kowloon East, New Territories South and New Territories North.

All Traffic officers were involved in the *Stage One Self Completed Health Survey*

Officers working in the Enforcement and Control (E&C) Division of Regional Traffic were selected *for Stage Two Respiratory Function Testing* as their duties involve the outdoor policing of traffic across the five regions. Officers employed in the E&C Patrol Sub Units (PSU) and Taskforce (TF) were of particular interest from the view point of estimating the impact of shift work exposures to ambient outdoor air on their lung function.

Comparison groups, who were assumed to have different exposures because of the nature and location of their duties, were selected from District/Divisional Beat (foot) Patrol Subunits (PSU and TF) and Marine Police. All District/Divisional Foot Patrol Officers and Marine officers were asked to complete the *Stage One Self Completed Health Survey* with selected groups being participants in *Stage Two Respiratory Function Testing.*

Information on police force as it was at the start of the project, and specific duty information, can be found in Appendix A.

1.3 Stage One: Officer Self-completed bilingual Health Survey

1.3.1 Initial steps

The Hong Kong Police Health Survey instrument (a self-administered questionnaire) was formulated after extensive discussion of the objectives between the Department of Community Medicine staff and the Traffic Police Headquarters on the scope and content.

Drafting of the questionnaire in both Cantonese and English was performed by Department of Community Medicine staff members.

The developmental and design phase of this questionnaire was lengthy, taking approximately 4½ months.

The final design of the instrument, allowing it to be processed by an automatic scanner, was undertaken by the Social Sciences Research Centre (SSRC) of The University of Hong Kong.

1.3.2 Survey questionnaire

All survey questions (Appendices C and D) excluding those in Part A were taken from well recognised and validated questionnaires which have been used in many different researched populations.

Health survey sources for items in the questionnaire included:

- Hong Kong Cardiovascular Risk Factor Prevalence Study 1994
- General Household Survey Report VII, Hong Kong Government
- Medical Research Council Respiratory Health Questionnaire, United Kingdom
- Youth Smoking and Health Survey, Hong Kong
- Government Outpatient Department Survey 1990, Hong Kong
- American Thoracic Society ATS-DLD-78
- National Health Survey 1992, Singapore
- Heart Disease Research Questionnaire, Hong Kong
- MMPI (M10), United States of America
- Perceived Stress Scale
- Chinese Health Questionnaire (CHQ12)

1.3.3 Pilot study

The aim of this pilot was to ensure that any problems were eliminated before the start of the main health survey. This was carried out on 10th November 1995 on two companies (n=350) attending training at Police Tactical Unit Headquarters (PTU) Fanling. The pilot study was well received by the officers attending training at the Police Tactical Unit, Fanling.

There was very good compliance with the health survey instructions which were given verbally in English by a Department of Community Medicine staff member and then translated into Cantonese for the benefit of the majority of officers. Instructions for completion were also provided on the front page of the survey and officers were provided with a black ball point pen if they did not have their own.

Overall the pilot survey went very well as the number of officers manageable and they all completed the survey on the same day in an extremely well controlled setting.

A scanned data set was obtained for 303 officers.

1.3.4 Selection of survey sample

Extensive liaison between Department of Community Medicine staff and Traffic Headquarters personnel was necessary to ascertain manpower (Establishment and Strength) figures for the Health Survey.

Initial manpower figures calculated from Royal Hong Kong Police Establishment and Strength (E&S) data (October 1995) had indicated a study population of between 13000 - 13500 disciplined police officers (Table 1.1).
These figures were used as the basis for planning the survey.

Table 1.1: Officers provisionally selected to complete the Royal Hong Kong Police Health Survey based on Establishment and Strength figures, October 1995

All officers of Regional Traffic, including Traffic Headquarters (THQ)	1433
All officers of District Traffic Teams	200
All Patrol Subunit (PSU) and Taskforce (TF) officers at District and Divisional Police Stations operating on beat/foot patrol duties. These officers were from Senior Inspector (SIP) to Police Constable (PC) rank	9000
4) All Marine Region officers including all launch crew and Marine Headquarters (MHQ)staff	2400
Total	**13033**

The main health survey was carried out over a two month period on a total of 11038 officers. Survey of all Regional Traffic, District Traffic Teams and Foot patrol Officers were completed in December 1995 with Marine Police completing in January 1996 (see Appendix B for schedules).

The difference between the Establishment and Strength figures *(Table 1.2)* and the final number selected for the Health Survey (Table 1.2*)* is due to the fact that of the 9000 officers posted into Patrol Sub-Units (PSU) and Taskforce (TF) at District/Divisional Police stations, only 7017 were actively involved in outdoor beat/foot patrol duties.

Table 1.2: Officers originally recruited to join the survey

Officers of Regional Traffic, including Traffic Headquarters (THQ)	1596
Officers of District Traffic Teams	199
All Patrol Subunit (PSU) and Taskforce (TF) officers at District and Divisional Police Stations operating on beat/foot patrol duties. These officers were from Senior Inspector (SIP) to Police Constable (PC) rank.	7017
All Marine Region officers including all launch crew and Marine Headquarters (MHQ) staff.	2226
Total	**11038**

1.3.5 **Main Health Survey**

Administration

The main survey was conducted in December 1995 and January 1996.
Administration of the health surveys was undertaken by Department of Community Medicine staff, SSP Eric Crowter and CIP Patrick Yew of Hong Kong Traffic Police Headquarters with cooperation and assistance from all Regional (RSRO) and District (DSRO) Staff Relations Officers.
The health surveys were administered in a supervised setting before the start of shift duties with RSRO/DSRO and/or Patrol Subunit Commanders from each unit present.
The information sheet issued to supervising officers is shown in Appendix B.
A staff member from the Department of Community Medicine was present on some of these occasions in an advisory/observer role only.
The keen interest and enthusiasm shown by most officers was encouraging given the complexity, length and personal nature of the survey.

Response rates

Response Rates for Stage One Officer Self-completed bilingual Health Survey have been calculated from the completion records obtained whilst administering the survey (Table 1.3).

All police units forwarded a standardised list indicating all officers who had or had not completed the health survey. A reason for non-completion (non-response) was also provided.

This completion record was attached to the batched completed questionnaires and returned to Regional Headquarters for collection by the survey team.

The response rates for district traffic teams by regions are shown in Table 1.4. Overall the responses were high and ranged from 84% to 100%; with an average of 90% in 1596 Traffic officers. Figures for Patrol Subunits and Taskforces, and Marine police are shown by regions in Tables 1.5-1.7.

Table 1.3: Summary of the Response Rates for Stage One Officer Self-completed Health Survey

	Response rate	Response rate as a percentage (%)
Regional Traffic Police	1432/1596	90%
District Traffic Teams	190/199	95%
Dist./Div. Patrol Subunits	6298/7017	90%
Marine Police	1995/2226	90%
Total	**9915/11038**	**90%**

Table 1.4: Summary of Traffic Police response rates by region and type of Traffic Police

Region	**Abbreviation for region**	**Response rate**	**Response rate (%)**
Traffic Headquarters	**THQ**	**112/133**	**84**
Hong Kong Island	**HKI**	**280/316**	**89**
Enforcement & Control	E&C	169/199	85
Accident Investigation	AI	72/74	97
Command, Admin & Support	COMM	39/43	91
Kowloon East	**KE**	**241/264**	**91**
Enforcement & Control	E&C	145/167	87
Accident Investigation	AI	47/48	98
Command, Admin & Support	COMM	49/49	100
Kowloon West	**KW**	**279/304**	**92**
Enforcement & Control	E&C	163/175	93
Accident Investigation	AI	83/95	87
Command, Admin & Support	COMM	33/34	97
New Territories South	**NTS**	**243/274**	**89**
Enforcement & Control	E&C	137/160	86
Accident Investigation	AI	61/69	88
Command, Admin & Support	COMM	45/45	100
New Territories North	**NTN**	**277/305**	**91**
Enforcement & Control	E&C	177/198	89
Accident Investigation	AI	70/77	91
Command, Admin & Support	COMM	30/30	100
Total		**1432/1596**	**90**

Table 1.5: Summary of District Traffic Teams response rates by region

Region	Abbreviation for region	Response rate	Response rate (%)
Hong Kong Island	HKI	38/40	95
Kowloon East	KE	30/33	91
Kowloon West	KW	45/45	100
New Territories South	NTS	24/24	100
New Territories North	NTN	45/47	96
Total		**182/189**	**96**

Table 1.6: Summary of Patrol Subunits and Taskforces at District/Divisional police stations response rates by region

Region	Abbreviation for region	Response rate	Response rate (%)
Hong Kong Island	HKI	1476/1638	90
Kowloon East	KE	985/1083	91
Kowloon West	KW	1502/1704	88
New Territories South	NTS	1039/1143	91
New Territories North	NTN	1296/1449	89
Total		**6298/7017**	**90**

Table 1.7: Summary of Marine Police response rates by region

Region	Abbreviation for region	Response rate	Response rate (%)
Marine Headquarters	MHQ	412/483	85
Harbour	Har	125/130	96
East	Eas	317/338	94
West	Wes	370/445	83
North	Nth	219/224	98
South	Sth	286/312	92
Islands	Isl	266/294	90
Total		**1995/2226**	**90**

A summary profile of those officers who did not complete the health survey has also been generated (Table 1.8).

Table 1.8: Summary profile of non-responders to Stage One Officer Self-completed Health Survey

Total	Leave	Training Course	Special & Other Duties	Unavailable	Refusal	Unknown
1122	625 (56%)	204 (18%)	123 (11%)	32 (3%)	61 (5%)	77 (7%)

Data management

More than 50% of the completed surveys needed some remarking of the tickboxes. In addition approximately 20% needed to be totally remarked as completion instructions listed at the front of the survey form were not followed consistently, (eg: circling around tickbox rather than filling it in). It was requested by the survey team that the forms be completed in black ball point pen. Pens were made available to officers if they were not in possession of an appropriate pen. However unfortunately a large number were marked with a light lead pencil which could not be read by the scanner.

A formal briefing of all officers (RSRO, DSRO + PSUC) involved in the administration and supervision process plus an additional information/instruction sheet was intended to have prevented this problem.

In the majority of cases each PSUC was present at the briefing by Department of Community Medicine staff, but on a few occasions they were unable to attend due to shift restrictions and/or duty commitments and thus had only the printed guideline to follow together with support of the RSRO and DSRO.

Completed health surveys (n=9921) underwent scanning into a computer data base by the Social Sciences Research Centre at The University of Hong Kong.

Scanning was completed in June 1996. The scanning procedure was to have only taken 8 weeks, but this was considerably delayed. Delays were attributed to the scanner being utilised for other University work and the RHKP Health Survey had to queue for processing.

The scanning process also developed some technical problems which required resolution (such as replacement of parts) which increased the length of time taken to complete the work.

A 10% sample (n=992) of health surveys underwent rescanning to determine the quality of the scanning process.

After viewing all error types a relatively high error rate was estimated and it was decided that the whole data set should be manually re-entered and verified to reduce or eliminate errors.

Four additional data entry clerks were employed during October/November 1996 to re-enter the whole data set.

Quality control checks (a procedure known as the MIL-STD-105D) were made on a daily basis to ensure data entry personnel were maintaining a high level of accuracy.

The data set then underwent internal consistency checks to ascertain the quality of data received from officers. The process was performed to test whether officers had followed the health survey instructions adequately.

A further procedure was also implemented to ascertain the quality of the scanning process. A manual check of the UI and Study numbers of the questionnaire, original scan and rescanned data sets was performed.

1.4 Basic characteristics of respondents

1.4.1 Distribution of officers responding to the survey by rank (Question A1)

The distribution by rank of the 9870 survey respondents can be compared to RHKP Establishment figures for 1/1/96 (Table 1.9).

Table 1.9: RHKP Rank Distribution of survey respondents and RHKP Establishment figures

RHKP Rank	RHKP Health Survey Dec 95/Jan 96 (%)	RHKP Establishment at 1/1/96 (%)
PC	7528 (76.3)	11001 (70.5)
SGT	1399 (14.2)	2612 (16.7)
SSGT	507 (5.1)	891 (5.7)
IP/SIP	363 (3.6)	692 (4.2)
CIP	38 (0.4)	202 (1.3)
SP	22 (0.2)	118 (0.76)
SSP	6 (0.1)	43 (0.28)
other	7 (0.1)	
missing	53 (0.5)	
CSP to CP		76 (0.49)
total	9870 (100)	15593 (100)

1996 Establishment figures exclude all PHQ and Crime officers.

1.4.2 **Distribution of officers in the survey by region/formation (Question A2)**
The number of officers in the six policing regions ranged from 1268 to 1957. These can be compared to RHKP regional distribution figures for 1/1/96 (Table 1.10).

Table 1.10: RHKP Regional Distribution of survey respondents and RHKP regional distribution figures

RHKP Region	RHKP Health Survey Dec 95/Jan 96 (%)	RHKP Regional Distribution 1/1/96 (%)
Hong Kong Island	1920 (19.4)	2884 (18.5)
Kowloon West	1812 (18.3)	3002 (19.3)
Kowloon East	1268 (12.8)	2417 (15.5)
NT South	1311 (13.3)	2090 (13.4)
NT North	1614 (16.3)	2625 (16.8)
Marine	1957 (19.8)	2575 (16.5)
missing	41 (0.4)	
total	9882 (100)	15593 (100)

Establishment figures exclude all PHQ and Crime officers.

1.4.3 **Duration of time in current formation and in the force among respondents (Questions A3, A4)**
The number of months spent in current police formation of survey responders ranges between 0 - 437 months (0 - 36.42 yrs). (Table 1.11) It is possible that this question was confused with duration of employment in the force by some respondents. RHKP are unable to supply current time in formation as this information is held in individual officer's files. A RHKP guideline is that an officer should have had a change in formation every five years.

RHKP have supplied wastage rates (Length Of Service) for five financial years which can possibly be used for comparative purposes.

Police officer retirement age is between 45 -55 years for a Junior Police Officer (JPO) (Ranks include PC, SGT + SSGT) with an option to be reemployed for up to 2 x 2½ years on contract terms. IP to CP must retire between 50 - 55 years.

Table 1.11: Number of months in current police formation by survey respondents

Number of months in current formation	Number of Police officers (%)
0 - 12 (1 yr)	3582 (36.4)
13 - 24 (2 yrs)	2177 (22.2)
25 - 36 (3 yrs)	1413 (14.4)
37 - 48 (4 yrs)	791 (8.0)
49 - 60 (5 yrs)	427 (4.3)
61 - 72 (6 yrs)	216 (2.2)
73 - 84 (7 yrs)	148 (1.5)
85 - 96 (8 yrs)	146 (1.5)
97 - 108 (9 yrs)	80 (0.8)
109 - 120 (10 yrs)	85 (0.9)
121 - 180 (11 - 15 yrs)	289 (2.9)
181 - 240 (16 - 20 yrs)	131 (1.3)
242 - 300 (21 - 25 yrs)	63 (0.6)
301 - 360 (26 - 30 yrs)	24 (0.2)
361 - 420 (31 - 35 yrs)	12 (0.1)
421 - 437 (36 - 36.42 yrs)	1 (0.01)
missing values	213 (2.17)
Total	9828 (100)

Question A4 asks for the month and year the respondent commenced employment with RHKP. The year of commencing employment ranges from 1920 - 1995. Duration of time (ie: number of years) spent in force can be calculated from this data. The mean duration in the force was 12.2 years (males 12.5; females 9.4) (Table 1.12).

Table 1.12: Duration in force

	Mean	95% CI	range	n	missing (%)
Female	9.4	8.9-10.0	1-35	869	16 (1.8)
Male	12.5	12.3-12.7	1-48	8786	223 (2.5)
Total	12.2	12.1-12.4	1-48	9677	246 (2.5)

1.4.4 **Age and gender of respondents (Questions I1, I2)**

Age at completion of the health survey was calculated from information on the officer's date of birth (Question I1). The mean age of the sample was 32.6 years (range 18-58); males were three years older than females on average Table 1.13.

Of the 9828 responders 8847 (90.0%) are males and 873 (8.9%) are females. Responses to this question were missing in 108 (1.1%) questionnaires.

Table 1.13: Age of officers by gender

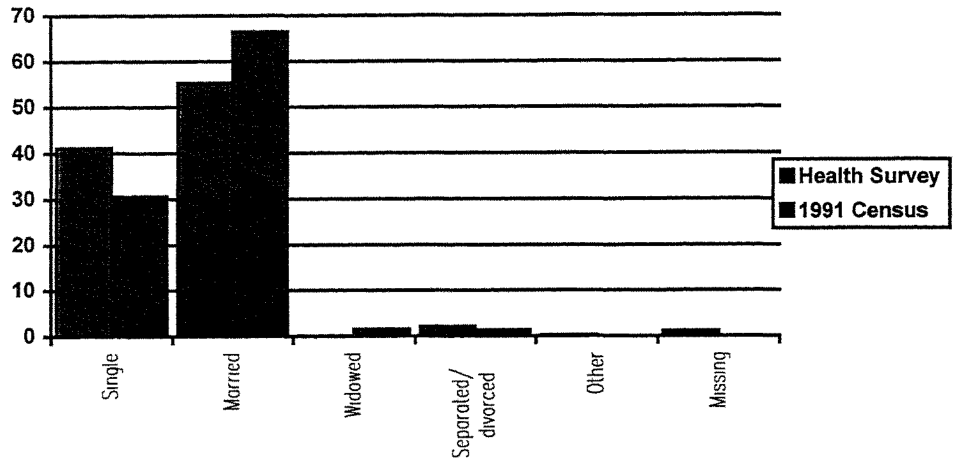
	Mean	95% CI	range	n	missing (%)
Female	29.9	29.3-30.5	19-55	880	5 (0.6)
Male	32.8	32.7-33.0	18-58	8989	21 (0.2)
Whole	32.6	32.4-32.8	18-58	9869	55 (0.6)

1.4.5 **Marital status (Question I3)**

More than half of all officers (5436 or 55.3%) were married whilst 4053 (41.2%) indicated they were single. Of the remaining responders 11 (0.1%) were widowed, 49 (0.5%) separated, 156 (1.6%) divorced and 15 (0.2%) who indicated otherwise. 108 (1.1%) did not answer this question. These can be compared to 1991 Census data. (Figure 1.1)

To enable comparison several age groups have been removed from Census data; ie: 15 - 19 yrs, 60 - 64 yrs and 65 + yrs.

Figure 1.1: Health Survey responders and 1991 Census marital status as percentages



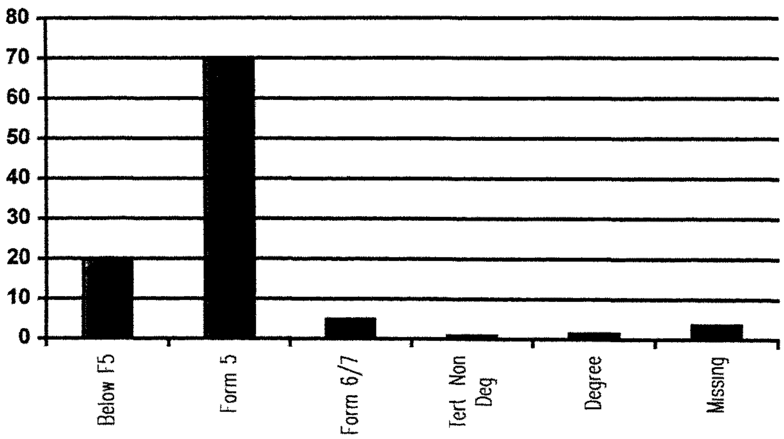
1.4.6 **Ethnicity (Question I4)**

The majority of officers (9401 or 95.7%) are Chinese, followed by 74 (0.8%) Caucasians, 12 (0.1%) Other Asian and 8 (0.1%) who answered otherwise. 333 (3.4%) did not answer this question.

1.4.7 **Educational attainment (Question I5)**

The highest level of education achieved by officers is shown in Figure 1.2. 1938 (19.7%) had completed below Form 5, 6848 (69.7%) had completed Form 5, 469 (4.8%) had completed to Form 6 or 7, 81 (0.8%) had completed a Tertiary non degree course and 135 (1.4%) had attained a degree. 357 (3.6%) did not answer this question.

Figure 1.2: Highest level of education achieved by Health Survey responders as percentage of all officers



1.5 Stage Two: Physiological lung function testing of selected groups of Hong Kong Police Officers

1.5.1 Sampling and methods

Officers for this stage were selected from amongst those who completed the *Stage One: Officer Self-Completed Health Survey.* These officers underwent a series of physiological tests of lung function performed over a 14 month period.

This assessment of lung function was performed using the following instruments:

- **The Mini-Wright Peak Expiratory Flow Meter**
  This portable, self-administered apparatus assesses the function of the large airways by measuring the peak expiratory flow rate (PEFR) in litres/minute. The subject is taught to blow hard into the instrument following full inspiration. Although this is an effort dependent measure, it is simple, reliable and convenient.
  On all occasions where the Peak Expiratory Flow Meter was used, the officers performed the test five (5) times each during both pre-shift and post-shift testing periods.

- **The Vitalograph Volumetric S model PFT II Plus Spirometer**
  This instrument provides a permanent record of breathing patterns. It can assess the impact of exposure to external irritants and allergens or the effect of intrinsic diseases, including acute and chronic lung disease. The spirometer directly measures lung volumes and can also provide indirect estimates of air flows. Measurement of a single forced expiration is a standard test which in normal subjects demonstrates that 80% of the Forced Vital Capacity (FVC) (near total volume) is exhaled in 1 second. This is referred to as the Forced Expiratory Volume in one second (FEV_1). In *obstructive* lung disease the measured FVC is reduced because the airways close and limit full expiration before the subject has completed the breathing out manoeuvre. The FEV_1 is markedly reduced because of the marked airways resistance which slows the rate of expiration. Factors which cause *restrictive* lung disease such as musculo skeletal problems or fibrotic changes in the lung lead to a reduction in FVC because of limited expansion of the chest wall or lung.

  The forced expiratory volume in one second FEV_1 was used in this analysis as one of the possible indicators of the acute effect of pollution on lung function during routine shift work.

  The percentage change in FEV_1 (FEV %) was calculated as

$$\frac{\text{Pre-shift } FEV_1 - \text{Post-shift } FEV_1}{\text{Pre-shift } FEV_1}$$

  On all occasions where the Spirometer was used, the officers performed the test three (3) times each during both pre-shift and post-shift testing periods.

- **The Bedfont Micro II Smokerlyzer for expired air carbon monoxide (CO)**
  This handheld electrochemical analyser measures the level of carbon monoxide in expired air. Carbon monoxide from cigarette smoke or ambient air pollution passes through the lungs and in the circulation where it dissolves in plasma and combines with haemoglobin to form carboxyhaemoglobin. The instrument is sufficiently sensitive to detect CO in the breath of smokers and distinguish them from non-smokers. It would not normally be used to detect variations in expired CO arising

from exposures to CO in ambient air. The expired air CO levels were recorded as parts per million.
On the one occasion where the Smokerlyzer was used only one (1) blow was performed for both pre-shift and post-shift tests.

1.5.2 Pilot study

On 19th December 1995 an initial pilot study was conducted on 110 officers from Traffic New Territories South, Enforcement and Control, Patrol Subunit's and Taskforce (NTS E&C PSU + TF).
Tests were performed at the Old Tsuen Wan Police Station, Tsuen Wan.
This pilot involved respiratory function tests on each officer before commencement of duties (pre-shift) and again at completion of duties (post-shift).
Officers involved were scheduled on the following tour of duty:

A shift (0700-1500 hours) (n=54)
M shift (1200-2000 hours) (n=4)
B shift (1500-2300 hours) (n=52)

Pre-shift testing included -

- Completion of brief questionnaire regarding:
  - respiratory symptoms on that day,
  - medication taken on that day,
  - smoking status and time since last cigarette,
  - respiratory protective mask wearer status.
- Height taken on a stadiometer.
- Weight taken on an analogue scale.
- Expired Air Carbon Monoxide measured in parts per million (ppm) and percentage Carboxyhaemoglobin (%COHb) using a handheld Bedfont Micro II Smokerlyzer.
- Lung function measurements of Forced Vital Capacity (FVC) and Forced Expiratory Volume in one second (FEV_1) taken on a Vitalograph Volumetric S model PFT II Plus Spirometer.

Post-shift testing included-

- Expired Air Carbon Monoxide measured in parts per million (ppm) and percentage Carboxyhaemoglobin (%COHb) using a handheld Bedfont Micro II Smokerlyzer.
- Lung function measurements of Forced Vital Capacity (FVC) and Forced Expiratory Volume in one second (FEV_1) taken on a Vitalograph Volumetric S model PFT II Plus Spirometer.

1.5.3 Peak expiratory flow rate

On the 19th December 1995 30 officers from NTS who had participated in the previous fieldwork were selected to join a three week study of the Mini-Wright Peak Flow Rate Meter.
These consisted of 15 officers who had experienced a 7% or more drop in respiratory function on the post-shift FEV_1 test and 15 officers who had experienced no change in their post-shift FEV_1 readings. The aim was to look at changes in Peak Expiratory Flow Rates (PEFR) between shift rotations (ie: A, B, C, M and X shifts) and also variation in individual officer daily peak expiratory flow rates.
Peak Expiratory Flow Rate (PEFR) was chosen as the monitoring tool because of the feasibility of making multiple daily measurements with reasonable convenience.

Each officer recorded his peak expiratory flow readings three (3) times on four (4) occasions daily. The officer recorded his PEFR on the following occasions:

* upon waking
* commencement of duties.
* completion of duties
* retiring to bed

Details of the briefing paper are provided in Appendix C.

1.5.4 Main lung function testing study

Between 13th May 1996 and 17th March 1997 further physiological respiratory function tests were undertaken. The first set of tests were done from 13th May to 9th June 1996 on 100 officers from Traffic Kowloon West, Enforcement and Control, Patrol Subunits and Taskforce. This testing was conducted over a 4 week period at the Mongkok Police Station.

Between 2nd December 1996 and 17th March 1997 further respiratory function tests were undertaken on nominated officers working in other regions and formations to confirm the findings of the initial studies and to achieve a larger sample. A total of 422 officers from Hong Kong Island (HKI E&C and Happy Valley Foot Patrol Subunits), Kowloon West (KW E&C and Mongkok Foot Patrol Subunits)and Kowloon East (KE E&C and Kwun Tong Foot Patrol Subunits) and Marine (launches based at Aberdeen Headquarters) were tested.

The testing schedule was as follows:

Kowloon West (study 1)	13th May - 17th June 1996
Hong Kong Island	2nd -14th December 1996
Kowloon East	20th January - 1st February 1997
Kowloon West (study 2)	6th - 18th January 1997
Marine Aberdeen	5th - 17th March 1997.

The tests involved officers on a 'B' shift tour of duty undergoing respiratory function tests before commencement of duties (pre-shift) and again at completion of duties (post-shift).

Marine Police were tested between 8.00 am -12.00 noon daily. As each launch crew works a 24 hour tour of duty they underwent pre-shift testing on Day 1 and post-shift testing on Day 2.

Both pre-shift and post-shift testing included:

- Completion of a brief questionnaire which took into account the period since waking and prior to commencement of duties (pre-shift) and the period of the officer's tour of duty (post-shift). Information collected included:
  - Respiratory symptoms experienced (cough, phlegm and sore throat)
  - Number of cigarettes smoked
  - Time exposed to Environmental Tobacco Smoke (ETS) during the shift
  - Time spent outdoors
- Lung function measures including Peak Expiratory Flow Rate (PEFR) taken on a Mini-Wright Peak Expiratory Flow Meter and Forced Expiratory Volume in one second (FEV_1) and Forced Vital Capacity (FVC) taken on a Vitalograph Volumetric S model PFT Plus Spirometer.

A copy of fieldwork data sheet is included in Appendix C.

1.5.5 Pilot trial of Respro mask

Between 5th to 25th August 1996 a group of officers (n=26) from New Territories South and Kowloon West who had undergone prior respiratory function testing in February and May/June 1996 respectively, were selected to participate in a three week trial of the *Respro* mask and filters. This testing was conducted at Mongkok and Old Tsuen Wan Police Station. This was a feasibility study before deciding on a large scale trial to assess the effects of mask wearing and various filters on respiratory symptoms and lung function.

Three filters were used for the study; the *Respro City "Dymanic ACC"* filter which mainly filters gaseous material, the *Respro Sportsta "Techno ST180"* filter which mainly filters out small respirable particles and a "placebo" filter which was an ordinary piece of cloth with no known specific filtering properties (see Appendix D for more details).

Officers from NTS were selected if they had decreased lung function measures (PEFR) on 70% or more occasions following their tour of duty during the 21 day PEFR measurements in February 1996.

Officers from KW were selected if they had decreased lung function measures (FEV1) on 95% or more occasions following their tour of duty in May/June 1996.

The trial followed a crossover design shown in Table 1.14, whereby all officers experienced a week of each *Respro* filter and the placebo filter. Officers were stratified for smoking status and then randomly allocated into one of three groups.

Table 1.14: Outline of the Respro Mask Trial

	Week One	Week Two	Week Three
Group One	City Filter	Sportsta Filter	Placebo Filter
Group Two	Sportsta Filter	Placebo Filter	City Filter
Group Three	Placebo Filter	City Filter	Sportsta Filter

Each officer was issued a Mini-Wright Peak Flow Meter, Respro Mask, nominated filter and a three week diary.

Diary entries were made twice daily (pre and post-shift) and included:

- Respiratory symptoms (cough, phlegm and sore throat) experienced
- Number of cigarettes smoked
- Time exposed to Environmental Tobacco Smoke (ETS)
- Time spent outdoors
- Time spent wearing mask during shift
- Reason/s for mask removal
- Mask comfort rating during shift
- Any difficulties associated with the mask
- PEFR recorded 5 times on each occasion

1.6 Operational problems encountered during lung function testing sessions

It became increasingly difficult as physiological testing of the officers progressed to maintain deployment of sufficient numbers of trainable staff and specially recruited additional helpers to perform the respiratory function tests.

The Department of Community Medicine had relatively few well trained and experienced staff who were able to help out with the extensive fieldwork. For the initial one day trial on the 19th December there were ample staff to cover the testing schedule.

However as fieldwork progressed temporary fieldworkers were sought through advertisements on the University of Hong Kong campuses and through the Government Labour Department, as departmental staff could not sustain the twice daily testing sessions in various geographical locations and meet a range of other service and academic commitments.

Often a temporary fieldworker would be trained on the testing procedures, but then only complete one or two sessions (often finding other remunerative work), thereby increasing the workload of the permanent staff members.
Reasons cited as deterrents to participating in the fieldwork include;

- Long distances required to travel to/from fieldwork sessions.
- The post-shift testing (B shift) did not commence until approximately 10.30 pm and often finished near to midnight, making journeys home by taxi the only option as the MTR and some public light buses had ceased operation.

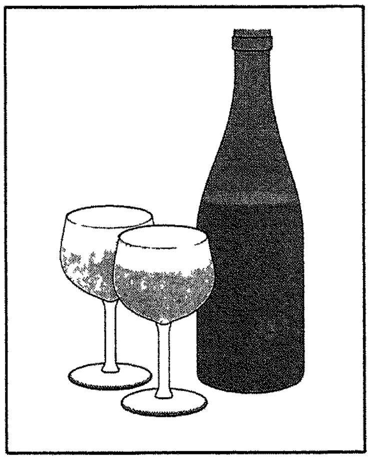
On the whole most PSUC and Operational Support personnel assigned to liaise with the Department of Community Medicine staff were very helpful and interested in the study. There was however some misunderstanding of the fieldwork requirements and on occasion we would arrive at a fieldwork location to discover that the liaison officer was on leave or otherwise unavailable and had neglected to tell the relevant PSUC and PSU members of our arrival and requirements for the fieldwork.
In the resulting confusion we often lost the opportunity to test officers who went off on a tour of duty before they could be tested.
In all fieldwork episodes there were a handful of officers who did not return for their post-shift testing. This was sometimes due to them being delayed in their tour of duty. In some instances we were notified that particular officers would be unable to attend, but in the majority of cases we had to try and locate the officer and often wait until quite late to complete measurements.

It had been suggested at the commencement of each fieldwork session that officers should remove their belt and firearms prior to performing the respiratory function tests. This procedure was not always reliably carried out and prompting by field workers was necessary on a continuing basis. Signs explaining the need for the procedure were posted next to each spirometer for the benefit of both fieldwork staff and officers but often the police officers were in such a hurry to go on duty that they did not want to remove any of their work attire.

On occasion some officers would endeavour to make fun of a fellow officer whilst he was performing one or all or the respiratory function tests. Crowding around the officer undergoing testing was also an occasional problem. This often resulted in the officer having to redo the tests after a few minutes break. Thereby disrupting both the officer and the fieldworker and adding to the testing times.

During the trial of the Mini-Wright Peak Expiratory Flow Meter (WPEFM) the officers were presented with a diary and WPEFM and briefed on the requirements of the trial as well as the correct technique of using the meter. Additional twice weekly visits by a Department of Community Medicine staff member aimed to check on the individual officer's progress. This was however hampered as officers were not always notified of the visit and went out on their tour of duty. Lengthy delays were involved in getting the officers back and the staff member had to start making daily visits in the hope of catching a few officers each day.

Fieldwork involving the Marine Police encountered many initial difficulties.
A detailed plan had been provided to the Department of Community Medicine on the timetable of the various marine launches that would be available for testing. However changes to the marine launch timetable at the last minute meant that members of some launches were unaware that they were to be involved in fieldwork. Thus there was only a fairly small number tested during the first week of fieldwork. Problems were eventually resolved and testing of officers based at Southern Region Marine headquarters in Aberdeen was then completed on schedule.

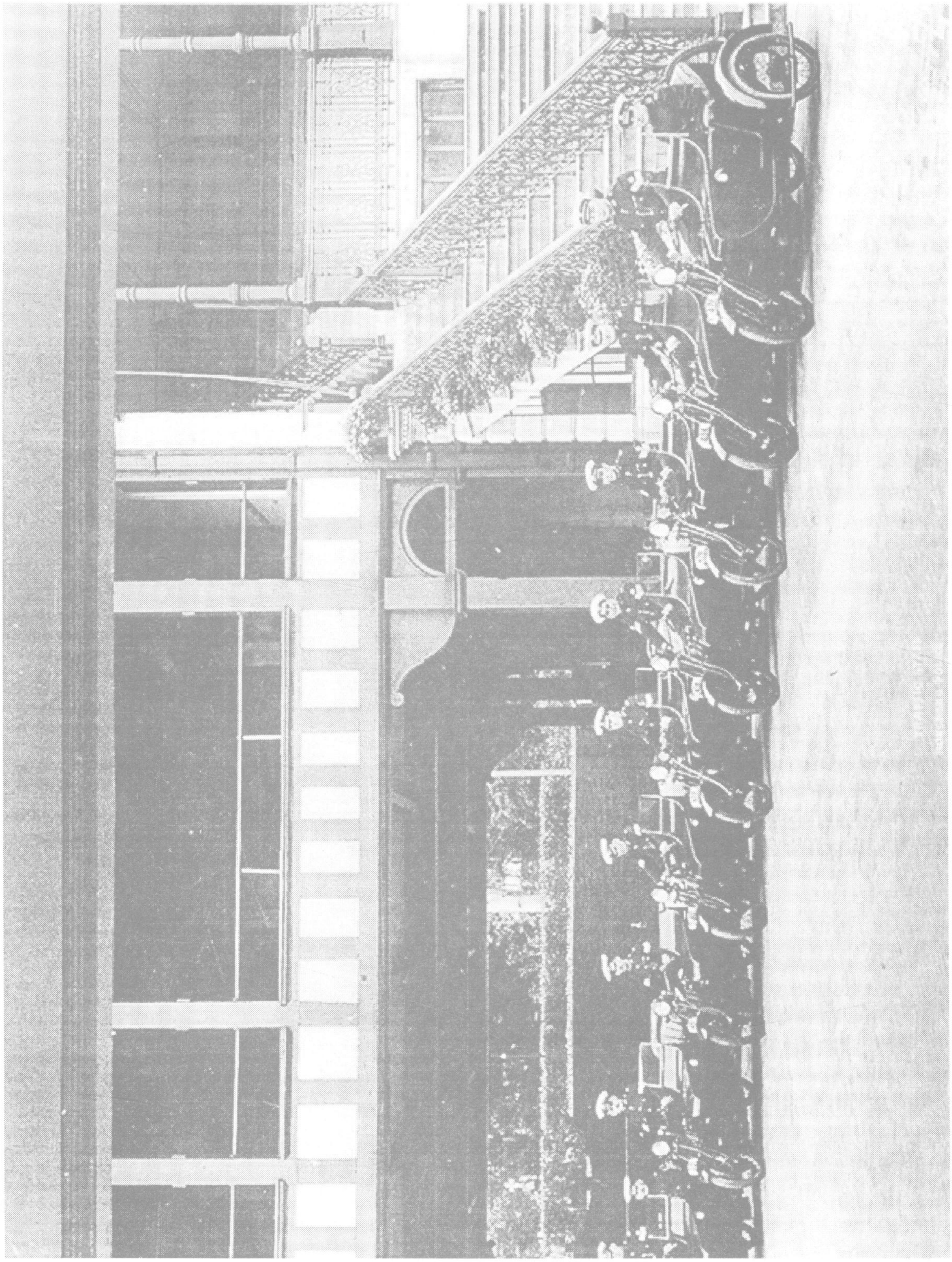


SECTION 2

Health related lifestyle patterns

Smoking
Alcohol
Exercise

Peymané Adab



ABSTRACT

Objective

This section explores the prevalence and pattern of certain lifestyle factors (smoking, alcohol consumption and physical inactivity) which are known to adversely affect current and future health experience.

Methods

The sections in the questionnaire related to smoking (B18a to B18z), alcohol consumption (F11) and exercise (F9) were used for the analysis. The prevalence of the different lifestyle factors among the survey participants was estimated. The relationship between lifestyle factors and respiratory symptoms (questions B9 to B16) and other medical illness (questions B17a to B17q) were then explored by logistic regression models and the estimation of odds ratios. Finally the interrelationship between the three lifestyle factors was examined.

Findings

TOBACCO

- Overall, 47% of all male and 12% of all female officers who responded in the survey, were ever-smokers: that is either previously smoked or currently smoke. This proportion is higher than that in the general population, even after adjusting for age and gender differences.
- The estimates of the amount of tobacco smoked by smokers also exceeds that quoted for the general population.
- Smokers are more likely to have respiratory symptoms with 150% excess risk of complaining of symptoms which are suggestive of chronic lung disease
- Smokers are more likely to have had a diagnosis of illnesses such as bronchitis, pneumonia, other chest trouble and peptic ulcers
- The risk of symptoms and illnesses increases with increasing amounts of tobacco smoked
- A large proportion of all smokers (44% of men and 48% of women) took up smoking after joining the force.
- 73% of smokers have been cutting down their smoking and 62% say they want to quit but the proportion of ex-smokers is relatively small (3%), suggesting more people could be helped to quit and that investment in quitting programmes would make a substantial contribution to the health of the force.
- Programmes for the prevention of smoking on entry to the force are urgently required as part of the force's approach to health protection and health maintenance for officers.

ALCOHOL

- Over half of all officers consume some alcohol but only 6% consume more than the currently recommended limits (more than 21 units per week for men and 14 units for women). However, 25% of all officers had at least one session of binge drinking (more than 5 units of alcohol at one session) over the previous month.
- Those who drink alcohol were more likely to have had various illnesses (particularly hypertension, pneumonia and allergies).
- The risk of reporting illness was greater with increasing levels of alcohol consumption.

EXERCISE

- 50% of women and 42% of men had done no exercise over the previous month.
- Only 8% of all officers participate in at least 3 exercise sessions per week (the recommended level for cardiovascular benefits).
- Those who do no exercise had 160% excess risk of complaining of shortness of breath whilst hurrying compared with those who do exercise, even after adjusting for age, gender and chest illness.

INTERRELATIONSHIP BETWEEN LIFESTYLE FACTORS

- Smokers were more likely to consume excess alcohol and to do none or little exercise.
- 12% of officers smoke, drink to excess and do no exercise, and are at greatest risk of health problems

Conclusion

There is a high prevalence of unhealthy lifestyle factors, particularly smoking amongst the Hong Kong police officers. This is likely to affect work performance and productivity. Programmes to prevent and control smoking and to encourage physical activity amongst officers are recommended.

2.1 Tobacco Smoking

2.1.1 Background

When investigating the effects of air pollution on health, it is necessary to also study certain common lifestyle factors which are known to affect health. Through this approach we can anticipate some of the health problems which officers in the police force may face now or in the future. In addition to long term health effects all of these factors can also potentially affect an individual's performance and work productivity in the short term.

The lifestyle factors studied in this survey included smoking, alcohol consumption and exercise. Smoking has been studied in most detail for two reasons. First, as discussed later, of all the lifestyle health risk factors smoking poses the greatest health hazard to society. Second, while some of the effects of air pollution on health may be similar in nature to the effects of cigarette smoking, in terms of risk smoking will predictably have a much greater effect. This factor must therefore be taken into account and adjusted for before any conclusions can be made about the effects of outdoor air pollution. Cigarette smoking is also the major source of indoor air pollution which is likely to have a major impact on health.

Cigarette smoking is the biggest single most preventable cause of premature death in most developed and post-industrial countries and in many developing countries. This is currently the position in Hong Kong and mainland China. The negative health consequences of this habit are increasingly being recognised and its role as a major risk factor for several diseases including lung cancer and coronary heart disease is now well established. Furthermore there is now convincing evidence about the adverse health effects of passive smoking which results from exposure to environmental tobacco smoke (ETS).

Well conducted research studies have shown that one half of those who regularly smoke are eventually killed by their habit; half of them in middle age (35-69) and half in old age[1]. The serious adverse health effects are usually only apparent in the population some 20 to 30 years after smoking becomes widespread[2]. However even in the short term smoking is a hazard to health, even in apparently fit healthy people. This includes disciplined services and studies of army officers in other countries have shown that smokers are more likely to fail combat training and have poorer athletic performance[3,4].

In addition to the health effects there is mounting evidence of the economic costs of smoking, not only to society as a whole but also to employers. There is increasing evidence of the occupational risks associated with smoking and the cost to employers. Several studies have shown that work absenteeism and use of sick leave is higher amongst smokers compared with their non-smoking colleagues[5,6,7]. Also, the greater the amount and duration of smoking (for example expressed in terms of pack-years) the greater the risk[8]. Smokers are also more likely to use health benefits[9] and are more likely to have occupational accidents and injuries[7]. Smoking in the workplace is also a fire risk and employers will not only have to pay more for fire insurance, but will also have to spend more time and money on cleaning and repainting and other forms of refurbishment. They also now run the risk of legal action by non-smoking employees who suffer from the adverse health effects of working in a smoke-filled environment.

2.1.2 Objectives

The objectives were two fold

(1) To determine the patterns of recruitment to smoking and current levels of smoking in police officers

(2) To estimate the impact of smoking on health in the force

2.1.3 Methods

The section on smoking (questions B18a to B18z in the questionnaire) was analysed initially to describe the prevalence and pattern of smoking. Whenever possible, these patterns were compared with those found in the general population. The relationships between smoking and respiratory symptoms (questions B9 to B16c), past medical history (questions B17a to B17q) and other health risk behaviours (questions F9 on exercise and F11 on alcohol consumption) were then explored.

The basic information from the questionnaire was used to define several new variables, each of which is described under the relevant section. The analysis was tailored towards answering specific questions which are the basis for the results section using cross tabluations and logistic regression modelling to estimate odds ratios with 95% confidence intervals.

2.1.4 Results

How common is smoking and what are the characteristics of smokers?

Amongst the survey responders 4,089 officers (41%) admitted to being smokers and at least a further 263 (3%) have smoked regularly in the past. 389 (4%) officers did not answer any of the questions on whether they smoke or not.

Classification of smoking status:

	B18a - do you smoke?		
	Yes	No	Missing
B18b - smoked in past?			
Yes	-	209 = EX-SMOKER	
No	-	4,209 = NEVER SMOKER	
Missing	4,089	986	389
TOTAL	4,089 = CURRENT SMOKER		

B18y - when last quit smoking?
number of officers who gave a response: 87 54 166 = 306

The following definitions of smokers were used:

Current smoker = those who answered yes to question B18a **= 4,089**
(since 87 of these gave a quit date, the actual number may be between 4,002 and 4,089)

Ex-smoker = answered no to B18a and - EITHER yes to B18b = 209
- OR missing for B18b, but responded to B18y = 54
= 263
(since 932 said they do not smoke but did not answer B18b or B18y, these may be either ex-smokers or never smokers. They are treated as "missing" in the analyses).

Never smoker = answered no to B18a and to B18b **= 4,209**
(as above, the 932 officers who did not answer B18b may be never smokers - but were treated as "missing" in the analyses)

Current smoking is significantly more common amongst officers who are aged below 30 years (Figure 2.1.1a) [F=19.7, p=0.00] and this age group make up nearly 50% of all smokers. This pattern of smoking is also reflected in the police rank where a higher proportion of police constables (PC) reported current smoking (46%) than officers of other rank (Figure 2.1.1b). As expected, the proportion of women who are smokers (12%) is significantly less than men (46%) [t=19.2, p=0.00].

Figure 2.1.1a: Smoking status by age group

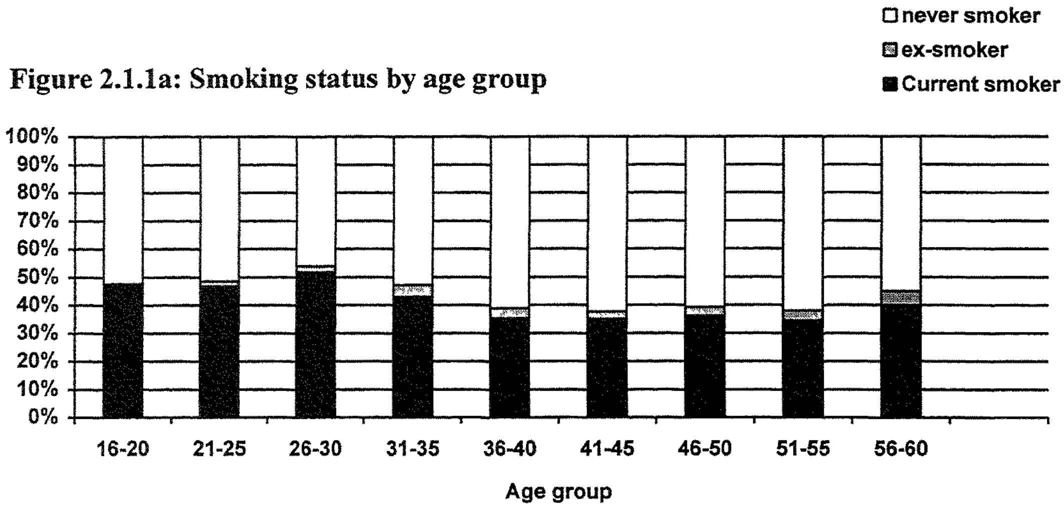
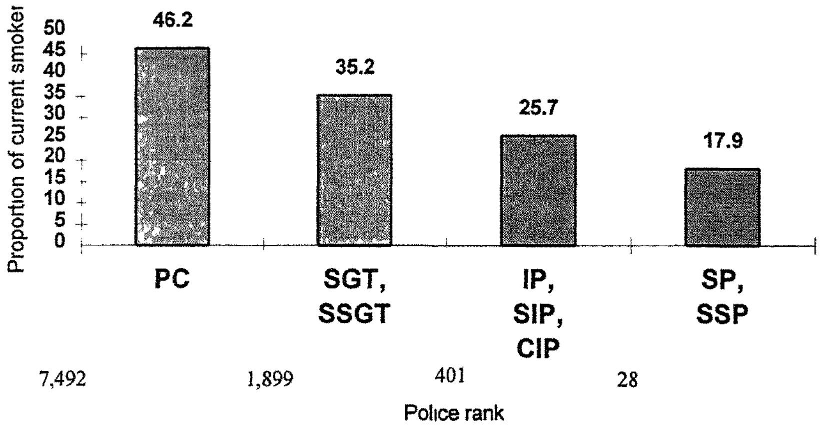


Figure 2.1.1b: Proportion of current smokers by rank



In comparison, current smoking in the general population is more common in an older age group (Table 2.1.1). In all age groups, amongst both men and women, smoking rates for officers working in the police force are much higher than those in the general population. The age and sex standardised smoking rate amongst responders to the police health survey (standardised to the 1993 census population) was 27.6% compared with 14.9% in the population sampled by the 1993 General Household Survey (GHS). The age standardised rate for men was 44.2% and for women 11.0% compared with 27.2% and 2.7% respectively in the GHS population (χ^2 for difference in age specific smoking rates for men = 1511, $p<0.001$, and for women = 488, $p<0.001$).

Table 2.1.1: Smoking rates at different ages amongst men and women in the Hong Kong Police compared with the general population in Hong Kong

	Men		**Women**	
Age group	Smoking rate in Hong Kong Police (% of responders)	Smoking rate in 1993 GHS	Smoking rate in Hong Kong Police (% of responders)	Smoking rate in 1993 GHS
15-19[‡]	49.0	7.5	20.0*	0.9
20-29	54.2	23.8	15.8	2.2
30-39	42.2	28.1	10.5	1.8
40-49	38.3	34.1	3.1	1.0
50-59[‡]	35.9	34.8	5.9*	3.1

[‡] Hong Kong police population ages range from 18 to 58 years for men and 19 to 54 years for women

** the number of women police officers in these age groups is small, therefore the comparisons should be treated with caution*

Although the prevalence of smoking is generally high throughout the force, there is marked variation between different formations and regions. There were significantly fewer marine officers who reported current smoking than all other officers and significantly more officers in Kowloon East smoke than those in New Territories North ($F=15.9$, $p=0.00$ for one way ANOVA). Marine officers are on average older than other officers (mean age 37 years compared with 31 years in other officers). However even when this is taken into account, smoking is less common amongst these officers .

Table 2.1.2: Variation in smoking status by ethnic group

Ethnic group	**Number of officers**	**Proportion (%) who currently smoke (95% CI)**
Chinese	9,116	43 (42-44)
Caucasian	75	20 (11-29)
Other Asian	12	42 (9-74)
Other, non-Asian	8	50 (5-95)

There was some variation in smoking by ethnicity. Officers who are Caucasian reported less smoking than officers from other ethnic groups and the difference was significant between Caucasian and Chinese officers (Table 2.1.2) [$F=5.6$, $p=0.00$]. Current smoking decreases significantly with increasing levels of education (Mantel Haenszel test for linear association = 34.2, $p=0.00$). Marital status is also associated with variation in smoking. Current smoking is least common amongst married officers and is significantly lower than amongst those who are single or separated ($F=15.0$, $p=0.00$ for one way ANOVA). The proportion of current smokers is about 8% higher ($p= 0.000$) in non-married officers (i.e. those who are single, divorced, widowed or separated) compared with those who are married.

Table2.1.3: Factors associated with current smoking amongst Hong Kong Police Officers

Variable		adjusted odds ratio (95% CI)	
Age	per year (increasing)	0.96 (0.96, 0.97)*	p = 0.000
Gender (female as ref)	male	7.18 (5.78, 8.94)*	p = 0.000
Work region (Marine as reference)	Kowloon East	1.69 (1.44, 1.98) *	p = 0.000
	HK Island	1.55 (1.35, 1.79)*	p = 0.000
	NT South	1.53 (1.31, 1.79)*	p = 0.000
	Kowloon West	1.48 (1.28, 1.71)*	p = 0.001
	NT North	1.27 (1.10, 1.48)*	p = 0.000
Marital status (widowed, separated, divorced or other as the reference group)	single	0.56 (0.42, 0.75)*	p = 0.000
	married	0.52 (0.40, 0.68)*	p = 0.000
Education level (tertiary [degree or non-degree] as reference)	Below form 5	3.72 (2.61, 5.32)*	p = 0.000
	Form 5	2.44 (3.44, 1.73)*	p = 0.000
	Form 6 - 7	1.65 (1.11, 2.45)*	p = 0.013

A logistic regression model was used to determine which of the officers social and demographic characteristics (Table 2.1.3) are the best predictors of current smoking status. This will help in characterising the most vulnerable officers who should be targeted for health promotion and may offer some explanation for why officers smoke. The variables used in the equation were age, work region, marital status, ethnicity, gender and level of education. All variables except ethnicity were significant in the final model (using forward stepwise logistic regression) which explains 61% of the observed variation.

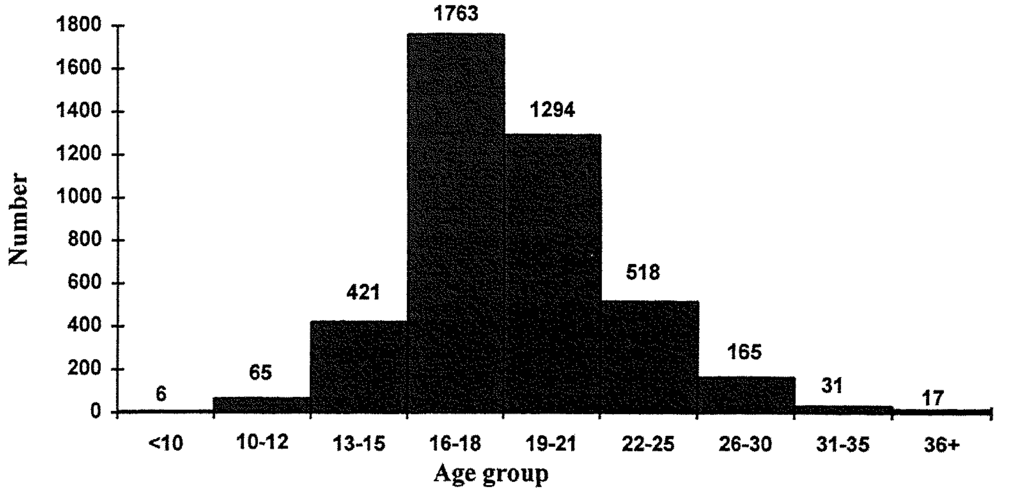
This analysis provides estimates of the excess risks attached to a particular characteristic of an individual in the force. Smoking is a dominantly male habit in the force but the use of the females as reference group for this analysis should not obscure the serious problem of smoking in female police officers. The association of smoking with age shows a decreasing gradient in risk from younger to older officers. There appears to be a district work culture for smoking in that variation is strongly regional with Kowloon East high and New Territories north relatively low. Another factor or set of factors appear to influence smoking in the marine police formation which has the lowest prevalence and is used as the reference group in this analysis. The social status of an individual has an important association with smoking, reflected by the apparent protective effect of marriage and the absence of a broken relationship.

Apart from gender, educational attainment is a strong indicator of the likelihood that an individual will be a smoker in the force with those below Form 5 level at highest risk.

2.1.5 When did officers start smoking?

Most officers (70%) who have ever smoked took up the habit between the age of 16 and 21 (Figure 2.1.2).

Figure 2.1.2: Age at starting to smoke amongst police officers who have ever smoked in the Hong Kong Police



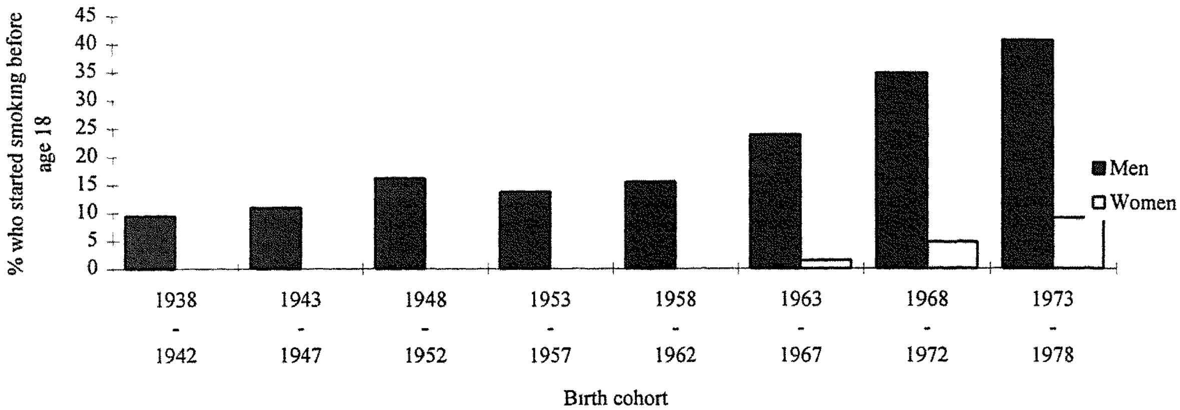
Compared with the Hong Kong 1993 GHS population, a much lower proportion of police officers reported starting to smoke before the age of 15 years. However recruitment to smoking between the age of 15-19 exceeds that in the general population for both men and women in the police (Table 2.1.4).

Table 2.1.4: Age of starting to smoke regularly amongst police officers compared with the Hong Kong 1993 GHS population (n=10,823)

Age group	Proportion of population who started to smoke at this age (%)			
	Men		Women	
years	Police	1993 GHS population	Police	1993GHS population
<15	5.5	9.3	2.9	14.2
15-19	55.7	44.4	51.5	38.3
20-24	30.7	33.9	37.9	22.0
25-29	5.7	8.3	4.9	7.1
30-39	2.3	3.7	1.0	14.9
40+	0.2	0.4	1.9	3.5

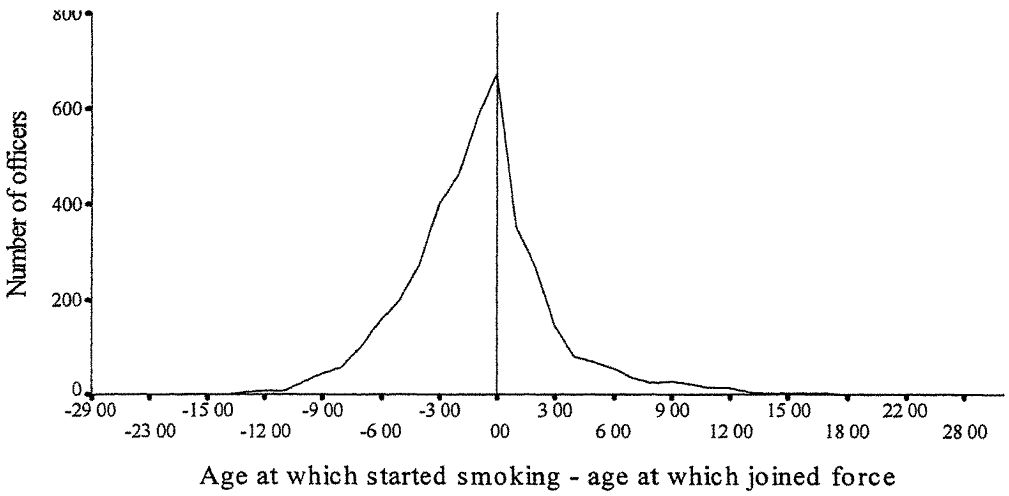
The proportion of officers who started to smoke before the age of 18 has increased over successive birth cohorts (Figure 2.1.3). This increase is seen amongst both men and women.

Figure 2.1.3: Proportion of officers in successive birth cohort who started smoking before the age of 18 years



Amongst those who have ever smoked, 44% started the habit after starting employment with the Hong Kong Police (Figure 2.1.4). Nearly 80% of these (35% of all ever-smokers) started the habit within 3 years of starting their employment with the police. Furthermore 46% of smokers started the habit within the 5 years before joining the force.

Figure 2.1.4: Relationship between the age at which officers started to smoke and the age at which they joined the police force



2.1.6 What do officers smoke?

A total of 361 officers who have ever smoked (8%) did not reply to questions about the type of tobacco smoked. Among the responders, the most common form of tobacco used was manufactured cigarettes (Table 2.1.5). The majority of ever smokers who responded to the question on smoking materials (99.7%) smoke manufactured cigarettes and 84% of these report this as the only form of tobacco that they use. There were 17 officers who reported smoking all forms of tobacco (i.e. manufactured cigarettes, hand-rolled cigarettes, large and small cigars and pipe tobacco).

Table 2.1.5: Type of tobacco smoked by officers:

Type of tobacco product used	number of officers	(%)
One form of tobacco only	**3342**	**(83.9)**
Manufactured cigarettes only	3336	(83.8)
Hand-rolled cigarettes only	3	(0.1)
Pipe only	2	(0.0)
Small cigars only	1	(0.0)
Two forms of tobacco	**372**	**(9.3)**
Manufactured cigarettes & hand-rolled	86	(2.2)
Manufactured cigarette & small cigars	192	(4.8)
Manufactured cigarette & other cigar	23	(0.6)
Manufactured cigarette & pipe	67	(1.7)
Hand-rolled & pipe	4	(0.1)
3 forms of tobacco	**193**	**(4.8)**
Manufactured cigarette & hand-rolled & other cigar	3	(0.1)
Manufactured cigarette & pipe & other cigars	7	(0.2)
Manufactured cigarette & pipe & small cigars	33	(0.8)
Manufactured cigarette & pipe & hand-rolled	71	(1.8)
Manufactured cigarette & hand-rolled & small cigars	8	(0.2)
Manufactured cigarette & small cigars & other cigars	71	(1.8)
4 forms of tobacco	**59**	**(1.5)**
Manufactured cigarette & hand-rolled & small cigars & other cigars	4	(0.1)
Manufactured cigarette & hand-rolled & pipe & other cigars	2	(0.0)
Manufactured cigarette & hand-rolled & pipe & small cigars	10	(0.2)
Manufactured cigarette & pipe & small cigars & other cigars	42	(1.0)
Pipe & small cigars & other cigars & hand-rolled	1	(0.0)
All forms of tobacco	**17**	**(0.4)**

2.1.7 How much do officers smoke?

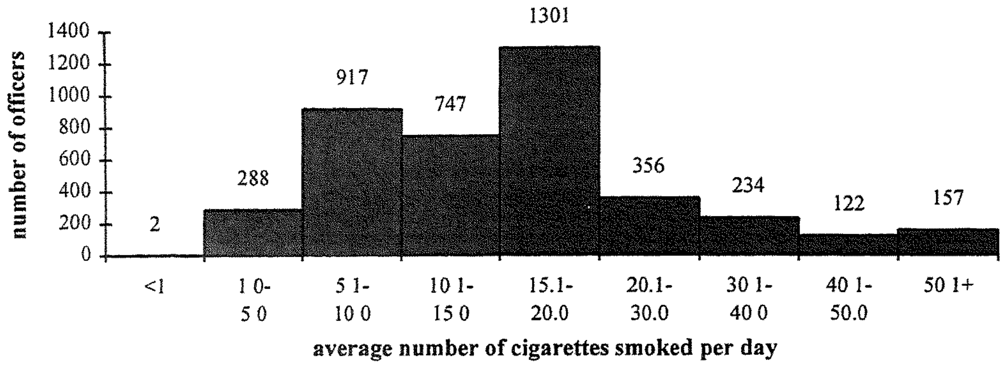
A total of 227 officers (5% of ever smokers) did not respond to questions on the amount of tobacco smoked. On average officers tend to smoke more during weekdays compared with weekend days (difference between paired means = 5.7, 95% CI = 5.3 - 6.4). The mean number of manufactured cigarettes smoked by ever smokers is 19 per day, although the reported numbers ranged from less than 1 to 93 per day (Figure 2.1.5). There were 37 officers who reported smoking more than 65 cigarettes a day on average. This seems implausible and if these officers were excluded, the mean number of cigarettes smoked per day reduced to 18.

* average number of cigarettes smoked per day =

$$\frac{(5 \times \text{number smoked per weekday}) + (2 \times \text{number smoked per weekend day})}{7}$$

The average number of cigarettes smoked was not significantly different between those who use plain cigarettes (4% of ever smokers) compared with those who smoke filter tip cigarettes. However those who reported smoking high strength cigarettes (77 officers) on average smoke 5 more cigarettes per day than those who smoke low strength (1,373 officers) [t=3.5, p=0.00].

Figure 2.1.5: Average number of cigarettes per day smoked by officers



Since some officers smoke more than one type of tobacco product, the total amount of tobacco smoked was categorised into 4 levels from low to high. The approximate amount of tobacco in each type of product used for the calculation was:

1 cigarette	=	10 gram
1 tael tobacco	=	35 gram
1 small cigar	=	40 gram
1 other cigar	=	100 gram

Amongst responders who have ever smoked, the majority smoke moderate amounts of tobacco and the mean amount smoked per day was 200 grams (equivalent to about 20 cigarettes a day) [202 grams for men and 136g for women]. However over one fifth report smoking more than the equivalent of 25 cigarettes per day. (Table 2.1.6). Also 29 officers (0.7% of smokers) report smoking more than the equivalent of 65 cigarettes per day, which as stated earlier seems implausible. If they are eliminated from the analysis, the mean amount smoked per day reduces to 191grams (equivalent to 19 cigarettes a day). However, even this is much higher than the average amount of tobacco consumed by smokers in the general population (mean = 13 per day for men and 11 per day for women according to the Government's General Household Survey (GHS).

Table 2.1.6: The amount of tobacco smoked per day by officers in the Royal Hong Kong Police

Smoking level category	grams of tobacco	No. of male officers (%)	No. of female officers (%)	Total number of officers (% of responders who smoke)
Lower	up to 50	248 (6.1)	19 (19.4)	267 (6.1)
Medium / lower	51 - 150	1,519 (37.3)	51 (52.0)	1,574 (37.3)
Medium / high	151 - 250	1,446 (35.5)	17 (17.3)	1,464 (35.5)
High	251 +	861 (21.1)	11 (11.2)	874 (21.1)

Amongst smokers who responded, 95% inhale the smoke. Among these, officers who inhale deeply (15%) smoke 82 grams more tobacco a day on average (equivalent to 8 cigarettes per day) compared with those who reportedly inhale slightly (17%).

2.1.8 **Officers' willingness to change behaviour and their reasons**

The majority of all current smokers (73%) said they had cut down their smoking in the last year (4% did not reply) and more than half (59%) said that they had at some time tried to quit (3% did not reply). The most common reason for trying to quit was health related (63%), including 8% who had been advised to do so by a doctor. Family objection was the next most common reason (20%).

Among current smokers who have tried to quit in the past, 447 (15%) said that they now do not want to quit smoking. A total of 1,337 officers (33% of current smokers) gave a reason for not wanting to quit. These included 432 (97%) of those who had previously tried but now do not want to quit and 901 who said they had never tried to quit. The most common reason given overall was that smoking kills time (54% of responses). This is also the most common reason given by smokers who have never tried to quit and do not want to quit who responded to the 1993 GHS, although the proportion giving this response amongst the officers is much higher (Table 2.1.7).

Table 2.1.7: Reasons given for not wanting to quit smoking amongst those who have never tried

Reason for not wanting to quit	% of officers (n = 901)	% of 1993 GHS population (n = 466,900)
Formed a habit or for killing time	505 (56.0)	33.3
Feeling physiologically uncomfortable	113 (12.5)	4.6
Not being determined enough	101 (11.2)	25.9
Enhances spirit	66 (7.3)	4.6
Necessary in social occasions	49 (5.4)	5.6
Most friends are smokers	29 (3.2)	13.0
Too easy to get cigarettes	21 (2.3)	0
Not mature enough/ it is stylish	2 (0.2)	-
Other reasons	15 (1.7)	13.0

There was no significant age or gender difference for those who had cut down, attempted or wanted to quit compared with those who had not. However heavier smokers (smoking more than 15 cigarettes per day) were least likely to have cut down, attempted, or want to quit smoking (Figure 2.1.6).

Figure 2.1.6a: Percentage of smokers who have cut down over last year by gender and the amount smoked

Figure 2.1.6b: Percentage of smokers who have tried to quit by gender and the amount smoked

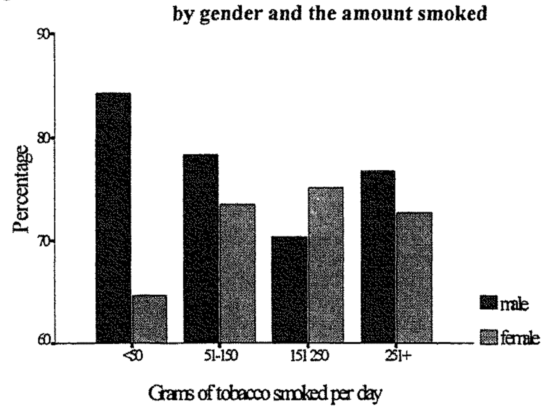
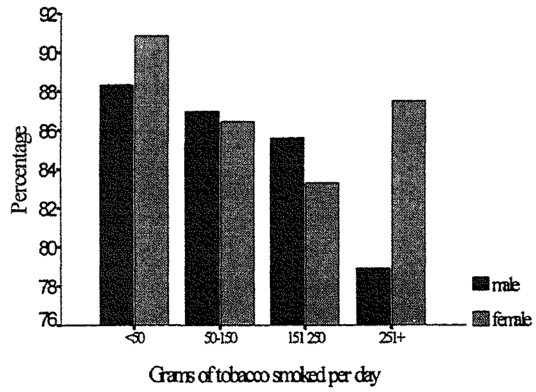


Figure 2.1.6c: Percentage of smokers who want to quit by gender and the amount smoked



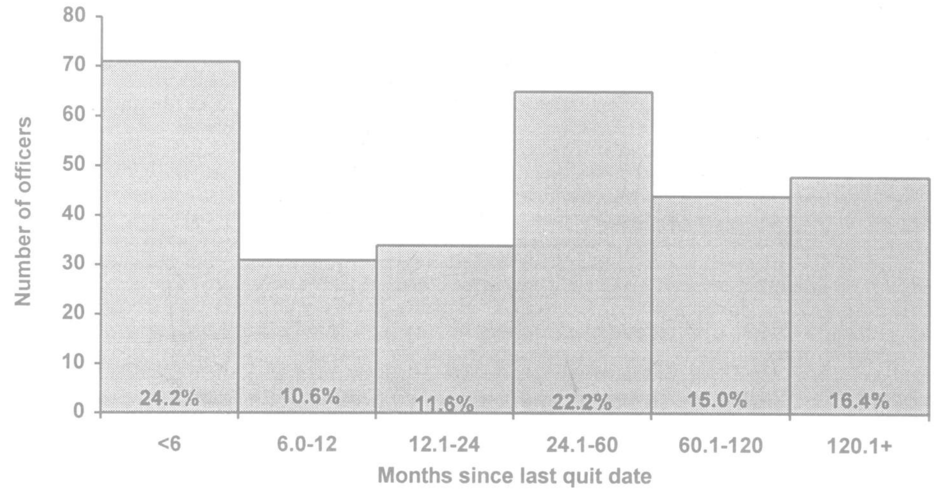
Out of the 306 officers who had successfully quit smoking at some time, the most common reason given was again health related (68%), followed by family objection (15%). This is similar to the responses given by quitters in the 1993 GHS population (Table 2.1.8).

Table 2.1.8: Reasons given for quitting smoking

Reason for quitting	**% of officers (n = 303)**	**% of 1993 GHS population (n = 134,500)**
Health (without a doctor's advice)	61.1	40.3
Health (with a doctor's advice)	7.3	24.3
Family objection	15.5	9.7
High price	5.3	14.0
Discourage at work or public place	2.6	2.0
Government anti-smoking policy	0.7	3.7
Other	7.6	6.0

Nearly a quarter of these officers had only quit in the last 6 months and the majority (70%) over the last 5 years (Figure 2.1.7).

Figure 2.1.7: Variation in time since last quit date



Officers who have ever smoked were divided into five groups according to the way they had responded to the above questions. The groups are based broadly (though not exactly) on the definitions of the five stages of behaviour change described by Prochaska:

1. ***Precontemplation*** - current smokers not considering quitting in the next 6 months.
2. ***Contemplation*** - current smokers considering quitting in the next 6 months, but not in the next 30 days.
3. ***Preparation*** - current smokers planning to quit in the next 30 days.
4. ***Action*** - not current smokers, but have smoked in the last 6 months.
5. ***Maintenance*** - not current smokers and have not smoked in the last 6 months.

The definitions used here were:

B18t - cut down smoking in last year	B18u - ever tried to quit	B18w - want to quit	**Stage of change**
no	no	-	
no	yes	no	**1**
yes	no	-	
yes	yes	no	
no	yes	yes	**2**
yes	yes	yes	**3**
B18y - date give up smoking	< 6 months before questionnaire date		**4**
	≥ 6 months before questionnaire date		**5**

The majority of ever smokers (96%) could be classified in this way into one of the five stages as shown in Table 2.1.9.

Table 2.1.9: Numbers and proportion of ever-smoking officers in each stage of smoking cessation

Stage of change	Number of Hong Kong Police officers (% of ever smokers)
1) precontemplation	1,396 (33.3)
2) contemplation	601 (14.4)
3) preparation	1,897 (45.3)
4) action	72 (1.7)
5) maintenance	222 (5.3)

This classification system is important when planning prevention interventions. There is evidence that people in each stage of change are susceptible to a different approach for smoking cessation interventions. Most approaches are only suitable for those who are in the preparation and action stages, who usually represent a minority of all smokers.

2.1.9 **How does smoking affect reported current health symptoms?**

Officers were asked about a range of respiratory symptoms (questions B9-B16c). The reporting of each symptom was compared between ever smokers and never smokers using the odds ratio (Table 2.1.10a). Approximately 5% of officers records were not used in the analysis because of missing information (1-2% had missing information about symptoms).

Ever-smokers were more likely to report all respiratory symptoms, suggesting that they have worse respiratory health. In particular smokers were more likely to report cough (120% increased risk) and phlegm (150% increased risk). These excess risks persisted after adjusting for age and gender.

Table 2.1.10a: Number of officers with respiratory symptoms and odds ratio (crude and adjusted) of symptom reporting for smokers compared with never-smokers

Symptom	Total number reporting symptom (% of population)	Number with symptom used in analysis (% of responders)	Crude odds ratio (ever smokers compared with never-smokers) [95% CI]	Adjusted odds ratio (adjusted for age and gender) [95% CI]
Sore itchy throat	3,400 (34)	3,289 (36)	1.4 [1.2 - 1.5]*	1.4 [1.2 - 1.5]* p<0.001
Cough in the morning	1,975 (20)	1,920 (21)	2.2 [1.9 - 2.4]*	2.1 [1.9 - 2.4]* p<0.001
Cough during day or night	1,882 (19)	1,838 (20)	2.0 [1.8 - 2.2]*	2.0 [1.8 - 2.2]* p<0 001
Phlegm in the morning	2,645 (27)	2,568 (27)	2.4 [2.2 - 2.7]*	2.4 [2.2 - 2.7]* p<0.001
Phlegm during day or night	1,894 (19)	1,847 (20)	2.5 [2.2 - 2.8]*	2.4 [2.2 - 2.7]* p<0.001
Increased cough/ phlegm lasting 3 weeks or more	1,883 (19)	1,829 (20)	1.5 [1.4 - 1.7]*	1.5 [1.4 - 1.7]* p<0.001
Shortness of breath when hurrying	2,747 (28)	2,678 (29)	1.5 [1.4 - 1.7]*	1.7 [1.6 - 1.9]* p<0.001
Chest ever sound wheezy	989 (10)	960 (10)	1.6 [1.4 - 1.8]*	1.5 [1.3 - 1.7]* p<0.001
Short of breath with wheezing	660 (7)	638 (7)	1.5 [1.3 - 1.8]*	1.4 [1.2 - 1.7]* p<0.001
Blocked nose/ runny nose	3,450 (35)	3,327 (35)	1.2 [1.1 - 1.3]*	1.2 [1.1 - 1.3]* p = 0.001
Chest illness at least one week in 3 yrs	362 (4)	352 (4)	1.4 [1.1 - 1.7]*	1.3 [1.0 - 1.6]* p = 0.020

* denotes statistical significance at 5% level

Amongst smokers, the proportion reporting each symptom was analysed according to the amount and duration of smoking. The variable "pack years" was created as defined below:

Pack years = $\frac{\text{duration of smoking (years) x average amount of tobacco smoked per day (grams)}}{200}$

Each pack-year is equivalent to exposure to an average of 20 cigarettes per day for one year. It is a useful measure for looking at the long term health effects of smoking. The number of pack years was further classified into 4 distinct categories:

category	number of pack years
lower	≤ 5
moderate/ lower	5.1-15
moderate/ higher	15.1 - 30
high	30.1+

(The use of the terms low and lower does not at all imply that this level of smoking is in any way safe.)

Using the χ^2 for trend in the analysis, increasing exposure to smoking in terms of pack years was shown to be associated with a significantly greater likelihood of reporting most respiratory symptoms (Table 2.1.10b). This means that there is a dose response relationship between pack years of smoking and the presence of respiratory symptoms.

Table 2.1.10 b: Relationship between the amount and duration of smoking (pack-year categories) and respiratory symptoms

Symptom	χ^2 for trend	p value
Sore itchy throat	31.6	<0.001*
Cough in the morning	63.0	<0.001*
Cough during day or night	42.8	<0.001*
Cough as much as 3 months/ year	1.3	0.251
Phlegm in the morning	105.9	<0.001*
Phlegm during day or night	56.0	<0.001*
Phlegm as much as 3 months/ year	8.9	0.003*
Increased cough/ phlegm lasting 3 weeks or more	29.1	<0.001*
> 1 period of increased cough/ phlegm	9.6	0.002*
Shortness of breath when hurrying	83.6	<0.001*
Shortness of breath when walking with others of own age	10.7	0.001*
Stop for breath when walk at own pace	1.7	0.195
Chest ever sound wheezy	0.0	0.047
Wheezy most days	14.5	<0.001*
Short of breath with wheezing	0.1	0.729
Blocked nose/ runny nose	14.2	<0.001*
Chest illness at least one week in 3 yrs	3.3	0.070
> 1 episode chest illness in last 3 yrs	1.4	0.244

* denotes statistical significance at 5% level

2.1.10 How is smoking related to medical history?

The officers were asked about their medical history using 17 questions addressing specific diagnoses. About 5% of officers had missing information and are not included in the analysis. As expected from a relatively young and fit workforce, relatively few responders reported any illnesses. It should also be borne in mind that as this is a cross-sectional study those who may have developed illnesses which led to their leaving the force will not be available to be counted and investigated. Allergies were relatively common, with over a quarter of responders suffering from allergic rhinitis.

The proportion of ever-smokers with a reported diagnosis was compared with the proportion of never smokers. After adjusting for age and gender, smokers were significantly more likely to have had a diagnosis of chest trouble, chronic bronchitis, a previous chest injury or operation, acute bronchitis, pneumonia or ulcers, with excess risks ranging from 30 to 60% (Table 2.1.11a). For heart disease there was also a trend for increasing risk amongst smokers, although this was not statistically significant. The small number of officers (33) who reported heart disease may partly explain this. In other words, there may be insufficient statistical power to detect a truely significant difference between smokers and non-smokers.

Smokers were less likely to report hypertension however (adjusted OR = 0.8). Hypertension causes no symptoms, and in this study blood pressure was not objectively measured. Therefore this apparent lower risk may either be due to lower awareness of hypertension among smokers or a true effect. Although it is known that the acute effect of inhalation of nicotine in cigarettes causes a sharp rise in blood pressure, some population studies do show that smokers as a whole tend to have lower blood pressures compared with non-smokers[10][11]. This is thought to be related to the effects of carbon monoxide from cigarettes on the blood vessel wall[12].

For smokers, the χ^2 test for trend was used to examine the relationship between the amount and duration of smoking (pack-years) and medical history (Table 2.1.11b). As expected from other research studies, a dose-response relationship was observed between smoking and several medical conditions:

- heart disease
- acute bronchitis
- chronic bronchitis
- pleurisy
- pulmonary tuberculosis
- other chest trouble
- diabetes
- hypertension and
- gastric or duodenal ulcer.

In addition there was a significant association between increasing pack-years and eczema. Conversely, increasing levels of smoking are significantly associated with a reduced risk of allergic rhinitis.

This is concordant with other studies which show that smoking exacerbates eczema but that it is inversely related to rhinitis[13]. This may be because people with rhinitis are irritated more by smoking and therefore smoke less.

Table 2.1.11a: Number and proportion of officers with various diagnoses and odds ratios for reported diagnoses for smokers compared with never-smokers

Diagnosis	Total number (% of population) reporting diagnosis	Number (% of responders) with diagnosis used in analysis	Crude odds ratio (ever smokers compared with never-smokers) [95% CI]	Adjusted odds ratio (adjusted for age and gender) [95% CI]
Chest injury / operation	178 (1.8)	168 (1.8)	1.5 [1.1 - 2.1]*	1.5 [1.1 - 2.0]* p=0.013
Coronary heart disease	33 (0.3)	32 (0.3)	1.3 [0.7 - 2.7]	2.0 [0.9 - 4.3] p=0.068
Acute bronchitis	360 (3.6)	348 (3.7)	1.4 [1.1 - 1.7]*	1.4 [1.1 - 1.7]* p=0.005
Chronic bronchitis	930 (9.4)	903 (9.6)	1.4 [1.2 -1.6]*	1.5 [1.3 - 1.7]* p<0.001
Pneumonia	235 (2.4)	225 (2.4)	1.3 [1.0 - 1.7]*	1.4 [1.0 - 1.8]* p=0.021
Pleurisy	100 (1.0)	97 (1.0)	1.2 [0.8 - 1.7]	1.2 [0.8 - 1.9] p=0.286
Pulmonary TB	128 (1.3)	125 (1.3)	1.0 [0.7 - 1.4]	1.0 [0.7 - 1.5] p=0.794
Bronchial asthma	303 (3.1)	294 (3.1)	1.2 [0.9 - 1.5]	1.1 [0.9 - 1.4] p=0.382
Other chest trouble	114 (1.2)	111 (1.2)	1.4 [1.0 - 2.1]	1.6 [1.1 - 2.3]* p=0.022
Hay fever	469 (4.7)	454 (4.8)	0.9 [0.7 - 1.1]	0.9 [0.7 - 1.1] p=0.337
Allergic rhinitis	2,818 (28.5)	2,715 (28.8)	1.0 [0.9 - 1.1]	1.0 [0.9 - 1.1] p=0.870
Sinusitis	547 (5.5)	527 (5.6)	1.2 [1.0 - 1.4]	1.2 [1.0 - 1.4] p=0.109
Eczema	1,202 (12.2)	1,160 (12.3)	1.1 [1.0 - 1.3]	1.1 [1.0 - 1.3] p=0.043
Skin allergies	1,978 (20.0)	1,901 (20.2)	1.0 [0.9 - 1.1]	1.1 [1.0 - 1.2] p=0.223
Diabetes	91 (0.9)	88 (0.9)	0.7 [0.5 - 1.1]	0.9 [0.6 - 1.5] p=0.821
Hypertension	414 (4.2)	405 (4.3)	0.7 [0.5 - 0.8]*	0.8 [0.6 - 1.0]* p=0.029
Ulcer	775 (7.8)	757 (8.0)	1.2 [1.0 - 1.3]	1.3 [1.1 - 1.5]* p=0.003

* denotes statistical significance at 5% level

Table 2.1.11b: Relationship between the amount and duration of smoking (pack-year categories) and medical diagnoses

Diagnosis	χ^2 for trend	p value
Chest injury or operation	1.3	0.25
Heart disease	5.4	0.02*
Acute bronchitis	5.9	0.01*
Chronic bronchitis	25.2	<0.01*
Pneumonia	3.2	0.07
Pleurisy	5.9	0.01*
Pulmonary TB	4.1	0.04*
Bronchial asthma	0.1	0.70
Other chest trouble	3.9	0.05*
Hay fever	0.3	0.61
Allergic rhinitis	22.6 (negative trend)	<0.01*
Sinusitis	1.9	0.17
Eczema	19.9	<0.01*
Skin allergies	0.2	0.68
Diabetes	20.0	<0.01*
Hypertension	57.0	<0.01*
Ulcer	25.7	<0.01*

* denotes statistical significance at 5% level

2.1.11 Discussion

Research has shown that self-reports of smoking prevalence are reasonably accurate in survey settings[14]. Based on these results, a fairly high proportion (41%) of police officers are current smokers. This proportion is lower than that reported in the field work study, where 48% of officers admitted to being smokers. This is probably explained by the fact that those who did the field work study were slightly younger, lower rank officers and that the field work was done in regions where smoking rates are higher (i.e. Kowloon East, Hong Kong Island and Kowloon west). Even after adjusting for the age and sex distribution of survey responders however, the smoking rates are almost double those in the Hong Kong population, particularly among younger officers and women in particular. This finding probably represents a cohort effect, that is a true trend affecting those born in the last two or three decades. There may however also be a survivorship effect with the progressive loss of heavy smokers from the force in previous years. Furthermore, the amount of tobacco consumed is higher for both men and women than that in the general population. Overall, those most at risk of being smokers are younger men with lower levels of education, and particularly those who are divorced, separated or widowed.

Smoking is also more common in certain police regions, particularly Kowloon East and lower in some formations particularly marine. This finding suggests that there may be a regional and formation related culture for smoking. If so, it would have important implications for the implementation of both smoking prevention and quitting programmes.

A high proportion of officers had started smoking before joining the force and a higher than expected proportion of smokers were initiated between ages 15-19. This may reflect a pattern of socialisation and lifestyle adoption which is also currently associated with an interest in a challenging career in a disciplined service. It may however simply reflect a general regional trend in recruitment to smoking in late adolescents and young adults. We have also observed a high smoking prevalence (compared to the general population) among young Hong Kong women entering service as cabin crew in an international airline.

Once they enter the force those who are still non-smokers will find themselves in a strong workplace smoking culture and many police officers tend to be recruited to smoking at a later age than the general population. The time at which officers join the force seems a critical period for taking up smoking. Over 40% started smoking after joining the force and most of the rest had started the habit within 5 years before joining. The training period which begins immediately after recruitment to the force would therefore seem to be an optimal period for smoking prevention programmes.

The proportion of ex-smokers (3%) is relatively low compared with western countries, where up to a quarter of the population have quit smoking[15]. In this survey nearly three quarters of smokers said that they had attempted to cut down their smoking in the previous 12 months and 62% (2531 officers) said they want to quit. This suggests that there is much scope for smoking cessation work. This is particularly important because research shows clearly that stopping smoking results in significant health benefits[16]. Officers who smoke are at different stages in their willingness to change behaviour. Although 45% suggested that they were seriously considering quitting, one third of officers have no thought of giving up. According to research, they are therefore likely to respond to different types of smoking control activity, depending on their stage of change.

The adverse health effects of smoking are already apparent in this group of relatively young officers. The smokers are more likely to have chronic lung problems, and even after adjusting for age, there is up to 150% excess risk of respiratory symptoms. They also show excess risk for several other diseases. This is likely to translate into poorer work performance and more time off work. The health effects are more marked with increasing exposure to tobacco. Therefore both smoking prevention and cessation activities are important for promoting the health of officers.

2.1.12 Conclusions and Recommendations

Smoking is a significant health problem in the police force resulting in considerable adverse effects on current health and predictably on future health. The strong association with both symptoms and illness diagnoses clearly indicate that smoking has a marked effect on work performance. Commencement of smoking often occurs around the time of joining the force, with a sizeable proportion taking up the habit after recruitment. Overall, smoking rates are much higher than in the general population.

It is possible to identify certain groups of officers who are at apparently greater risk of smoking and who could be targeted for smoking prevention. There are clear indications that this would be acceptable to officers as many of the existing smokers want to quit and there is much scope for smoking cessation programmes.

The following recommendations are based on the application of information from smoking control research to the survey findings in the force:

2.1.12.1 Smoking prevention

- A smoking prevention programme and related advice and support for health protection should be a core part of training at the Police Training School.
- The smoking control programme should particularly target new recruits.

- The programme should have the active support of the Commandant of the School and the Commissioner of Police and become an integral part of training.
- The program should aim to teach assertiveness skills (learning how to refuse cigarettes) as well as increasing knowledge about the effects of tobacco use.

2.1.12.2 **Providing support for employees who smoke**

- Smoking cessation programmes should be offered to officers in order to encourage those who have or are currently considering quitting. Such programmes could either be tailor made or offered by contracting with existing agencies which present such services. These should be supported by self-help material.
- District and regional formations, particularly those with the highest smoking rates such as Kowloon East, should be encouraged to set up smoking control activities. These should target employees who are not yet thinking about quitting.
- Smoking control activities could include articles in the force publication "Offbeat", placing posters which encourage quitting in prominent places, offering incentives or even competitions. Such activities should ideally be "grass-roots" led and may differ from district to district.
- All contracts held by health professionals working with the Hong Kong Police (e.g. for pre-employment check-up, Police Tactical Unit (PTU) screening or doctors doing sessions at the Police Training School (PTS) should include a clause on smoking control activities. Smoking control advice and support should be given whenever police officers who smoke are seen by such health professionals.

2.1.12.3 **Smoking control policy**

- A healthy work force policy which promotes a no-smoking culture should be adopted by the force. This should be a force-wide policy which is actively supported from the top (Commissioner level) and is implemented and monitored regionally.
- Police buildings, offices, vehicles, classrooms and public areas such as cafeterias should be smoke-free.
- Smoking whilst on duty should be prohibited and strictly enforced. This is not simply a matter of discipline but often found to be helpful to smokers who are trying to quit. One additional finding reported in the sectional on ETS (page 78-97), that many officers in the force, both smokers and non-smokers, suffer very marked adverse health effects from breathing environmental tobacco smoke in the course of shift duties, makes the implementation of a workplace no-smoking rule imperative and urgent.

2.1.12.4 **All activities should be ongoing and regularly monitored.**

- Audit of the implemenation and acceptance of smoking control policies is essential if the initiative is to be effective and sustained.
- The effectiveness of the programme should be fully reviewed on an annual basis with special emphasis on the prevention of uptake of smoking by new recruits.

2.2 Alcohol consumption

2.2.1 Background

Alcohol consumption is an important lifestyle factor with both economic and health implications. Excess consumption contributes to high blood pressure which is one of the major risk factors for heart disease and stroke. Drinking excess alcohol is also thought to impair the body's immunity and play a part in various diseases, such as cancers of the mouth, oesophagus and breast, liver cirrhosis, pancreatitis and diabetes. Alcohol consumption is also an important contributor to accidents, crime and social problems and is implicated in up to one third of all accidents in some countries. Furthermore, research suggests that alcohol consumption adversely affects work productivity and performance[17,18] Heavy drinkers are more likely to have illness and injury and therefore time off work[19].

Equally alcohol is regarded by many as an important social lubricant. Its use as a social drug should be distinguished from tobacco. The latter is a uniquely dangerous. Substance which inescapably damages the consumer when the product is used as intended. Alcohol taken in moderation is not associated with any adverse effects and in fact confers health benefits, particularly in lowering the risk of cardiovascular disease.

2.2.2 Methods

The approximate number of units of alcohol consumed per week was calculated using information from questions F11a (how often do you have alcoholic drinks?), F11b (what is your usual alcoholic drink?) and F11c (how much do you drink on any one occasion?):

The number of units of alcohol for each type of drink and measure was calculated based on the following assumptions. The average alcohol content for each type of beverage was estimated to be 4.5% for beer, 12% for wines, 40% for spirits[20] and 30% for Chinese rice wine[21]. The alcohol content for those stating no preference was assumed to be 12% and for those stating 'other' to be 30%.

The volume of beverage in each measure was based on the assumption that one can, one bottle or one glass of beer contained 360 ml, one bottle of wine, spirits or Chinese rice wine contained 800 ml, one glass of wine or Chinese rice wine contained 120 ml and one glass of spirits contained 45 ml[22,23,24] These assumptions were used to calculate the volume of alcohol in each beverage type and measure, and these were converted to grams of alcohol and then to units (assuming that 1 unit contains 10 grams of alcohol). The units of alcohol per drink and measure were then as shown below.

Type of drink	**units of alcohol per:**	**can**	**glass**	**bottle**
Beer		1.27	1.27	1.27
Wine		1.0	1.13	7.54
Spirits		1.0	1.41	25.1
Chinese rice wine		-	2.83	18.8
No preference		1.13	1.13	1.13
Other		2.83	2.83	2.83

The amount was multiplied by the following factors to obtain the average units consumed per week:

daily (4-7 days per week)	-	x 6
1 - 3 days a week	-	x 2
1 - 3 days per month	-	x 0.5
< once per month	-	x 0.1

The units of alcohol consumed per week was further categorised as follows:

	Men	**Women**
Very low	<1	<1
Low	1 - 10	1 - 7
Moderate	10.1 - 21	7.1 - 14
Moderate/ high	21.1 - 35	14.1 - 25
High	35.1 - 50	25.1 - 35
Very high	50.1 +	35.1+

The characteristics of drinkers, the amounts consumed and the relationship between alcohol consumption and reported health were then explored.

The level of safe drinking could be based on the recommendations of the UK Royal College of Psychiatrists. These suggest that the maximum intake in males should not exceed 21 units per week (i.e. about 3 units per day) and in women should not exceed 14 units per week.

2.2.3 Results

2.2.3.1 Who drinks alcohol and how much?

Overall 5,458 (55%) officers said that they do drink alcohol at some time and 4,349 (44%) that they do not (there were 75 non-responders). Those who consume alcohol are more likely to be male (odds ratio = 2.3, 95% CI = 2.0-2.6), Caucasian (χ^2 = 34.8, p=0.00), older (χ^2 for trend = 14.8, p=0.000) and in a higher police rank (χ^2 for trend = 42.6, p = 0.000). Although those with higher levels of education are also more likely to be drinkers, the trend is not statistically significant.

Overall the average number of units of alcohol consumed per week is low (mean = 3.4, median = 0.1), however the range is quite wide (Table 2.2.1). Only 350 officers who drink (6%) admit to drinking more than a moderate amount of alcohol (i.e. levels which are harmful to health), but there are some heavy drinkers (Table 2.2.1).

Table 2.2.1: Variation in the amount of alcohol consumed per week amongst those who ever drink

Alcohol consumption category	Number of officers (% of drinkers)		
	Male (%)	Female (%)	Total (including gender missing)
Very low	1,765 (35)	187 (58)	1,990 (36.5)
Low	2,447 (48)	106 (33)	2,554 (47.0)
Moderate	548 (11)	15 (5)	564 (10.3)
Moderate/ high	196 (4)	6 (2)	204 (3.7)
High	74 (1.5)	4 (1.2)	78 (1.4)
Very high	63 (1.2)	5 (1.5)	68 (1.2)

There were 18 officers who report drinking more than 100 units of alcohol per week, which seems implausible. Furthermore 3 of these officers also report smoking more than 450 grams of tobacco per week, which may suggest that these responses are invalid. However the small numbers make no real difference to the results of the analyses.

Officers who admit to drinking alcohol were also asked how many times in the last month they had had more than 5 drinks in one session (question F11d). 2,455 officers (45% of those who drink, or 25% of all officers) admitted to at least one such session (Table 2.2.2). As expected, there was a strong correlation between the amount of alcohol consumed per week and the frequency of such episodes (Pearson's R = 54%, p = 0.000) [Figure 2.2.1].

Table 2.2.2: Number of occasions in the last month when more than 5 drinks were consumed in one session by drinkers

No. of occasions when >5 drinks were consumed at 1 session	Number of officers (% of drinkers)		
	Male (%)	Female (%)	Total (including gender missing)
None	2,678 (53.1)	231 (72.2)	2,915 (53.4)
1 occasion	1,124 (22.3)	52 (16.3)	1,177 (21.6)
2 occasions	568 (11.3)	19 (5.9)	588 (10.8)
3 or more occasions	672 (13.3)	18 (5.6)	690 (12.6)
Non-responders			88 (1.6)

Amongst drinkers, men consume about 3 more units of alcohol per week than women (95% CI = 1.6-3.6 units per week) and Caucasians consume more than other ethnic groups (mean difference in consumption between Caucasians and Chinese officers = 13 units per week, 95% CI = 10-17 units). Officers with degree level education on average consume 3-4 more units of alcohol per week than those with lower levels of education (p=0.007). Higher rank officers (above Inspector level) also tend to be heavier drinkers (χ^2 for trend = 23.5, p=0.000). Finally, the amount consumed is highest amongst those who are divorced or separated (Table 2.2.3).

Figure.2.2.1: Relationship between the number of occasions when more than 5 alcoholic drinks were consumed and the mean number of units of alcohol generally consumed per week

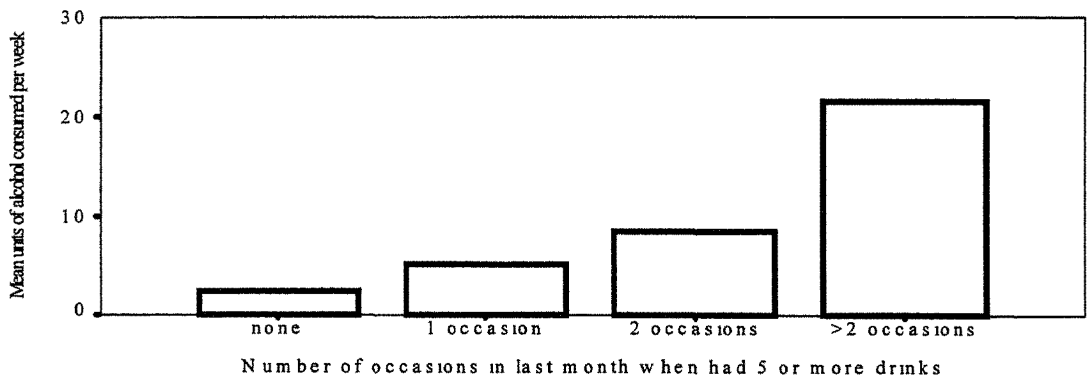


Table 2.2.3: Alcohol consumption according to marital status

Marital status	No. of officers	Mean units of alcohol consumed per week (range)
Single	4071	3.5 (0-229)
Married	5440	2.9 (0-321)
Widowed	11	3.5 (0-20)
Separated	49	7.9 (0-59)
Divorced	155	14.3 (0-849)
Other	15	3.3 (0-15)

ANOVA - F ratio = 19.1, p = 0.000

2.2.3.2 How is alcohol consumption related to medical history?

Those who reported drinking alcohol were significantly more likely to have had a diagnosis of chronic bronchitis, pneumonia, previous chest injury or operation, allergic rhinitis, eczema and hypertension. After adjusting for age, gender and smoking, officers who drink alcohol were still more likely to have had chronic bronchitis, pneumonia, allergic rhinitis, eczema, skin allergies and hypertension (Table 2.2.4).

Amongst drinkers, increasing alcohol consumption was associated with increased risk of chronic bronchitis, asthma, other chest trouble, sinusitis and hypertension (Table 2.2.4). After adjustment for smoking, never smokers who drink are at increased risk of chronic bronchitis (χ^2 for trend = 5.6, p = 0.02) and hypertension (χ^2 for trend = 13.6, p = 0.00) with increasing alcohol consumption. Smoking together with higher levels of alcohol consumption are associated with an increased risk of chest trouble and sinusitis.

These findings are mainly compatible with research done elsewhere. The relationship between alcohol consumption and hypertension is now well established world wide.[25,26,20] Research has also shown that alcohol consumption increases the risk and adversely affects the prognosis in community acquired pneumonia.[27] Some research also suggests that lung function is adversely affected by chronic alcohol consumption,[28] particularly in Asian populations where alcohol exacerbates existing lung disease.[29]

In this study, the association between alcohol consumption and skin allergy, eczema and allergic rhinitis is statistically less significant suggesting a relatively weaker association. This observation may therefore still be purely due to chance. It may also be due to other factors which may be associated with both alcohol consumption and these particular conditions. However limited research evidence does suggest a link between alcohol consumption and allergies; particularly skin disease.[30] The observation may therefore be due to a true, albeit weak association. Unfortunately this type of study cannot distinguish between the possibilities and therefore any interpretation of these latter findings must be cautious.

Table 2.2.4: Number of officers with various diagnoses, odds ratio (crude and adjusted) of reported diagnosis for drinkers compared with non-drinkers and relationship between the amount of alcohol consumed by drinkers and these diagnoses

Diagnosis	Total number (% of population) reporting diagnosis	Number (% of responders) with diagnosis used in analysis	Crude odds ratio (drinkers compared with non-drinkers) [95% CI]	Adjusted odds ratio (adjusted for age, gender and smoking) [95% CI]		χ^2 for trend (increasing amounts of alcohol)	p value
Chest injury / operation	178 (1.8)	177 (1.8)	1.4 [1.1 - 2.0]*	1 3 [1.0 - 1.8]	p=0 080	2.8	0.09
Coronary heart disease	33 (0.3)	33 (0.3)	0.7 [0.4 - 1.5]	0 7 [0.3 - 1.4]	p=0.0327	1.3	0.25
Acute bronchitis	360 (3.6)	359 (3.7)	1.2 [0.9 - 1.5]	1.2 [0.9 - 1.5]	p=0.141	0.1	0.8
Chronic bronchitis	930 (9.4)	925 (9.5)	1.3 [1.1 -1.5]*	1.3 [1.1 - 1.5]*	p=<0.001	12.5	<0.01*
Pneumonia	235 (2.4)	235 (2.4)	1.5 [1.2 - 2.0]*	1.6 [1.2 - 2.1]*	p=0.002	2.3	0.13
Pleurisy	100 (1.0)	99 (1.0)	1.0 [0.7 - 1.5]	1.0 [0.7 - 1.5]	p=0.923	0.3	0.60
Pulmonary TB	128 (1.3)	128 (1.3)	1.1 [0.8 - 1.6]	1.0 [0.7 - 1.5]	p=0.781	0.5	0.50
Bronchial asthma	303 (3.1)	302 (3.1)	1.0 [0.8 - 1.3]	1.0 [0.8 - 1.3]	p=0.949	5.5	0.02*
Other chest trouble	114 (1.2)	114 (1.2)	1.5 [1.0 - 2.3]*	1.5 [1.0 - 2.2]	p=0.072	5.7	0.02*
Hay fever	469 (4.7)	468 (4.8)	1.1 [0.9 - 1.3]	1.2 [1.0 - 1.4]	p=0.110	0.0	0.87
Allergic rhinitis	2,818 (28.5)	2,804 (28.8)	1.1 [1.0 - 1.2]*	1.1 [1.0 - 1.3]*	p=0.004	0.0	0.98
Sinusitis	547 (5.5)	546 (5.6)	1.2 [1.0 - 1.4]	1.1 [1.0 - 1.4]	p=0.129	5.4	0.02*
Eczema	1,202 (12.2)	1,197 (12.3)	1.2 [1.1 - 1.4]*	1.2 [1.0 - 1.3]*	p=0.009	2.6	0.11
Skin allergies	1,978 (20.0)	1,971 (20.3)	1.1 [1.0 - 1.2]	1.1 [1.0 - 1.2]*	p=0.038	2.0	0.16
Diabetes	91 (0.9)	90 (0.9)	1.0 [0.6 - 1.4]	0.8 [0.5 - 1.2]	p=0.244	0.0	0.93
Hypertension	414 (4.2)	412 (4.2)	1.5 [1.2 - 1.9]*	1.5 [1.2 - 1.9]*	p=<0.001	7.9	<0.01*
Ulcer	775 (7.8)	771 (7.9)	1.1 [0.9 - 1.2]	1.1 [0.9 - 1.2]	p=0.433	1.4	0.23

* denotes statistical significance at 5% level

2.2.4 Discussion

Over half of all officers consume some alcohol. Although only 6% admit drinking levels which are known to be harmful to health, about a quarter (2,455 officers) had at least one episode of binge drinking (more than 5 units of alcohol in one session) in the month before the questionnaire. The harmful effects of alcohol depend both on the amount and frequency of drinking. Therefore even if overall drinking levels are low, the pattern of binge drinking is likely to cause harm to a significant proportion of officers.

Men are more likely to be drinkers, and to drink more harmful levels of alcohol. In contrast with smoking, higher rank officers and those with higher levels of education were more likely to drink, to be heavy drinkers and to be binge drinkers.

The health effects of alcohol consumption are already apparent in this group of officers. Drinkers, and particularly heavy drinkers, are more likely to have had various infections and investigations and treatment for high blood pressure. Their work productivity and performance is therefore likely to have suffered. Research suggests that workplace health promotion interventions can successfully alter behaviour and improve productivity.[31]

2.2.5 Conclusions and recommendations

Excess alcohol consumption is a less important health hazard amongst currently serving officers than smoking. Nevertheless at least a quarter of officers admit to unhealthy drinking patterns which may have harmful health consequences and subsequent adverse effects on work performance. In contrast with smoking, it is the higher rank officers who are at more risk of excess alcohol consumption, and any intervention must therefore target all officers. There is an indication that those who both drink and smoke are at higher risk.

Caution should be exercised in the interpretation of findings on alcohol related health risks from a cross-sectional survey as it is very likely that officers with a serious drink problem would have been dismissed from the force. A study with this design cannot therefore provide good evidence on the risk of officers developing alcohol related health problems.

Based on the survey findings, the following recommendations are made:

2.2.5.1 Intervention at training level

- Information about harmful and hazardous drinking should be available to new recruits at the Police Training School, preferably in conjunction with an overall healthy lifestyle programme.

2.2.5.2 Education for other officers

- All officers should be offered advice about the hazards and harmful effects of excess consumption of alcohol. This could be done by articles in the "Offbeat" magazine.
- Excess alcohol consumption may be more common during particular periods, such as holiday periods, or after special police events. Reminders about the hazards of excess alcohol could be distributed before such events.

2.3 Exercise

2.3.1 Background

Physical inactivity is an important and largely avoidable cause of lifetime risks of poor health. Regular physical activity is associated with reduced risk of death and disability from several chronic diseases. More specifically, research studies show that regular activity protects against heart disease, hypertension, stroke, non-insulin dependent diabetes mellitus, osteoporosis, colon cancer, anxiety and depression.[32]

Furthermore, research shows that amongst workers, participation in exercise and increasing numbers of exercise sessions are both associated with reduced rates of absenteeism.[33]

2.3.2 Methods

Information from questions F9 [In the past month did you participate in any sport or exercise?], F9a [How many times in the last month have you exercised or played sport?] and F9b [What type of sport/ exercise did you participate in?] were used for the analysis. The level of exercise was further categorised as follows:

Category	Number of sessions per month
0 = none	0
1 = less than once per week	1 - 3
2 = once or twice per week	4 - 7
3 = two to three times per week	8 - 11
4 = three to four times per week	12 - 19
5 = most days per week	20 - 30
6 = more than once per day	31+

Descriptive analysis was used to examine the type and level of activity amongst officers. The relationship between exercise and some reported health factors was then examined using logistic regression. Question B13a [shortness of breath when hurrying] was used as a subjective measure of fitness. The relationship between exercise and coronary heart disease [B17b], diabetes [B17o] and hypertension [B17p] were also examined.

2.3.3 Results

2.3.3.1 How active are officers in the Hong Kong Police?

More than half of all officers (5,646 people or 57.1%) said that they had participated in some sport over the previous month [0.7% did not respond]. This indicates that the others, some 43% of all officers, lead a fairly sedentary lifestyle. The amount of exercise in which officers participated in the last month was variable (Table 2.3.1). Amongst those who did exercise, the number of sessions ranged from 1 to 90 in the previous month (mean = 7, median = 4, mode = 2 sessions in last month).

The likelihood of having taken part in some exercise over the last month was higher in certain groups:

- *Men:* compared with women (58% compared with 50% of women OR = 1.4, 95% CI 1.2, 1.6);
- *Non-Chinese officers:* (66% of non-Chinese, compared with 57% of Chinese, OR = 1.5; 95% CI 1.2, 1.8);
- *Higher education:* those with higher levels of education (χ^2 for trend = 93.5, p = 0.000);

- *Higher rank*· those with higher police rank (χ^2 for trend = 11.4, p = 0.001);
- *Singletons:* being single (63% of single officers compared with 54% of married and 53% of widowed, separated, divorced or other officers did exercise in last month χ^2 = 83.0, p=0.000) and
- *Young:* being younger (mean age difference = 1.4 years, 95% CI 1.0, 1.7).

Table 2.3.1: Exercise level categories

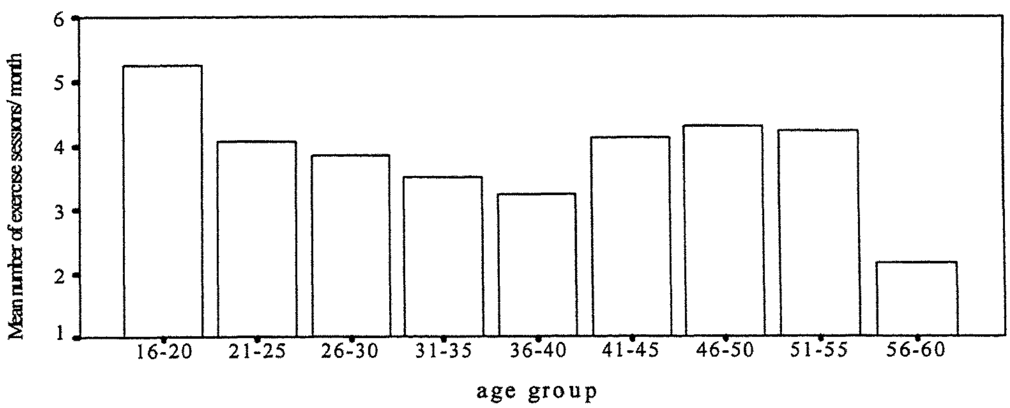
Number of sessions per month	Number of officers (% of all officers)
none (0)	4,168 (42.2)
less than once per week (1 - 3)	2,258 (22.8)
once or twice per week (4 - 7)	1,488 (15.1)
two to three times per week (8 - 11)	959 (9.7)
three to four times per week (12 - 19)	354 (3.6)
most days per week (20 - 30)	394 (4.0)
more than once per day (31+)	32 (0.3)
missing	229 (2.3)

Of those who do exercise, the number of sessions per month also vary between groups. The average number of sessions per month is higher amongst:

- men (difference between means = 1.0; 95% CI 0.2, 1.6);
- non-Chinese (difference between means = 1.3; 95% CI 0.4, 2.3);
- those with tertiary education (F ratio 7.6, p = 0.000);
- officers of higher rank (F ratio 10.4, p = 0.000) and
- those with a shorter duration of service (F ratio 12.6, p = 0.000 for various duration of service categories).

The number of exercise sessions was not associated with marital status and the relationship between the number of sessions and age is shown in Figure 2.3.1.

Figure 2.3.1: Relationship between the number of exercise sessions in last month and age



2.3.3.2 What forms exercise do officers participate in?

The most popular form of exercise was running or jogging, followed by racquet sports, soccer, swimming, cycling and basketball (Table 2.3.2).

Table 2.3.2: Types of activities undertaken by officers who take exercise

Type of sport / exercise	Number of officers who participated in this (%)
Running or jogging	3,458 (35.1)
Racquet sports	1,346 (13.7)
Soccer / rugby	877 (8.9)
Swimming	751 (7.6)
Cycling	639 (6.5)
Basketball / netball	544 (5.5)
Brisk walking	395 (4.0)
Tai Chi/ yoga	72 (0.7)
Aerobics	68 (0.7)
Social dancing	62 (0.6)
Other (including martial arts, weight training)	489 (5.0)

*Note - officers could indicate more than one type of exercise

2.3.3.3 **Exercise and health**

Nearly a quarter of officers (2,747) complained of shortness of breath whilst hurrying. This symptom may be an indicator of general fitness and its association with exercise was therefore examined. After adjusting for age, gender, smoking and having a diagnosis of asthma or chronic bronchitis, officers who had done no exercise were more likely to report shortness of breath (OR = 1.6, 95% CI 1.4, 1.7). Furthermore amongst those who had done some exercise, increasing number of exercise sessions was negatively associated with reporting of this symptom (adjusted odds ratio = 1.04 for increasing numbers of sessions, p = 0.000). Care must be taken in the interpretation of this association however. Although it suggests that those who do no exercise are more likely to experience breathlessness, it is possible that the symptom itself is preventing officers from exercising.

The relationship between exercise and three common diseases associated with inactivity was explored. Physical inactivity over the previous month was associated with increased likelihood of reporting diabetes mellitus (OR adjusted for age and gender = 1.6, 95% CI 1.04, 2.41). However there was no significant association between inactivity and reports of heart disease or hypertension.

2.3.4 **Discussion**

Amongst the survey responders, half of all women and 42% of men lead a fairly sedentary lifestyle. Research suggests a continuous graduated benefit from increasing levels of exercise,[34] but the main health benefits (particularly cardiovascular benefits) require at least 3 exercise sessions per week[35]. However only 8% of all officers exercise for at least three sessions per week.

Officers who are newly trained are the most likely to exercise and the number of exercise sessions per week tends to reduce with time since initial training. There may be several reasons for this, such as loss of incentive and obligation which is present during training, lack of facilities, or poor motivation arising from a lack of understanding of the importance and direct benefits of fitness and exercise.

Those officers who do exercise, mainly participate in running or jogging, whilst other forms of exercise are less popular. This may reflect convenience because of limited facilities rather than choice.

2.3.5 Conclusions and recommendations

Although in terms of actual levels of individual risk, cigarette smoking is more hazardous than physical inactivity but because of its high prevalence a relatively sedentary lifestyle remains an important modifiable lifestyle factor. The following recommendations are based on the survey findings:

2.3.5.1 Education about physical activity

- Information about the health benefits of life time continuing regular exercise should be available to all recruits at the Police Training School. This should be emphasised during their physical training sessions.
- Information about the health benefits of continuing regular exercise should also be made available to other officers, perhaps through articles in the "Offbeat" magazine.

2.3.5.2 Providing opportunity for regular exercise

- Adequate shower and changing facilities should be available at all work places for those staff who walk or cycle to work, or exercise during any break times.
- The Hong Kong Police could consider providing improved exercise facilities for employees. This may be achieved through building sports facilities where such space is available within or near to the work-site, or by special contracts with existing gym and sport facilities elsewhere.

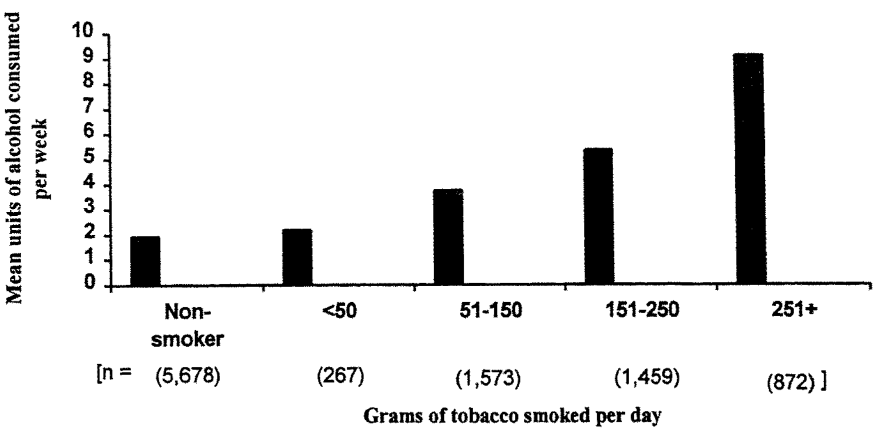
2.4 Is smoking associated with other health risk behaviours?

Studies suggest that those who smoke are more likely to engage in other health risk behaviours. The relationship between smoking (and the amount smoked) and alcohol consumption and exercise was therefore examined.

2.4.1 Alcohol

Current smokers were two times more likely to report alcohol consumption (odds ratio = 2.0, 95% CI 1.9, 2.3). Furthermore amongst those who smoke and drink, there was a linear relationship between the amount of alcohol consumed per week and the amount of tobacco smoked per day (Figure 2.4.1) [χ^2 for trend = 69.1, p<0.000].

Figure 2.4.1: Association between the amount of alcohol consumed per week and the amount of tobacco smoked per day

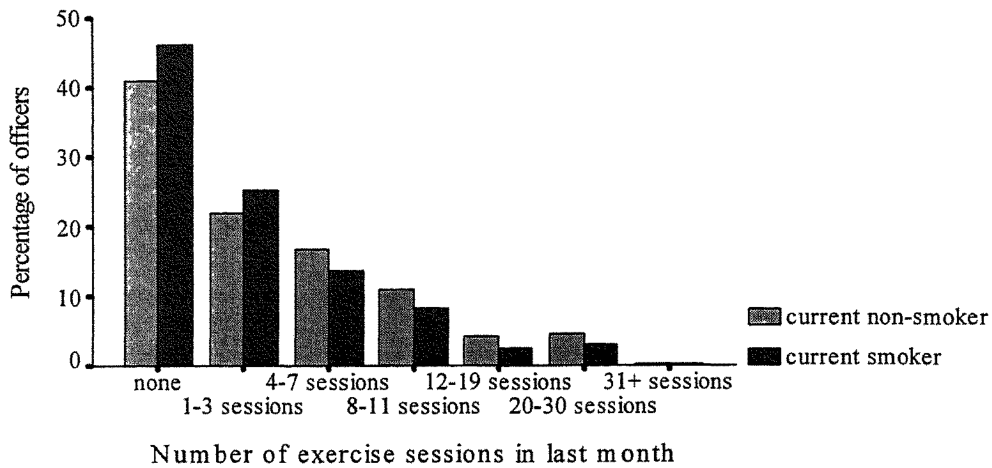


Among the 350 officers who drink more than moderate quantities of alcohol, 70% smoke, the majority (74%) smoking more than the equivalent of 15 cigarettes per day.

2.4.2 Exercise

Current non-smokers were more likely to have participated in sports than those who smoke (60% and 54% respectively; $\chi^2 = 25.7$, p=0.000) [Figure 2.4.2]. Furthermore amongst those who have exercised, non-smokers on average did one more exercise session per month than smokers (7 sessions compared with 6 respectively; t-test for difference between means = 4.9, p<0.000).

Figure 2.4.2: Number of exercise sessions in last month according to smoking status



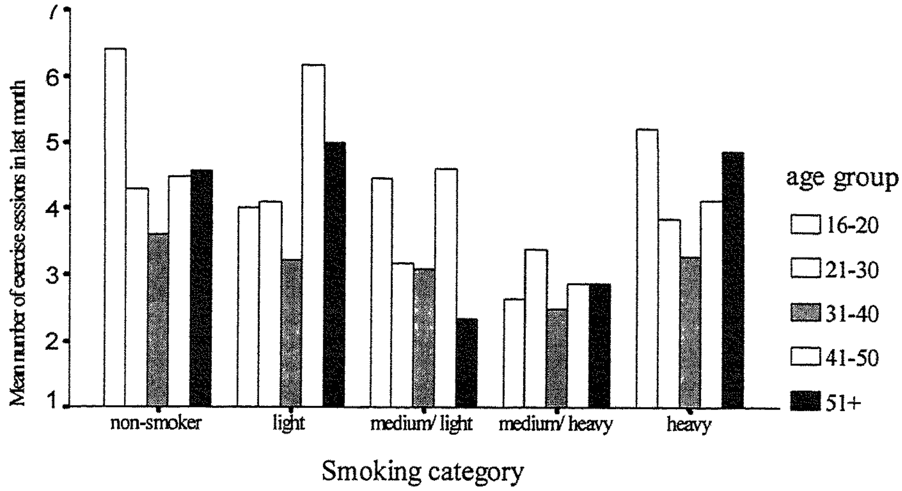
Amongst smokers, the mean number of exercise sessions in the last month was higher among light and heavy smokers compared with those who smoke medium amounts of tobacco (Table 2.4.1). This may be partly because 5 out of the 32 officers who report participating in more than one exercise session per day are heavy smokers (a greater proportion than other smoking categories). These officers report high levels of tobacco consumption and up to 3 sessions of exercise per day, each lasting for at least half an hour.

Table 2.4.1: Mean number of exercise sessions by smoking category

Smoking category	Number of officers	Mean number of exercise sessions (95% CI)
Non-smoker	5019	4.1502 (3.9648, 4.3357)
Light smoker	260	4.0385 (3.2560, 4.8209)
Medium/ light smoker	1542	3.3171 (3.0346, 3.5997)
Medium/ heavy smoker	1435	2.9596 (2.6616, 3.2576)
Heavy smoker	794	3.7985 (3.2524, 4.3446)

A breakdown of the mean number of exercise sessions by smoking status and age group is shown in Figure 2.4.3. Amongst smokers in almost all age groups, the mean number of exercise sessions is higher in the lighter and heavier smoking categories than those who smoke medium amounts of tobacco.

Figure 2.4.3 Average number of smoking sessions according to the amount smoked



Research also suggests that the stage of change in smoking cessation is a predictor of health risk behaviour, so that those who are in the pre-contemplation phase are more likely to take other health risks. The relationship between stages of change and exercise was therefore examined.

As predicted, those who were in pre-contemplation were least likely to have participated in any exercise in the last month, compared with those in the action phase (F ratio 17.5, p = 0.000). Similarly the pre-contemplators had done significantly less exercise than those in the action stage of change (F ratio 7.9, p = 0.000).

2.4.3 Smoking, alcohol and exercise

When we look at all three lifestyle factors together, 1,513 officers (15.2%) do not smoke or drink alcohol but do exercise, whilst 1,147 (11.6%) drink and smoke and do no exercise. There were 123 officers (1.2% of all responders) who reported doing no exercise, smoking and drinking more than moderate levels of alcohol. A total of 218 (2.2%) report doing less than 3 exercise sessions per week, smoking and drinking more than moderate levels of alcohol.

2.4.4 Discussion

As expected, there is an inter-relationship between the three lifestyle factors. Smokers are also more likely to drink and to do no or very little exercise, whilst non-smokers tend to lead a healthier lifestyle. Therefore it is important to address all lifestyle factors together.

Among smokers, there are a few individuals who exercise excessively and also smoke heavily. The reason for this is unclear. It may be due to intentional misinformation, or that these officers think that they are somehow compensating for their smoking behaviour. There are potentially serious health hazards to individuals who smoke and take vigorous exercise. Sudden death resulting from abnormal cardiac rhythm is one example and is well documented in young male smokers.

There were 12% of officers who smoke, drink and do no exercise. These officers, and particularly the 1% who drink to excess, are most at risk of health problems and are therefore likely to have poor work performance. They may be considered a priority group in any new programmes designed to reduce health risks in the force.

2.4.5 Conclusions and recommendations

Smoking is the most hazardous lifestyle factor to health. However excess alcohol consumption and lack of exercise are also important and not uncommon among the officers in the Hong Kong Police. The three factors interact and smoking is often an indication of a generally unhealthy lifestyle. The following recommendations are based on the survey findings:

2.4.5.1 Health promotion

A health promotion desinged programme to address all lifestyle factors should be a core part of training at the Police Training School.

2.4.5.2 Health maintenance

The health promotion programmes provided to new recruits should be reifnorced at intervals with health maintenance programmes which should be specifically designed to take account of increasing maturity, responsibility, stress and ageing. Health maintenance programmes with advice and support should be available to all officers in the force.

2.4.5.3 Special emphasis on smoking

Any smoking control programme organised by the force should include a component on other lifestyle factors. However it should emphasise the relative importance of smoking compared with the other factors and focus on both prevention in non-smokers and quitting in smokers.

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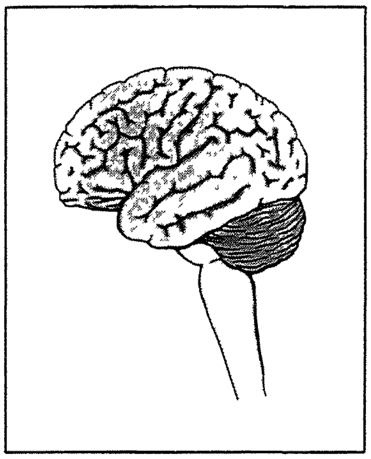
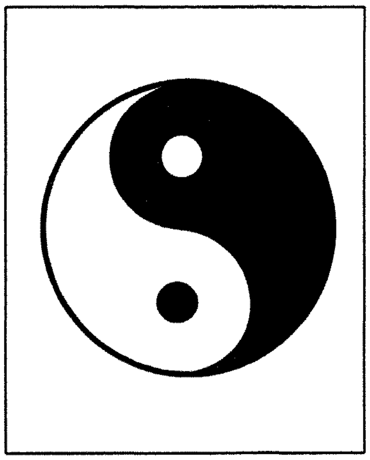
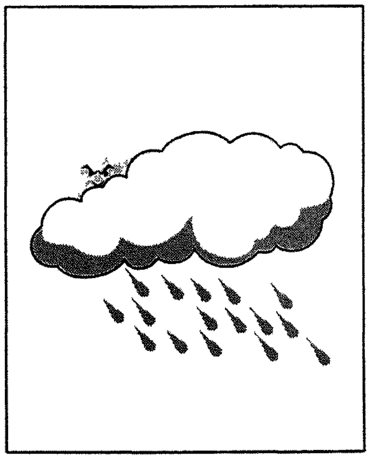


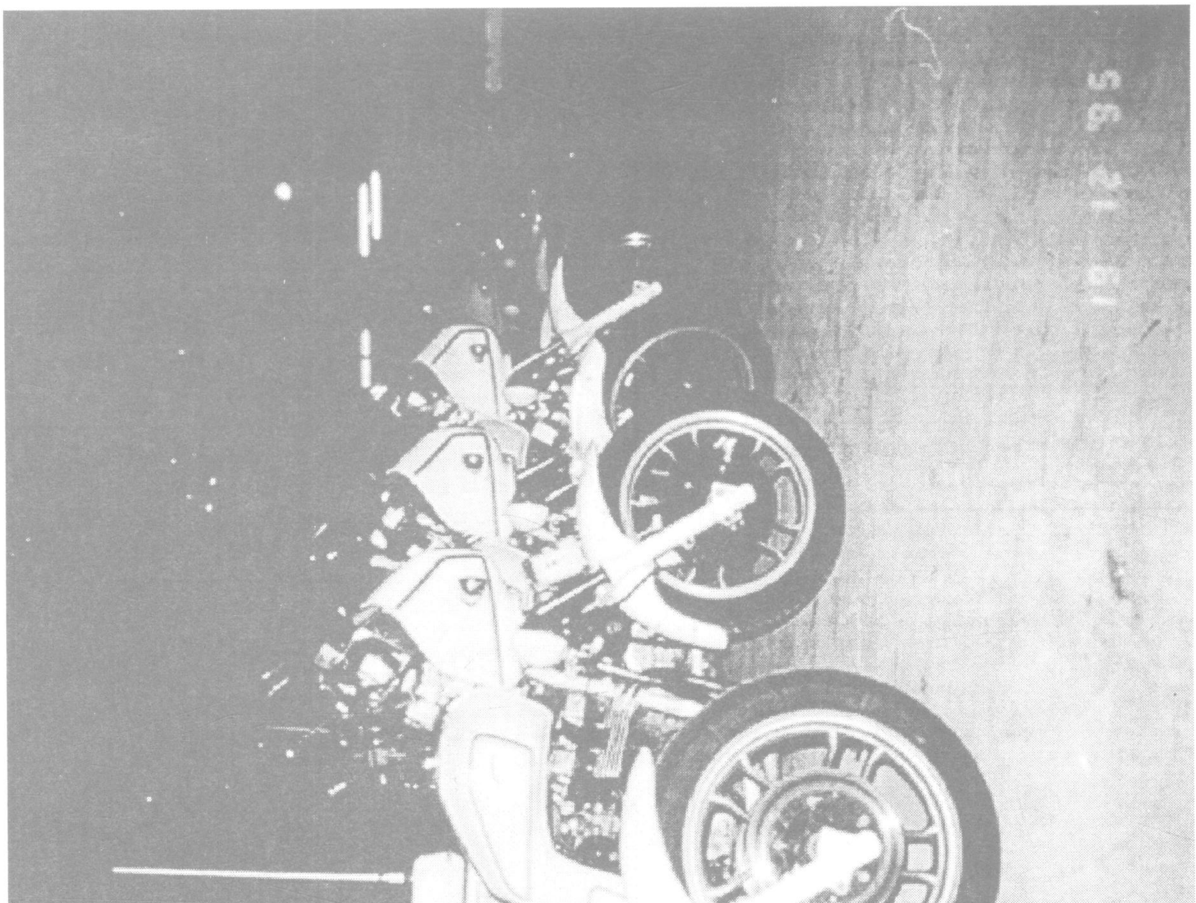




SECTION 3

Perceptions of general health, stress and psychological wellbeing

Richard Fielding



ABSTRACT

Background

An individual's perception of his or her own health is a strong predictor of recent health care seeking behaviour and of recent medication use. Perceived health is an important generic predictor of future health experience and more powerful than any one problem or group of health problems; it is closely linked to a sense of well being or good psychological health.

Objective

To assess the levels and predictors of perceived health, psychological symptomatology and stress.

Main outcome measures

Estimation of general and current perceived health, psychological morbidity and levels of perceived stress.

Findings

- Levels of perceived health were comparable to those seen in a general population sample, with the difference that older officers tended to report better perceived health. One officer in 12 (8%) reported their current perceived health to be "poor" or "very poor".

- Levels of psychological morbidity were acceptable, but one officer in four reported moderate or high symptom levels. Average stress levels were slightly lower than those reported among an American community sample. One officer in six reported stress levels in the moderately high to high range. Officers reporting poor perceived health were likely to have had more days off work due to sickness in the previous six months, more consultations with a doctor during the previous 14 days and have taken medication more often during the past 14 days. More stress was associated with reporting greater medication use over the previous 14 days.

- A number of factors were associated with an increased likelihood of reporting poor perceived health, most notably tobacco and alcohol use, poor sleep quality and work exposure to ETS. There was a protective effect from exercise.

- After adjusting for demographic characteristics, lifestyle and occupational factors and previous medical history, psychological morbidity was more likely to be reported among officers who described their marital status as "separated", who reported very poor sleep quality, who were exposed to ETS at work, and who reported between one to nine days off work due to illness in the previous six months. A number of medical conditions were also more likely to be reported, particularly those reflecting nasal or skin disorders.

- When adjustment was made for demographic and other factors, reporting a higher stress score was associated with higher educational achievement, being divorced, exercising, poor sleep quality, increasing alcohol consumption, and 1-4 days work absence due to illness during the previous six months. After adjusting for psychological morbidity and general perceived health, educational level, alcohol consumption and work absenteeism remained significant for all officers. Older officers reported less stress. The association between work ETS exposure and stress was significant for non-smoking, but not smoking officers.

- After adjusting for demographic and other factors, poor current perceived health (perceived health at the time of completing the questionnaire) was predicted primarily by lifestyle factors of poor sleep quality and work ETS exposure, lack of exercise and being in the Marine policing division. A medical history of nasal symptoms, skin allergies, hypertension and ulcers were also associated with increased reporting of poor current perceived health after adjusting for the effects of stress and psychological morbidity.

Conclusions

- The Force should initiate an educational programme to teach officers about the indicators of stress. The programme should also challenge the perception that stress is an indication of weakness or inability to cope. This should be supplemented by work site intervention programmes by trained personnel, accessible to officers who are experiencing high levels of stress.

- Officers should be encouraged to take regular exercise as this is associated with better perceived health. Poor sleep quality, probably related to shift work is an important and significant predictor of poorer perceived health.

- Counselling on the theme of sensible drinking may benefit those officers who used larger amounts of alcohol on a daily basis as they were more likely to rate their health as poor or very poor.

- All officers must be protected from environmental tobacco smoke. This is necessary on the basis of the global evidence of risk for cancer, lung and heart disease. In this survey there was a strong association between exposure to environmental tobacco smoke and an officer's perception that his or her health was poor.

- The numbers of officers who are identified to be the most vulnerable are relatively small. This suggests that the scoring systems used in this survey are practicable and provide a feasible approach to planning acceptable and manageable interventions.

3.1 Background

Perceived health refers to a person's estimation of their own health status. Perceived health is a strong predictor of recent medication and consultation behaviour, and is the single most powerful predictor of future health and longevity. Perceived health is only loosely related to detectable physical conditions, diseases, and yet is more important as a generic predictor of health outcomes than any one or group of disease states so far identified[1,2].

Perceived health is closely linked to a sense of wellbeing, which in turn partially reflects what we might call good mental or psychological health. The opposite, psychological morbidity or symptoms, is widespread in the general population, with between one person in 10 and one in three who consult a GP reporting diagnosable levels of psychiatric disorders[3-5]. A local community survey in Hong Kong identified a prevalence of 19% for generalized anxiety disorder, 10% for alcohol abuse or dependence and about 8% for depressive conditions[6]. Actual prevalence is likely to be higher as much psychological morbidity goes undetected and unreported. Symptoms most commonly experienced include those of anxiety, depression and stress. These problems are often linked to occupational or performance related factors, and as such are important indicators of a broader concept of health.

Substance use, deterioration in work performance, an impaired sense of wellbeing, family problems, a change in normal behaviour such as appetite, libido or sleep, physical symptoms such as headaches, gastric disturbance and skin problems, increased absenteeism, poor productivity and, rarely, catastrophic events such as suicide or homicide may all be indicators of stress. Occupational stress has been extensively reported in police officers[7,8], and Hong Kong has had its share of high profile events within the force which have been linked to stress.

We have therefore included in this study two measures of perceived health, a measure of psychological morbidity, and a measure of stress commonly used in general population surveys. This chapter reports on the findings regarding perceived health, psychological morbidity and stress.

3.2 Methods

In this study, stress and psychological wellbeing were examined through the use of two formal instruments, the Chinese Health Questionnaire (CHQ)[9], a measure of psychological symptoms or morbidity for use among a generally well population, and the Perceived Stress Scale (PSS)[10], a measure of perceived stress, also for use among a general population. Perceived health was examined by using two simple but well validated measures of general and current perceived health[11-13].

The CHQ is a measure of psychological morbidity in the general population. It was developed from the widely used and well established General Health Questionnaire (GHQ) developed to detect psychological problems among populations attending general practitioner clinics. The CHQ is a modified version suitable for use on a Chinese population and has been validated on a Taiwanese sample[9]. It consists of twelve questions which detect presence and frequency of a range of symptoms associated with anxiety and depression. A score above the mid point in the scale (30) indicates that all symptoms are present some or most of the time. However, some symptoms will be present in scores above 18.

The PSS was developed in the USA for detecting symptoms of stress in a general population. The instrument has not been modified from the original in this study and it is possible that there are stress symptoms unique to the local context which are not included in the instrument. If so, then the levels of stress described herein are likely to be under-reported. The PSS measures stress over the past month by the answers given to a series of 14 questions. The minimum score is 14 and the maximum score is 70. Scores above 28 are likely to indicate some symptoms of stress are present sometimes, while those above 40 indicate some symptoms are present fairly often or very often.

Perceived health was measured using two 4-point rating scales, measuring health generally and health today. The distinction between the two has been validated in earlier studies in Hong Kong[11-13], and previous data exists on a sample of police trainees at the Police Training School for comparison purposes.

Data on the present study are reported at three levels. First, a description of the prevalence of psychological symptoms, stress and wellness, followed by information on the distribution of these features by demographic factors such as age and gender to identify who is most at risk of these problems. Finally, analyses are reported that adjust for differences in demographics, lifestyle, occupational and past medical history affecting the prevalence of symptoms, stress and perceived health, and explore the interrelation of these factors with substance use and reported health problems.

The aim has been as follows:

- to give an overall picture of the respondents' profile based on these variables
- to assess the degree of association between different dimensions and variables insofar as they might reflect spurious relationships
- to identify independent variables which predict poor perceived felt health, psychological symptoms and stress.
- to explore if psychological symptoms, stress or poor wellbeing are associated with behaviours detrimental to health and / or increased illness behaviour.

3.3 Results

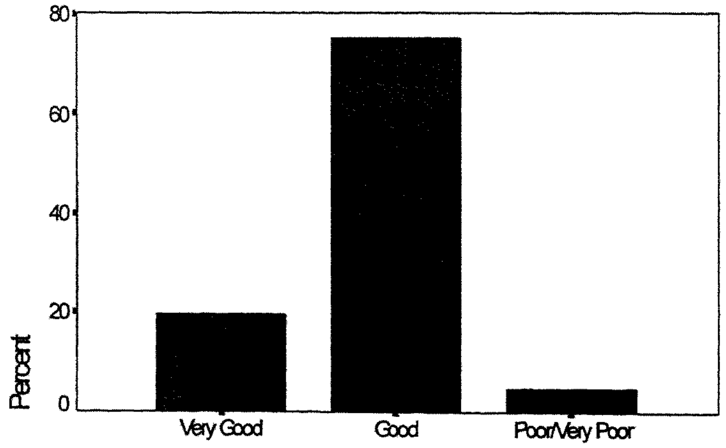
3.3.1 How good do officers perceive their health to be?

This section describes the range of perceived health, psychological morbidity and stress reported by officers, using the four variables measuring general perceived health (B1), current perceived health (B3), Chinese Health Questionnaire (H1-22 summed), and the Perceived Stress Scale (H23-36 summed).

a. How good is general perceived health?

When asked how they perceived their health generally (general perceived health), 20%, 75% and 5% of officers responded "very good", "good" and "poor/very poor" respectively (Figure 3.1).

Figure 3.1: How do officers feel their health is generally? Distribution of general perceived health scores.

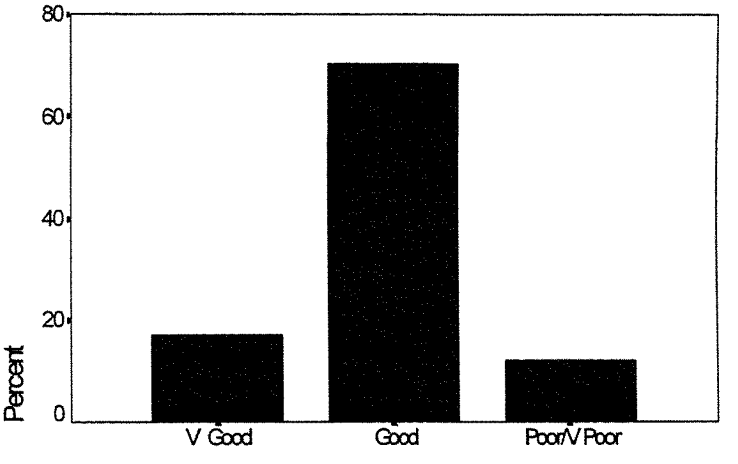


b. How good is current perceived health?

In contrast, when asked how they perceived their health at the time of completing the survey (current perceived health), almost one officer in six (17%) perceived their health right now to be "very good", almost three quarters (71%) "good", while one officer in eight (12%) perceived their health to be "poor" or "very poor" (Figure 3.2).

In comparison with earlier studies on police recruits at the PTS[13], these proportions reflect smaller numbers rating their health as v.good and poor/v.poor and more respondents rating their health as "good". This probably reflects a healthy worker effect.

Figure 3.2: How do officers feel their health is right now? Distribution of current perceived health ratings



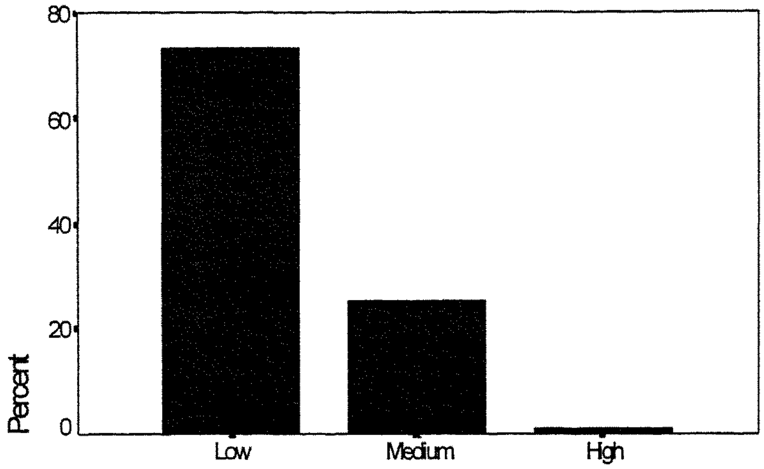
Thus, it seems that, at the time of reporting, officers felt their current perceived health was poorer than usual, with two and a half times more officers reporting their health in the lowest poor/very poor category compared to their usual level of perceived health. However, this is consistent with other studies which have reported current perceived health to be assessed as poorer than general perceived health[11-13]. In this regard, these results do not indicate any particularly unusual problems in terms of perceived health.

c. How common are symptoms of psychological distress?

The CHQ has a range of 12-48, with a mean of 20.1 and a median of 19.0. The range of scores was divided into three equal parts (tertiles) of 12-24 ("low"), 25-36 ("Medium") and 37-48 ("High"). The majority (73%) of responding officers had scores falling in the low symptom category, with one in four (25%) reporting moderate symptoms, and a small number (2%) had high levels of psychological symptoms (Figure 3.3).

Scores in the highest tertile reflect symptom levels occurring much more frequently than respondents usually experience them and may warrant treatment if levels persist, while those in the mid-tertile indicate greater than desirable levels of psychological symptoms, but not necessarily problematic if transient or of short duration. Scores in the lowest tertile indicate that there has been no recent exacerbation of symptoms although it is possible that levels are actually high.

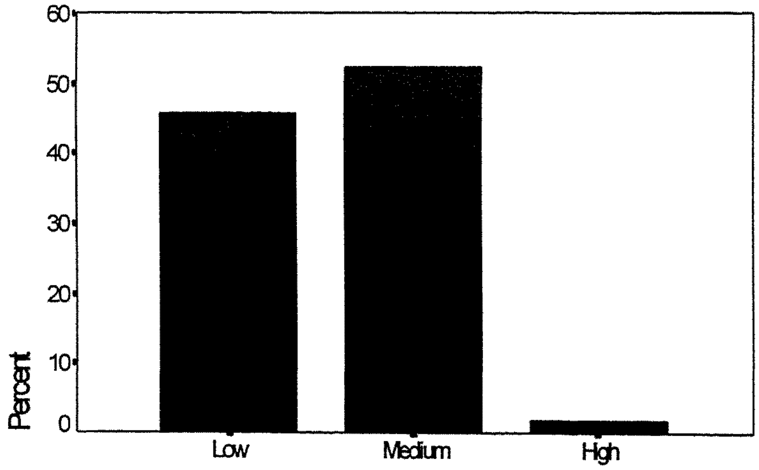
Figure 3.3: Reported levels of psychological morbidity (CHQ tertiles)



d. What degree of stress was reported by officers?

The PSS has a possible range of 14-70. Officers produced an average score of 33.9 and a median of 36. Two in five (46%) officers perceived low stress levels, one officer in two (52%) perceived moderate levels of stress and 2% high levels of stress (Figure 3.4) . When the range of PSS scores was divided in to four equal parts (quartiles) 60% of officers perceived low-to-moderate stress (range between 29-42), one in eight (13%) moderate-to high stress (43-56) with one officer in 500 having scores in the highest quartile of 57-70, a level that indicates a likely detrimental effect on work performance. Cohen et al reported slightly higher comparable levels of stress among a community sample equivalent to a mean score of 38 on the PSS, indicating officers here reported a slightly lower mean stress score[10].

Figure 3.4: Prevalence of stress symptoms among officers.



3.3.2 **Which officers have good or poor perceived health?**

This section explores some of the determinants of poor perceived health, psychological morbidity and stress.

a. Are age and gender important influences on perceived health?

The average age of respondents was 32.6 (± 8.5) years, and 9% (876) of respondents were female. Age was categorized as "young" (youngest - 30); "middle" 2 (31- 40); and "older" (41- oldest) unless otherwise stated.

The age trends seen in perceived health are notable. First, in the general population, perceived health generally deteriorates with increasing age, but among these officers perceived health improved with increasing age. This suggests a "healthy worker" effect, where officers whose perceived health deteriorates are less likely to remain in the force and hence are not included, giving undue emphasis to those healthy officers who remain with skewing towards "good" levels of reported perceived health. These officers may also perceive their health to be better than average for their age, and in doing so add to the bias.

Tables 3.1 and 3.2 show older officers reported better perceived health than younger officers and that male officers reported better perceived health than did female officers. These differences were statistically significant (age by general health, Pearson= 26.089, df=4, p<0.00003: age by current health, Pearson=27.741, df=4, p<0.00001: gender by general health, Pearson=47.345, df=2, p<0.0000: gender by current health, Pearson=39.91485, df=2, p<0.0000). These gender differences are consistent with other studies of uniformed services officers and other groups in the community in Hong Kong and Guangzhou[11,13].

Table 3.1: Proportions (%) of officers in each age category of general and current felt health

Perceived health	Very Good		Good		Poor /very poor	
Age Category	Generally	Current	Generally	Current	Generally	Current
Young	19	16	76	71	4	13
Middle	18	15	76	72	5	13
Older	23	20	72	71	5	10

Table 3.2: Proportions of officers by gender and general and current felt health

Perceived health	Very good		Good		Poor /very poor	
Gender	Generally	Current	Generally	Current	Generally	Current
male	20	18	75	70	5	12
female	12	10	81	74	8	16

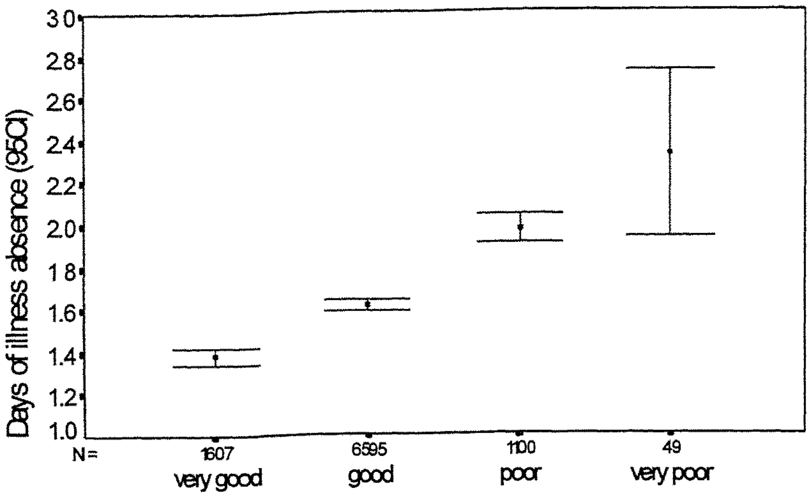
Analysis of co-variance showed psychological morbidity was associated with numbers of days off sick due to accident in the past six months (F=22.19, p<0.001) and was more likely to be the case with male than female officers (F=9.94, p<0.002), as females showed no association between accidents and psychological morbidity. There were other weak associations between psychological morbidity and age, region of work and exposure to ETS.

Reporting of higher stress levels declined with age (F=107.69, p<0.0000). Levels were generally higher for females than males, except in the oldest age category (F=6.45, p<0.011). Officers reporting poorer current perceived health were more likely to report higher stress levels (F=113.29, p<0.0000), but female officers in any given category of perceived health reported significantly higher stress levels (F=10.05, p<0.002) compared to male officers. Increasing educational level was significantly associated with higher stress scores (F=86.12, p<0.0000), with female officers up to matriculation levels reporting higher stress, but with tertiary level education females reported lower stress than their male counterparts (F=7.19, p<0.007).

3.3.3 **Does perceived health have any association with measurable illness behaviour?**
This section examines the impact of perceived health on three measures of illness behaviour quantified as: days off work during the past six months due to illness (C6), consultations with a doctor during the past 14 days (B4), and medication use during the past 14 days (B6).

a. Do officers who report poorer health have more days off work due to illness than other officers?

Figure 3.5: Relationship between level of current perceived health and days of illness absence (males & females).



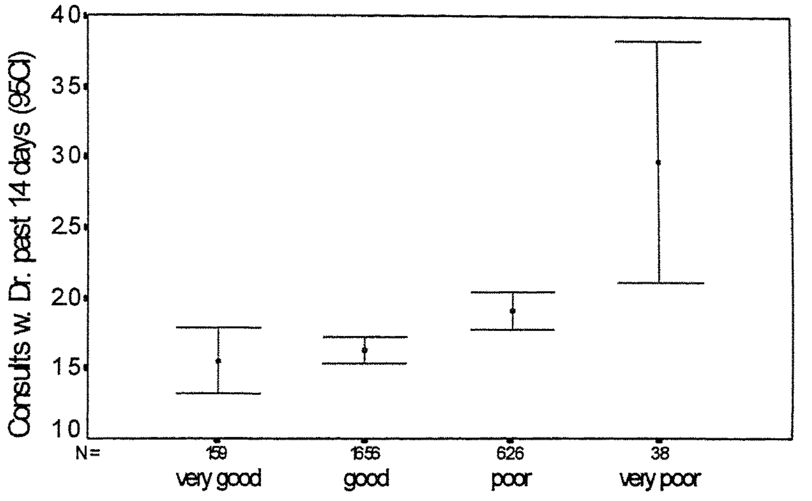
Current perceived health is strongly associated with number of days of absence from work due to illness (Figure 3.5). Examining the strength of this relationship involved considering other main influences on days off sick, and ETS exposure level was chosen as this was associated with variations in perceived health and is also a known independent contributor to sickness. Analysis of covariance was used to adjust for ETS effects while the relationship between perceived health and days off due to sickness was examined. A significant effect was seen for both level of perceived health (F=72.95, p<0.001), as well as an independent effect for ETS on days of sickness (F=63.24, p<0.0001). More psychological morbidity was associated with more days off work due to illness (F=52.16, p<0.0000), but this was not dependent on gender. PSS scores were significantly higher among those having had more days off sick (F=39.62, p<0.0000), with females reporting higher PSS scores (F=8.04, p<0.004).

b. Do officers who report poor health consult a doctor more?

Is poor current perceived health associated with more illness? Taking consultation with doctors during the past 14 days (B6) as an analogue for illness, female officers with poor/very poor general perceived health made more visits to doctors than those reporting very good and good perceived general health (F=30.41, p<0.0000). A more extreme version of this pattern was seen among male officers (F=34.0, p<0.0000).

There was a significant tendency for officers reporting more psychological morbidity to have consulted with a doctor during the past 14 days, (F=5.89, p<0.003). There were no gender differences in this regard, nor was there any tendency for officers who reported higher stress to have consulted doctors more frequently during the previous 14 days.

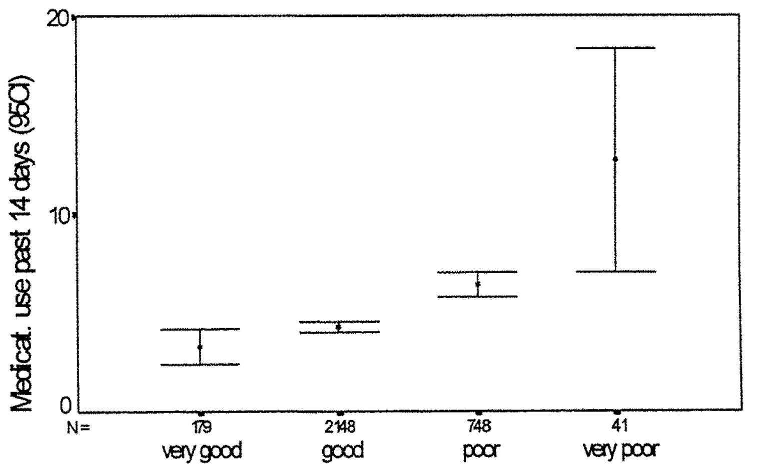
Figure 3.6: Relationship between number of consultations with a doctor during the past 14 days and levels of current perceived health, (males and females).



While there are no differences in consultation rates for officers with very good and good current perceived health, those having poor current perceived health consulted more frequently, and those with very poor current perceived health had a mean consultation rate approximately double that of officers in the very good/good categories of current perceived health (Figure 3.6).

c. Do officers with poorer perceived health take more medication?

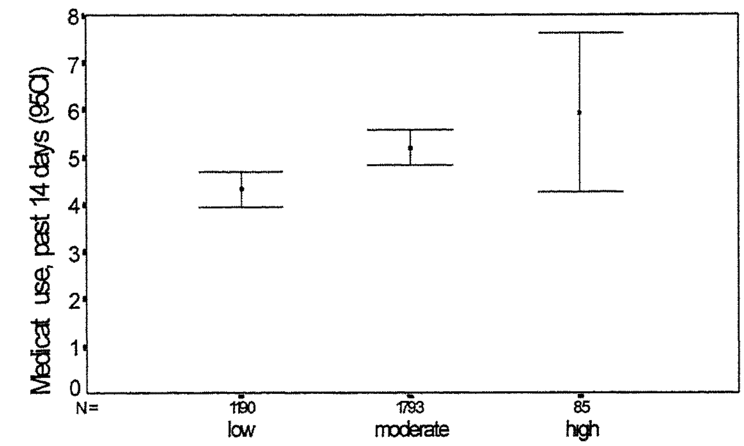
Figure 3.7: Medication use, past 14 days by *current perceived health*



Officers rating their current perceived health as poor or very poor took more medicines than those rating their health as very good or good (Figure 3.7).

There was also a graded relationship between medication use and CHQ scores. Finally, officers reporting higher levels of stress were also more likely to have taken medication during the past 14 days, irrespective of their gender, ($F=6.32$, $p<0.002$) (Figure 3.8).

Figure 3.8: Medication use, past 14 days by *PSS score*



It seems that officers who have higher levels of stress and psychological symptoms are more likely to have poorer current perceived health, and those having poorer current perceived health are more likely to have consulted a doctor during the past 14 days. Similarly, current perceived health, psychological morbidity and stress all associate with medication use in the preceding two weeks.

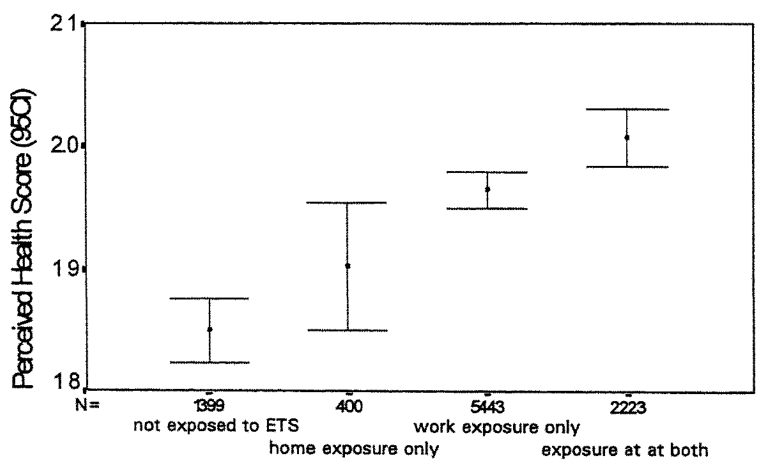
Finally, days off due to sickness are predicted by current perceived health and ETS exposure independently, and by CHQ and PSS scores. As there is clear evidence then that perceived health is an important associate of illness behaviour it is important to consider the influences on perceived health.

3.3.4 What influences perceived health?

This section examines a selected range of factors thought or known to influence current perceived health, psychological morbidity and stress.

a. Is exposure to ETS associated with perceived health?

Figure 3.9: Mean levels of current perceived health[1] by extent of *ETS exposure.*



[1] A higher mean score indicates poorer perceived health

We have reported earlier that exposure to ETS is associated with poorer current perceived health. This relationship is depicted in Figure 3.9 and is clearly linear.

b. Is alcohol consumption association with perceived health?

Officers falling into the highest category of alcohol consumption were more likely to classify their general perceived health as poor/very poor. While 20% of officers in the lowest category of alcohol consumption (<11gm/day) rated their general perceived health as very good and 5% as poor/very poor, among those officers consuming more than 25gm (female) or 60 gm (male) daily, only 14% rated their perceived health as very good and 9% as poor/very poor. There was a significant trend for officers consuming greater amounts of alcohol to report higher psychological symptom scores and, while a similar trend was observed in stress scores, this was not significant.

3.3.5 What is the relationship between illness, perceived health, stress and lifestyle and occupation?

3.3.5.1 **Sources of information:** In order to understand the complex interplay between personal characteristics, lifestyle and work, and to examine how these interact to influence health, and thence illness, a conceptual model was developed based on the following principles.

There are relationships between the factors examined which can be used to help generate models of how they might interact. For example, age and gender and previous medical history pre-date current mood and symptoms. While age and gender might influence symptom reporting at the time of the survey, symptoms cannot influence age. We can therefore look at the effect of age and gender on symptoms. With careful consideration, this approach can be adopted for other factors. Four categories of potential risk factors have been compiled.

Demographic factors (Age, gender, education and marital status);
Lifestyle factors (smoking, ETS exposure,alcohol consumption, exercise, sleep quality);
Occupational factors (policing region & formation), and;
Previous medical history (past history of diagnoses (B17a-q) and days off work due to illness over the past six months).

These have been used to explore the excess risk they confer for reporting on the following health measures we are interested in: poor general perceived health, high psychological morbidity, greater perceived stress, current perceived health, use of medication and consultations with a doctor during the past 14 days, in that order. As each health measure was studied in turn, the measure preceding it was also included as an additional potential risk factor.

3.3.5.2 What factors directly influence general perceived health?

The significant influences on poor general perceived health are, in decreasing order of importance, sleep quality, work exposure to ETS, and a protective effect of exercise. Officers reporting very poor sleep quality had an 18 times greater excess reporting of poor general perceived health compared to officers reporting very good sleep quality. Officers not exercising over the past month had a 53% excess of reported poor general perceived health. Work exposure to ETS was associated with a 72% excess reporting of poor or very poor general perceived health. For non-smokers only, this excess increased to 84%, but was not significant for smokers. Moderate alcohol drinkers were only half as likely to report poor general perceived health than those who drank very little. Work absence over the past 6 months of between 1-9 days was highly predictive of reporting poorer health. Previous medical history is understandably important and a history of either TB, other chest problems, hay fever, rhinitis, diabetes, hypertension and ulcers is associated with reporting poorer health. Occupational factors were apparent in an 56% excess reporting of poor general perceived health among officers in Kowloon West using Marine division as a reference group. However, there were no differences between work type overall. Demographic factors were not significant influences on poor general perceived health (Appendix 1 Table A).

3.3.5.3 **What factors influence psychological morbidity?**

Among the demographic factors included, only increasing age conferred a reduced risk of reporting higher psychological morbidity. Officers describing their marital status as "separated" were seen to have a 34% excess of reporting poor psychological health relative to single officers but this excess was not statistically significant.

In terms of lifestyle factors, officers reporting a very poor sleep quality had an 11 times excess likelihood of reporting a poor psychological state relative to those reporting a very good quality of sleep. High and very high alcohol use (see section on Lifestyle factors for definitions) were associated with a 56% and 77% respective excess reporting of poor psychological health, but this was not statistically significant. Officers exposed to ETS at work demonstrated a significant 32% excess reporting of poor psychological health. Exercise taken during the past month conferred a slight protective effect (Adjusted OR 0.91, $p<0.041$).

No occupational factors were associated with poor psychological health. Past medical history of note included a history of chest injury or operation (67% excess), skin allergies (38% excess), hypertension (112% excess) and ulcer (59% excess). Work absence due to illness of between 5-9 days also increased risk of reporting higher psychological morbidity.

Taking general perceived health into account lead to an increased risk of reporting poor psychological health for separated and "other" categories of marital status, and an under reporting among widowed officers compared to that of single people. The excess reporting associated with work ETS exposure remained significant, most being accountable for by an association with psychological morbidity. While there was a decline in the impact of very poor sleep quality, this retained, at 8.6 times, its position as offering the largest excess reporting of poor psychological health. Other than a decrease in the effect of number of days work absence from illness, there were no changes in the influence of past medical history. There was a clear graded relationship for officers reporting poorer general perceived health to be between 62% and 247% more likely to report increased psychological morbidity when other factors are held constant.

3.3.5.4 **What factors influence perceived stress?**

Perceived stressfulness (measured by PSS scores) was strongly associated with demographic factors. Increasing educational level, with excess risk of reporting higher levels of stress ranging from 32% among those completing Form 5 to a 6.6 times excess among those with a tertiary level education, and being divorced (158% excess) increased reporting, but increasing age was associated with reduced reporting of high stress. Holding steady the influence of perceived general health and psychological morbidity generally lead to an increase in the excess risk of perceiving high stress for those reporting marital breakdown and those with higher educational levels.

An unexpected finding was the association of exercising with an increased likelihood of reporting higher stress of about 22%. The increase may reflect officers who feel stressed taking increased remedial exercise. Exposure to ETS at work raised the risk of reporting higher stress by about 35%. Poor sleep quality was again significantly associated with stress reporting. There was a graded and increasing risk of reporting higher stress with increasing alcohol consumption, ranging from a 12% excess among those alcohol consumption category was "low" through to a 1.5 times excess in the heaviest drinkers. Among the heaviest drinkers risk remained high even when psychological morbidity and general health were taken into account. When smokers wee compared to non-smokers, work ETS was associated with 25% excess reporting of higher stress for non-smokers, but not smokers. Separate analyses of ETS exposure controlling for CHQ, current perceived health, alcohol use, age, gender, education and marital status indicated a significantly greater (37%) excess reporting of stress for non-smokers compared to smokers (23%) if exposed to ETS.

Occupationally, there was no excess reporting of high stress by either work division or region, beyond a slight, but non-significant excess at New Territories South.

Work absence due to illness of between 1-4 days over the past six months was associated with a 41% excess of reporting higher stress. A number of past illnesses were also significant, particularly nasal and skin complaints, hypertension and ulcers.

General perceived health added an increased risk of reporting stress of 24-75%, while psychological morbidity was associated with a 23% excess.

3.3.5.5 **What factors influence current perceived health?**

Current perceived health is a known significant predictor of consultation behaviour and medication use[11,12]. Officers reporting their current perceived health in the poor/very poor categories had an 11 times excess reporting of medication use during the past 14 days, and a seven-times excess in reporting doctor consultations compared to officers reporting their current perceived health to be very good. It is therefore important to be able to identify predictors of current perceived health.

No demographic factors were significantly associated with poorer CPH, though female officers showed excess reporting of poor current perceived health of about 25%, widowed (170% excess), separated or divorced (34% excess), and "other" (103% excess) marital statii were associated with higher reporting of poorer CPH, while higher education was associated with a slight protective effect (adjusted OR 0.57), though none of these odds ratios were statistically significant. The effects of age, gender and education acted directly on CPH, while the excess reporting of poor CPH associated with marital status was partly accountable for by higher psychological morbidity and stress.

Lifestyle factors showed the strongest associations with poor current perceived health. ETS exposure showed a graded excess of 53% among those exposed at home, 83% among those exposed at work, and a 94% excess in those exposed at both work and home. Poor sleep quality was again significant, conferring a 16 times excess for reporting poor current perceived health, largely through greater psychological morbidity exacerbated by stress. Alcohol use was associated with non-significant increased risk of poor current perceived health among those with the highest consumption level, accounted for mainly by its association with psychological morbidity. The excess reporting of poor CPH for those with work exposure to ETS was partly mediated by higher psychological morbidity and stress.

Traffic and foot patrol officers had a lower risk of reporting poor current perceived health, (adjusted OR=0.78, p<0.04; OR=0.80, p<0.015, respectively) relative to marine officers. Officers in Kowloon West had a non-significant 19% excess reporting of poor current perceived health. This effect was direct and not associated with psychological morbidity or stress.

Past medical history was again associated with excess reporting of poor health, with numbers of days absence due to illness and a number of past diagnoses being associated with increased risk of reporting poor current perceived health.

When we adjusted for the effects of general perceived health, the excess reporting of poor current perceived health associated with demographic variables generally increased, but did not achieve significance. There was a highly significant effect of general perceived health on current perceived health, indicating a high degree of mutual influence between the two variables. To avoid distorting effects, subsequent discussion of this model exclude general perceived health.

3.3.5.6 **What factors are predictive of medicine take over the past 14 days?**

Retaining the same set of potential risk factors used above, older (OR1.02, p<0.0000), female (OR 1.55, p<0.0000), married (OR 1.23, p>0.003) or separated (OR 2.05, p<0.05) officers reported significant excess risk of medicine use. ETS exposure (work, OR 1.24, p>0.008; both, OR 1.32, p<0.003) and poor sleep quality (OR 1.48, p<0.007) were associated with excess risk of medication use. Number of days off work due to illness and previous diagnoses were, not surprisingly also strongly associated with increased reporting of medication use. While stress was not associated with medication use, psychological morbidity (OR 1.02, p<0.0007)) and CPH ("Good", OR 3.25, p<0.0000; "Poor/v.poor" OR 12.00, p<0.0000) were also associated with medication use. Poor general perceived health was not associated with medication use when current health was included.

3.3.5.7 **What factors are predictive of consulting a doctor during the past 14 days?**

Again the same set of factors were retained. Older age (OR 1.02, p<0.0000), female (OR 1.34, p<0.003) officers were more likely to consult, and those with lower educational attainment ("Form 5", OR 0.85, p<0.05; "Matriculation", OR 0.62, p<0.002) less likely. Poor sleep quality and days absence from work due to illness and past medical history were again significant, but ETS was not.

3.4 Discussion

Levels of perceived health are more moderate among this sample of officers than a sample of trainees at the PTS. Levels of psychological symptoms and stress are generally within acceptable limits, though some officers do report both high levels of psychological symptoms and high levels of stress. In profiling such officers, it is apparent that there is considerable overlap between some of the factors reported on in this chapter. To take this into account a series of models were analysed and presented (Tables 4-6).

Demographic factors showed a general tendency for female officers to report their subjective health as poorer. This is consistent with studies from around the world[1-3,11-13]. Of particular interest is the vulnerability to stress posed by educational achievement. This probably represents a responsibility effect, with higher qualified officers taking more senior ranks at younger ages. Age itself is not a risk factor for stress and the slightly lower levels of stress reported by older officers are consistent with the interpretation that younger and higher ranking officers would find their work most stressful. Both age and rank independently affected perceived stress.

Lifestyle factors and past medical history have the greatest influence on subjective health. Sleep quality, alcohol, ETS and exercise are all independently associated with subjective well being. ETS is a particularly prominent environmental factor that is associated with an excess reporting of poor health on all measures used, and is also associated with greater medication use, both indirectly through current perceived health, and directly in its own right. Both smokers and non-smokers reported excess poor current perceived health on ETS exposure, and reported work ETS exposure to be associated with higher levels of stress. Alcohol use is also associated with a generalised risk of reporting higher stress. The excess for heavy drinkers was 2.5 times that for those who drank the least. This may reflect officers drinking to help them relax. However, heavy alcohol usage is associated with a 20-30% excess risk of reporting medication and consultation behaviour, even when the stress level is held constant, though the effect was not significant due to small numbers drinking heavily. It is also common for people experiencing difficulty in dropping off to sleep to take alcohol in the belief it helps them to relax. While this may be true for small amounts of alcohol, if taken in excess the stimulant effect of alcohol will produce a poorer quality of sleep.

Sleep quality is a major predictor of poor health reporting. Which is the cause and which the effect cannot be unequivocally identified from this study, but poor sleep quality is often a primary symptom of prolonged stress. Depression is associated with poor sleep quality, particularly early waking. More than 2,000 participating officers decribed their sleep as poor or very poor. While poor sleep may be symptomatic of stress it is likely that shift work is the most probable reason for poor sleep in this particular sample of officers. Poor sleep can exacerbate existing psychological difficulties, and contribute to the development of poor mental health through burn out, where people become demotivated and uncaring, and helplessness, a condition where people feel that they are unable to influence events to achieve the goals they want. Also, poor sleep quality can significantly impair officers' perforrrrmance more directly, through lowering their capacity to deal optimally with job demands. While it may not in itself be unreasonable to expect policing to be a stressful activity, and officers to tolerate the stress of their work, when stress becomes a problem, there is likely to be a deterioration in work performance and this may be potentially hazardous to both the officer and members of the community. One officer in eight (13%) reported moderate-to high stress with one officer in 500 having scores in the highest quartile, a level that indicates a probable deterioration in performance and health risk.

It is worth noting that work absenteeism is also related to stress, and that in the models explored, days off work due to illness over the past six months remained independently predictive of higher stress reporting when variation in both current perceived health and psychological morbidity was held constant. It may be then that days off work due to illness in fact reflects a stress-related phenomenon.

Stress is not associated with any one division or district of work. However, officers in Kowloon East and Kowloon West Districts tended to report poorer perceived health in excess to their colleagues in other Districts. Marine officers had poorer perceived health at the time of the survey than did their counterparts in Traffic and Foot Patrol divisions.

In summary, these models present evidence for the generally detrimental effect of ETS exposure at work on subjective wellbeing, particularly for non-smokers, and on medication use. ETS is associated with increased reporting of stress, which in turn is associated with increased alcohol consumption and poorer sleep quality. Poor sleep quality is also associated with increased risk of reporting psychological morbidity and poor perceived health. In turn, poor perceived health is associated with increased risk of medication use and consultation with doctors.

Stress is associated with alcohol consumption, educational level and having taken fewer than 10 days off work due to illness during the past six months, while excerising generally confers a protective benefit of improved subjective health.

3.5 Principal recommendations

3.5.1 In the light of the pervasive negative effect of ETS exposure at work, the Force *must* implement an immediate ban on smoking in the workplace as a priority to improve subjective health.

3.5.2 Poor sleep quality is most commonly a result of shift disruption of body clocks. Placing officers on a less intensive shift rota should help improve sleep quality. However, further investigation of the causes of poor sleep quality are warranted for the 2,000 officers reporting such before firm recommendations can be made.

3.5.3 Stress, while not excessive is reported by a significant number of officers, one in eight reporting moderate levels, and one in 500 high levels. There should therefore be a general education campaign to raise officers' awareness of the symptoms of stress, and its hazards, particularly for officers on active duty. This campaign should also challenge the widespread belief that stress indicates some form of weakness, an attitude reported in police forces in several western countries, and dubbed the "John Wayne Syndrome", and that stress can often be effectively combated. The Force should consider identifying organizational factors which contribute to stress for officers and consider less stressful alternatives, where possible.

3.5.4 Exercise is associated with better perceived health. Officers should also be urged to take regular exercise for general health maintenance.

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Appendix 1: Logistic models of excess risk associated with demographic, lifestyle, occupational and medical history components on health measures.

The numbers in the tables A to C are adjusted odds ratios, the ratio reflects the likelihood of an effect in persons possessing a risk factor relative to the likelihood of that effect in those not possessing the same risk factor.

Where odds ratios remain more or less constant across rows, this reflects a direct influence of the risk factor represented by that row on the health measure specified for each column. This influence is unaffected by adjustment for the impact of other risk factors on that health measure.
Odds ratios which decrease across rows indicate negative confounding. In other words, if the odds ratio of a risk factor (column 1) decreases following adjustment for a second factor (column 2), this suggests some of the influence of the first factor is acting through the second factor. For example, in Table B, ETS exposure at home and work has an adjusted odds ratio of 1.29 for a high stress score (a 29% excess risk of higher stress compared to those not exposed). When further adjustment is made for GPH, the odds ratio decreases marginally to 1.25, indicating a very slight indirect effect of ETS exposure lowering perceived health, and through it, contributing to increased stress. When further adjustment for mental health (CHQ) is made in column 3, the adjusted odds ratio declines to 1.12, a halving of the excess risk of reporting a high PSS score for those exposed to ETS. This suggests that about half of the increased risk high PSS score for those exposed to ETS results from raised psychological morbidity from those with ETS exposure. In other words, ETS exposure increases risk of high PSS *directly*, and also *indirectly*, being associated with a concurrently greater risk of psychological morbidity to about the same extent among those exposed to ETS.

Odds ratios which increase across rows reflect positive confounding, the additive impact of removing protective influences acting through the risk factor on the health measure. For example, in Table B, Higher Education shows an odds ratio of 7.33 for high PSS scores. When adjustment is made for GPH, the odds ratio increases to 7.63, indicating that good GPH offers some protection against stressfulness of ETS. When further adjustment is made for psychological morbidity, the OR increases still further to 8.73, reflecting the modulating effect of CPH on the relationship between education and PSS.

Table A: Adjusted odds ratios for predictors of general perceived health, and psychological symptoms (CHQ) without[1] and with[2] the inclusion of GPH. Changes in ORs across rows 2-3 gives a general indication of the addition or removal of protective effects on CHQ from GPH.
(* p<0.05; ** p<0.001; # p<0.0001)

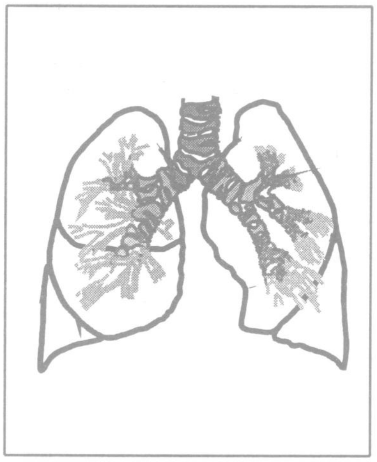
Variable		1. GPH	2. CHQ[1]	3. CHQ[2]
Age	increase	1.00	0.98*	0.98*
Gender	female	1.38	1.11	1.05
Marital status	married	0.80	1.02	1.03
(ref. single)	widowed	0.02	0.61	0.64
	separated	0.44	1.34	1.33
	divorced	1.45	1.04	1.03
	other	0.01	1.07	1.29
Education level	Form 5	0.99	0.94	0.92
	matriculation	0.90	1.21	1.17
(ref. < Form 5)	tertiary non-deg	0.55	1.23	1.29
	tertiary degree	0.13	1.19	1.30
Exercise?	yes	0.65*	0.91*	0.94
Smokes?	yes	1.06	0.94	0.92
ETS	home only	1.48	1.11	1.10
(ref. non	work only	1.72*	1.32*	1.31#
exposed)	home and work	1.53	1.38*	1.38#
Sleep quality	good	1.74	2.08*	1.86#
(ref. v.good)	poor	6.93*	5.60*	4.92#
	v.poor	19.06#	12.34#	9.64#
Alcohol use	low	0.88	1.06	1.06
(ref. v.low)	moderate	0.59*	1.07	1.06
	moderate/high	0.50	1.15	1.17
	high	1.00	1.56	1.48
	v.high	1.08	1.77	1.77
Police division	traffic	0.84	1.06	1.00
(Ref. marine)	foot	1.02	1.06	1.06
Region of work	KLE	1.25	0.95	0.94
(ref. Marine)	KLW	1.56*	0.95	0.93
	NTS	0.94	1.10	1.10
	NTN	0.89	0.94	0.95
	HKI	1.32	0.93	0.93
Days of work	<1	1.22	1.18	1.14
absence	1-4	1.29#	1.43#	1.35#
(ref. none)	5-9	5.94#	1.52**	1.31
	10+	3.68#	1.16	1.06
Medical history	chest injury/op.	1.70	1.67*	1.62*
	CHD	1.78	1.67	1.50
	TB	2.41**	1.67*	1.09
	other chest.	2.51**	1.23	1.18
	hay fever	1.63*	1.14	1.11
	rhinitis	1.32*	1.11	1.08
	sinusitis	1.27	1.49#	1.48**
	eczema	1.13	1.36#	1.33**
	skin allergies	1.28	1.38#	1.36#
	diabetes	2.63*	1.03	0.93
	hypertension	4.58#	2.12#	1.94#
	ulcer	2.15#	1.59#	1.48#
Gen. P. health	good	-	-	1.62#
(ref. v.good)	poor/v.poor	-	-	3.47#

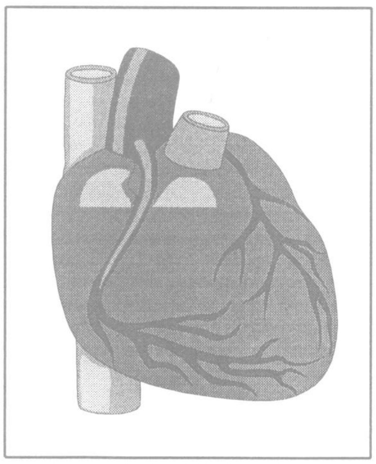
Table B: Adjusted odds ratios for predictors of stress scores (PSS), without and with the inclusion of GPH alone[1], and GPH plus psychological symptoms (CHQ)[2]. Change in ORs across rows 2-3 gives a general indication of the amount of deterimental or protective effect on PSS from GPH and psychological morbidity (CHQ).
(* $p<0.05$; ** $p<0.001$; # $p<0.0001$)

Variable		1. PSS	2. PSS[1]	3. PSS[2]
Age	increasing	0.98#	0.98#	0.98#
Gender	female	1.05	1.02	0.99
Marital status	married	0.93	0.93	0.92
(ref. single)	widowed	0.14	0.14	0.09*
	separated	2.58*	2.59*	2.68*
	divorced	1.17	1.16*	1.09
	other	1.98	2.17	1.63
Education level	Form 5	1.33#	1.32#	1.46#
	matriculation	2.42#	2.38#	2.58#
(ref. < Form 5)	tertiary non-deg.	6.51#	6.65#	7.31#
	tertiary degree	7.33#	7.63#	8.73#
Exercise?	yes	1.22#	1.25#	1.36#
Smokes?	yes	0.93	0.91	0.92
ETS	home only	1.09	1.09	1.05
(ref. no exposure)	work only	1.35#	1.35#	1.21*
	home and work	1.29*	1.25*	1.12
Sleep quality	good	1.35**	1.28**	1.03
(ref. v.good)	poor	2.40#	2.17#	1.08
	v.poor	4.53#	3.98#	1.12
Alcohol use	low	1.12**	1.19**	1.18**
(ref. v.low)	moderate	1.30*	1.30*	1.24
	moderate/high	1.40*	1.41*	1.29
	high	1.51	1.48	1.46
	v.high	2.51**	2.49**	2.53**
Police division	traffic	1.00	1.02	1.04
(Ref. marine)	foot patrol	1.04	1.04	1.04
Region of work	KLE	1.02	1.02	1.06
(ref. Marine)	KLW	0.99	0.98	1.02
	NTS	1.13	1.13	1.12
	NTN	0.97	0.98	1.02
	HKI	0.98	0.97	0.99
Days of work	<1	1.07	1.06	0.98
absence	1-4	1.41#	1.37#	1.20**
(ref. "None")	5-9	1.27	1.18	1.00
	10+	0.95	0.91	0.81
Medical history	chest injury/op.	0.92	0.91	0.74
	CHD	1.47	1.40	1.07
	TB	1.18	1.13	1.25
	other chest	1.13	1.18	1.15
	hay fever	1.08	1.06	1.06
	rhinitis	1.20*	1.19**	1.15*
	sinusitis	1.32*	1.32*	1.09
	eczema	1.28**	1.27**	1.11
	skin allergies	1.45#	1.44#	1.23**
	diabetes	1.23	1.08	0.95
	hypertension	1.45**	1.39**	1.06
	ulcer	1.42#	1.37#	1.21*
GPH	good	-	1.24#	1.01
(ref. v.good)	poor/v.poor	-	1.75#	0.97
CHQ	increasing	-	-	1.23#

Table C: Adjusted odds ratios of risk factors for poor current perceived health (CPH) without (1) and with the inclusion of CHQ(2), CHQ plus stress scores (PSS) (3). Columns 4-6 repeat these when GPH is included.
(* p<0.05; ** p<0.001; # p<0.0001)

Variable		1. CPH	2. CPH	3. CPH	4. CPH	5. CPH	6. CPH
Age	increasing	0.99	0.99	0.99	0.99	0.99	0.99
Gender	female	1.25	1.25	1.24	1.11	1.11	1.11
Marital status	married	1.01	1.03	1.02	1.08	1.10	1.09
(ref. single)	widowed	2.72	2.87	2.88	4.26	4.25	4.23
	separated	1.34	1.28	1.27	1.70	1.70	1.66
	divorced	1.34	1.24	1.16	1.23	1.14	1.04
	other	2 03	1.85	1.84	3.96	3.78	3.77
Education level	Form 5	1 07	1.08	1.07	1.08	1.07	1.05
	matric	1.25	1.20	1.19	1.29	1.22	1.20
(ref. < Form 5)	tertiary non.	1.00	0.99	0.99	1.41	1.36	1.34
	tertiary deg.	0.57	0.59	0.58	0.85	0.88	0.86
Exercise?	yes	0.75#	0.76#	0.76#	0.84*	0.84*	0.84#
Smokes?	yes	1.03	1.02	1.02	0.97	1.10	0.97
ETS	home only	1.53	1.50	1.50	1.47	1.44	1.43
(ref. no expose)	work only	1.83#	1.72#	1.72#	1.76#	1.66#	1.65#
	home & work	1.94#	1.82#	1.81#	1.96#	1.84#	1.83#
Sleep quality	good	2.02**	1.77*	1.86*	1.61	1.49	1.53
(ref. v.good)	poor	7.07#	4.82#	5.08#	4.37#	3.28#	3.37**
	v.poor	17.52#	8.44#	9.27#	9.86#	5.76#	6.13*
Alcohol use	low	0.99	0.96	0.97	1.00	0.98	0.98
(ref. v.low)	moderate	0.96	0.91	0.90	1.06	1.02	1.02
	mod./high	0.87	0.76	0.77	0.99	0.89	0.91
	high	1.76	1.72	1.72	1.73	1.67	1.66
	v.high	1.25	1.04	1.05	1.30	1.16	1.16
Police division	traffic	0.78*	0.82	0.80	0.81	0.94	0.83
(Ref. marine)	foot patrol	0.80*	0.82*	0.81	0.79*	1.19	0.79
Region of work	KLE	1.17	1.17	1.17	1.11	1.09	1.09
(ref. marine)	KLW	1 19	1.18	1.20	1.07	0.82	1.09
	NTS	0.94	0.90	0.91	0.94	0.91	0.91
	NTN	1.00	1.00	1.01	1.01	0.99	1.00
	HKI	1.13	1.11	1.13	1.08	0.92	1.07
Days of work	<1	1.11	1.09	1.08	1.04	1.03	1.02
absence	1-4	1.68#	1.55#	1.55#	1.37#	1.28	1.27*
(ref. none)	5-9	2.38#	2.06#	2.05#	1.27	1.15	1.15
	10+	1.96**	1.85**	1.87**	1.34	1.28	1.30
Medical history	chest inj./op.	1.12	1.06	1.02	0.95	0.90	0.87
	CHD	2.04	2.04	2.05	2.00	1.62	1.61
	TB	1.83*	1.87*	1.80*	1.32	1.37	1.33
	other chest	1.34	1.17	1.12	0.89	0.87	0.79
	hay fever	1.18	1.17	1.17	1.00	1.00	1.01
	rhinitis	1.35#	1.32#	1.31**	1.27**	1.26*	1.24*
	sinusitis	1.57#	1.49**	1.46**	1.60**	1.55**	1.53**
	eczema	1.26*	1.16	1.16	1.24	1.14	1.14
	skin allergies	1.34**	1.22*	1.20*	1.30**	1.21	1.19
	diabetes	1.79	1.81	1.62	1.17	1.21	1.13
	hypertension	1.83#	1.49	1.52**	1.05	0.89	0.91
	ulcer	1.90#	1.74*	1.75#	1.57#	1.46**	1.47*
GPH	good	-	-	-	5.03#	4.77#	4.77#
(ref. v.good)	poor/v.poor	-	-	-	96.87#	85.01#	83.37#
CHQ	increasing	-	1.09#	1.09#	-	1.08#	1.07#
PSS	increasing	-	-	1.00	-	-	1.00

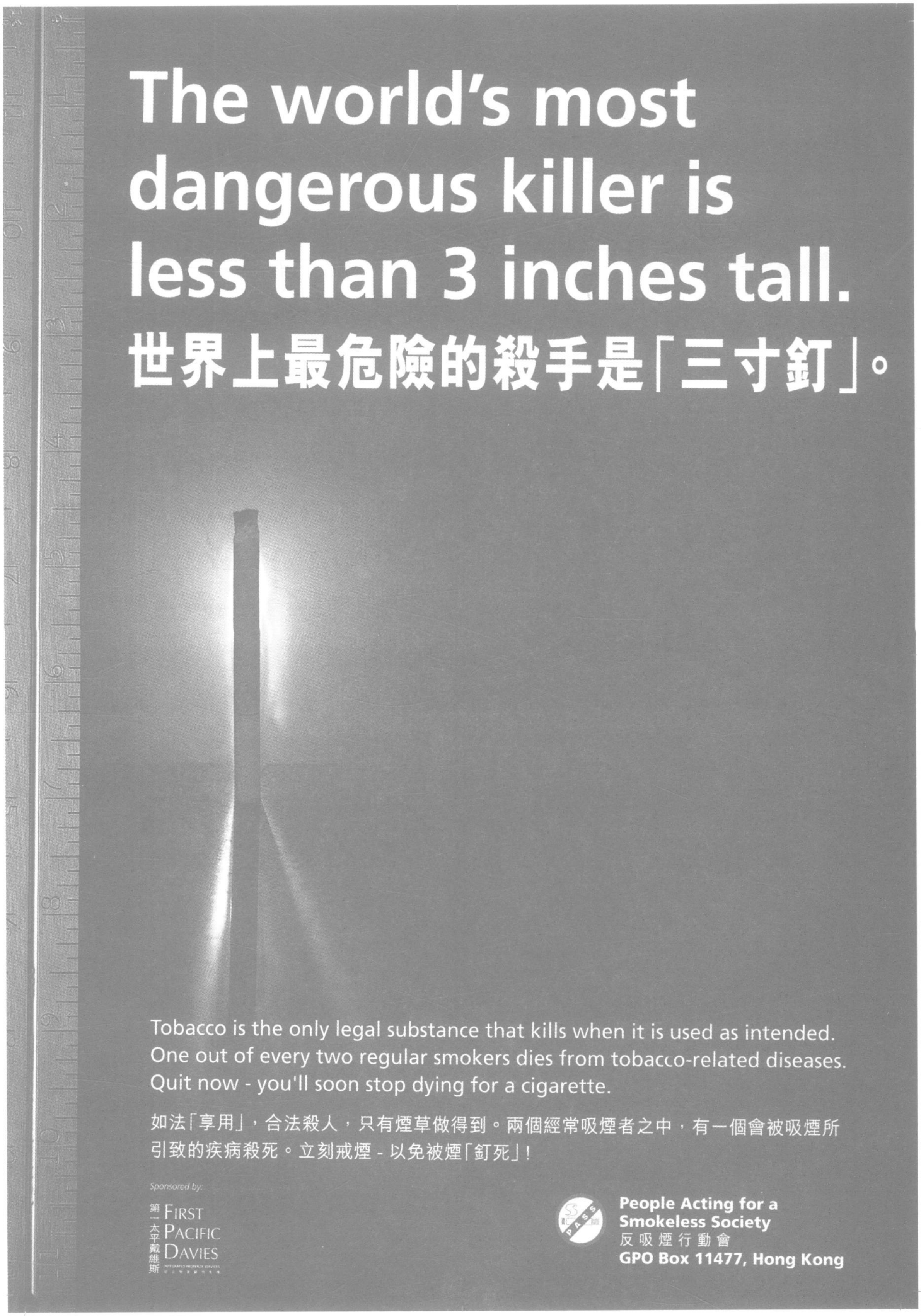




SECTION 4

Health effects of passive smoking through exposure to environmental tobacco smoke at work and at home

Lam Tai-hing
Limor Aharonson-Daniel


The world's most dangerous killer is less than 3 inches tall.
世界上最危險的殺手是「三寸釘」。
Tobacco is the only legal substance that kills when it is used as intended. One out of every two regular smokers dies from tobacco-related diseases. Quit now - you'll soon stop dying for a cigarette.
如法「享用」，合法殺人，只有煙草做得到。兩個經常吸煙者之中，有一個會被吸煙所引致的疾病殺死。立刻戒煙 - 以免被煙「釘死」！
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ABSTRACT

Background

Whereas exposure to environmental tobacco smoke (ETS) or passive smoking has been clearly shown to be a cause of ill health in studies published worldwide, no studies have been carried out in police officers. Studies in Hong Kong on ETS were mainly on children and the results consistently show that ETS is a major cause of respiratory ill health. As the smoking prevalence was known to be high in the Hong Kong police officers, and smoking in the workplace was quite common, whether ETS could be a cause of ill health was a major concern.

Setting

The Hong Kong Police Force: all the subjects who had completed the self administered questionnaire during December 1995 to January 1996.

Objectives

To describe the extent of passive smoking through ETS exposure at work and in the homes of officers and its effect on general and respiratory health.

Methods

The data on gender, age, smoking habit, ETS exposure, general health status (3 items), doctor consultation, medication, and respiratory symptoms (12 items) in the questionnaire were used. Cross-tabulations were used to compare exposure and adverse health effects. Logistic regression modelling was used to estimate odds ratios, with adjustment for potential confounding variables and other exposure variables.

Findings

- Exposure to ETS at work was more common (81%) than exposure to ETS at home (28%).
- ETS at work was strongly associated with poorer general health, doctor consultation and medication, in both non-smokers and smokers.
- Increased risks of respiratory ill health (from 30% to 140%) were associated with ETS at work.
- The trends of risks increasing with increasing amount of exposure suggested that the association was likely to be causal.
- ETS exposure at home was also associated with increases in risk (10% to 30%) of respiratory ill health, mainly in the smokers.
- The excess risks due to ETS at work were similar to those due to active smoking.
- Risks from active smoking could be under-estimated due to a *healthy smoker effect* and the cross-sectional design of the survey.

Conclusions and recommendations

- Exposure to ETS at work is involuntary and is a serious health hazard to both smokers and non-smokers.

- A total ban on smoking in the workplace is seen as an urgent and effective measure which is needed to protect all members of the force and to help smokers to quit smoking.

4.1 Background

In 1962 and 1964 the UK Royal College of Physicians[1] and the Surgeon General of the United States[2] released major reports documenting the relationship between active smoking and lung cancer. Research on passive smoking also resulted in substantive reports from the US Surgeon General in 1982 and 1986. Between 1986 and 1990 a total of seven reports from public health bodies in the US, UK, WHO/IARC and Australia were published.[3,4,5,6,7,8,9] They all supported the Surgeon General's Conclusion that

> *"involuntary smoking is a cause of disease, including lung cancer, in healthy non-smokers".*

In 1992 the US Environmental Protection Agency (EPA) published a comprehensive report on environmental tobacco smoke.[10] At this time 24 out of 30 studies showed a positive association between passive smoking and a range of different health problems.[11] The EPA classified ETS as a known human carcinogen.

An equally important report has been published in 1997 by the California Environmental Protection Agency.[12] It was, like the EPA report, also subject to extensive peer review and a round of specialist and public consultation with revision.

The latest contribution to the establishment of a causal relationship between passive smoking and health problems is presented in the British Medical Journal in October 1997.[13,14] The researchers at the Wolfson Institute of Preventive Medicine St Bartholomews and Royal London School of Medicine concluded that breathing other people's smoke is an important and preventable cause of ischaemic heart disease, which increases the passive smokers risk by 25%. They also concluded that

> *"the epidemiological and biochemical evidence on exposure to environmental tobacco smoke, with the supporting evidence of tobacco specific carcinogens in the blood and urine of non-smokers exposed to environmental tobacco smoke, provides compelling confirmation that breathing other people's tobacco smoke is a cause of lung cancer".*

From a public health perspective the issue is clear; ETS causes lung cancer, heart disease and many other serious health problems in both children and adults. It follows that all employers should take whatever action is necessary in the workplace to protect both non-smokers and smokers from exposure to passive smoking.

This view is being reflected in legislation banning smoking in public places and the move to make restaurants smoke-free. The establishment of the evidence is also reflected in legal judgements on cases where those suffering from the health effects of passive smoking are bringing law suits against the tobacco industry or employers.

Although the adverse effects of passive smoking have been replicated in many social and occupational groups worldwide there are no reported studies on the health effects of ETS in police officers.

In Hong Kong, we have found that ETS exposure poses a higher risk to respiratory health in children than ambient (outdoor) air pollution.[15] We have also found that non-smoking women in Hong Kong and mainland China exposed to ETS have higher risks of respiratory and cardiovascular health problems.[16,17]

4.2 Objectives

The objectives of this enquiry were:

(1) To describe the extent of exposure to ETS among police officers

(2) To study the effect of ETS exposure on general and respiratory health.

4.3 Methods

4.3.1 Questionnaire data

The data were derived from the answers to the relevant questions in the self-administered questionnaires and they were extracted and re-coded as appropriate, as follows:

(a) *Demographic data:* gender, age

(b) *Smoking habit:* The subjects were classified into (i) current smokers, and (ii) non-smokers. Because the proportion of ex-smokers was very small, for this particular analysis ex-smokers were also classified as non-smokers.

(c) *Exposure to ETS:* There were two main sources of exposure, (i) at home, and (ii) at work. Subjects were classified as exposed or not exposed.

(d) *General health status:* There were three questions on general health: (i) in general, (ii) in the recent three months, and (iii) today. Three categories of the answers were used: (i) very good, (ii) good, and (iii) poor or very poor. The latter was formed by pooling the very small proportion of 'very poor' together with the 'poor'.

(e) *Doctor consultation and medication:* Doctor consultation was defined as having consulted a doctor at least once during the past 14 days. Medication was defined as those who had taken some medications or treatments in the past 14 days.

(f) *Respiratory health:* 12 items of respiratory symptoms, including frequent throat problems, cough and phlegm, shortness of breath, wheezing, nose problems and chest illness.

(g) The adverse health outcomes used were poorer general health in (d), and (e) and (f) above.

4.3.2 Statistical analysis

Cross-tabulations were carried out to compare the prevalence of an adverse health outcome in the exposed subjects with the non-exposed. Logistic regression modelling was carried out to calculate the odds ratio (OR) of having an adverse outcome (such as having throat problem) which was associated with a risk factor or exposure, after adjusting for potential confounding factors (such as age and gender). The odds ratio is a measure of the degree of association or risk. An odds ratio of one means that there is no association. An odds ratio of greater than one means that there is some increase in risk (e.g. OR = 1.5 means that there is 50% excess risk).

4.4 Results

4.4.1 Descriptive information on ETS exposure for whole population

4.4.1.1 **Exposure at home:** About 28% of the officers (including both smokers and non-smokers) were exposed to passive smoking at home (Table 1). 19% were exposed to one smoker, 5% to two smokers and 3% to three or more smokers. The most common source of exposure was from parents (15%), followed by siblings (11%), spouse (5%), children (1%) and others (4%) (the sum was more than 28% as some were exposed to more than one source).

Table 4.1: Exposure to ETS at home (all subjects)

	n	valid %
no	7004	72.2
yes	2691	27.8
total	9695	100.0
missing	229	(2.3)

Note: 229 subjects with missing data were excluded (229/(229 + 9695) = 2.3%). The percentages in similar tables below were calculated in the same way.

4.4.1.2 **Exposure at work:** About 81% of the officers were exposed to ETS at work (Table 2). 28% were exposed for less than 1 hour during work, 22% for 1-2 hours, 12% to 3-4 hours and 18% for 5 hours or more. 11% had one smoker nearby at work, 17% had two, 19% had three and 33% had four or more.

Table 4.2: Exposure to ETS at work (all subjects)

	n	valid %
no	1851	19.1
yes	7848	80.9
total	9699	100.0
missing	225	(2.3)

% in table is column percent

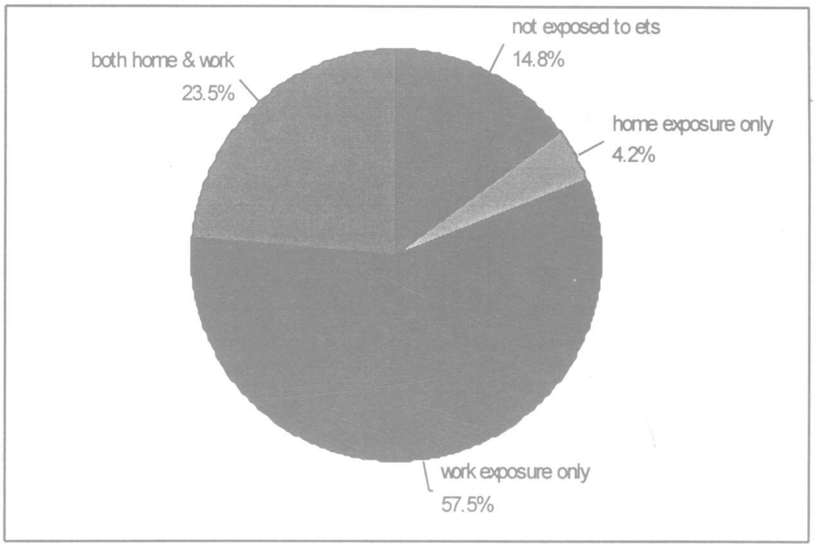
4.4.1.3 **Source of exposure to ETS at home and/or at work:** Considering the two sources together, only 15% were not exposed to ETS both at home and at work; 4% were exposed at home only; 58% were exposed at work only and 24% were exposed both at home and at work (Table 4.3 and Figure 4.1). Work exposure was the predominant source, affecting 81% of the officers. In contrast exposure at home was relatively less common and affected only 28%.

Table 4.3: Source of exposure to ETS (all subjects)

	n	valid %
not exposed to ets	1411	14.8
exposed at home only	405	4.2
exposed at work only	5485	57.5
exposed both at home and work	2243	23.5
total	9544	100.0
missing	382	(3.8)

% in table is column percent

Figure 4.1: Source of exposure to ETS for all subjects



4.4.2 ETS exposure by smoking status, age and gender

4.4.2.1 **Breakdown by current smokers:** More smokers (35%) were exposed at home than non-smokers (22%) (Table 4.4). Those with missing answers on their smoking status also had a similar proportion of exposure (23%) to that of the non-smokers.

Table 4.4: Home exposure to ETS by current smoking status

	Smoking status					
	Non-smokers		Current smokers		Missing	
Exposure	n	valid %	n	valid %	n	valid %
no	4115	77.6	2607	64.8	282	76.8
yes	1187	22.4	1418	35.2	85	23.2
Total	5302		4025		367	
missing	119	(2.2)	88	(2.1)	22	(5.7)

% in table is column percent

Overall the responses to this section of the enquiry indicate that 85% of the work force were exposed to ETS and over 80% received exposures in the workplace.

The proportion of smokers exposed at work (83%) was similar to that in non-smokers (80%) (Table 4.5). Again, those with missing answers on smoking status showed a similar proportion with exposure (80%).

Table 4.5: Work exposure to ETS by current smoking status

	Smoking status					
	Non-smokers		Current smokers		Missing	
Exposure	n	valid %	n	valid %	n	valid %
no	1071	20.2	706	17.5	74	19.9
yes	4221	79.8	3329	82.5	298	80.1
Total	5292		4035		372	
missing	130	(2.4)	78	(1.9)	17	(4.4)

% in table is column percent

Although more non-smokers (17%) reported no exposures from both sources than smokers (12%), and more smokers (30%) reported exposure at both sources than non-smokers (19%) (Table 4.6), there was relatively little variation in ETS exposures between smokers and non-smokers. The proportions for those with missing data on smoking status were similar.

Table 4.6: Source of exposure to ETS by current smoking status

	smoking status					
	non current smokers		*current smokers*		*missing*	
exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
not exposed to ets	862	16.6	493	12.4	56	15.5
exposed at home only	189	3.6	201	5.1	15	4.1
exposed at work only	3179	61.1	2083	52.4	223	61.6
exposed at both	975	18.7	1200	30.2	68	18.8
total	5205		3977		362	

% in table is column percent

missing	217	(4.0)	136	(3.3)	29	(7.4)

4.4.2.2 **Breakdown by gender:** More females (41%) were exposed at home than males (26%) (Table 4.7). This was probably due to the fact that more women were exposed to spousal smoking than men as men had a much higher prevalence of smoking than women.

Table 4.7: Home exposure to ETS by gender

	Gender					
	Female		Male		Missing	
Exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
no	516	59.2	6476	73.6	12	63.2
yes	356	40.8	2327	26.4	7	36.8
Total	872		8803		19	

% in table is column percent

missing	13	(1.5)	206	(2.3)	10	(34.5)

The proportions of subjects exposed at work were similar in females and males (80-81%) (Table 4.8). Those with missing answers for gender reported less exposure (61%). This could be due to the fact that those who did not even answer the question on gender tended to say no in answering other questions as well.

Table 4.8: Work exposure to ETS by gender

	Gender					
	Female		Male		Missing	
Exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
no	172	19.7	1672	19.0	7	38.9
yes	703	80.3	7134	81.0	11	61.1
Total	875		8806		18	

% in table is column percent

missing	10	(1.1)	204	(2.3)	11	(37.9)

More females (35%) reported exposure at both sources than males (22%) (Table 4.9). This was due to the higher proportion of exposure at home in women.

Table 4.9: Source of exposure to ETS by gender

	gender					
	male		*female*		*missing*	
exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
not exposed to ets	1286	14.8	119	13.8	6	18.5
exposed at home only	354	4.1	50	5.8	1	0
exposed at work only	5090	58.7	390	45.2	5	55.4
exposed at both	1936	22.3	303	35.2	4	26.2
total	8666		885		31	
missing	344	(3.5)	23	(2.6)	15	(48.4)

% in table is column percent

4.4.2.3 **Breakdown by gender and smoking status:** In women, more smokers were exposed at home (56%) than non-smokers (38%), and the same was true in men (35% and 20% respectively) (Table 4.10). Women reported more exposure at home than men for both non-smokers and smokers.

Table 4.10 (a): Home exposure to ETS by gender and smoking status-females

gender	**female**					
	non-smoking		**smoking**		**missing**	
exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
no	442	61.1	45	44.1	29	61.7
yes	281	38.9	57	55.9	18	38.3
total	723		102		47	
missing	10	(1.4)	1	(1.0)	2	(4.1)

% in table is column percent

Table 4.10 (b): Home exposure to ETS by gender and smoking status - males

gender	**male**					
	non-smoking		**smoking**		**missing**	
exposure	**n**	**valid %**	**n**	**valid %**	**n**	**valid %**
no	3664	80.2	2559	65.3	253	79.1
yes	904	19.8	1357	34.7	67	20.9
total	4568		3916		320	
missing	105	(2.2)	83	(2.1)	18	(5.3)

% in table is column percent

In both genders, slightly more smokers than non-smokers were exposed at work, however the difference between smokers and non-smokers was not so marked as in home exposure. Females still reported a proportionately higher rate of exposure but the differences were not statistically significant (Table 4.11).

Table 4.11: Work exposure to ETS by gender and smoking status

gender	female					
	non-smoking		smoking		missing	
exposure	n	valid %	n	valid %	n	valid %
no	144	19.9	15	14.7	13	26.5
yes	580	80.1	87	85.3	36	73.5
total	724		102		49	
missing	9	(1.2)	1		2	(4.1)

gender	male					
	non-smoking		smoking		missing	
exposure	n	valid %	n	valid %	n	valid %
no	923	20.3	688	17.5	61	18.9
yes	3634	79.7	3238	82.5	262	81.1
total	4557		3999		323	
missing	116	(2.5)	7	(1.8)	15	(4.4)

In women, more smokers (51%) reported exposure at both home and work than non-smokers (34%) and this was also true for male smokers (30%) as compared with male non-smokers (16%) (Table 4.12).

Table 4.12: Exposure to ETS by gender and smoking status

gender	female					
	non-smokers		smokers		missing	
exposure	n	%	n	%	n	%
not exposed to ets	103	14.4	9	8.7	7	14.9
exposed at home only	38	5.3	6	5.9	6	12.8
exposed at work only	333	46.6	35	34.7	22	46.8
exposed at both	240	33.6	51	50.5	12	25.5
total	714		101		47	

gender	male					
	non-smokers		smokers		missing	
exposure	n	%	n	%	n	%
not exposed to ets	755	16.8	482	12.5	49	15.8
exposed at home only	151	3.4	194	5.0	9	2,9
exposed at work only	2842	63.4	2047	52.9	201	64,3
exposed at both	734	16.4	1146	29.6	56	17.0
total	4482		3869		315	

4.4.2.4 **Age distribution by ETS exposure category and gender:** In both genders, the mean age of those not exposed to ETS at home was significantly higher than those who were exposed; younger people were more likely to be exposed to ETS (Table 4.13).

Table 4.13: Home exposure: mean age (95% confidence interval) by gender

gender		female				male			
exposure		**mean age (years)**	**95% CI**	**n**	**missing (%)**	**mean age (years)**	**95% CI**	**n**	**missing (%)**
home	no	31.0	30.2-31.7	514	2 (0.4)	34.1	33.9-34.3	6459	17 (0.3)
	yes	27.9	27.1-28.7	353	3 (0.8)	29.1	28.8-29.4	2323	4 (0.2)

The mean age of those exposed to ETS at work was significantly lower in females but was similar in males. Younger females were more likely to be exposed to ETS at work while there was no age difference between those exposed and those not exposed in males (Table 4.14).

Table 4.14: Work exposure: mean age (95% confidence interval) by gender

gender		female				male			
exposure		**mean age (years)**	**95% CI**	**n**	**missing (%)**	**mean age (years)**	**95% CI**	**n**	**missing (%)**
work	no	33.0	31.7-34.3	171	1 (0.6)	32.9	32.5-33.3	1664	8 (0.5)
	yes	29.1	28.5-29.7	699	4 (0.6)	32.7	32.5-32.9	7122	12 (0.2)

4.4.2.5 **Age by ETS exposure category and gender:** In women, those who were exposed at both sources were the youngest (mean age = 27 years). In men, the youngest group was those who were exposed at home only (mean age = 28 years). However, in both women and men, those who were not exposed were the oldest (33 years and 34 years respectively) (Table 4.15).

Table 4.15: Mean age (95% confidence interval) by exposure and gender

gender	female			male		
exposure	**mean age (years)**	**95% CI**	**n (missing)**	**mean age (years)**	**95% CI**	**n (missing)**
not exposed to ets	32.9	31.3-34.5	118 (1)	34.2	33.7-34.7	1279 (7)
exposed at home only	32.2	29.8-34.7	50 (0)	27.7	26.9-28.5	354 (0)
exposed at work only	30.4	29.5-31.3	389 (1)	33.9	33.7-34.2	5081 (9)
exposed at both	27.1	26.2-27.8	300 (3)	29.2	28.9-29.5	1933 (3)

(missing) is number, not percent

4.4.3 ETS exposure, general health, doctor consultation and medication

4.4.3.1 **Reported general health status in relation to ETS exposure:** Table 4.16 compares the prevalence (percentage) of poor or very poor general health first in non-smokers exposed or not exposed to each source of ETS, and then in the smokers.

In non-smokers, no significant differences were found between those exposed at home and those not exposed for all the 3 items of general health, although the prevalence in the exposed subjects were slightly higher. In smokers, those exposed had higher prevalence of poor general health than those not exposed (6.1% versus 4.8%, not significant for general health; 15.9% vs 11.5%, p<0.001 for health in past 3 months; 15.0% vs 11.7% for health today, p=0.008).

As for work exposure, in both non-smokers and smokers, those exposed had consistently higher prevalence of poor general health than those not exposed.

Table 4.16: Prevalence of poor general health by smoking and by sources of ETS

		ETS Home			ETS Work		
		No %	Yes %	p	No %	Yes %	p
General health*	N-sm	4.9	4.9	0.6	2.6	5.5	<0.001
	Sm	4.8	6.1	0.07	2.6	5.8	<0.001
Health, past 3 months*	N-sm	11.3	13.0	0.2	6.5	13.1	<0.001
	Sm	11.5	15.9	<0.001	7.8	14.2	<0.001
Health, today*	N-sm	11.4	12.9	0.09	6.9	13.1	<0.001
	Sm	11.7	15.0	0.008	7.0	14.2	<0.001

* Poor or very poor
N-sm = Non-smokers, Sm = Current smokers
P value was based on χ^2 test with 2 degrees of freedom
Missing data were excluded.

4.4.3.2 **Doctor consultation and medication:** No significant differences were found in the proportion of subjects with doctor consultations or taking medicine, during the past 14 days, in both smokers and non-smokers exposed or not exposed to ETS at home. However, in non-smokers and in smokers, those who were exposed to ETS at work had a higher prevalence of doctor consultations and of taking medication (Table 4.17).

Table 4.17: Prevalence of doctor consultation and medication by smoking and by source of ETS

		ETS Home			ETS Work		
		No %	Yes %	p	No %	Yes %	p
Doctor consultation in past 14 days	N-sm	27.0	27.9	0.5	22.6	28.5	<0.001
	Sm	25.1	25.3	0.9	20.0	26.3	<0.001
Medicine taken in past 14 days	N-sm	35.9	37.0	0.5	26.5	38.8	<0.001
	Sm	34.6	35.1	0.7	28.4	36.2	<0.001

Logistic regression analysis showed that ETS at work, age and gender were significant predictors for doctor consultation, whereas ETS at home and smoking status were not significant (Table 4.18). All the odds ratios in the model were adjusted for the other variables in the same model. The adjusted odds ratios (OR) of doctor consultation due to ETS at work was 1.39. This means that those who were exposed to ETS at work had a 39% excess risk of doctor consultation than those who were not exposed. The OR for age was 1.023, meaning that the risk of doctor consultation increased by 2.3% per each year increase in age. The OR for males was 0.63, indicating that men had 37% less risk of doctor consultation than women.

Table 4.18: Logistic regression model for having doctor consultation in the past 14 days

Factor	B	S.E.	P	OR	95% CI
ETS home	0.0903	0.0563	0.1	1.09	0.98-1.22
ETS work	0.3293	0.0649	<0.001	1.39	1.22-1.58
Age (per year)	0.0230	0.0030	<0.001	1.02	1.02-1.03
Gender (males)	-0.4607	0.0821	<0.001	0.63	0.54-0.74
Smoking (smokers)	-0.0345	0.0506	0.5	0.97	0.87-1.07
Constant	-1.6697	0.1007	<0.001		

9409 subjects included in the analysis.
515 subjects with missing data were excluded.

Table 4.19 shows that ETS at work, age and gender were significant factors for medication, whereas ETS at home and smoking were not significant. The adjusted OR for ETS at work was 1.64.

Table 4.19: Logistic regression model for taking medicine in the past 14 days

Factor	B	S.E.	P	OR	95% CI
ETS home	0.0784	0.0521	0.1	1.08	0.98-1.20
ETS work	0.4935	0.0603	<0.001	1.64	1.46-1.84
Age (per year)	0.0221	0.0028	<0.001	1.02	1.02-1.03
Gender (males)	-0.5805	0.0780	<0.001	0.56	0.48-0.65
Smoking (smokers)	0.0172	0.0467	0.7	1.02	0.93-1.11
Constant	-1.2172	0.0954	<0.001		

8977 subjects included in the analysis.
947 subjects with missing data were excluded.

4.4.4 **Respiratory symptoms in relation to ETS exposure:** Table 4.20 shows the prevalence of 12 items of respiratory symptoms. For ETS at home in non-smokers, significant excesses in those who were exposed were found only for the symptom of ever wheezing (10.8% in exposed vs 7.9% in the non-exposed, p=0.003) and for the symptoms of blocked or running nose (36.9% vs 32.7%, p=0.007). More significant items were found in smokers, which were throat problems, cough in the morning, or day or night, phlegm day or night, increased cough or phlegm for 3 weeks, ever wheezing, and nose problems (7 items). However, for ETS at work, highly significant excesses were found in those exposed, in both smokers and in non-smokers, for almost all the health complaints, than those who were not exposed.

Table 4.20: Prevalence of respiratory symptoms by smoking and by source of ETS

		ETS Home			ETS Work		
		No %	Yes %	p	No %	Yes %	p
1. Throat problems	N-sm	32.4	32.6	0.9	21.6	35.3	<0.001
	Sm	37.9	42.4	0.006	29.4	41.6	<0.001
2. Cough, morning	N-sm	14.5	15.6	0.4	9.6	16.2	<0.001
	Sm	26.9	31.1	0.006	19.2	30.3	<0.001
3. Cough, day or night	N-sm	14.5	15.5	0.4	9.9	15.9	<0.001
	Sm	24.3	30.0	<0.001	17.0	28.1	<0.001
4. Cough, 3 months	N-sm	4.2	3.6	0.4	2.4	4.6	0.002
	Sm	6.8	8.0	0.2	3.4	8.0	<0.001
5. Phlegm, morning	N-sm	20.0	18.8	0.4	12.7	21.6	<0.001
	Sm	36.6	39.6	0.06	29.5	39.4	<0.001
6. Phlegm, day or night	N-sm	13.7	13.0	0.6	7.8	15.1	<0.001
	Sm	26.6	30.4	0.01	19.5	29.8	<0.001
7. Phlegm, 3 months	N-sm	4.7	4.7	1.0	2.4	5.3	<0.001
	Sm	9.6	10.6	0.4	5.3	11.0	<0.001
8. Increased cough or phlegm for 3 weeks	N-sm	16.4	18.5	0.1	9.9	18.7	<0.001
	Sm	22.3	25.4	0.03	15.0	25.1	<0.001
9. Shortness of breath when hurrying	N-sm	24.1	26.8	0.06	16.8	26.9	<0.001
	Sm	33.3	34.2	0.6	25.5	35.3	<0.001
10. Wheezing, ever	N-sm	7.9	10.8	0.003	6.3	9.1	0.005
	Sm	11.1	15.1	<0.001	9.8	13.1	0.02
11. Blocked or running nose	N-sm	32.7	36.9	0.007	23.8	36.2	<0.001
	Sm	34.6	63.3	<0.001	32.4	38.9	0.001
12. Chest illness for a week	N-sm	3.6	3.2	0.6	2.8	3.7	0.2
	Sm	3.5	4.8	0.06	2.0	4.5	0.003

Subjects with missing data were excluded.
N-sm: Non-smokers; Sm: Smokers

To estimate the odds ratio of having a respiratory symptom due to exposure to ETS, logistic regression modelling was carried out for non-smokers and smokers separately. In each model, each symptom was used as the dependent variable, and age, gender, ETS at home, and ETS at work were entered as the independent variables. In non-smokers, 10 of the 12 adjusted ORs (95% confidence interval) for ETS at home (adjusted for age, gender and ETS at work) were not significantly raised (they were about 1.00, meaning that there was no association between the symptoms and ETS at home). The only two items which showed significant increases in odds ratio were shortness of breath when hurrying (OR=1.19, p<0.05) and ever had wheezing (OR=1.29, p<0.05).

In smokers, five items showed significantly increased OR, which were cough in the morning, cough day or night, phlegm in the morning, phlegm day or night, and nose problems. However, for ETS at work, almost all items showed significantly increased risks, in non-smokers and smokers. The odds ratios, ie excess risks in non-smokers were similar to those in smokers, and were all higher than those for ETS at home.

These results suggested that ETS at work were strongly associated with increased risks of respiratory health in both smokers and non-smokers, the excess risks (OR-1) for ETS at work ranged from 30% to 140%. ETS exposure at home posed lower risks than ETS at work, but excess risks were observed more consistently in smokers; the excess risks in smokers exposed to ETS at home ranged from 10% to 30%.

Table 4.21: Adjusted odds ratio of respiratory symptoms due to ETS at home or at work in non-smokers and smokers

		ETS Home		ETS Work	
		Non-sm OR (95% CI)	Sm OR (95% CI)	Non-sm OR (95% CI)	Sm OR (95% CI)
1.	Throat problems	0.99 (0.86-1.15)	1.15 (1.00-1.32)	1.98*** (1.68-2.38)	1.66*** (1.39-1.99)
2.	Cough, morning	1.06 (0.88-1.29)	1.22* (1.04-1.41)	1.79*** (1.43-2.24)	1.78*** (1.45-2.18)
3.	Cough, day or night	1.05 (0.87-1.27)	1.30*** (1.12-1.52)	1.68*** (1.35-2.10)	1.85*** (1.49-2.29)
4.	Cough, 3 months	0.82 (0.57-1.18)	1.15 (0.89-1.49)	1.89** (1.24-2.89)	2.36*** (1.54-3.62)
5.	Phlegm, morning	0.98 (0.83-1.17)	1.24** (1.08-1.43)	1.93*** (1.58-2.36)	1.50*** (1.25-1.79)
6.	Phlegm, day or night	0.98 (0.80-1.20)	1.26** (1.08-1.46)	2.13*** (1.66-2.72)	1.70*** (1.39-2.09)
7.	Phlegm, 3 months	1.02 (0.74-1.41)	1.14 (0.91-1.43)	2.35*** (1.53-3.60)	2.13*** (1.50-3.02)
8.	Increased cough or phlegm for 3 weeks	1.09 (0.91-1.31)	1.12 (0.95-1.31)	2.00*** (1.61-2.49)	1.86*** (1.49-2.33)
9.	Shortness of breath when hurrying	1.19* (1.01-1.39)	1.13 (0.98-1.31)	1.85*** (1.55-2.22)	1.56*** (1.29-1.88)
10.	Wheezing, ever	1.29* (1.03-1.63)	1.20 (0.98-1.47)	1.45** (1.10-1.91)	1.33* (1.01-1.75)
11.	Blocked or runny nose	0.99 (0.86-1.15)	1.20* (1.04-1.38)	1.77*** (1.51-2.07)	1.29** (1.08-1.54)
12.	Chest illness for a week	0.93 (0.63-1.35)	1.34 (0.96-1.88)	1.34 (0.89-2.00)	2.16** (1.24-3.76)

Subjects with missing data were excluded.
Non-sm: Non-smokers; Sm: Smokers
All odds ratios were adjusted for age, gender and the other exposure variable in the same model.
* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

4.4.5 Comparison of risks of respiratory symptoms due to active and passive smoking

Logistic regression modelling was carried out for each of the 12 items of respiratory problems for all the subjects (except for those with missing data) as the dependent variable, and smoking, ETS at home, ETS at work, age and gender as the independent variables. Table 22 shows the adjusted ORs of each item of respiratory health for active smoking, ETS at home and at work, all adjusted for age, gender and each other. Almost all of the odds ratios for smoking and ETS at work were highly significant. The excess risks ranged from 10% to 140%. The ORs for smoking appeared to be slightly greater than those for ETS at work for cough or phlegm in the morning or during the day or night. The ORs for ETS at work for more chronic symptoms appeared to be slightly greater than those for active smoking (e.g. cough for 3 months, phlegm for 3 months) but these differences could be due to chance. The ORs for ETS at work for throat problems, nose problems, increased cough or phlegm lasting for 3 weeks and chest illness were higher than those for active smoking.

Therefore, overall, the excess risks of respiratory ill-health due to ETS at work were similar to those due to active smoking. It should be noted that risk estimates due to smoking in a cross-sectional study of a healthy population as in the present study, tend to be under-estimated due to the so-called 'healthy smoker effect' which can be envisaged as a kind of 'survivor effect'. This is because only those who are healthy and can tolerate smoking will continue to smoke (the survivors), whereas those smokers who have ill-health due to smoking would have stopped smoking, or some of those who have not started smoking because of pre-existing ill-health.

ETS at work obviously posed higher risks to respiratory ill health than ETS at home, with excess risks in the former ranging from 40% to 120%, and in the latter, the excess risks were about 10% to 20%.

These results confirmed the findings in the previous analyses and showed that active smoking was the most important factor for respiratory ill-health, followed by ETS at work and then by ETS at home. Whereas smoking is voluntary and the effects of active smoking were confined to the smokers, ETS exposure at work is involuntary and was associated with similar excess risks in both non-smokers and smokers. Furthermore, smokers who were exposed to ETS would have the combined risks due to both active and passive smoking. The combined excess risks would be the mulitplicative product of each risk. These excesses risks ranged from 71% for chest illness (1.07 * 1.61, - 1.00) to 383% in phlegm for 3 months (2.22 * 2.17, - 1.00).

Table 4.22: Adjusted odds ratio of respiratory symptoms due to smoking and ETS at home and at work in the total sample

	Smoking	ETS Home	ETS Work
	OR (95% CI)	OR (95% CI)	OR (95% CI)
1. Throat problems	1.34** (1.22-1.46)	1.07 (0.97-1.19)	1.83*** (1.62-2.06)
2. Cough, morning	2.23*** (2.00-2.49)	1.15* (1.02-1.30)	1.78*** (1.54-2.08)
3. Cough, day or night	2.01*** (1.80-2.24)	1.20** (1.07-1.35)	1.77*** (1.52-2.06)
4. Cough, 3 months	1.77*** (1.46-2.15)	1.02 (0.83-1.26)	2.12*** (1.57-2.87)
5. Phlegm, morning	2.41*** (2.19-2.66)	1.13* (1.01-1.26)	1.69*** (1.48-1.93)
6. Phlegm, day or night	2.37*** (2.12-2.64)	1.15* (0.34-3.83)	1.87*** (1.60-2.19)
7. Phlegm, 3 months	2.17*** (1.83-2.58)	1.10 (0.91-1.32)	2.22*** (1.69-2.91)
8. Increased cough or phlegm for 3 weeks	1.46*** (1.31-1.63)	1.11 (0.98-1.25)	1.93*** (1.65-2.26)
9. Shortness of breath when hurrying	1.68*** (1.53-1.86)	1.15** (1.04-1.29)	1.71*** (1.50-1.95)
10. Wheezing, ever	1.37*** (1.19-1.58)	1.24** (1.07-1.45)	1.39*** (1.15-1.69)
11. Blocked or runny nose	1.11* (1.01-1.21)	1.09 (0.99-1.21)	1.54*** (1.37-1.73)
12. Chest illness for a week	1.07 (0.85-1.34)	1.13 (0.89-1.45)	1.61** (1.17-2.23)

Subjects with missing data were excluded.
All odds ratios were adjusted for age, gender and the other variables in the same model.
* $p<0.05$; ** $p<0.01$; *** $p<0.001$.

4.4.6 Respiratory symptoms and the amount of ETS exposure at work

As respiratory symptoms were found to be strongly associated with ETS exposure at work, further logistic regression analysis was carried out to examine whether the risk increased with increasing amounts of exposure. Two indicators of the amount of exposure were used: (a) the number of smoking co-workers nearby, and (b) the number of hours of exposure to second-hand smoke from co-workers each day. Because the results using both indicators were very similar, only those for the number of smoking co-workers were shown.

Table 4.23 shows that the risks for each of the symptoms increased with increasing numbers of smokers nearby, and the increasing trends were all highly statistically significant, for both non-smokers or smokers, after adjusting for age, gender and ETS at home, with few exceptions. For example, in non-smokers, the adjusted odds ratio of having throat symptoms, defined as 1.00 in those not exposed, was 1.44, 1.81, 1.92 and 2.37 in those exposed to 1, 2, 3 or 4 or more smokers respectively. In smokers, the corresponding odds ratios were 1.00, 1.47, 1.58, 1.65 and 1.79. In the total group (never-smokers plus smokers), the odds ratios, after adjusting for age, gender and smoking, were 1.00, 1.47, 1.71, 1.79 and 2.01.

The results were similar for the 7 items of symptoms of cough and phlegm, and for shortness of breath.

The only non-significant test for trend was found for nose problems in smokers (p=0.06). Although the smokers also had significant excess risks of nose problems due to ETS exposure at work, the risks appeared not to increase with increasing number of smoking co-workers.

Table 4.23: Adjusted odds ratio of respiratory symptoms due to ETS at work by number of smokers

		0 smoker OR	1 smoker OR (95% CI)	2 smokers OR (95% CI)	3 smokers OR (95% CI)	4 or more smokers OR (95% CI)	p for trend
1. Throat problems	N-sm	1.00	1.44** (1.13-1.83)	1.81*** (1.48-2.22)	1.92*** (1.58-2.34)	2.37*** (1.99-2.84)	<0.001
	Sm	1.00	1.47** (1.15-1.89)	1.58*** (1.27-1.98)	1.65*** (1.33-2.05)	1.79*** (1.47-2.18)	<0.001
	All	1.00	1.47*** (1.23-1.74)	1.71*** (1.47-1.98)	1.79*** (1.55-2.07)	2.01*** (1.83-2.38)	<0.001
2. Cough, morning	N-sm	1.00	1.80*** (1.31-2.47)	1.76*** (1.33-2.32)	1.90*** (1.45-2.49)	1.96*** (1.53-2.51)	<0.001
	Sm	1.00	1.40* (1.05-1.86)	1.57*** (1.22-2.02)	1.80*** (1.41-2.29)	2.07*** (1.66-2.57)	<0.001
	All	1.00	1.57*** (1.27-1.94)	1.65*** (1.37-1.99)	1.83*** (1.53-2.19)	2.02*** (1.71-2.38)	<0.001
3. Cough, day or night	N-sm	1.00	1.49* (1.08-2.06)	1.55** (1.18-2.05)	1.79*** (1.37-2.33)	1.95*** (1.53-2.48)	<0.001
	Sm	1.00	1.46* (1.09-1.95)	1.67*** (1.29-2.16)	1.84*** (1.43-2.36)	2.08*** (1.66-2.61)	<0.001
	All	1.00	1.47*** (1.18-1.82)	1.62*** (1.34-1.96)	1.81*** (1.51-2.17)	2.02*** (1.71-2.38)	<0.001
4. Cough, 3 months	N-sm	1.00	1.50 (0.81-2.78)	1.56 (0.92-2.65)	1.99** (1.21-3.28)	2.34*** (1.49-3.68)	<0.001
	Sm	1.00	1.75* (1.03-2.97)	1.59 (0.97-2.61)	1.91** (1.20-3.05)	2.61*** (1.71-3.97)	<0.001
	All	1.00	1.64* (1.10-2.44)	1.58* (1.10-2.27)	1.94*** (1.38-2.73)	2.49*** (1.83-3.39)	<0.001

5. Phlegm, morning	N-sm	1.00	1.37* (1.02-1.84)	1.79*** (1.41-2.29)	2.05*** (1.62-2.60)	2.18*** (1.76-2.71)	<0.001
	Sm	1.00	1.27 (0.99-1.63)	1.42** (1.14-1.78)	1.46*** (1.17-1.82)	1.70*** (1.40-2.07)	<0.001
	All	1.00	1.32** (1.09-1.60)	1.59*** (1.35-1.87)	1.71*** (1.46-2.01)	1.91*** (1.65-2.20)	<0.001
6. Phlegm, day or night	N-sm	1.00	1.46* (1.02-2.10)	2.02*** (1.50-2.73)	2.17*** (1.62-2.90)	2.67*** (2.05-3.48)	<0.001
	Sm	1.00	1.41* (1.07-1.87)	1.80*** (1.40-2.30)	1.68*** (1.32-2.14)	1.77*** (1.42-2.21)	<0.001
	All	1.00	1.44** (1.16-1.80)	1.89*** (1.57-2.29)	1.87*** (1.55-2.25)	2.11*** (1.78-2.50)	<0.001
7. Phlegm, 3 months	N-sm	1.00	1.37 (0.72-2.59)	2.02** (1.21-3.38)	2.00** (1.20-3.32)	3.36*** (2.15-5.26)	<0.001
	Sm	1.00	1.71* (1.10-2.68)	1.93** (1.29-2.88)	1.52* (1.01-2.28)	2.45*** (1.72-3.49)	<0.001
	All	1.00	1.62** (1.12-2.32)	1.98*** (1.45-2.71)	1.70*** (1.24-2.33)	2.79*** (2.11-3.68)	<0.001
8. Increased cough or phlegm for 3 weeks	N-sm	1.00	1.73*** (1.27-2.35)	1.78*** (1.36-2.32)	2.06*** (1.60-2.67)	2.40*** (1.90-3.03)	<0.001
	Sm	1.00	1.57** (1.16-2.13)	1.76*** (1.34-2.31)	1.85*** (1.42-2.41)	2.10*** (1.65-2.67)	<0.001
	All	1.00	1.65** (1.33-2.05)	1.77** (1.46-2.14)	1.96*** (1.63-2.35)	2.25*** (1.90-2.65)	<0.001
9. Shortness of breath when hurrying	N-sm	1.00	1.60*** (1.24-2.08)	1.66*** (1.32-2.07)	2.03*** (1.64-2.51)	2.01*** (1.65-2.44)	<0.001
	Sm	1.00	1.37* (1.06-1.78)	1.40** (1.11-1.77)	1.61*** (1.28-2.01)	1.65*** (1.35-2.03)	<0.001
	All	1.00	1.49*** (1.24-1.79)	1.53*** (1.30-1.80)	1.82*** (1.56-2.12)	1.83*** (1.59-2.11)	<0.001
10.Wheezing ever	N-sm	1.00	1.49* (1.01-2.19)	1.31 (0.93-1.85)	1.50* (1.08-2.08)	1.46* (1.09-1.97)	0.02
	Sm	1.00	1.14 (0.78-1.67)	1.13 (0.80-1.59)	1.29 (0.93-1.78)	1.42* (1.07-1.90)	0.01
	All	1.00	1.30 (0.99-1.70)	1.22 (0.96-1.55)	1.39** (1.10-1.75)	1.44*** (1.17-1.77)	<0.001
11. Blocked or running Nose	N-sm	1.00	1.53*** (1.21-1.93)	1.70*** (1.40-2.08)	1.74*** (1.44-2.12)	1.97*** (1.65-2.34)	<0.001
	Sm	1.00	1.34* (1.05-1.72)	1.47*** (1.17-1.83)	1.28* (1.03-1.59)	1.30** (1.07-1.58)	0.06
	All	1.00	1.45*** (1.23-1.72)	1.60*** (1.38-1.86)	1.52*** (1.32-1.76)	1.64*** (1.44-1.86)	<0.001
12. Chest illness for a week	N-sm	1.00	1.13 (0.61-2.10)	0.90 (0.51-1.58)	1.28 (0.77-2.12)	1.86** (1.20-2.87)	0.002
	Sm	1.00	2.09* (1.10-3.98)	1.41 (0.75-2.67)	2.24** (1.26-3.99)	1.68 (0.97-2.93)	0.12
	All	1.00	1.52 (0.98-2.35)	1.11 (0.73-1.68)	1.65** (1.13-2.40)	1.76** (1.25-2.48)	<0.001

Subjects with missing data were excluded.
N-smk: Non-smokers; Sm: smokers
All odds ratios were adjusted for age, gender, ETS at home, and for the total sample (all), also for smoking.

4.5 Conclusions

Exposure to ETS at work and home

- Exposure to ETS at work was very common (81%), and one third were exposed to high levels ie to four or more smoking co-workers nearby. Exposure to ETS at home was less common (28%), but when the two sources were considered together, most (85%) were exposed to ETS either at home or at work or at both sources. Women were more exposed at home (41%) than men (26%).

- Both non-smokers and smokers were similarly exposed to other people's cigarette smoke; more smokers tended to be exposed to both sources of ETS.

- In both non-smokers and smokers, those who were exposed to ETS at work had poorer general health. For ETS at home, exposed smokers showed poorer general health than non-exposed smokers. No significant differences were found between exposed and non-exposed non-smokers.

- ETS at work was associated with doctor consultation and medication within the past 14 days; the excess risks were 39% and 64% respectively. No significant association was found for doctor consultation, medication and ETS exposure at home.

Respiratory health and ETS exposure

- Respiratory ill health, including nose and throat problems, cough, phlegm, wheezing and shortness of breath, was strongly associated with ETS at work, in both smokers and non-smokers, the excess risks ranged from 30% to 140%. ETS at home was associated with relatively smaller increases in risks mainly in smokers, the excess risks ranged from 10% to 30%.

- Dose-response relationships were observed, with the risks of respiratory ill health increasing with increasing amount of ETS exposure at work, in both smokers and non-smokers. These results strongly suggest that the association between ETS at work and respiratory ill health was likely to be causal.

- Comparing the three risk factors for respiratory ill health, active smoking was associated with high excess risks, and the risks due to ETS at work were almost as high, whereas ETS at home was associated with a small excess risk. It should be noted that the risks observed in current smokers could be under-estimates due to the "healthy smoker effect". Active smoking is voluntary and is a serious health threat to the smokers. Exposure to ETS at work is involuntary and is a serious health threat to the non-smokers, as well as the smokers.

- The evidence obtained from this survey clearly shows that exposure to ETS is likely to be responsible for many cases of cancer and heart disease in members of the force in the future.

4.6 Recommendations

- The severity of the exposure to ETS at work suggests that the police officers are working in a very hazardous environment. A total ban of smoking in the workplaces will protect everyone from second-hand smoking and will encourage the smokers to reduce and quit smoking. It is the most urgent and effective measure which is needed to solve the problem of ETS exposure at work. A partial ban, by allowing smoking in designated smoking room, would only reduce exposure if separate ventilation is provided in the smoking room. The latter is technically difficult and expensive to implement.

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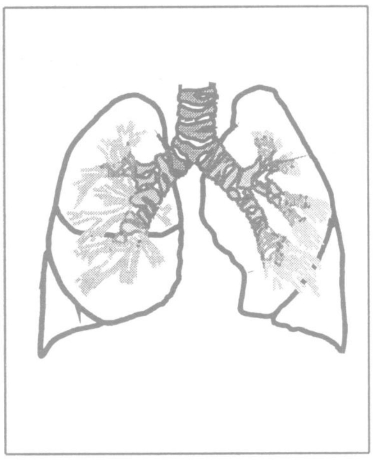

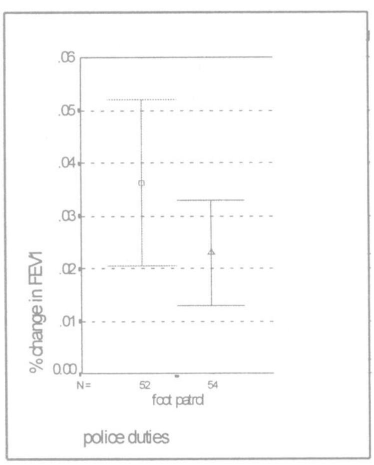

SECTION 5

Factors affecting lung function measurements in Traffic, Foot Patrol and Marine officers

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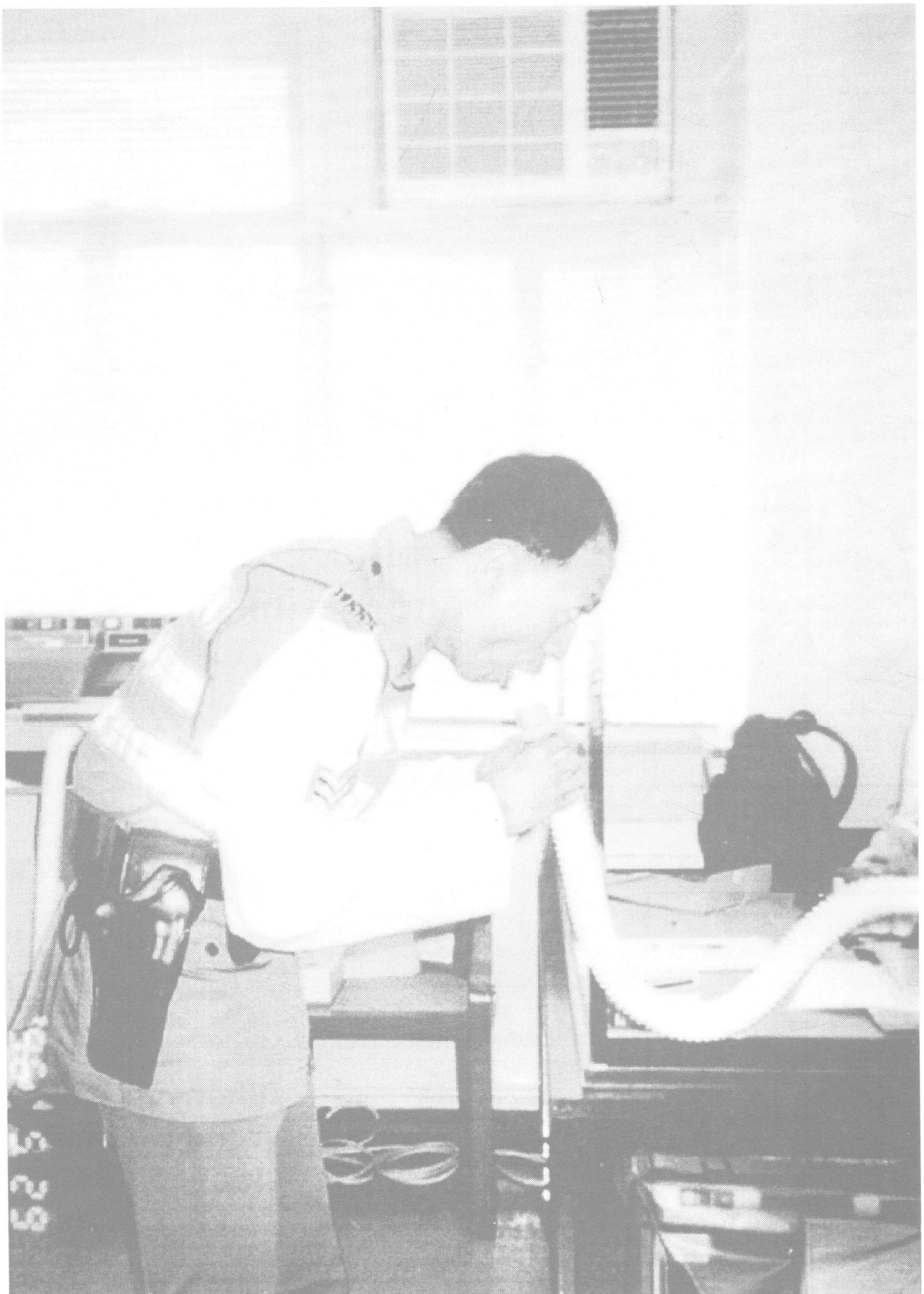


ABSTRACT

Background: Exposure to mixed pollutants in traffic congested urban conurbations has been related to respiratory symptoms in both children and adults. In addition to symptoms there is some evidence that acute changes in lung function occur during and following exposure to ambient pollution in urban areas. Excess hospital admissions and excess mortality risks are also associated with pollution episodes in urban environments.

Subjects and methods: Traffic and Foot Patrol officers undertaking routine shift work in Hong Kong Island, New Territories South, Kowloon East, Kowloon West and the Aberdeen division of Marine police took part in pre- and post-shift lung function testing over periods of up to two weeks. A total of 530 officers were tested. Expired air carbon monoxide, peak expiratory flow rates *(Miniwright peak flow meter)* and lung volumes (Forced expiratory volume in 1 second [FEV_1] and Forced Vital Capacity [FVC]) *(Vitalograph)* were measured. Smoking and respiratory symptom histories were obtained at the time of testing.

Officers from New Territories South and Kowloon West who showed a post-shift drop in PEFR and FEV_1 were selected for a pilot three week randomised controlled trial of a face mask with filters designed principally for particulate exclusion and gaseous exclusion and a placebo. Officers in the trial kept a record of peak flow measurements (five) throughout the day, together with smoking histories, ETS exposure and symptoms. Data on ambient air pollution during the period of the trial was obtained from the Hong Kong Environmental Protection Department and used in modelling of the trial results.

Findings: The smoking histories of officers were validated by the expired air carbon monoxide levels which were uniformly within normal limits for all non-smokers and high in over 90% of all declared smokers. Respiratory symptoms of cough, phlegm and wheeze were strongly associated with smoking (odds ratio 3.0).

All groups of officers (Traffic, Foot Patrol and Marine) showed post-shift falls in peak flow rates, FEV_1 and FVC. The proportional fall in FEV_1, standardised for initial pre-shift values, was greatest in Foot Patrol officers. Values for Traffic and Marine were similar. Within each group the observed post-shift fall was consistently higher in non-smokers than in smokers. In Traffic and Foot Patrol officers, after adjustment for age, height and smoking, the strongest predictor of a post-shift FEV_1 drop was type of police duties (Foot Patrol) ($p=0.0007$) with a greater effect also observed in older officers ($p=0.019$). None of the other variables were significant predictors of post-shift FEV_1 change.

In the mask trial there were many practical problems with the wearing of masks throughout the shift. Complaints of discomfort, interference with communication and of an adverse public image were predominant. Taller officers and non-smokers were more comfortable wearing masks. In officers taking part in the trial the presence of any post-shift symptoms was associated with smoking ($p=0.025$). The predictors of post-shift peak flow rate were age, pre-shift symptoms and ambient temperature. In comparison to the dummy filter the *Sportsta* filter (particulate exclusion) was associated with a reduction in post-shift symptoms ($p=0.071$) and wearing the *City* filter (gaseous exclusion) was associated with a higher post-shift peak flow ($p=0.028$).

Conclusions

- Exposures to ambient pollutant levels during routine outdoor shift work are associated with a decline in peak expiratory flow rates (PEFR) and lung volumes (FEV_1 and FVC) as measured by standard peak flow meters and spirometry.
- There was wide dispersion of the observed values for post-shift FEV_1 differences. Further analysis of the data may help to identify the most vulnerable officers.
- The pattern of test results suggests that restoration of lung function, following these acute adverse effects, takes place between shifts.

- These post-shift changes were seen in all groups of officers but the proportional pre-post shift changes in FEV_1 were up to two times greater, in Foot Patrol than in Traffic officers and in non-smokers than in smokers. The findings suggest that Foot Patrol officers, spending long periods of the shift at the kerbside in close proximity to slow moving or stationary vehicles, have high exposures to exhaust gases and particulates with a significant effect on lung function by the end of the shift

- The inference which can also be drawn from these findings is that smoking before and during a shift had induced major changes in airways' resistance which reduced peak expiratory flow rate and FEV_1. Any additional changes induced by air pollution would be small by comparison, but nevertheless they were measureable.

- The studies on lung function have several limitations. No personal monitoring of NO_x and RSP exposures was carried out because of resource and logistical constraints. This could be done in future studies to determine whether variations in lung function are directly related to measured personal exposures. Closer monitoring in the survey and field studies would have achieved better quality data collection; problems identified in this enquiry should be taken into account in the management of any future studies.

- A pilot randomised controlled trial showed some apparent protective effect against post-shift symptoms (*Respro Sportsta* particulate exclusion filter) and improved post-shift peak flow (*Respro City* gaseous exclusion filter).

- Mask wearing was perceived to be uncomfortable and inconvenient by many officers. Older officers showed greater compliance with mask wearing and this group also had a relatively greater benefit from the trial in terms of higher post-shift peak flow rates.

- Overall the findings in the lung function test group and the pilot RCT suggest that some officers would benefit by having masks available for use when working in heavily polluted areas. Those who would benefit most include old officers, non-smokers, Foot Patrol officers and others working alongside stationary or slow moving columns of traffic, at intersections, vehicle testing stations and other venues where heavy pulses of exhaust pollutants are likely to arise.

- The selection and fitting of masks for individual officers and detailed discussions on their use and possible benefits would be important factors in the success of any future mask wearing programmes. A larger scale trial of masks would probably contribute more useful information on the utility and protective health benefits of masks for police officers.

- Overall, ambient air pollution is a hazard for officers working in urban areas of Hong Kong. The magnitude of the risk appears to be related to type of duties and probably to time spent in close proximity to slow moving vehicles.

Recommendations

- Three measures would help to protect the respiratory health of officers on duty in Kong Kong streets and other environs.

    * Avoidance, as far as this is possible, of prolonged unprotected exposure to high levels of vehicular exhaust gases.

    * Reduction of pollutants in vehicular exhaust, reduction of idling time and slow moving traffic.

    * Protection based on particulate and/or gaseous exclusion masks for officers on selected duties.

    * Prevention of smoking before and during shift work.

5.1 Background

5.1.1 Adverse health effects of ambient air pollution

The field studies of officers' lung function before and after routine shift work were carried out to determine whether there were acute effects of this type of environmental exposure which could be measured in individuals with normal lung function.

Relatively few studies have been mounted to study the impact of ambient air pollution on the health of police engaged in traffic work and other duties. Other groups working in close proximity to vehicular exhausts have also been studied.

In 1973 Speizer and Ferris[1] studied the health of police exposed to automobile exhaust and others working in mainly indoor environments. They found a trend for increasing years of exposure to traffic environments to be associated with higher symptom prevalence. Lui et al (1994)[2] in Guangzhou concluded that traffic officers' health was lower than other comparison groups. In traffic wardens in Milan and traffic police in Cairo exposure to traffic pollution is associated with raised blood lead levels and impaired nerve conduction times. Shilling and Brackbill (1987)[3] reported that police along with fire fighters and farmers, out of a broad spectrum of other workers, reported the greatest proportions with perceived exposure to occupational risk, from vehicles, in terms of chemicals, noise and injury.

Bridge and tunnel workers examined by Evans et al (1988)[4] showed evidence of adverse effects on pulmonary function and increased respiratory symptoms from chronic exposure. Studies of traffic toll booth workers in Malaysia (Yaziz 1992)[5] showed that they are continuously exposed to high levels of CO, SPM, Pb and NO_2 during an 8 hour shift.

Diesel bus garage workers who were assessed by pre and post shift spirometry showed no significant reductions in FEV_1 and FVC (Gamble et al 1987).[6] However measured exposures to NO_2 and respirable particles were associated with symptoms of cough, itching, burning or watering eyes, difficult or laboured breathing, chest tightness and wheezing. Those who had work related symptoms generally had a slightly greater mean reduction in FEV_1 and FEF than those who were symptom free, but the differences were not statistically significant.

Ulfvarson and Alexandersson (1990)[7] showed that in stevedores exposed to truck exhausts, those who were exposed to diesels fitted with filters the average decline in FVC over the work shift was reduced by 50-60% compared to the group exposed to unfiltered diesel.

Tollerud et al (1983)[8] did not find a clear relationship between exposures in toll booth workers and lung function but the numbers in their sample were small. However in this group smoking was strongly associated with symptoms of cough and phlegm.

Exposure to outdoor air pollution from NO_2 in Tokyo, estimated by personnel and indoor monitors showed a gradient in symptoms of cough, phlegm, wheeze and shortness of breath between three zones with higher or lower pollution but no consistent differences in FEV_1 and FVC (Maeda et al 1991).[9]

Pollutants at street level may be very much higher than the estimated ambient or background levels for a whole area. Laxen and Noordally (1987)[10] described NO_2 levels in "canyon-like" streets in London using passive diffusion samplers. A steady decline in concentrations was found with increasing height above street level so that at 20m above the levels were similar to background. Concentrations were 10-15% higher closer to traffic lights than they were 60m upstream.

5.1.2 Use of FEV_1 as a measure of lung disease

FEV_1 is a useful screening procedure and in cohort follow-up studies, reduction in FEV_1 in adults has been shown to be a predictor of later mortality.

Subjects with asthma have variable airway narrowing which may be partially or largely reversed by inhaled bronchodilator drugs.

The limitation of using FEV_1 is that the test does not necessarily reflect airway narrowing in more peripheral airways so that fairly extensive changes may develop in the lung in this so-called "silent-zone" before it is recognised by these conventional tests. Even when the FEV_1 becomes abnormal the subjects may not admit to shortness of breath on exertion until FEV_1 is only 50% or less of the predicted value for age and height. By the time this happens exposures to a risk factor, such as smoking or other occupational health risks may have been going on, with gradual development of the lung damage, for over 20 years.

Cigarette smoking induces an acute response in physiological measurements of lung function. In Table 5.1 the ratio of several post-smoking lung function variables are shown for both filtered and unfiltered cigarettes (Da Silva and Hamosh 1980).[11] Airways resistance increased and there were small reductions in both FVC and FEV_1.

Table 5. 1 : The ratio of several pre to post-smoking lung function tests for both filtered and unfiltered cigarettes

Measure	Filtered	Unfiltered
Airways resistance	1.27*	1.22*
FVC	0.988	0.988
FEV_1	0.992	0.990

*p<0.01

The long term effects of smoking on FEV_1 have been demonstrated in several studies (O'Brien and Drizd 1981[12]; Dockery et al 1988[13]). Whereas normal non-smoking subjects experience a decline in FEV_1 of 30-40 ml/year this is greater in smokers and higher still in those who develop symptomatic airflow obstruction. Dockery et al estimated an additional loss of FEV_1 of 7.4 mls per pack year smoked.

Several studies have documented effects of long term exposure to ambient air pollution on the outcome of FEV_1 and FVC testing. For example in 965, residents of eight different areas of Switzerland, consistent effects on FVC and FEV_1 were found for NO_2, SO_2 and PM_{10} (<10µm). PM_{10} showed the most consistent effect with a reduction of FVC by 3.4% per 10µm/m^3 (Ackerman-Liebrich et al 1997).[14]

5.2 Objectives

To estimate the acute effects of routine outdoor shift work on physiological parameters of lung function in Traffic and Foot Patrol police.

5.3 Methods for the lung function studies

5.3.1 Sampling, numbers recruited and questionnaire data

Sample: The officers were identified from the establishment lists of officers deployed on shifts in Hong Kong Island/Happy Valley (HKI) Enforcement and Control (E&C) and Foot Patrol Subunits (FPS), Kowloon West/Mongkok E&C and FPS; and Kowloon East/Kwun Tong (KE) E&C and FPS. Marine officers based at Aberdeen Headquarters were also tested. A total of 422 officers were tested from these regions/formations, including two samples from Kowloon West (KW96 and KW97). Only KW97 has been used in the final analysis of lung function based on statistical modelling, in 296 officers from HKI, KE and KW.

In addition pilot studies on peak flow rates, spirometry and measurement of expired air carbon monoxide were made in a total of 110 officers in New Territories South.

Officers were lost from the designated sample if they were on sick leave, on routine leave or changed shift. Some officers did not complete the pre-test or return for the post-shift test and so did not contribute to the estimates of pre-post shift differences. Problems with liaison also resulted in loss and this led to relatively few Foot Patrol officers being tested in Kowloon West (Table 5.2).

Table 5.2: Distribution of traffic and foot patrol officers between KE, KW and HKI

Type of police duties	Count Row percent Column percent	KE	KW	HKI	Row total
Traffic	n row % column %	67 35.4 56.8	48 25.4 81.4	74 39.2 62.2	189 63.9
Foot patrol	n row % column %	51 47.7 43.2	11 10.3 18.6	45 42.0 37.8	107 36.1
Total		118 39.9	59 19.9	119 40.2	296 100.0

Questionnaire data: The proportion of officers who stated that they had completed the main health survey questionnaire was high, averaging over 93%. However matching their UI numbers and field survey record to the main survey data set showed that many could not be linked (Table 5.3). This was probably due to incorrect UI numbers as well as missing numbers. We attempted to repeat the main survey enquiries in this group to provide data specifically for this stage of the survey. However these new records were not merged with the main survey file because many were likely to be duplicates.

Table 5.3: Problems with matching field survey records to the main survey file

	n	Reported to have questionnaire		Questionnaire matched	
		n	%	n	%
HKI	119	111	93.3	110	92.4
KE	118	113	95.8	72	61.0
KW	60	55	93.0	43	71.3
Total	297	279		225	

Characteristics of officers in field studies

Age: The mean age was 31.2. The distribution of ages in KE, KW and HKI regions were similar but marine officers were significantly older (Table 5.4) The officers who participated in the field studies tended to be younger than the larger group in the main survey reflecting the predominance of lower ranks.

Table 5.4: Age of Traffic and Foot Patrol officers in HKI, KE and KW; and Marine (Aberdeen) officers

Age	Subjects of lung function tests			Subjects in main health survey		
	n	Mean	95% CI	n	Mean	95% CI
HKI	120	31 3	29.7-32.8	1825	31.8	31.4-32.2
KW96	100	31.1	30.0-32.3	1761	31.6	31.2-32.0
KW97	59	32.2	30.3-34.0	"	"	"
KE	118	30.5	29.3-31.8	1226	31.2	30.8-31.7
Marine	126	37.0	35.7-38.3	1913	37.2	36.7-37.5

Marine officers were older than those in the three Foot Patrol/Traffic regions which had a similar age distribution.

Height: The mean height in HKI, KE and KW was 171.7 cm with similar distributions across these three groups. Marine officers tended to be shorter (170.7; 95% CI 170.0-171.4) but the differences between means were not significant (Table 5.5).

Table 5.5: Height

	Mean	95% CI	n	Missing
HKI	172.2	171.3-173.0	119	0
KE	171.3	170.3-172.3	118	0
KW	171.7	170.2-173.3	59	1
Marine	170.7	170.0-171.4	126	0

Comparison of means not significant.

Smoking: Data on current smoking were available for 417 with 6 records missing (Table 5.6). Current smoking prevalence was about 47%-54% in HKI, KE and KW and lower at 36.0% in Marine. The declared prevalence of current and ex-smokers was higher in the lung function studies group than in the main health survey (Table 5.7). In general both the age range and ranks of officers in the field work sample were lower than in the main survey.

Figure 5.1: Lung function testing in New Territories South

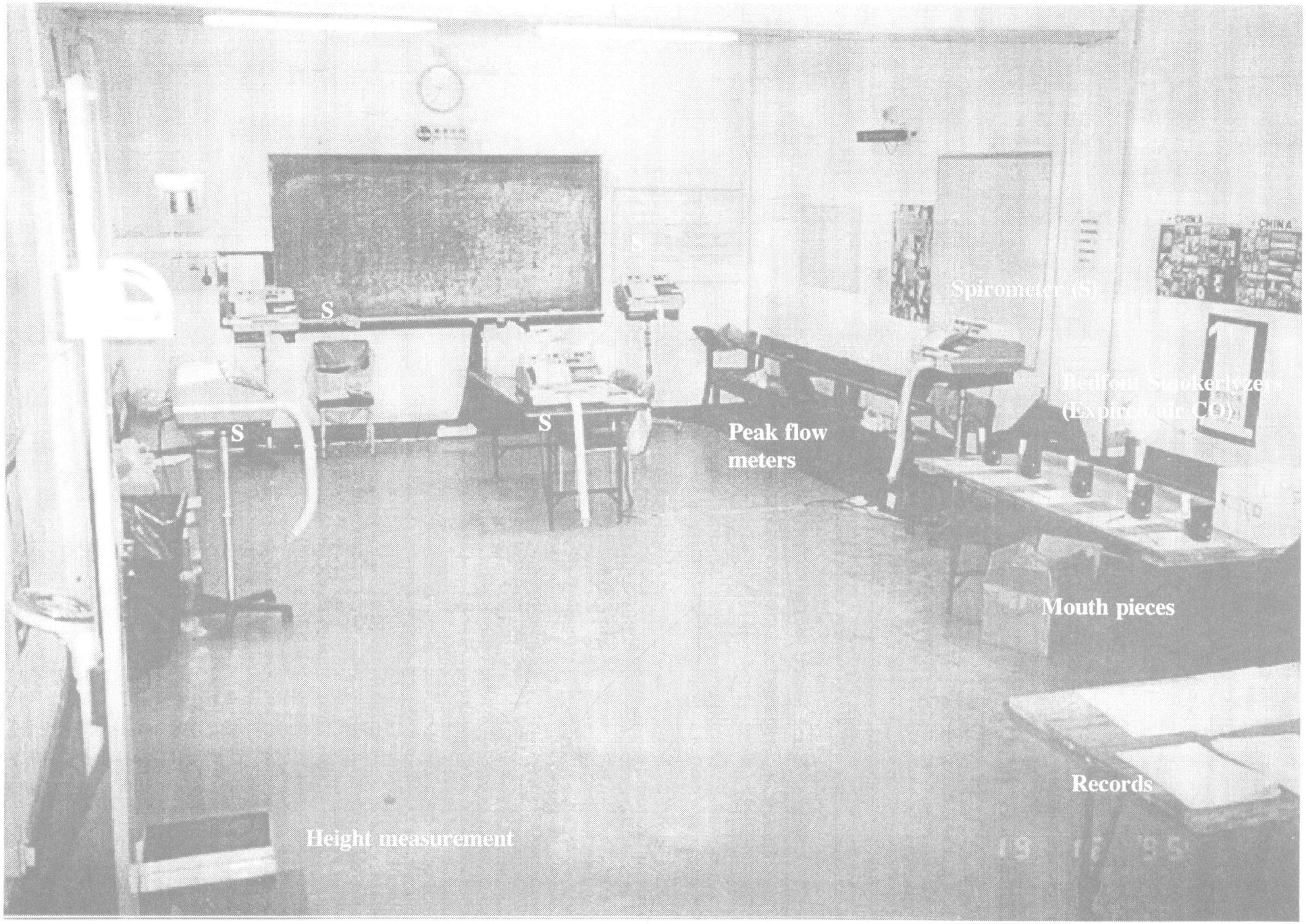


Table 5.6: Smoking in HKI, KE, KW and Marine

	Smokers		Non-smokers		Total	Missing
	n	%	n	%	n	n
HKI	58	50.4	57	49.6	119	4
KE	55	46.6	63	53.4	118	0
KW	28	47.5	31	52.5	59	0
Marine	45	36.0	80	64.0	126	1

The χ^2 statistic for smoking by region was not significant.

Table 5.7: Smokers and ex-smokers in regions/formations in the lung function field work studies compared with the main health survey

	Field work studies				Main health survey			
	Smokers		Ex-smokers*		Smokers		Ex-smokers	
	n	%	n	%	n	%	n	%
HKI	59	51.0	10	8.8	825	45.8	36	2.3
KE	35	46.6	18	15.5	590	48.4	51	3.1
KW96	54	54.0	-	-	777	44.9	36	2.3
KW97	28	47.5	8	14.8	"	"	"	"
Marine	45	35.7	10	13.3	649	34.8	30	2.7

5.3.3 Lung function and other tests in police officers

Lung function measuring stations equipped with *Mini Wright* Peak Flow Meters and *Vitalograph* Spirometers were set up in each region or formation where testing was carried out. A typical set up is shown in Figure 5.1.

A short questionnaire was completed before and after a shift to document the presence of symptoms, smoking pattern, time spent outdoors and exposure to ETS. Information on smoking and symptoms was generally complete and considered to be reliable but information on time outdoors and ETS exposure in this sample was less complete.

Expired air carbon monoxide: Expired air carbon monoxide levels (ppm) were estimated using a hand held Bedfont Micro II Smokerlyzer. Carbon monoxide from cigarette smoke or ambient air pollution passes through the lungs and in the circulation where it dissolves in plasma and combines with haemoglobin to form carboxyhaemoglobin. A sample of 110 officers in New Territories South provided samples of expired air, before and after shift work, using a hand held carbon monoxide analyzer based on an electrochemical cell. This provides a specific measurement of carbon monoxide in expired air. It is sufficiently sensitive to detect CO in the breath of smokers and distinguish them from non-smokers. It would not normally be used to detect variations in expired CO arising from exposures to CO in ambient air. The expired air CO levels were recorded as parts per million.

Peak expiratory flow rate: The peak flow rate (PEFR) (litres/min) is an effort dependent measure of large airway integrity produce by blowing hard through a flow meter after full inspiration. In subjects with either acute (eg asthma) or chronic airflow obstruction [e.g. chronic obstructive pulmonary disease (bronchitis and emphysema)] we find a marked reduction in PEFR. The peak flow rate is simple, reliable and convenient to use in the field. The hand held Wright (Mini Wright) meter was used for all survey measurements. Officers were taught how to use the meter, reset it and produce five consecutive measurements. The best (maximum peak flow observed) was used as the subject's measurement on each occasion.

Spirometry: Changes in the bellows function of the lung can be used to measure the impact of exposures to external irritants, allergens, or the effect of intrinsic diseases including acute and chronic lung disease. The spirometer directly measures lung volumes and can also provide indirect estimates of air flows. Measurement of a single forced expiration is a standard test which in normal subjects demonstrates that 80% of the Forced Vital Capacity (FVC) (near total volume) is exhaled in 1 second. This is referred to as the Forced Expiratory Volume in one second (FEV_1). In *obstructive* lung disease the measured FVC is reduced because the airways close and limit full expiration before the subject has completed the breathing out manoeuvre. The FEV_1 is markedly reduced because of the marked airways resistance which slows the rate of expiration. Factors which cause *restrictive* lung disease such as musculo skeletal problems or fibrotic changes in the lung lead to reduction in FVC because of limited expansion of the chest wall or lung.

The forced expiratory volume in one second FEV_1 was used in this analysis as the possible indicator of the acute effect of pollution on lung function during routine shift work.

The proportional change in FEV_1 was calculated as

$$\frac{\text{Pre-shift } FEV_1 - \text{Post-shift } FEV_1}{\text{Pre-shift } FEV_1}$$

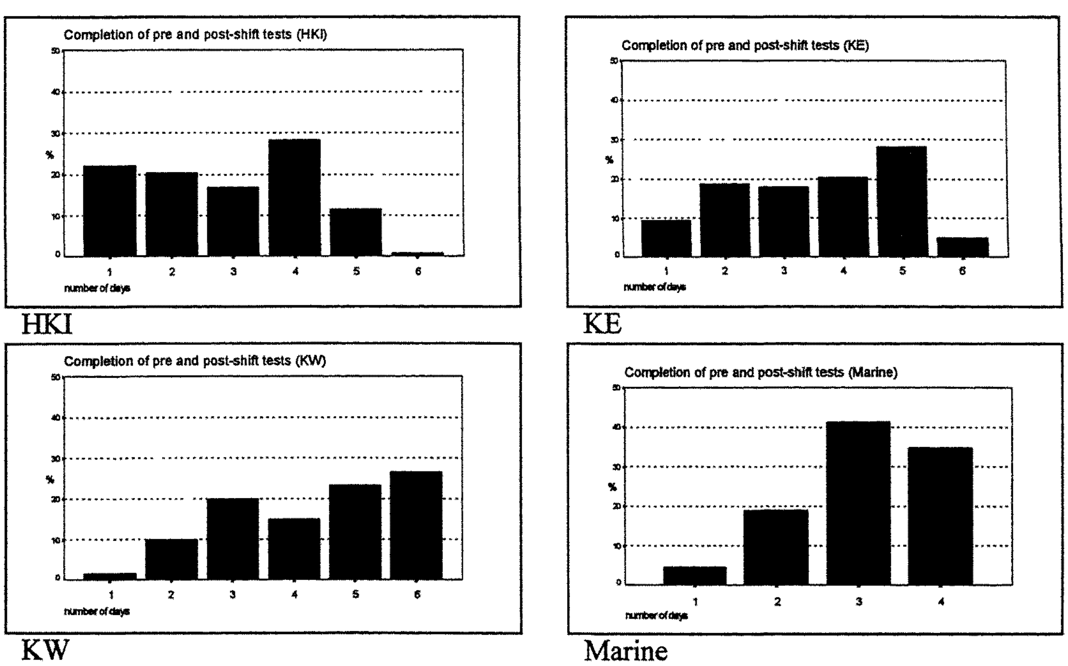
So that a post-shift drop is recorded as a positive value in tables and graphs.

5.3.4 Completion of pre- and post-shift tests

The completeness of pre- and post-shift testing and the total number of days for which individual subjects were tested varied between regions. On some occasions the post-shift test was not carried out; on others the pre-shift test was omitted.

Hong Kong Island/Happy Valley and Kowloon East had a relatively poorer performance in completing both shift tests between days 4-6, while the opposite pattern was seen in Kowloon West (Figure 5.2).

Figure 5.2: Number of days on which both pre- and post-shift tests were completed by region/formation



5.4 Results

5.4.1 Factors associated with respiratory symptoms in officers participating in lung function tests

During preparation for the pre-shift lung function tests on each day of testing, officers were asked about the presence of respiratory symptoms and records compiled for complaints of cough and/or production of phlegm on any day.

The dependent variable was defined either as (a) cough and/or phlegm on day 1 of testing, or (b) on any day of testing.

The effects of current smoking, age, height, police type (duties) and absolute FEV_1 pre-post shift difference were examined in logistic regression models. Only two independent variables current smoking and height predicted the presence of respiratory symptoms. The results were similar with any of the definitions of respiratory symptoms. The data for the model based on "cough and/or phlegm on any day of testing are shown in Tables 5.8 and 5.9).

The odds ratios showed that excess risk (calculated by OR-1 multiple by 100%) for symptoms associated with smoking was about 200% in this sample of officers. Shorter officers tended to have more symptoms but the protective effect of height was only about 5%.

The point estimate for the effect of environmental tobacco smoke was 1.37 (i.e. about 40% excess risk) but there were many missing data for this variable in the field work studies. Reference should be made to Section 4 for data on ETS from the main health survey.

Table 5.8: Whole population with police type (duties) (P_TYPE) as independent variable

Variable	B	S.E.	p	OR	95% CI
AGE	0.2048	0.0230	0.2818	1.0251	1.17-1.28
HEIGHT	-0.0633	0.298	0.0337	0.9387	0.52-1.68
FEVIDIFF	-1.3668	1.1920	0.2515	0.2549	0.02-2.64
ETSWORK(1)	-0.3208	0.4362	0.4621	1.3782	0.31-1.71
SMOKER(1)	1.1137	0.3403	0.0011	**3.0455**	1.56-5.93
P_TYPE	0.4478	0.3836	0.2430	1.5649	0.74-3.32
Constant	11.2588	5.3044	.0338		

Table 5.9: Estimation of risk for symptoms on any day: Whole group of officers in field studies, with pre-shift mean peak flow rate (PREMEAN) as independent variable

Variable	B	S.E.	p	OR	95% CI
SMOKER(1)	1.1765	0.2855	0.0000	**3.2430**	1.85-5.68
AGE	0.0092	0.0186	0.6217	1.0092	0.97-1.05
HEIGHT	-0.0526	0.0253	0.0374	0.9488	0.90-1.00
FEVIDIFF	-0.7648	0.9386	0.4152	0.4654	0.07-2.93
PREMEAN	-0.0027	0.0020	0.1753	0.9973	0.99-1.00
Constant	11.2602	4.4277	0.0110		

Notes: FEVIDIFF = Difference between pre- and post-shift FEV_1

5.4.2 **Expired air carbon monoxide in traffic police officers**

New Territories South, Enforcement and Control, Patrol Subunit's and Taskforce
This pilot study was carried out to examine the feasibility of working in regional police stations with lung function testing equipment and to complete basic operational studies of testing officers who were joining and leaving shifts. The exercise was also used to validate declared smoking histories of officers participating in lung function studies.

The studies covered

A shift	0700 - 1500	54
M shift	1200 - 2000	4
B shift	1500 - 2300	52
Total		110

Both pre- and post-shift measurements were made in 55 smokers and 24 non-smokers.

The pre-shift readings on shift A ranged from 0-45 ppm and 5-35 ppm on shift B (rounded to nearest 5).

None of the non-smoker CO levels exceeded 10 ppm in pre- or post-shift measurements whereas 50/55 of the smokers values were greater than 10 ppm on both occasions (Figures 5.3a & 5.3b).

The results indicate that the declared history of smoking was valid and both sensitive and specific, so that misclassification of smokers as non-smokers was unlikely to occur.

The expired air CO levels clearly show that a minimum of 90% of the smokers had smoked at least one cigarette before coming to the pre-shift lung function testing session and only 5 (9%) out of 55 had a pre-shift level less than 10 ppm. 35% of the smokers had high pre-shift levels (>20 ppm).

These findings are relevant to the interpretation of lung function testing field studies in Kowloon East, West and Hong Kong Island.

Figure 5.3 a: CO reading, pre-shift and post-shift for smokers

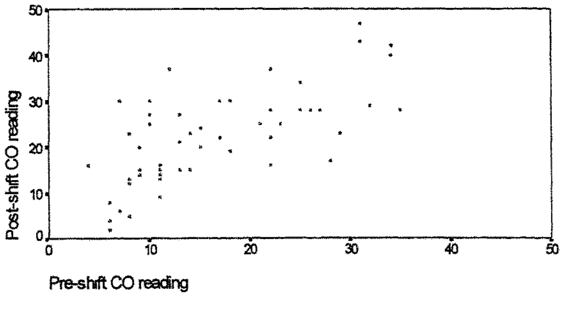
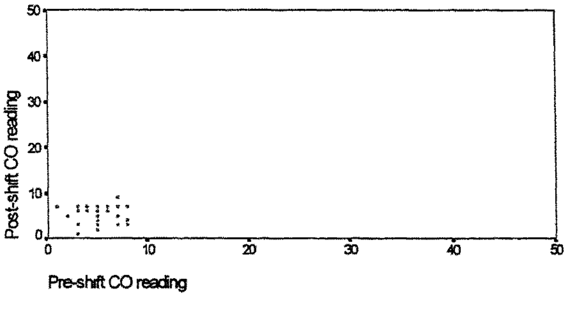


Figure 5.3 b: CO reading, pre-shift and post-shift for non-smokers



5.4.3 **Pre-shift values for peak flow and FEV_1 of traffic police**

5.4.3.1 **Pre-shift PEFR:** Marine officers showed the greatest variation and their estimated mean value was lower at 540 L/min than the range of means in the other regions/formations (569.3-577.3 L/min). These differences were not significant (Table 5.10).

Table 5.10: Mean pre-shift PEFR

	Mean	95% CI	n	Missing
KE	577.3	563.6-591.0	118	0
KW	569.3	551.9-586.8	59	1
HKI	577.3	564.0-590.5	118	0
Marine	556.1	540.1-571.3	126	0

Difference between means not significant.

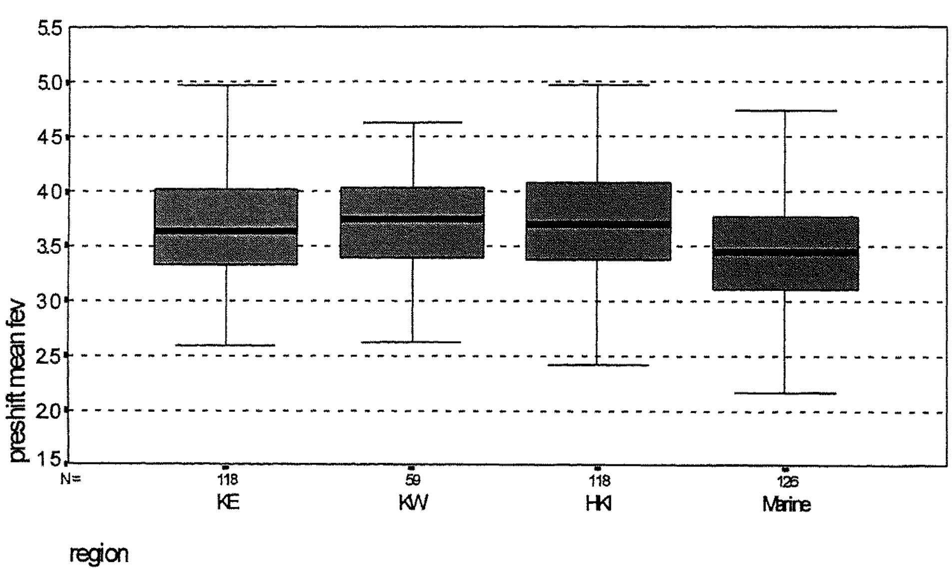
5.4.3.2 **Pre-shift FEV_1:** Comparison of means showed significant differences between groups. Marine pre-shift mean FEV_1 (3.45 L) was significantly lower than KE, KW and HKI (3.66-3.71 L/min) (Table 5.11).

Table 5.11: Mean pre-shift FEV_1

	Mean	95% CI	n	Missing
KE	3.66	3.57-3.75	118	0
KW	3.68	3.55-3.82	59	1
HKI	3.71	3.61-3.81	118	0
Marine	3.45	3.36-3.55	126	0

These values are unadjusted for height and age. The medians, interquartile ranges and overall ranges for pre-shift FEV_1 are shown in Figure 5.4.

Figure 5.4: Median, interquartile range and overall range for pre-shift FEV_1



5.4.3.3 **Pre- and post-shift differences in peak flow rates (PEFR):** The pattern of pre/post shift changes in WPEF can be illustrated by the data from HKI, Kowloon East and Kowloon West. Percentiles were calculated for the Day 1 pre-shift values; these were then grouped into quintiles: (1) 0-10%, (2) 11-25%, (3) 26-75%, (4) 76-90%, (5) 91-100% (Tables 5.12a-c).

Table 5.12: Peak flow rate means and pre- and post-shift differences for HKI, KE and KW

Table 5.12a: HKI

	preshift PEFR			postshift PEFR			paired
Quintile	mean	95% CI		mean	95% CI	n	t-test
1	457	443-470	→	457	439-474	12	ns
2	511	505-517	↘	499	481-518	17	ns
3	577	570-584	↘	564	545-574	60	p=0.01
4	649	642-656	↘	642	625-658	16	ns
5	715	697-733	↘	701	668-735	9	p=0.06

Table 5.12b: KE

	preshift PEFR			postshift PEFR		paired t-test	
Quintile	mean	95% CI		mean	95% CI	n	sig
1	449	432-467	↘	432	401-464	12	p=0.05
2	514	507-522	↘	508	493-522	18	ns
3	574	568-581	↘	571	562-579	58	ns
4	644	635-652	↘	634	620-647	18	p=0.02
5	727	702-753	↘	714	687-741	11	ns

Table 5.12c: KW

	preshift PEFR			postshift PEFR		paired t-test	
Quintile	mean	ci		mean	ci	n	sig
1	441	386-495	↘	407	307-5-7	4	ns
2	512	503-521	↘	491	471-512	8	p=0.01
3	572	564-580	↘	558	546-571	29	p=0.004
4	630	616-643	↘	630	611-650	9	ns
5	698	675-721	↘	684	631-738	5	ns

Table 5.12d: KW

	postshift category				
Quintile	1	2	3	4	5
1	4 (100%)				
2	3 (43%)	4 (57%)			
3	1 (4%)	2 (7%)	24 (86%)		1 (4%)
4			2 (22%)	7 (78%)	
5				2 (40%)	3 (60%)

In all three regions post-shift readings showed a fall compared with the pre-shift. There was no marked evidence of regression to the mean in these data in that the majority of the bands of pre-shift readings showed a fall. The proportions in the pre-shift category falling post-shift to a lower or higher category are shown for Kowloon West (Table 5.12d).

The peak flow data can be used to illustrate the need for careful interpretation of the lung function data. Officers in the upper quantiles of peak flow and FEV_1 measurements were, as would be expected, younger than those in the lower range of values. On the other hand the proportion of smokers increased markedly in the younger groups. The general pattern of pre-shift test levels, age and smoking prevalence is shown in Table 5.13 for peak flow rate measurements in HKI. The proportion of smokers rises from 31% in the lowest end of the peak flow range to 60-70% at the high end.

Table 5.13: Bands of pre-shift PEFR, age and proportion of smokers

Pre-shift Quintile	Age			Proportion of smokers	
	Mean	95% CI	n	%	n
1	32.8	28.6-37.0	17	30.8	13
2	36.8	31.4-42.4	16	52.9	17
3	30.4	28.3-32.4	62	46.6	58
4	27.3	21.9-32.7	11	62.5	16
5	27.9	23.5-32.3	9	72.0	11
Total			115		115

5.4.3.4 **Pre- and post-shift FEV_1 differences**

The pattern of pre- and post-shift FEV_1 values is shown in Figure 5.5. The expected strong correlation between the two measurements is clearly demonstrated, but there is also a clear tendency for post-shift values to be lower.

Figure 5.5: Pre-shift by post-shift FEV_1

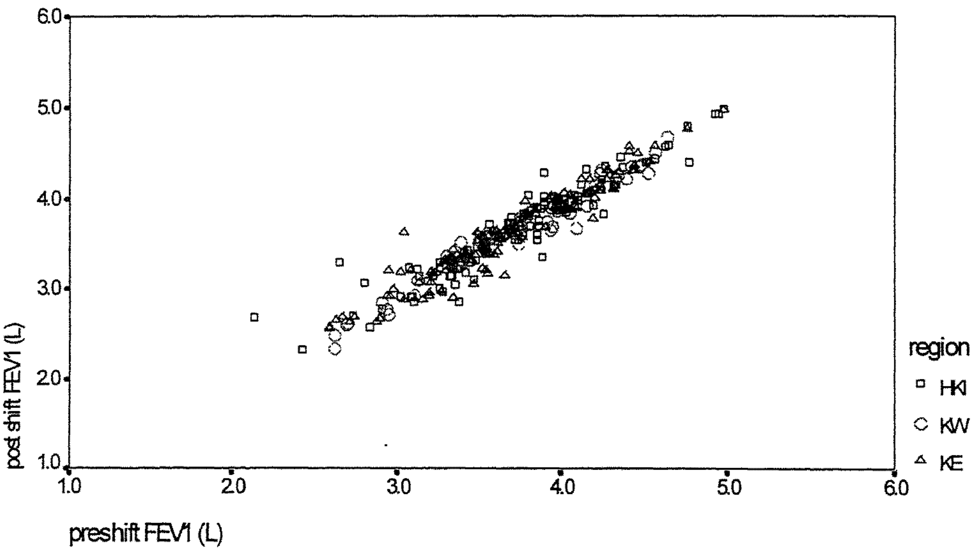
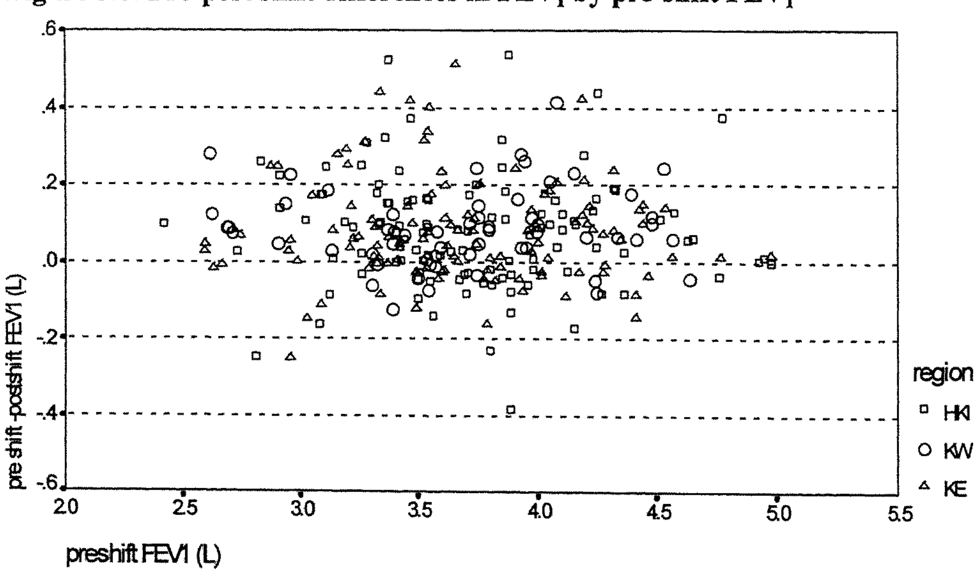


Figure 5.6: Pre-post shift differences in FEV_1 by pre-shift FEV_1



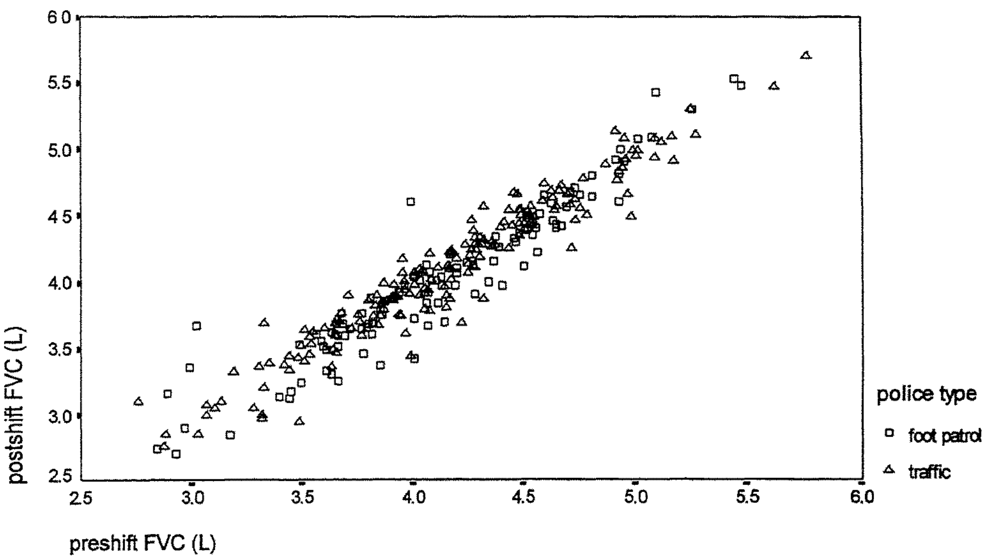
Absolute differences in pre- and post-shift FEV_1 are shown in Figure 5.6. Most of the pre/post-shift paired readings show a post-shift drop. The majority of these are less than 0.2L, with 13.1% 0.2-0.4L and eight cases greater than 0.4L.

5.4.3.5 **Pre-shift and post-shift FVC and FEV_1/FVC ratio differences:** Overall FVC values showed a post-shift drop (Table 5.14) (Figure 5.7) which was consistent across all regions/formations, smokers and non-smokers.

Table 5.14: Pre-post shift drop in FVC for each region/formation

	FVC pre-post differences (L)			
	Smoker	Ex-smoker	Never-smoker	All
HKI	0.06	0.18	0.15	0.11
KE	0.04	0.05	0.05	0.05
KW96	0.09	N/A	0.07	0.08
KW97	0.10	0.05	0.10	0.08
Marine	0.07	0.02	0.07	0.08

Figure 5.7: Mean pre-shift by mean post-shift FVC (HKI)



The FEV_1/FVC ratio did not show any consistent pattern of change between pre- and post-shift measurements.

A summary of the mean values for peak flow and spirometry measurements for the whole survey is given in Table 5.15.

Table 5.15: Summary of mean values of PEFR, FEV_1, FVC and FEV_1/FVC ratio for all regions, smokers and non-smokers

Hong Kong Island

Group	Sample size		PEFR				FEV_1				FVC				FEV_1 /FVC ratio			
mean values pre/post-shift	pre	post	pre	post		p value	pre	post		p value	pre	post		p value	pre	post		p value
smokers	58	57	591.1	581.3	↘	0.05	3.75	3.67	↘	0.009	4.23	4.17	↘	0.003	0.89	0.88	↘	ns
ex smokers	10	10	562.9	556.7	↘	ns	3.49	3.35	↘	0.002	3.85	3.67	↘	0.005	0.91	0.91	→	ns
never smoked	45	42	561.7	547.0	↘	0 009	3.69	3.60	↘	n.s.	4.22	4.07	↘	0.003	0.88	0.88	→	ns
between group			ns	ns			ns	ns			ns	ns			ns	ns		
All	113	109	575.7	565.0	↘	0.001	3.70	3.64	↘	0.000	4.19	4.08	↘	0.000	0.88	0.89	↘	ns

Kowloon East

Group	Sample size		PEFR				FEV_1				FVC				FEV_1 /FVC ratio			
mean values pre/post-shift	pre	post	pre	post		p value	pre	post		p value	pre	post		p value	pre	post		p value
smokers	55	55	572.7	562.3	↘	0.001	3.70	3.64	↘	0.001	4.14	4.10	↘	ns	0.90	0.89	↘	0.01
ex smokers	18	18	574.3	566.5	↘	ns	3.64	3.55	↘	0.02	3.98	3.93	↘	ns	0.91	0.90	↘	ns
never smoked	43	42	585.0	580.8	↘	ns	3.62	3.55	↘	0.004	4.01	3.96	↘	ns	0.91	0.90	↘	ns
between group			ns	ns			ns	ns			ns	ns			ns	ns		
All	116	115	577.5	570.1	↘	0.000	3.66	3.59	↘	0.000	4.07	4.02	↘	0.03	0.90	0.89	↘	0.00

Kowloon West 96

Group	Sample size		PEFR				FEV_1				FVC				FEV_1 /FVC ratio			
mean values pre/post-shift	pre	post	pre	post		p value	pre	post		p value	pre	post		p value	pre	post		p value
smokers	54	54	571.0	565.5	↘	0.001	3.70	3.63	↘	0.000	4.37	4.28	↘	0.000	0.85	0.85	→	ns
non-smokers*	46	46	575.4	567.1	↘	0.02	3.73	3.67	↘	0.000	4.29	4.21	↘	0.000	0.87	0.87	→	ns
between group			ns	ns			ns	ns			0.05	ns			ns	ns		
All	100	100	573.0	566.3	↘	0.000	3.72	3.65	↘	0.000	4.33	4.24	↘	0.000	0.86	0.86	→	ns

* We did not ask about past smoking in this study.

Kowloon West 97

Group	Sample size		PEFR				FEV_1				FVC				FEV_1 /FVC ratio			
mean values pre/post-shift	pre	post	pre	post		p value	pre	post		p value	pre	post		p value	pre	post		p value
smokers	27	28	590.0	578.0	↘	0.002	3.84	3.74	↘	0.000	4.36	4.26	↘	0.000	0.88	0.88	→	ns
ex smokers	8	8	558.0	547.3	↘	ns	3.41	3.37	↘	0.05	3.84	3.81	↘	ns	0.89	0.89	→	ns
never smoked	18	18	554.8	545.4	↘	ns	3.63	3.54	↘	0.01	4.07	3.97	↘	0.02	0.89	0.89	→	ns
between group			ns	ns			ns	ns			0.05	ns			ns	ns		
All	53	54	573.2	562.6	↘	0.000	3.70	3.62	↘	0.000	4.18	4.10	↘	0.000	0.89	0.89	→	ns

Marine

Group	Sample size		PEFR				FEV_1				FVC				FEV_1 /FVC ratio			
mean values pre/post-shift	pre	post	pre	post		p value	pre	post		p value	pre	post		p value	pre	post		p value
smokers	45	45	554.7	538.6	↘	0.000	3.47	3.43	↘	0.02	4.11	4.04	↘	0.01	0.84	0.88	↗	ns
ex smokers	16	16	595.6	584.7	↘	0.05	3.49	3.42	↘	ns	4.00	3.98	↘	ns	0.87	0.87	→	ns
never smoked	59	59	549.9	537.3	↘	0.001	3.46	3.41	↘	0.01	3.97	3.90	↘	0.01	0.87	0.88	↗	ns
between group			ns	ns			ns	ns			ns	ns			0.03	0.06		
All	120	120	557.8	544.1	↘	0.000	3.47	3.42	↘	0.000	4.03	3.95	↘	0.00	0.86	0.86	→	ns

p = significance of the difference between pre- and post-shift means.
ns = not significant
between groups = test for significant differences between smokers, ex-smokers, never-smokers.

5.4.4 Pre-post shift proportional change in FEV_1

5.4.4.1 FEV_1 and FEV_1 proportional change during shifts by police duties and smoking:

Hong Kong Island, Kowloon East, Kowloon West and Marine

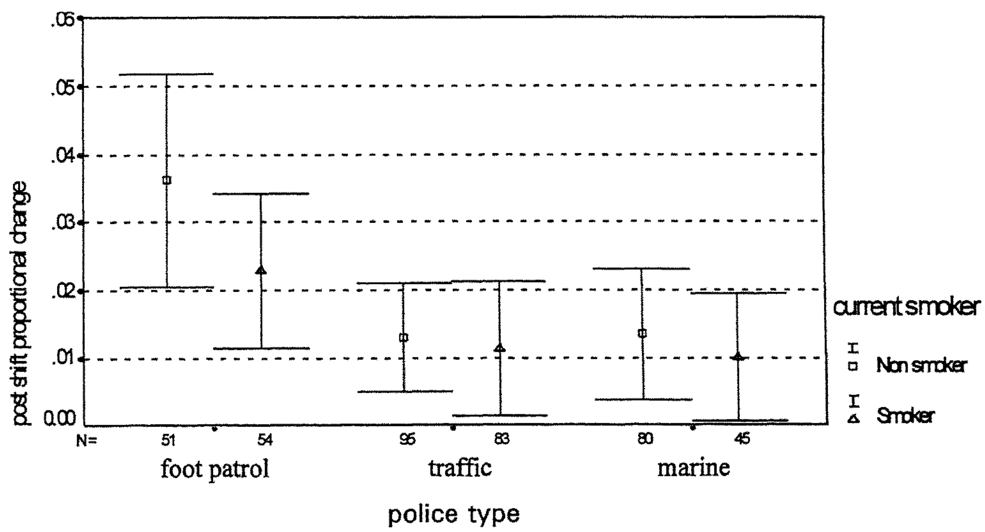
In HKI, KE and KW the average pre-post shift difference in FEV_1 ranged from 0.05L in Traffic and Marine to 0.11L in Foot Patrol officers. The absolute differences for non-smokers and smokers were similar (Table 5.16).

Table 5.16: FEV_1 absolute difference and proportonal change during shift

		Absolute difference		% change	
Group	n	Mean	95% CI	Mean	95% CI
Traffic	181	0.05	0.03-0.07	0.014	0.01-0.02
Foot Patrol	107	1.11	0.08-0.14	0.029	0.02-0.04
Marine	126	0.05	0.02-0.07	0.018	0.01-0.03
Smokers	182	0.06	0.04-0.08	0.016	0.01-0.02
Non-smokers	227	0.07	0.05-0.09	0.021	0.01-0.03

The proportional change in FEV_1 from the pre-shift baseline to post-shift measurement was also examined by both police duties and smoking (Table 5.15). Again an average post-shift fall in FEV_1 was observed in all groups of officers. The biggest gradient was observed in Foot Patrol officers. Within police formations non-smokers consistently showed a bigger proportional post-shift drop in FEV_1 than current smokers (Figure 5.8). There was wide dispersion of individual values.

Figure 5.8: Plot of FEV_1 (mean; 95% CI) proportional change by police duties and current smoking



standardized for age and height

A similar pattern was observed for Marine officers after a 24 hour shift. The point estimate for FEV_1 change in non-smokers was also higher than in smokers in this group, as observed in both the traffic and foot patrol officers.

5.4.4.2 **Factors influencing the shift effect in FEV in KE, KW and HKI:** The effects of smoking and police duties, with age and symptoms (proportion of test days with any cough and/or phlegm) as covariates, were examined in an analysis of variance (ANOVA) (Table 5.17a).

The main effect is associated with police duties indicating that Foot Patrols experience a larger post shift drop, as a proportion of their pre-shift values, than traffic officers (F ratio 10.806; p=0.001).

Additional ANOVA with the inclusion of region, symptoms as main effects and six combinations of 2-way interactions between smoker, police type, symptoms and region did not provide any further evidence for the identification of possible causal factors (Table 5.17b).

Table 5.17a: Analysis of variance for determinants of post-shift FEV_1 drop

Source of Variation		Sum of Squares	DF	Mean Square	F	p
Covariates		0.006	1	0.006	3.007	0.084
Age		0.006	1	0.006	3.007	**0.084**
Main Effects		0.028	4	0.007	3.552	0.008
Smoker		0.001	1	0.001	0.725	0.395
Police Duties		0.025	1	0.025	12.601	**0.000**
Region		0.005	2	0.002	1.162	0.314
2-Way Interactions		0.006	5	0.001	0.596	0.703
Smoker	Police Duties	0.002	1	0.002	1.039	0.309
Smoker	Region	0.000	2	0.000	0.042	0.959
Police Duties	Region	0.003	2	0.002	0.873	0.419
Explained		0.040	10	0.004	2.019	0.032
Residual		0.541	273	0.002		
Total		0.581	283	0.002		

Table 5.17b:

Source of Variation		Sum of Squares	DF	Mean Square	F	p
Covariates		0.006	1	0.006	2.984	0.085
Age		0.006	1	0.006	2.984	**0.085**
Main Effects		0.030	5	0.006	2.999	0.012
Smoker		0.001	1	0.001	0.341	0.560
Police Duties		0.025	1	0.025	12.622	**0.000**
Region		0.005	2	0.002	1.153	0.317
Symptom		0.002	1	0.002	0.895	0.345
2-Way Interactions		0.010	9	0.001	0.551	0.836
Smoker	Police Duties	0.001	1	0.001	0.694	0.406
Smoker	Region	0.000	2	0.000	0.003	0.997
Smoker	Symptoms	0.003	1	0.003	1.490	0.223
Police Duties	Region	0.004	2	0.002	0.919	0.400
Police Duties	Symptoms	0.000	1	0.000	0.171	0.680
Region	Symptoms	0.001	2	0.000	0.131	0.877
Explained		0.046	15	0.003	1.529	0.094
Residual		0.535	268	0.002		
Total		0.581	283	0.002		

5.4.5 Modelling the effect of shift work on FEV_1 change

5.4.5.1 **Hong Kong Island, Kowloon East and Kowloon West:** Multiple regression models were created to examine the influence of age, physique, respiratory symptoms, smoking and police duties on FEV_1 change during shift work. The correlation matrix and variables in the equation, for 284 officers in HKI, KE and KW, are shown in Table 5.18.

Table 5.18: Matrix of correlation coefficient (r) and 1-tailed significance (p) for characteristics of 284 officers in HKI, KE and KW

		FEV_1 drop	Smoker	Age	Height	Police duties
FEV_1 drop	r	1.000	-0.059	**0.101**	0.020	0.172
	p	.	0.161	**0.044**	0.367	0.002
Smoker	r	-0.059	1.000	**-0.120**	-0.037	0.042
	p	0.161	.	**0.022**	0.267	0.242
Age	r	0.101	-0.120	1.00	**-0.131**	-0.192
	p	0.044	0.022	.	**0.013**	0.001
Height	r	0.020	-0.037	-0.131	1.000	-0.074
	p	0.367	0.267	0.013	.	0.108
Police duties	r	0.172	0.042	**-0.192**	-0.074	1.000
	p	0.002	0.242	**0.001**	0.108	.

Again, the strongest correlations were observed between FEV_1 drop and police duties ($r = 0.172$; $p = 0.002$) and age ($r = 0.101$; $p = 0.044$). Other significant correlations shown are between smoking and younger officers ($r = -0.120$; $p = 0.022$); age and current police duties ($r = -0.192$; $p = 0.001$); age and height, with younger officers taller ($r = 0.131$; $p = 0.013$).

In this multiple regression model the characteristics of the 284 officers included are shown in Table 5.19. The mean age was 30.9 years, mean FEV_1 drop 20% and prevalence of smoking 48.2%. Police type was labelled as either Traffic or Foot Patrol duties.

The four independent variables smoking, age, height and police duties were examined to determine how well they predicted the dependent variable, ie FEV_1 change, the outcome measure for the effect of shift work on lung function.

Only two variables, police duties (Foot Patrol) ($p = 0.0007$) and age ($p = 0.019$) were strong predictors of FEV_1 drop during shift work.

Table 5.19: Multiple regression outcome in combined group of 284 Traffic and Foot Patrol officers

Variable	Beta	T	p
Smoker	-0.048715	-0.829	0.4078
Age	0.141685	2.343	**0.0198**
Height	0.052096	0.881	0.3792
Police duties	0.204771	3.432	**0.0007**
(Constant)		-1.188	0.2357

Adjusted $R^2 = 0.039$

Separate models were created for smokers and non-smokers. In 137 smokers none of the variables were significant predictors of FEV_1 drop (Table 5.20) but in 147 non-smokers both age ($p = 0.0068$) and police duties ($p = 0.0028$) were strong predictors (Table 5.21).

Tables 5.20: Multiple regression: Factors associated with pre/post-shift FEV_1in 137 smoking Traffic and Foot Patrol officers

Variable	Beta	T	p
Age	.028419	.320	0.7492
Height	.072294	.818	0.4146
Symptoms	.024080	.276	0.7829
Police duties	.132643	1.489	0.1389
(Constant)		-.827	0.4095

Table 5.21: Multiple regression: Factors associated with pre/post-shift FEV_1change in 147 non-smoking Traffic and Foot Patrol officers

Variable	Beta	T	p
Age	.226168	2.746	0.0068
Height	.028453	.349	0.7279
Symptoms	-.079733	-.979	0.3294
Police duties	.250017	3.044	0.0028
(Constant)		-.742	0.4593

The prediction of FEV_1 drop was also examined separately in Traffic police and Foot Patrols. In 179 Traffic (mean FEV_1 % police drop 0.014) none of the variables were significant predictors for FEV_1 change but in 106 Foot Patrols (mean FEV_1 proportional drop 0.03), age ($p = 0.0096$) was a strong predictor and there was a trend for height ($p = 0.091$) (Table 5.22).

Table 5.22: Multiple regression; factors associated with pre/post-shift FEV_1 change in 106 Foot Patrols

Variable	Beta	T	p
Smoker	-.035389	-.340	.7343
Age	.258324	2.639	**.0096**
Height	.172847	1.706	**.0911**
Police duties	-.130257	-1.212	.2284
(Constant)		-1.688	.0945

Adjusted $R^2 = 0.075$

In 125 Marine officers the mean age was 36.9 years, mean FEV_1 drop 0.013, smoking prevalence 36%. There were no strong correlations between the selected variables apart from age and smoking reflecting a higher prevalence in younger officers (Table 5.23).

Table 5.23: Matrix of correlation coefficients and 1 tailed significance (p) for characteristics of Marine officers

		FEV_1 % drop	Smoker	Age	Height
FEV_1 %	r	1.000	-0.054	-0.071	0.041
	p	.	0.276	0.216	0.326
Smoker	r	-0.054	1.000	-0.216	-0.022
	p	0.276	.	0.008	0.403
Age	r	-0.071	**-0.216**	1.000	-0.272
	p	0.216	**0.008**	.	0.001
Height	r	0.041	-0.022	-0.272	1.000
	p	0.326	0.403	3001	.

None of the independent variables predicted the post-shift changes in FEV_1 for Marine officers and there were no trends related to age or height in this group (Table 5.24).

Table 5.24: Multiple regression: factors associated with pre/post-shift FEV_1 change in 125 Marine officers

Variable	Beta	T	p
Smoker	-.071011	-.764	.4464
Age	-.081487	-.844	.4005
Height	.017094	.181	.8565
(Constant)		.027	.9785

Adjusted R^2 = -0.0142

5.5 Randomised controlled trial of the Respro Mask A pilot study

5.5.1 Introduction

A group of officers (n=26) from New Territories South (NTS) and Kowloon West (KW), who had undergone earlier respiratory function testing in February and May/June 1996 were selected, on the basis of their lung function in the tests, to participate in a three week pilot study of a Respro Mask Trial.

The objectives of the Mask Trial Pilot Study were to obtain the basic information necessary for the determination and planning of a possible full scale study on the effectiveness of wearing either a gaseous/particulate mask filter among officers working in traffic or foot patrol duties in Hong Kong.

5.5.2 Subjects and methods

Sampling: Officers from NTS were selected if they had decreased lung function measures (PEFR) on 70% or more occasions following their tour of duty during the 21 day measurement of peak flow rates in February 1996.

Officers from KW were selected if they had decreased lung function measures (FEV_1) on 95% or more occasions following their tour of duty in May/June 1996. Twenty-six officers (13 in NTS and 13 in KW) were selected.

Methods: Each officer was randomly assigned to one of the following three groups with different sequences in wearing masks with three filter types, each for one week, as follows:

	Week One	Week Two	Week Three
Group One	Placebo Filter	Sportsta Filter	City Filter
Group Two	Sportsta Filter	City Filter	Placebo Filter
Group Three	City Filter	Placebo Filter	Sportsta Filter

Specifications of the Respro filters: The following outlines the performance specifications of the two Respro filters included in the trial, namely the City - "Dynamic ACC" and the Sportsta - "Techno ST180" (Figure 5.9).

City - Respro "Dynamic ACC" filter

Filtration of:

* Organic vapours (unburnt and burnt hydrocarbons) uptake - $1.0 mg/cm^2$
* Acid gases (nitrogen oxide, nitrogen dioxide, sulphur dioxide) NO_x uptake - $0.50 mg/cm^2$, SO_2 uptake - $0.30 mg/cm^2$
* Particulate material of 10 microns and upwards (lead oxide, building dust, carbon dust, pollen)
* Photochemical smog (ground level ozone and other oxidants).

Sportsta - Respro "Techno ST180" filter

Filtration of:

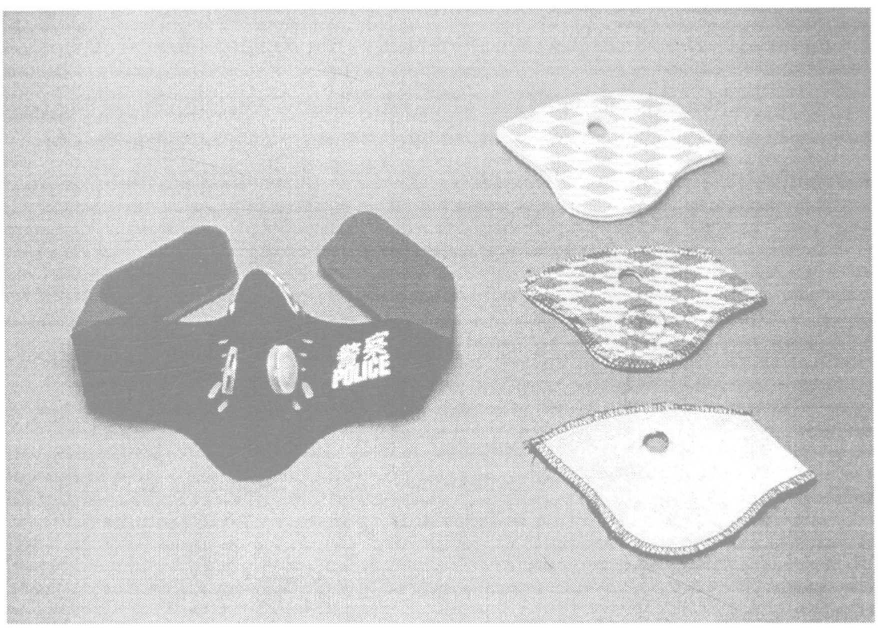
* Submicron particulate dusts down to 0.3 microns (viruses, fumes, bacteria, carbon dust, clay/grain dust, rapeseed/soya dust, pollen dust, plant spores, building dust).

Dummy - In-house simple cloth filter

* For the dummy or placebo filter, tailor's lining material was fashioned into the same shape of the two active filters using a similar stitching pattern.

Data collection: Each officer was issued with a Mini-Wright Peak Flow Meter, Respro Mask, nominated filter for each week and a three week diary.

Figure 5.9: Respro *City* and *Sportsta* filters and the placebo (dummy) filter



Diary entries were made twice daily (pre and post-shift) and included:

Respiratory symptoms (cough, phlegm and sore throat) experienced
Number of cigarettes smoked
Time exposed to environmental tobacco smoke (ETS)
Time spent wearing mask during shift
Reason(s) for mask removal
Mask comfort rating during shift
Any difficulties associated with the mask
PEFR recorded 5 times on each occasion.

Air pollutant concentrations and weather conditions: daily mean concentrations of air pollutants including sulphur dioxide (SO_2), nitrogen dioxide (NO_2), respirable suspended particulates (RSP) measured by Tapered Oscillating Microbalance (TEOM) and ozone (O_3) were obtained from the Hong Kong Environmental Protection Department data files provided on CD ROM and prepared by the EPD Air Quality Monitoring Unit. Except for O_3, data were from the Shatin Monitoring Station and the Kwai Chung Monitoring Station. Daily weather conditions including temperature and relative humidity recorded by the Hong Kong Observatory were also obtained from the CD ROM. During the period of the study (5.8.1996-25.8.1996), the mean pollutant concentration (standard deviation) in each of the monitoring stations were as follows:

Pollutant	**Shatin (μg/m^3)**		**Kwai Chung (μg/m^3)**	
	Mean	**(SD)**	**Mean**	**(SD)**
SO_2	15.86	(10.67)	29.80	(13.48)
NO_2	36.93	(12.04)	39.99	(16.42)
RSP	37.00	(9.65)	31.33	(11.10)
O_3	28.80	(34.06)*	-	

* from Central and West Monitoring Station

Mean (SD) temperature was 28.3°C (1.46) and mean humidity was 81.1% (6.1) in Hong Kong.

5.5.3 Statistical methods

In view of the small numbers of subjects recruited in the study, respiratory symptoms were grouped to form a variable for any symptoms reported pre-shift and post-shift, and number of cigarettes smoked, time exposed to environmental tobacco smoke (ETS), time spent wearing mask during shift, and mask comfort rating during shift were recoded into three levels in the analysis. This avoided using very small numbers in some of the original scales and making assumptions about the effect of the variables on the outcomes. The five PEFR readings recorded pre-shift and post-shift on each day were summarized to one value either by averaging or by taking the maximum reading.

Summary statistics for the main outcome and explanatory variables are presented by the three weekly periods and by filter type, region and smoking status. As the study used a three group cross-over (Latin square) design, the following were adjusted for and assessed in the modelling:

sequencing effect (comparison between groups);
repeated measure (by generalized estimating equations);
filter effects (comparison between filter groups);

covariate effects (including smoking, pre-shift symptoms,
pre-shift PEFR, ETS, and amount smoked pre-shift and post-shift);
air pollutant concentrations and weather conditions.

As there were a substantial number of dropouts during the period of the study (2 to 3 in each group of 8 to 9 participants) so that the data became unbalanced, regression analyses instead of analysis of variance methods was used in the statistical analysis. A generalised estimating equation procedure was used in the regression, using identity link function and Gaussian distribution for the lung function value as an outcome; using logit link function and binomial distribution for post-shift respiratory symptoms as another binary outcome measure; and using proportional odds logistic regression for the outcome variables which were grouped into three groups. Statistical package STATA was used for the analysis. Correlation among repeated measures was assumed to be the same (exchangeable).

5.5.4 Findings

The Figures and Tables for the trial data are shown in the Appendix to this section.

Crude analysis: Figures 5.10 - 5.12 depicted the pre-shift and post-shift peak expiratory flow rates (PEFR) for individual officers during the three week study period, for each of the three groups (placebo (P)-Sportsta (S) - City (C); S-C-P and C-P-S) respectively. The numbers of officers and their characteristics in the three groups were summarized as follows (NTS=New Territories South; KW=Kowloon West; S=Smoker; NS=Non-Smoker):

	NTS/KW	S/NS	Mean Age	All filters
Group One	4/4	4/4	30.5	5
Group Two	4/5	5/4	34.2	5
Group Three	5/4	5/4	31.2	6

Overall the plots showed tracking of measurements within individual officers. This was reflected by the very high correlation between repeated measurements (0.97). There did not appear to be marked distinguishable patterns of pre-shift to post-shift changes in PEFR, over a period of time, between shift A and B, between groups and filter type users (Figure 5.10).

Figures 5.11-5.12 and Tables 5.25-5.34 are included in Appendix D.

Table 5.25 shows some summary statistics for the main outcome measures (defined according to peak expiratory flow rates) and characteristics of individual officers.

Table 5.26 shows the breakdowns of the main outcome measures of the officers by region, smoking status, shift and filter type.

Table 5.27 shows the summary statistics for the main outcome measures and characteristics of officers in each of the three consecutive weeks broken down by (a) sequence group, (b) region and (c) smoking status.

Table 5.28 shows the distributions of number of cigarettes smoked pre-shift, number of cigarettes smoked post-shift, time spent in wearing the mask, time spent outdoor post-shift, how comfortable was in wearing the mask and whether removed mask for longer than one hour. The distributions were compared among filter types of masks worn, broken down by region and smoking status.

Modelling: Table 5.29 shows the results of statistical modelling (using generalized estimating equations procedure) for post-shift PEFR on filter type with adjustment for pre-shift PEFR, age, height, smoking status, shift, region, pre-shift any symptoms, temperature and humidity.

In comparison to using the placebo, wearing the City mask was associated with a relatively higher post-shift PEFR (a) when all officers were included in analysis (coefficient (coef) = 4.09; p=0.028) and (b) when only those who participated in all of the three filter trials (coef=3.82; p=0.074). Pre-shift PEFR, age, pre-shift any symptoms, and temperature were important factors in both analysis. Effects of air pollutant concentrations were not significant (data not shown). The age effect indicates that older officers had relatively better post-shift PEFR values, possibly reflecting their greater compliance with mask wearing (see Table 5.32). The results were the same when mask sequence was further adjusted (data not shown).

Table 5.30 shows the results of modelling for the pre-shift PEFR using methods similar to those of modelling on post-shift PEFR except that adjustment for post-shift PEFR level was not necessary in the model. No effects were found except for age in those who received the three filter types (p=0.072).

Table 5.31 shows the results of modelling for degree of discomfort while mask wearing (comfortable versus uncomfortable and very uncomfortable) using proportional odds logistic regression. The greater the height of officers, the lower were the effects of level of discomfort (log odds ratio, LOR=0.192; p<.000); smokers showed greater discomfort than non-smoker (LOR=0.730; p=0.049); officers in KW showed greater discomfort than those in NTS (LOR=2.318; p<.001).

Table 5.32 shows the results of modelling for whether having removed the mask for longer than one hour. Younger age (LOR=0.117; p=0.065), non-smoker (LOR=1.791; p=0.049) and wearing the City filter (LOR=0.861; p=0.007) were associated with having removed the mask.

Table 5.33 shows the results of modelling for any symptoms post-shift. Smokers were more likely to report any symptoms (LOR=2.26; p=0.025). Wearing the Sportsta filter mask was less likely to be associated with any symptoms than those wearing the placebo filter mask (LOR=0.398; p=0.071). NO_2 and RSP pollutants were associated with any symptom (LOR=0.043, p=0.003 and LOR=-0.047, p=0.011).

Table 5.34 shows the results of the comparison among groups for the major outcome measures, any post-shift symptoms, post-shift PEFR, pre-shift PEFR, percentage change between pre- and post-shift PEFR and maximum PEFR. No significant differences were found among the groups of officers.

Table 5.35 shows the results of modelling on wearing mask time. Younger age (LOR=0.240; p<0.001), height (LOR=0.106; p=0.001), being a smoker (LOR=0.842; p=0.006) and working in KW (LOR=1.446; p=0.000) were associated with a longer time spent in wearing the mask.

5.5.5 Discussion

Power of this sample to detect any change: In design, the study aimed to detect a change of less than 5% of the peak expiratory flow rate (PEFR). Overall the mean PEFR was around 550 l/min. Nine officers were to be recruited in each of three groups of a cross-over trial. Using information from the pilot trial (between subjects standard deviation 90 and within subjects correlation 0.95), to detect a change of 27.5 L/min at 5% level of significance, the power would have been 88%. However, because of dropout of officers from the study, only 5 officers in each group completed the study using all the three mask filters in the three periods, as a result of which the power dropped to 59%.

It can be envisaged that should the effect of wearing the mask on PEFR be smaller than 27.5L/min for various reasons, including non-compliance with the study protocol, the power of the test would have been much smaller (say 43% if the change was only 22.5 L/min instead of 27.5 L/min).

In using a cross-over design the following have been assumed:

(i) the period effects were uniform
(ii) there were no carry over or residual effects
(iii) the between subjects standard deviations are the same for all treatments/periods and that the correlations between pairs of treatments/periods are constant.

In view of each of the above assumptions, in order to ensure the validity of the study design, the following procedures should have been implemented:

(i) the study should have ideally been carried out during periods when the air pollution and weather concentrations were likely to be relatively stable such as November/December (so that the period effects could be uniform).
(ii) a wash-out period in between any two mask trial periods should have been introduced (so as to avoid any possible carry-over effects).
(iii) control for as much heterogeneity as possible in the randomisation process of subjects into sequence groups, and greater measures taken to ensure compliance with the measurement protocol as strictly as possible (so that between subjects variations and within subjects correlation were constant throughout the study period and in all study groups).

Unfortunately such an approach was beyond the resources available for the pilot. In this pilot study the sample size was small, dropout rate was high and there was no mechanism available to ensure compliance to the study protocol during the measurement period.

Sample size required for the main study: In a three treatment (Placebo, Sportsta and City filters) cross-over (Latin square) trial, five readings are to be obtained for each subject on each day over a three week with a different filter type in each week.

The following assumptions about the post-shift PEFR were used

a) between subject standard deviation : 90 l/min
b) correlation among repeated measures : 0.90-0.95
c) minimum differences to be detected : 5% of the overall mean of around 550

Sample size (number of subjects) per group

Within subject correlation	Minimum difference to be detected (with 90% power at 5% sig level)		
	27.5	22.5	17.5
0.95	14	20	31
0.90	26	38	61

This scheme can be applied and repeated for two or more regions if resources allowable.

5.5.6 Summary of results of mask trial

Background
A pilot study to determine the effect of wearing two types of mask filters (Sportsta and City), compared to a placebo filter, was carried out with the objective of obtaining the basic information necessary for the planning of a possible full scale trial at a future date.

Subjects and methods
Twenty-six subjects were recruited initially on the basis of their lung function tests, which had shown a decrease after routine shift work in peak expiratory flow rate (PEFR) on 70% occasions or a decrease after work in FEV_1 on 95% or more occasions.

The subjects were divided into three groups each with a sequence in using the three filters (Placebo (P)-Sportsta (S)-City (C); S-C-P or C-P-S) each for a week in a cross-over (Latin square) design. Peak expiratory flow rate (using Mini Wright Flow Meter) were performed and recorded by the participating officers themselves over the period of the study. Respiratory symptoms (including cough, phlegm and sore throat) were also recorded, together with the number of cigarettes smoked, time exposed to environmental tobacco smoke, time spent wearing the mask, discomfort when wearing the mask and whether they removed the mask for more than one hour were also recorded for analysis. Air pollutant concentrations and weather conditions with the daily means for the study period were also taken for analysis.

Findings
Eight officers did not complete the whole study using all the three types of filter during the three week period according to schedule. The number of days spent wearing the masks and recording the PEFR each week/period varied for each officer from 2 to 7. The results on PEFR shows that there were no marked discernible patterns between pre-shift and post-shift, between A shift and B shift, nor between groups and periods. However after adjusting for repeated measurements and various covariates, there was some evidence that wearing the *City* mask may lead to a benefit in terms of a higher post-shift PEFR ($p=0.028$) and wearing the *Sportsta* mask was likely to be associated with fewer any symptoms reported ($p=0.071$).

Other factors likely to be associated with post-shift PEFR were pre-shift PEFR, age, pre-shift any symptoms and temperature. The other factors likely be associated with any post-shift symptoms were being a smoker, exposure to nitrogen dioxide and respirable suspended particulates.

Conclusions

From this pilot study information necessary for the planning of the main study were derived, which included the between subjects standard deviation and within subjects correlation necessary for calculation of the sample size required, the potential outcome variables to be used (post-shift PEFR and post-shift symptoms) as well as some useful covariates to be measured or controlled for (including smoking status, age, height, pre-shift PEFR, pre-shift symptoms, air pollutant concentrations and temperature). A number of variables likely to be associated with acceptability of wearing masks were also identified.

Discussion

The survey clearly demonstrates that exposure to the environment of routine shift work has a measureable effect on lung function of officers in all regions and formations. The biggest effect was observed in Foot Patrol officers with non-smokers and older officers showing the largest proportional change in FEV_1.
The results suggest that the bigger change observed in Foot Patrols is related to the nature of their duties and time spent in close proximity to the exhaust gases of slow moving or stationary columns of traffic. Vehicles moving away from stops at junctions typically expel large volumes of gases and particulates from exhausts after spending a period with the engine idling. These pulses of dense aerosols will produce high levels of pollutants such as NO_2 and RSP. Traffic police, by comparison, probably spend less time on average in such exposures by moving around on motorcycles or in vehicles and also returning to base periodically to complete administrative work. The post-shift changes in the Traffic and Marine police were similar.

The larger observed effect in non-smokers indicates that lung function in smokers is already impaired in the pre-shift period with the result that the relative change in FEV_1 induced by the shift exposure is smaller. There is however a measureable additive effect of shift work in smokers.

The interpretation of the shift effect on FEV_1 is limited by the lack of data on personal monitoring and individual exposures to specific pollutants. The investigation of the possible relationship between specific pollutants, individual exposures and lung function changes could be explored in follow-up studies with personal monitoring.

The pilot mask trial provides some evidence of a protective effect against shift exposures to pollutants. The data generated from the statistical models should be interpreted cautiously. The filters designed to exclude principally either gases or particulates were associated, respectively, with improvement in post-shift peak flow rate or symptoms. There were no benefits observed from wearing the dummy filter.

The effects were relatively small and the raw data indicate that most officers had relatively stable peak flow rates throughout the period of the study. Mask wearing was not readily accepted and was found to be uncomfortable.
In any further evaluation of the potential benefits from wearing masks the selection of mask sizes should be carried out carefully in conjunction with expert advice. The selection of officers for a future trial should probably focus on non-smoking Foot Patrols. The numbers required for adequate statistical power should be adjusted to take account of the possible high attrition rate. However careful planning should be undertaken to avoid high drop out rates. Good cooperation of the officers is needed.

Conclusions

- Exposures to ambient pollutant levels during routine outdoor shift work are associated with a decline in peak expiratory flow rates (PEFR) and lung volumes (FEV_1 and FVC) as measured by standard peak flow meters and spirometry.

- There was wide dispersion of the observed values for post-shift FEV_1 % differences. Further analysis of the data may help to identify the most vulnerable officers.

- The pattern of test results suggests that restoration of lung function, following these acute adverse effects, takes place between shifts.

- These post-shift changes were seen in all formations of officers but the proportional pre-post shift changes (FEV_1 %) were two times greater, up to two fold, in Foot Patrol compared with Traffic officers and in non-smokers compared with smokers. The findings suggest that Foot Patrol officers, spending long periods of the shift at the kerbside in close proximity to slow moving or stationary vehicles, have high exposures to exhaust gases and particulates with a significant effect on lung function by the end of the shift.

- The inference which can also be drawn from these findings is that smoking before and during a shift had induced major changes in airways' resistance which reduced peak expiratory flow rate and forced expiratory volume in 1 second. Any additional changes induced by air pollution would be small by comparison.

- The studies on lung function have several limitations. No personal monitoring of NO_x and RSP exposures was carried out because of resource and logistical constraints. This could be done in future studies to determine whether variations in lung function are directly related to measured personal exposures. Closer monitoring in the survey and field studies would have achieved better quality data collection; problems identified in this enquiry should be taken into account in the management of any future studies.

- A pilot randomised controlled trial showed some apparent protective effect against post-shift symptoms (*Respro Sportsta* particulates exclusion filter) and improved post-shift peak flow (*Respro City* gaseous exclusion filter).

- Mask wearing was perceived to be uncomfortable and inconvenient by many officers. Older officers showed greater compliance with mask wearing and this group also had a relatively greater benefit from the trial in terms of higher post-shift peak flow rates.

- Overall the findings in the lung function test group and the pilot RCT suggest that some officers would benefit by having masks available for use when working in heavily polluted areas. Those who would benefit most include older officers, non-smokers, Foot Patrol officers and others working alongside stationary or slow moving columns of traffic, at intersections, vehicle testing stations and other venues where heavy pulses of exhaust pollutants are likely to arise.

- The selection and fitting of masks for individual officers and detailed discussions on their use and possible benefits would be important factors in the success of any future mask wearing programmes. A larger scale trial of masks would probably contribute more useful information on the utility and protective health benefits of masks for police officers.

- Overall, ambient air pollution is a hazard for officers working in urban areas of Hong Kong. The magnitude of the risk appears to be related to type of duties and probably to time spent in close proximity to slow moving vehicles.

Recommendations

- Three forms of action would help to protect the respiratory health of officers on duty in Kong Kong streets and other environs.

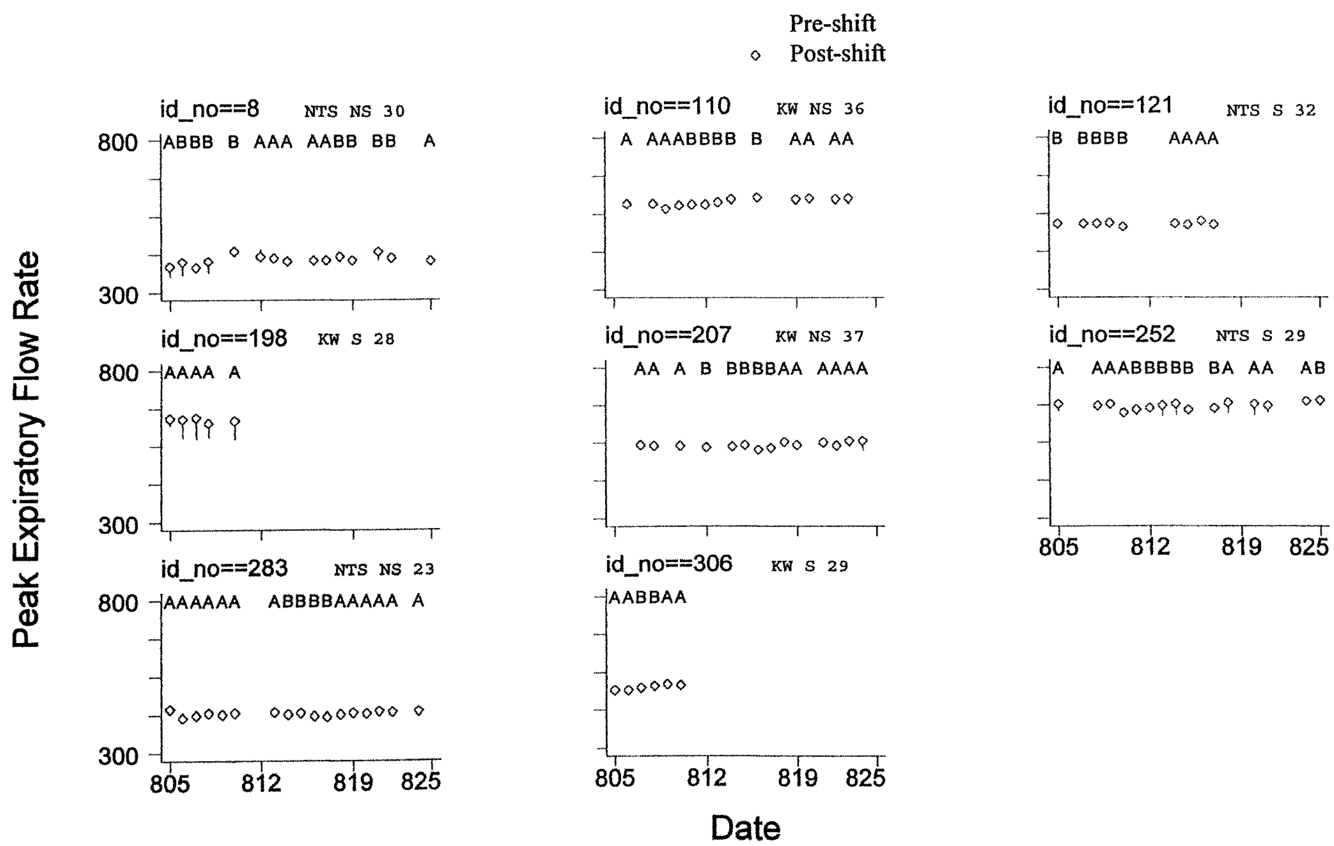
    * Avoidance, as far as this is possible, of prolonged unprotected exposure to high levels of vehicular exhaust gases.

    * Reduction of pollutants in vehicular exhaust, reduction of idling time and slow moving traffic.

    * Protection based on particulate and/or gaseous exclusion masks for officers on selected duties.

    * Prevention of smoking before and during shift work.

Figure 5.10: Mean pre-shift and post-shift peak expiratory flow rate for individual officers (NTS=New Territories South; KW=Kowloon West; S=Smoker; NS=Non-smoker; and age in year) taking shift A & B and in group: placebo-sport-city



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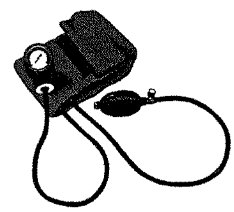

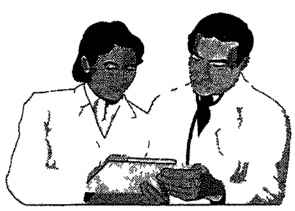

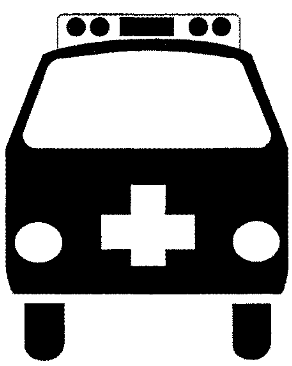

SECTION 6

Symptoms, utilisation of health services and days off work

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ABSTRACT

Objectives

This section aimed to examine patterns of utilisation of health care services, use of medicines and days off work as well as the factors affecting these.

Methods

The survey data was analysed in a descriptive fashion and also using logistic regression models to examine the effect of respiratory symptoms, perceptions of health and psychological variables on visiting the doctor, using medications and taking days off work. The effects of preventable risk factors, smoking, ETS exposure and drinking alcohol on the above symptoms and health measures were summarised from other sections. The possible effect of air pollution on the symptoms and health measures were assessed by examining the associations between the *working* environment, including type of police duty (Foot Patrol, Traffic or Marine), active or administrative work and region of work and the symptoms and the health measures. As far as possible, findings were compared with the general population

Findings

- Rates of visiting a doctor shows a pattern similar to that in the general population.
- Rates of admission to hospital seem to be higher than in the general population; this is being investigated further.
- The numbers of days taken off work also appear to be higher than in the general population but this could be due to a seasonal effect.
- Three of the risk factors examined, smoking, exposure to ETS and working outdoors, increase the risk of symptoms and, indirectly, the risk of visiting a doctor, using medication and taking days off work.
- Exposure to ETS also appears to increase the risk of poor perception of health which has the greatest effect on utilisation of health care services and taking days off work.
- Around 8,000 visits to the doctor could be saved each year if ETS exposure at work were eliminated.

Recommendations

- Because of the potential for saving costs of visits to the doctor and lost productivity, in addition to the direct health benefits to individuals, ETS exposure at work should be reduced. Reduction in smoking levels would also save on medical costs and lost days of work.

6.1 Introduction

We have collected data which reflects the utilisation of health services by police officers. The questionnaire items included (a) visiting the doctor in the last 14 days, (b) use of medicines in the last 14 days (c) admission to hospital in the last 6 months and (d) data on self-reported days off work due to illness or injury. Visiting a doctor or consuming medicines in the last 14 days, as well as taking days off work, could reasonably be assumed to be a result of symptoms or feelings of poor health. The factors which may contribute to the symptoms or feelings of poor health, in addition to hazards such as viral respiratory infections, include lifestyle factors such as smoking, excess alcohol intake, environmental tobacco smoke (ETS) and, possibly, air pollution. Psychological health and stress may also be contributing factors. The approach taken in this section is that the utilisation and time taken off work are first described, as well as the demographic characteristics which are associated with them. Then the reported symptoms and feelings of poor health are examined to determine how much each influences utilisation. In the final step, the factors which are associated with symptoms and poor perceptions of health are examined and quantified to determine the possible direct or indirect influence these factors may have on utilisation. For admissions to hospital, the numbers with this health outcome are smaller and the possible contribution of lifestyle factors in this relatively young age group may be less. For this group, only the descriptive analyses have been completed and are presented.

6.2 What are the levels and patterns of utilisation?

6.2.1 Methods

6.2.1.1 Validation of utilisation data

Periodically, the General Household Survey (GHS) collects data on a sample of around 10,000 households and reports on their stated utilisation. The latest such data on doctor visits[1] and hospitalisation[2] date from 1996 and 1995 respectively and have been compared with the data collected in our survey.

The data obtained from the questionnaire on admission to hospital were also validated by selecting a sample of individuals, in four stations on Hong Kong Island, who claimed to have an admission to hospital in the last 6 months and checking their personnel files for recorded days off or hospital admissions. Out of 9 officers who reported an admission in the previous six months, 4 had insufficient sick leave recorded to cover the claimed admission; hence, it is assumed that these 4 officers had admissions prior to the previous six months period and only 5/9 or 56% of those reporting an admission in the last six months actually had such an admission in the last 6 months. In the following sections and analyses the actual data recorded on the questionnaire is used although it is acknowledged that there may be some degree of over-reporting.

6.2.1.2 Analysis

Descriptive analysis was done using simple frequency distributions. The contribution of symptoms, psychological health and perceived health status factors to utilisation was assessed by using a logistic regression model where the utilisation variable was coded in a dichotomous fashion (e.g. visit to doctor in last 14 days: Yes/No) and used as the dependent variable. A number of factors were adjusted for as covariates in the model; these were age, gender, marital status, ethnicity, educational level, and past illness. Odds ratios (OR) quoted below are therefore adjusted for the covariates listed above; 95% confidence intervals (95% CI) were calculated manually using the value of the β parameter and the standard error.

6.2.2 Results

6.2.2.1 How many officers had visited a doctor in the past 14 days?

A total of 2495 officers (25.1%) reported at least one visit to the doctor in the last 14 days. Of these, 1630 (65.3%) visited once only, 532 (21.3%) visited twice and the remainder (333, 13.3%) visited 3 times or more. The data from the GHS indicates that 14.9% of the population visited the doctor in the last 14 days[1]; this is, however, subject to seasonal variation. Of these, 62.5% of the population visited once, 24.1% visited twice and 13.5 visited 3 times or more, which is a very similar pattern to the findings in the force. The average number of consultations in the last 2 weeks for those police officers who visited the doctor was around 1.7 per officer compared with 1.6 in the GHS.

The principal reasons for visiting the doctor are shown in Table 6.1 below.

Table 6.1: Reasons for visiting the doctor

Reason for visiting the doctor	Frequency	% of those visiting who gave this reason (n=2495)	% of whole group who visited for this reason (n=9811)
Upper respiratory tract infection	1,766	70.8	18.0
Bronchitis	216	8.7	2.2
Other respiratory problem	146	5.9	1.5
Muscle/joint problem	384	15.4	3.9
Diabetes	27	0.1	0.3
Accident/injury	183	7.3	1.9
Hypertension	76	0.3	0.8
Headache	367	14.7	3.7
Stomach problem	490	19.6	5.0

Age, gender and level of education appeared to affect whether or not the doctor was visited, with a greater likelihood of visiting for the older officers, females and those with lower levels of educational attainment.

The commonest past illness was allergic rhinitis (28.4%) followed by skin allergies (19.9%) (Table 6.2).

Table 6.2: Past illnesses

Past illness	No. (%) reporting
Chest injury/operation	178 (1.8)
Coronary heart disease	33 (0.3)
Acute bronchitis	360 (3.6)
Chronic bronchitis	930 (9.4)
Pneumonia	235 (2.4)
Pleurisy	100 (1.0)
Pulmonary TB	128 (1.3)
Asthma	303 (3.1)
Other chest trouble	114 (1.1)
Hay fever	469 (4.7)
Allergic rhinitis	2818 (28.4)
Sinusitis	547 (5.5)
Eczema	1202 (12.1)
Skin allergies	1978 (19.9)
Diabetes	91 (0.9)
High blood pressure	414 (4.2)
Ulcer	775 (7.8)

Some of these past illnesses increased the likelihood of visiting the doctor; these were heart disease and diabetes and, to a lesser extent, chronic bronchitis, pleurisy, asthma, allergic rhinitis, sinusitis, skin allergies, hypertension and ulcer.

6.2.2.2 What factors influenced visiting patterns?

The variables which were considered as being possible contributors to the likelihood of visiting the doctor during the past 14 days were added to the logistic regression model one at a time. For the symptoms, the baseline is defined as not having that symptom, hence the odds ratio shows the odds of visiting the doctor for those with the symptom against those without the symptom. For the current perceived health variable, the baseline is taken as a self-report of very good health. The Perceived Stress Scale (PSS) and Chinese Health Questionnaire (CHQ) scores are continuous variables and were split into tertiles for this analysis. In each case, the two lower tertiles are compared against the higher tertile which indicates the best score (Table 6.3).

Table 6.3: Factors affecting whether doctor was visited

Possible contributor to visiting doctor	No. (% of population) reporting that factor	Adjusted OR [95% CI]	Probability of the factor predicting doctor visit	Excess risk %
Sore itchy throat	3400 (34)	1.51 [1.37 - 1.68]	<0.0001	51
Cough morning, day or night	2354 (24)	1.89 [1.70 - 2.11]	<0.0001	89
Phlegm morning, day or night	2914 (29)	1.42 [1.28 - 1.57]	<0.0001	42
Shortness of breath/hurrying/ wheezy chest	2835 (29)	1.53 [1.38 - 1.70]	<0.0001	53
Blocked nose/runny nose	3450 (35)	1.34 [1.20 - 1.51]	<0.0001	34
Very poor current health	51 (0.5)	19.39 [9.64 - 39.0]	<0.0001	1839
Poor current health	1146 (12)	10.41 [8.43 -12.87]	<0.0001	941
Good current health	6940 (70)	2.86 [2.40 - 3.42]	<0.0001	186
CHQ score in poorest tertile	125 (1)	1.97 [1.33 - 2.94]	0.0008	97
CHQ score in middle tertile	2458 (25)	1.49 [1.33 - 1.66]	<0.0001	49
PSS score in poorest tertile	176 (2)	1.60 [1.13 - 2.24]	0.0073	60
PSS score in middle tertile	5033 (51)	1.22 [1.10 - 1.35]	0.0002	22

6.2.2.3 Which officers use medication?

A total of 3452 (35.0%) officers reported using medication in the last 14 days. The reasons for using medicines are given in Table 6.4.

Table 6.4: Reasons for using medication

Reason for using medication	Frequency	% of those using medication who gave this reason	% of whole group who used medication for this reason
Upper respiratory tract infection	2312	67.0	23.3
Bronchitis	218	6.3	2.2
Other respiratory problem	197	5.7	2.0
Muscle/joint problem	390	11.3	3.9
Diabetes	43	1.2	0.4
Accident/injury	124	3.6	1.2
Hypertension	108	3.1	1.1
Headache	687	19.9	6.9
Stomach problem	616	17.8	6.2

Age, gender and marital status affected whether or not medication was used, with a greater likelihood of use for the older officers, females and those who are married.

Some previous illnesses increased the likelihood of using medication; these were heart disease, hypertension and diabetes and, to a lesser extent, chronic bronchitis, pneumonia, asthma, hay fever, allergic rhinitis, sinusitis, eczema, skin allergies and ulcer.

Most medications were obtained from western doctors. Full results are shown in Table 6.5.

Table 6.5: Source of medications

Source of medication	Number reporting this source	% of those using any medication	% of whole group
Western doctor	2402	69.6	24.2
Chinese herbalist	361	10.5	3.6
Recommended by pharmacist	93	2.7	0.9
Recommended by other health care provider	41	1.2	0.4
Bought over the counter	1154	33.4	11.6
Recommended by friends/ family	192	5.6	1.9

The amounts most frequently spent on medications taken in the last 14 days ranged between $1 and $100.

6.2.2.4 **What factors are associated with medication use in the last 14 days?**

The variables which were considered as being possible contributors to the likelihood of using medication were analysed in exactly the same way as for visits to the doctor. The results obtained are shown in Table 6.6.

Table 6.6: Factors affecting whether medication was used

Possible contributor to using medication	No. (% of population) reporting that factor	Adjusted OR [95% CI]	Probability of the variable predicting use of medication	Excess risk %
Sore itchy throat	3,400 (34)	1.54 [1.40 - 1.69]	<0.0001	54
Cough morning, day or night	2,354 (24)	1.94 [1.74 - 2.15]	<0.0001	94
Phlegm morning, day or night	2,914 (29)	1.65 [1.50 - 1.82]	<0.0001	65
Shortness of breath/hurrying/ wheezy chest	2,835 (29)	1.73 [1.57 - 1.91]	<0.0001	73
Blocked nose/runny nose	3,450 (35)	1.85 [1.66 - 2.06]	<0.0001	85
Very poor current health	51 (0.5)	20.34 [9.45 - 43.77]	<0.0001	1934
Poor current health	1,146 (12)	16.70 [13.52 - 20.63]	<0.0001	1570
Good current health	6,940 (70)	3.57 [3.03 - 4.20]	<0.0001	257
CHQ score in poorest tertile	125 (1)	2.54 [1.68 - 3.86]	<0.0001	154
CHQ score in middle tertile	2458 (25)	1.57 [1.42 - 1.74]	<0.0001	57
PSS score In poorest tertile	176 (2)	2.16 [1.54 - 3.03]	<0.0001	116
PSS score in middle tertile	5033 (51)	1.37 [1.25 - 1.51]	<0.0001	37

6.2.2.5 What is the risk of admission to hospital in the last six months

Number of admissions: In the whole group of officers, 646 (6.5%) claim to have been admitted to hospital in the last 6 months. Adjusting this to take account of the validation results already reported, we can assume that approximately 343 (3.6%) actually had such an admission. Of those who claim to have had an admission in the last 6 months, 78 (12.1)% claim to have had more than one admission.

The latest GHS data on hospitalisation is from 1995 and reports that 3.0% of the whole population are estimated to have had an admission in the last 6 months, although only 36.6% of these were employed people[2]. The estimate of overall admissions (public and private) for employed people is 2.3%.

Age, gender and marital status are associated with admission to hospital with older officers and males being less likely and married officers more likely to be admitted. The strongest associations between a past illness and admission to hospital in the last six months are for heart disease and pleurisy while chest injury or operation, hypertension and ulcer show a weaker association.

Number of days spent in hospital: The median number of days spent in hospital is 4 with a modal value of 2 but a mean of 7.6 days (SD 22.1); that is, most people have short admissions but a minority have long ones.

Cost of admissions to hospital: The median amount which officers claim to have paid themselves for hospital admissions is $150 with a range of $0 to $50,000; 26.3% of those responding to this question (113/429) claim to have paid nothing. The mean cost paid was $2,517 (SD 6756); this figure was influenced by a few large costs.

Just over half of the officers (50.5%) claim to have medical insurance paid for by themselves, while 5.9% claim to have insurance paid for by others (Table 6.7).

Table 6.7: Medical insurance

	No.	(%)
Self paid	4997	(50.6)
RHKP paid	332	(3.4)
Agency paid	248	(2.5)
None	3899	(39.5)
Missing	406	(4.0)
Total	9882	(100)

6.2.3 Discussion

Each of the selected symptoms examined and the different levels of perceptions of health render an individual more likely to visit the doctor. The largest ORs are associated with current perceived health being very poor or poor. Among the symptoms, cough is associated with the highest odds of visiting the doctor and blocked or runny nose with the lowest.

The psychological scores (CHQ and PSS), give ORs between 1.5 and 2.0 showing that, for example, those in the poorest third for the CHQ score are twice as likely to visit the doctor as those in the best third for that score.

As reported for the general population[3], upper respiratory tract infection is the most frequently stated reason for visiting the doctor. The most common past illnesses are those related to allergies, that is, rhinitis and skin allergies. These conditions are also frequently found in the general population.

Similarly, symptoms and perceptions of health make an individual more likely to use medications. Again, the largest ORs are for current perceived health being very poor or poor. Again cough is associated with the highest odds ratios and sore or itchy throat with the lowest. A poor psychological score increases the likelihood of using medication with ORs even higher than those for visiting the doctor, being over 2 for the poorest third compared with the best third for both the CHQ and the PSS scores.

The self-reported rate of admission to hospital seems high, being around twice that of the general population as described in the GHS report (6.5% compared with 3.0%). Although this rate is probably over-reported by as much as 50%, the difference is unlikely to be fully explained by over-reporting because the GHS should, in theory, be subject to the same degree of over-reporting.

The high proportion with medical insurance is interesting and probably due to officers opting out of the pension scheme and taking out private insurance which may also provide medical benefits. Hence a higher proportion of the police have medical insurance compared with the general public.

6.3 How are health problems related to sickness absence?

6.3.1 Methods

6.3.1.1 Validation of absence data

The General Household Survey (GHS) collects data on a sample of around 10,000 households and reports their stated days off work. The latest such data are from a survey in 1987[4] and have been compared with the data collected in our survey.

The data obtained from the questionnaire were also validated by checking the personnel files for recorded days off for a sample of individuals in four stations on Hong Kong Island who claimed to have time off in the last 6 months. Out of 8 officers who reported leave due to illness or injury of 10 days or more, 4 had no sick leave of more than 4 days recorded in the last six months; it is therefore assumed that these periods of absence occurred prior to the previous six months and only 4/8 (50%) of those reporting illness absence of 10 days or more in the last six months actually had such an absence.

The data obtained from the questionnaire could be validated further against the existing data for absence kept by the Hong Kong Police. It was not possible for us to carry out this validation since we do not have access to that data.

The analysis was done in a similar fashion to that for utilisation of health care. Descriptive analysis was done using simple frequency distributions. The contribution of symptoms, psychological health and perceived health to sickness absence from work was assessed by logistic regression. The odds ratios quoted below are adjusted for age, gender, marital status, education level and ethnicity as well as for past medical history.

The two variables available from the questionnaire are days off due to injury, and days off due to illness, both answered in ranges. The two have a high correlation; those who have days off due to injury are also more likely to have days off due to illness. A composite variable, *days off Yes/No*, was used for the regression analyses.

6.3.2 Results

6.3.2.1 Frequency and patterns of days lost from work

A total of 2965 officers (29.9%) reported days off due to illness and 1260 (12.7%) days off to injury in the last 6 months. The ranges of days off are shown in Table 6.8 below. When the dichotomous variable is used, 3335 (33.6%) claim to have had time off in the last 6 months.

Table 6.8: Distribution of days off work

No. of days off work	For illness n (%)	For injury n (%)
none	6426 (64.7)	8051 (81.1)
<1 day	643 (6.5)	140 (1.4)
1 - 4 days	1944 (19.6)	627 (6.3)
5 - 9 days	218 (2.2)	218 (2.2)
10 or more days	160 (1.6)	275 (2.8)
Missing	536 (5.4)	616 (6.2)
Total	9927 (100)	9927 (100)

Age and gender affected whether any time off work due to illness had been taken, with males being less likely to have time off work than females and younger officers more likely than the older ones. Only 30% of males had some time off work due to illness compared with 45% of women; women also took longer periods of time off with 3.0% having 10 days or more compared with only 1.6% of men. The number taking no days off due to injury or illness in the last 6 months is 5871 (59.1%) overall but varies from age group to age group as shown in Table 6.9.

Educational level also had an effect with the highest level being less likely to take time off work. Some previous illnesses increased the likelihood of taking time off, namely, chest injury or operation, eczema, skin allergies, hypertension and ulcer.

The data for the GHS shows that 5.6% of employees, in the previous month, took time off work of less than 4 days while 2.3% took four or more days off in the last 6 months. In both cases, females and older people took more days off.

Table 6.9: Number having no days off in the last 6 months by age group

Age group	Number having no days off	% of the whole group
<25 years	1171	50.2
26 - 35	2394	63.3
36 - 45	1718	73.7
46 years and over	588	79.4
Total	5871	59.1

6.3.2.2 What factors affect whether time is taken off work?

The variables which were considered as being possible contributors to the likelihood of taking time off were analysed in exactly the same way as for visits to the doctor. The results obtained are shown in Table 6.10.

Table 6.10: Factors affecting whether days off were taken

Possible contributor to taking days off	No. (% of population) reporting that factor	Adjusted OR [95% CI]	Probability of the factor predicting taking days off	Excess risk %
Sore itchy throat	3400 (34)	1.40 [1.28 - 1.55]	<0.0001	40
Cough morning, day or night	2354 (24)	1.46 [1.31 - 1.63]	<0.0001	46
Phlegm morning, day or night	2914 (29)	1.41 [1.27 - 1.56]	<0.0001	41
Shortness of breath/hurrying/ wheezy chest	2835 (29)	1.40 [1.27 - 1.56]	<0.0001	40
Blocked nose/runny nose	3450 (35)	1.18 [1.06 - 1.31]	0.0032	18
Very poor general health	15 (0.2)	2.42 [0.56 - 10.52]	0.2368	-
Poor general health	480 (5)	3.57 [2.80 - 4.55]	<0.0001	257
Good general health	7420 (75)	1.56 [1.38 - 1.77]	<0.0001	56
CHQ score in poorest tertile	125 (1)	1.55 [1.03 - 2.32]	<0.0368	55
CHQ score in middle tertile	2458 (25)	1.50 [1.35 - 1.67]	<0.0001	50
PSS score in poorest tertile	176 (2)	1.72 [1.23 - 2.42]	0.0016	72
PSS score in middle tertile	5033 (51)	1.34 [1.21 - 1.47]	<0.0001	34

6.3.3 Discussion

As we have seen, each of the symptoms examined and the individual's perceptions of health make an individual more likely to take time off work. The largest OR is for general perceived health being poor compared with very good but the number with general perceived health being very poor is very small. While cough gives the highest ORs and blocked or runny nose the lowest among the symptoms, none of the symptoms have very high associated ORs. The psychological scores (CHQ and PSS) have a similar effect on days off work as on visiting the doctor with ORs around 1.5 to 2.0.

The number taking more than 4 days off work in the last six months appears higher than the reported data for the general employed population (3.8% for more than 4 days off for illness alone compared with 2.3% of the general population taking 4 or more days for illness or injury). The number taking less than 4 days off cannot be compared with the general population because the GHS does not use a six month time period for this data. The age distribution of those who take time off is also different from the general population with fewer days off being taken by older age groups. This is what we would expect when examining data within one occupational group where age is associated with rank, responsibility and income.

6.4 An examination of the factors which may lead to poor health, utilisation of health care and days off work.

6.4.1 Introduction

In order to understand what leads to symptoms and feelings of poor health, several risk factors were examined. These were smoking status, ETS exposure, alcohol drinking and several proxy indicators of pollution levels in working environments. The first three have been described elsewhere in the report and are summarised in section 6.4.6. The measures used as pollution indicators are described below.

Data was collected on three variables which might be used to indicate pollution levels. These variables are type of police duties (Foot Patrol, Traffic or Marine), type of work (administrative or active (outdoor) police work) and region of work. Each of these variables was examined to determine whether any of them were associated with respiratory symptoms, feelings of poor health or the psychological variables.

6.4.2 Possible indicators of pollution: Are the types of police duties carried out or the region of work associated with the probability of having symptoms?

6.4.2.1 Methods

The type of police duties carried out was considered as a proxy indicator for exposure to air pollution. The existing groupings, Foot Patrol, Traffic and Marine were used to determine whether any one group was more likely to have symptoms. Marine was used as the baseline.

Each individual was then characterised by whether they worked in a solely administrative job (e.g. at Headquarters) or not. Those whose role was not solely administrative were classified as being 'active', although this category covers a wide range of activities.

The region of work was used as another possible proxy indicator for exposure to air pollution. New Territories North (NTN) was used as the baseline against which the other regions, Hong Kong Island (HKI), Kowloon East (KE), Kowloon West (KW), New Territories South (NTS) and Marine were compared. NTN was taken as the baseline for comparison because all symptoms were more common in the other regions. A further analysis was done using 'Region' as a continuous variable ordered as KW, KE, HKI, NTS, NTN in descending order of approximate expected pollution levels based on reported total suspended particulate levels in 1995.

Foot Patrol and Traffic were investigated separately because they appeared on initial inspection to show a different pattern of association between symptoms and regions using NTN as the reference group.

For the Marine Police, this analysis was done using the whole group of officers.

A logistic regression model was run using each symptom in turn as the dependent variable. For each symptom, the variables 'Active duty or not' and 'Type of police' were entered separately. The following variables were controlled for in the model: age, type of pets kept, whether exercise is taken, gender, marital status, ethnicity, education level, exposure to ETS, alcohol drinking habit, smoking status and past medical history. Asthma and bronchitis were not included as these conditions could themselves be linked to air pollution. The results for each analysis are shown as odds ratios (OR) and the percentage of excess risk in Tables 6.11 to 6.20.

6.4.2.2 **Results**

Type of police duties: For cough, phlegm and sore/itchy throat, the ORs are significant although the result is borderline for the latter two (Tables 6.11, 6.12 and 6.13). For cough, the excess risk of having this symptom is 43% for those in Traffic and a similar level of 49% of those in Foot Patrol compared with Marine. This suggests that there may be a causal association between exposures encountered in Foot Patrol or Traffic duties and suffering these symptoms.

For chest wheezing or whistling (Table 6.13) and blocked or running nose (Table 6.15), no such association is found.

Table 6.11: Association between cough and type of police duties

Type of duties	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	345 (24.1)	1.43 [1.18 - 1.73]	0.0002	43
Foot patrol	1617 (25.1)	1.49 [1.29 - 1.74]	<0.0001	49
Marine	392 (19.6)	1.00	-	-
	2354 (23.8)			

Table 6.12: Association between phlegm and type of police duties

Type of duties	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	441 (30.8)	1.20 [1.01 - 1.43]	0.0360	20%
Foot patrol	1898 (29.4)	1.17 [1.02 - 1.34]	0.0235	17%
Marine	575 (28.8)	1.00	-	-
	2914 (29.5)			

Table 6.13: Association between chest wheezing or whistling and type of police duties

Type of duties	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	135 (9.5)	1.01 [0.77 - 1.33]	0.9265	-
Foot patrol	674 (10.6)	0.93 [0.76 - 1.15]	0.5279	-
Marine	180 (9.2)	1.00	-	-
	989 (10.2)			

Table 6.14: Association between sore or itchy throat and type of police duties

Type of duties	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	497 (35.5)	1.18 [1.00 - 1.39]	0.0476	18
Foot patrol	2259 (35.8)	1.16 [1.02 - 1.32]	0.0234	16
Marine	644 (33.4)	1.00	-	-
	3400 (35.3)			

Table 6.15: Association between blocked or running nose and type of police duties

Type of duties	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	445 (31.3)	1.11 [0.92 - 1.35]	0.2803	-
Foot patrol	2384 (37.2)	1.16 [1.00 - 1.35]	0.0513	-
Marine	621 (31.5)	1.00	-	-
	3450 (35.2)			

Active duty: All symptoms appear to be associated with active rather than administrative work (Tables 6.16 to 6.20). The excess risk ranges from 27% for sore or itchy throat to 65% for chest wheezing or whistling.

Table 6.16: Association between cough and active or administrative work

Type of work	No. reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Active	2240 (24.6)	1.57 [1.24 - 1.98]	0.0002	57
Admin.	114 (13.9)	1.00	-	-
	2354 (23.7)			

Table 6.17: Association between phlegm and active or administrative work

Type of work	No. reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Active	2730 (30.0)	1.32 [1.07 - 1.61]	0.0082	32
Admin.	184 (22.5)	1.00	-	-
	2914 (29.4)			

Table 6.18: Association between chest wheezing or whistling and active or administrative work

Type of work	No. reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Active	950 (10.6)	1.65 [1.13 - 2.42]	0.0097	65
Admin.	39 (5.1)	1.00	-	-
	989 (10.2)			

Table 6.19: Association between sore or itchy throat and active or administrative work

Type of duty	No. reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Active	3190 (35.8)	1.27 [1.05 - 1.54]	0.0157	27
Admin.	210 (28.8)	1.00	-	-
	3400 (35.3)			

Table 6.20: Association between blocked or running nose and active or administrative work

Type of work	No. reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk %
Active	3259 (36.0)	1.41 [1.13 - 1.77]	0.0026	41
Admin.	191 (25.0)	1.00	-	-
	3450 (35.1)			

Region of work: As can be seen from Table 6.21 for cough, the estimated ORs are higher for HKI for the Foot Patrol and for NTS for Traffic; the ORs for Traffic are also higher than those for Foot Patrol. However these differences are small. For the continuous variable 'Region', the Traffic data give a result which is just significant indicating that there appears to be a trend for increasing cough consistent with our assumption of increasing pollution levels across the regions. For phlegm (Table 6.22), HKI and KE show the highest excess risks for Foot Patrol and NTS and KW for Traffic so there is no consistent pattern except that HKI and NTS seem high. The 'Region' variable is not significant for either Foot Patrol or Traffic. For chest wheezing or whistling (Table 6.23), all regions show an increase relative to NTN in Foot Patrol but none in Traffic. The small numbers in Traffic could account for the non-significant finding. There is little of note in the analysis of sore and itchy throat (Table 6.24). For blocked or running nose (Table 6.25) the main finding is that the region variable is significant for Foot Patrol; however, ranking of the ORs for the regions are in the opposite order from that expected with NTS having the highest and KW the lowest.

Finally, Table 6.25 shows the results for Marine for each of the symptoms. The only symptom for which Marine appear to be at higher risk than NTN officers is chest wheezing or whistling.

Table 6.21: Association between cough and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% of no. in region) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk	Traffic n=1414 No. (%) reporting this symptom	Odds ratio & 95%CI	Probability	Excess risk
HKI	420 (28.2)	1.37 [1.13 - 1.67]	0.0013	37%	91 (23.8)	1.64 [1.04 - 2.59]	0.0324	64%
KE	262 (25.6)	1.21 [0.98 - 1.49]	0.0833	21%	60 (24.6)	1.71 [1.04 - 2.82]	0.0340	71%
KW	390 (25.4)	1.22 [1.01 - 1.49]	0.0430	22%	80 (28.7)	1.98 [1.23 - 3.17]	0.0048	98%
NTS	252 (24.1)	1.13 [0.91 - 1.40]	0 2756	-	63 (26.8)	2.08 [1.26 - 3.42]	0.0040	108%
NTN	291 (21.7)	1.00	-	-	51 (18.7)	1.00	-	-
	1615 (25.1)				345 (24.4)			
Region		1.04 [0.99 - 1.09]	0.0847			1.11 [1.00 - 1.23]	0.0419	11%

Table 6.22: Association between phlegm and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% in region) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk	Traffic n=1414 No. (%) reporting this symptom	Odds ratio & 95%CI	Probability	Excess risk
HKI	487 (32.7)	1.41 [1.17 - 1.70]	0.0002	41%	109 (28.5)	1.18 [0.77 - 1.79]	0.4544	-
KE	324 (31.6)	1.40 [1.14 - 1.71]	0.0011	40%	77 (31.6)	1.42 [0.89 - 2.26]	0.1364	-
KW	463 (30.2)	1.27 1.05 - 1.53	0.0124	27%	103 (36.9)	1.69 [1.09 - 2.61]	0.0186	69%
NTS	290 (27.8)	1.08 [0.88 - 1.36]	0.4878	-	81 (34.5)	1.67 [1.05 - 2.65]	0.0290	29%
NTN	330 (24.6)	1.00	-	-	69 (25.3)	1.00	-	-
	1894 (29.4)				439 (31.0)			
Region		1.03 [0.99 - 1.08]	0.1488			1.05 [0.95 - 1.15]	0.3556	-

Table 6.23: Association between chest wheezing or whistling and region of work: NTN as reference group

Region	Foot patrol No. (% of no. in region) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk	Traffic No. (%) reporting this symptom	Odds ratio & 95%CI	Probability	Excess risk
HKI	162 (11.0)	1.32 [0.98 - 1.76]	0.0643	-	33 (8.7)	1.01 [0.51 - 1.98]	0.9805	-
KE	115 (11.4)	1.45 [1.06 - 1.98]	0.0192	45%	23 (9.6)	1.19 [0.58 - 2.44]	0.6361	-
KW	170 (11.2)	1.52 [1.14 - 2.02]	0.0044	22%	29 (10.4)	1.50 [0.77 - 2.93]	0.2302	-
NTS	120 (11.7)	1.43 [1.05 - 1.95]	0.0246	-	23 (9.8)	1.42 [0.69 - 2.93]	0.3417	-
NTN	105 (8.0)	1.00	-	-	26 (9.6)	1.00	-	-
	672 (10.6)				134 (9.6)			
Region		1.05 [0 98 - 1.12]	0.1647			1.01 [0.87 - 1.18]	0.8743	-

Table 6.24: Association between sore or itchy throat and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% in region) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk	Traffic n=1414 No. (%) reporting this symptom	Odds ratio & 95%CI	Probability	Excess risk
HKI	543 (37.2)	1.21 [1.01 - 1.44]	0.0334	21%	121 (32.4)	1.10 [0.74 - 1.63]	0.6360	-
KE	370 (36.9)	1.18 [0.98 - 1.43]	0.0873	-	87 (36.1)	1.21 [0.78 - 1.86]	0.3917	-
KW	542 (36.3)	1.18 [0.99 - 1.41]	0.0592	-	123 (44.4)	1.78 [1.19 - 2.66]	0.0053	78%
NTS	384 (37.2)	1.20 [1.00 - 1.46]	0.0549	-	78 (34.1)	1.18 [0.77 - 1.83]	0.4465	-
NTN	416 (31.9)	1.00	-	-	85 (31.7)	1.00	-	-
	2255 (35.8)				494 (35.6)			
Region		1.04 [1.00 - 1.08]	0.0613	-		0.97 [0.89 - 1.07]	0.5426	-

Table 6.25: Association between blocked or running nose and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% of no. in region) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk	Traffic n=1414 No. (%) reporting this symptom	Odds ratio & 95%CI	Probability	Excess risk
HKI	565 (38.0)	1.30 [1 06 - 1.58]	0.0097	30%	110 (28.8)	1.11 [0.69 - 1.78]	0.6789	-
KE	388 (38.0)	1.26 [1.02 - 1.57]	0.0325	26%	74 (30 5)	1.11 [0.65 - 1.87]	0.7065	-
KW	560 (36.7)	1.21 [0.99 - 1.47]	0.0576	-	100 (35 8)	1.47 [0 90 - 2 39]	0.1200	-
NTS	441 (42.3)	1.51 [1.22 - 1 86]	0.0001	51%	75 (31 9)	1 38 [0.82 - 2.33]	0 2216	-
NTN	424 (32 0)	1.00	-	-	83 (30 6)	1 00	-	-
	2378 (37.2)				442 (31 3)			
Region		1.09 [1 04 - 1.14]	0.0002	9%		1 02 [0.92 - 1.14]	0 6786	-

Table 6.26: Association between symptoms and working as Marine police (NTN as reference group)

Symptom	No. (%) reporting this symptom	Adjusted OR [95% CI]	Probability	Excess risk
Cough in morning, day or night	386 (19.7)	0.84 [0.69 - 1.01]	0.0662	-
Phlegm in morning, day or night	566 (28.9)	1.08 [0.90 - 1.28]	0 4066	-
Chest wheezing or whistling	178 (9.3)	1.39 [1.05 - 1.83]	0.0204	39%
Sore or itchy throat	638 (33.8)	1.01 [0.85 - 1.19]	0.9343	-
Blocked or running nose	607 (31.4)	1.06 [0.87 - 1.28]	0.5664	-

6.4.3 Possible indicators of pollution: Does type and region of work affect perceptions of health.

6.4.3.1 Methods

This analysis was done exactly as described in the section on symptoms but using general perceived health and current perceived health as dependent variables.

6.4.3.2 Results

As Tables 6.27 and 6.28 show, there is no apparent association between type of police duties and perceptions of health. Similarly, there is no apparent association between active or administrative work and perceptions of health (Tables 6.29 and 6.30).

Table 6.27: Association between current perceived health (poor/very poor compared with good/very good) and type of police work

Police duties	No. (%) reporting health poor/very poor	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	165 (11.6)	1.05 [0.82 - 1.34]	0.7184	-
Foot patrol	808 (12.6)	1.10 [0.91 - 1.33]	0.3324	-
Marine	224 (11.3)	1.00	-	-
	1197 (12.2)			

Table 6.28: Association between general perceived health (poor/very poor compared with good/very good) and type of police work

Police duties	No. (%) reporting health poor/very poor	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	68 (4.8)	1.13 [0.79 - 1.62]	0.5067	-
Foot patrol	321 (5.0)	1.04 [0.78 - 1.38]	0.1454	-
Marine	106 (5.3)	1.00	-	-
	495 (5.0)			

Table 6.29: Association between current perceived health (poor/very poor compared with good/very good) and active or administrative work

Type of work	No. reporting health poor/very poor	Adjusted OR [95% CI]	Probability	Excess risk %
Active	1124 (12.4)	1.10 [0.82 - 1.46]	0.5262	-
Admin.	73 (9.5)			
	1197 (12.2)			

Table 6.30: Association between general perceived health (poor/very poor compared with good/very good) and active or administrative work

Type of work	No. reporting health poor/very poor	Adjusted OR [95% CI]	Probability	Excess risk %
Active	467 (5.1)	1.34 [0.84 - 2.13]	0.2160	-
Admin.	28 (3.6)	1.00	-	-
	495 (5.0)			-

Tables 6.31 and 6.32 show the association between perceptions of health and region of work. The Traffic group has very small numbers in this analysis and shows no pattern. In the Foot Patrol, those working in NTN have the best perceptions of their current health and, as Table 6.32 shows, those working in HKI, KE and KW have an excess risk of over 50% of reporting poorer health. However, the 'Region' variable is not significant in this analysis showing that any association between region of work and perception of health is not consistent with our assumption of ordering of levels of pollution.

6.4.4 Possible indicators of pollution: Does type and region of work affect psychological morbidity and stress levels

6.4.4.1 Methods

The same analysis was done for the psychological morbidity measure (CHQ) and the stress measure (PSS) as the dependent variables.

6.4.4.2 Results

As Tables 6.33 and 6.34 show, there is no apparent association between type of police duties and either psychological morbidity or stress level. Similarly, there is no apparent association between active or administrative duties and psychological morbidity or stress scores (Tables 6.35 and 6.36). For regions, there appears to be no consistent association for either Foot Patrol or Traffic officers (Tables 6.37 and 6.38).

Table 6.31: Association between *current health* (poor/very poor compared with good/very good) and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% of no. in region) reporting poor/very poor *current health*	Adjusted OR [95% CI]	Probability	Excess risk %	Traffic n=1414 No. (%) reporting poor/very poor health today	Odds ratio & 95%CI	Probability	Excess risk %
HKI	208 (14.0)	1.26 [0.98 - 1.62]	0.0707	-	38 (10.1)	0.92 [0.49 - 1.73]	0.7997	-
KE	128 (12.6)	1.18 [0.89 - 1.55]	0.2533	-	30 (12.3)	1.84 [0.96 - 3.52]	0.0668	-
KW	205 (13.5)	1.24 [0.97 - 1.60]	0.0878	-	37 (13.3)	1.48 [0.78 - 2.79]	0.2300	-
NTS	119 (11.4)	1.00 [0.75 - 1.33]	0.9918	-	30 (12.8)	1.50 [0.77 - 2.90]	0.2295	-
NTN	146 (10.9)	1.00	-	-	30 (11.0)	1 00	-	-
	806 (12.6)				165 (11.7)			
Region		1.01 [0.95 - 1.07]	0.8454	-		1.01 [0.88 - 1.16]	0.8618	-

Table 6.32: Association between *general health* (poor/very poor compared with good/very good) and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% in region) reporting poor/very poor *general health*	Adjusted OR [95% CI]	Probability	Excess risk %	Traffic n=1414 No. (% in region) reporting poor/very poor general health	Odds ratio & 95%CI	Probability	Excess risk %
HKI	79 (5.3)	1.58 [1.04 - 2.40]	0.0311	58	17 (4.5)	1.12 [0.45 - 2.76]	0.8092	-
KE	57 (5.6)	1.64 [1.05 - 2.56]	0.0281	64	7 (2.9)	0.99 [0.34 - 2.90]	0.9883	-
KW	89 (5.8)	1.66 [1.10 - 2.50]	0.0155	66	20 (7.2)	2.12 [0.86 - 5.20]	0.1024	-
NTS	46 (4.4)	1.24 [0.78 - 1.98]	0.3597	-	10 (4.3)	1.15 [0.42 - 3.20]	0.7835	-
NTN	49 (3.7)	1.00	-	-	14 (5.1)	1.00	-	-
	320 (5.0)				68 (4.8)			
Region		1.03 [0.94 - 1.13]	0.4937	-		0.94 [0.77 - 1.36]	0.5573	-

Table 6.33: Association between CHQ score (poorest third compared with the rest) and type of police duties: Marine as reference group

Police duties	No. (%) in poorest third for CHQ score	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	398 (28.3)	1.08 [0.91 - 1.28]	0.4051	-
Foot patrol	1653 (26.0)	0.95 [0.83 - 1.09]	0.4611	-
Marine	532 (27.4)	1.00	-	-
	2583 (26.6)			

Table 6.34: Association between PSS score (poorest third compared with the rest) and type of police duties: Marine as reference group

Police duties	No. (%) in poorest third for PSS score	Adjusted OR [95% CI]	Probability	Excess risk %
Traffic	442 (31.7)	1.10 [0.92 - 1.30]	0.2928	-
Foot patrol	1972 (31.2)	0.94 [0.82 - 1.08]	0.3680	-
Marine	552 (28.6)	1.00	-	-
	2966 (30.8)			

Table 6.35: Association between CHQ score (poorest third compared with the rest) and type of work: Admin. as reference group

Type of work	No. (%) in poorest third for CHQ score	Adjusted OR [95% CI]	Probability	Excess risk %
Active	2408 (26.9)	1.03 [0.84 - 1.25]	0.8032	-
Admin.	175 (23.1)	1.00	-	-
	2583 (26.6)			

Table 6.36: Association between PSS score (poorest third compared with the rest) and type of work: Admin. as reference group

Type of work	No. (%) in poorest third for PSS score	Adjusted OR [95% CI]	Probability	Excess risk %
Active	2752 (31.0)	0.94 [0.78 - 1.14]	0.5478	-
Admin.	214 (28.6)	1.00	-	-
	2966 (30.8)			

Table 6.37: Association between CHQ score (poorest third compared with the rest) and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% of no. in region) in poorest third for CHQ score	Adjusted OR [95% CI]	Probability	Excess risk %	Traffic n=1414 No. (%) reporting poor/very poor health today	Odds ratio & 95%CI	Probability	Excess risk %
HKI	385 (26.1)	1.01 [0.84 - 1.21]	0.9434	-	102 (26.9)	1.34 [0.87 - 2.06]	0.1898	-
KE	274 (27.0)	1.03 [0.84 - 1.26]	0.7902	-	68 (28.5)	1.55 [0.96 - 2.49]	0.0737	-
KW	382 (25.5)	0.97 [0.86 - 1.25]	0.7205	-	84 (30.5)	1.58 [1.00 - 2.49]	0.0490	58
NTS	275 (26.5)	1.03 [0.84 - 1.26]	0.7505	-	75 (32.5)	1.87 [1.17 - 2.99]	0.0085	87
NTN	335 (25.6)	1.00	-	-	68 (25.5)	1.00	-	-
	1651 (26.1)				397 (28.5)			
Region		1.01 [0.97 - 1.06]	0.6338	-		1.10 [0.99 - 1.21]	0.0639	-

Table 6.38: Association between PSS score (poorest third compared with the rest) and region of work: NTN as reference group

Region	Foot patrol n=6432 No. (% in region) in poorest third for PSS score	Adjusted OR [95% CI]	Probability	Excess risk %	Traffic n=1414 No. (% in region) reporting poor/very poor general health	Odds ratio & 95%CI	Probability	Excess risk
HKI	462 (31.6)	1.15 [0.96 - 1.37]	0.1391	-	115 (30.7)	1.00 [0.67 - 1.48]	0.9953	-
KE	314 (31.1)	1.07 [0.88 - 1.30]	0.5246	-	86 (36.0)	1.31 [0.85 - 2.02]	0.2150	-
KW	470 (31.5)	1.10 [0.92 - 1.32]	0.2878	-	84 (30.3)	0.96 [0.63 - 1.46]	0.8410	-
NTS	348 (34.0)	1.22 [1.02 - 1.46]	0.0447	22	74 (32.6)	1.09 [0.70 - 1.69]	0.6994	-
NTN	371 (28.5)	1.00	-	-	80 (30.5)	1.00	-	-
	1965 (31.2)				439 (31.8)			
Region		1.04 [1.00 - 1.09]	0.0488	4		1.02 [0.93 - 1.12]	0.6837	-

6.4.5 Discussion

There is a consistent association between type of police duties and reported respiratory symptoms; this association is seen for both Foot Patrol and Traffic when compared with Marine. It should be noted that there is a higher prevalence of smoking in Foot Patrol and Traffic compared with Marine. Although current smoking status was controlled for in the model used, a residual smoking and ETS exposure effect cannot be ruled out.

There is also an apparent clear association between symptoms and carrying out active work. This may be worth investigating further if a more detailed breakdown of work activities could be attached to each individual. Overall these findings are consistent with an association between outdoor work exposures and the development of both upper and lower respiratory symptoms.

The association with region of work is less clear. There again appears to be an association with cough but only in Traffic does it follow what we considered to be the possible rank order of regions in terms of pollution levels. Total suspended particulates from the 1995 EPD report were used as the guide to this ranking. Other composite indices and numbers of exceedences of air quality objectives would allow more complete analyses. Ozone levels would be an additional source of information but they are only quoted for Hong Kong Island in 1995.

On the other hand, there is no apparent association between any of these assumed indicators of working in a polluted environment and perceptions of health or psychological symptoms.

In summary, therefore, if type of police duties carried out can be considered as an indicator of exposure to pollution, then the increased symptoms we observe in some of these groups may be a result of working in a polluted atmosphere. This is a tentative but feasible hypothesis at present and needs to be supported by further studies. The findings for region of work are unclear but overall they support the hypothesis that working in more polluted regions is associated with excess reporting of the symptom of cough. However, none of the variables which may indicate working in a polluted atmosphere is associated with perceptions of health, mental wellbeing or stress levels.

6.4.6 Effect of possible risk factors on utilisation of health care and days off work

6.4.6.1 Summary of risk factors for symptoms, poor perceptions of health and psychological morbidity.

The risk factors which might lead to the symptoms and/or poor perceptions of health, and hence to utilisation of health care and days off work are smoking, exposure to environmental tobacco smoke and passive smoking, drinking high levels of alcohol and ambient air pollution in the work environment.

Table 6.39 summarises the results for smoking, ETS exposure and drinking alcohol from previous sections of the report and includes the pollution indicators reported in this section. The ranges presented in Table 6.39 are for the different symptoms or pollution variables used in the previous analyses. NA indicates that this data is not available; this is because the effects of drinking high levels of alcohol on respiratory symptoms and the effects of ETS exposure on some of the symptoms were not assessed. The effect of ETS has been given separately for non-smokers and smokers where possible.

Table 6.39: Summary of effect of possible risk factors on symptoms, perceptions of health and psychological variables

Symptom/health perception	Excess risk for smokers compared with never/non-smokers %	Excess risk for ETS exposure at home and/or work compared with none %		Excess risk for air pollution variables	Excess risk for drinking very high levels of alcohol compared with very low levels %
		non-smoker	smoker		
Cough	100-120†	72	104	11-57	NA
Phlegm	140-150†	86		17-32	NA
Chest wheezing or whistling	60†	NA		65	NA
Sore/itchy throat	40†	98	97	16-27	NA
Blocked/running nose	20†	NA		9-41	NA
Poor general health	6 NS#	84	40 NS	Nil	Nil
Poor current health	3 NS#	54	113	Nil	Nil
Psychological morbidity as measured by CHQ	-6* NS#	-1* NS	57	Nil	Nil
Stress level as measured by PSS	-7* NS#	25	15 NS	Nil	151%

*Note: * indicates a negative value for excess risk implying a protective effect; however, these are all non-significant (NS).*
† For those variables the comparison is between smokers versus never-smokers.
 # For these variables, the comparison is smokers versus current non-smokers.

Smoking, ETS and air pollution all appear to affect respiratory symptoms with the greatest excess risk associated with smoking. The effect of smoking is greatest for cough and phlegm. On the other hand, there is little difference in the size of the effect of ETS on cough, phlegm and sore throat. For cough alone, smokers appear to have more of an effect from ETS than non-smokers.

Only ETS appears to affect health perceptions and psychological morbidity. This is interesting in view of the apparent lack of effect of smoking on these variables. This may, however, be accounted for by a healthy smoker effect, meaning that those who continue to smoke are a relatively healthy group since those who were not so healthy have already stopped smoking. This is borne out by the fact that the effect of smoking on perceptions of health do show the same direction of excess risk, that is positive, even though the point estimates are small and not significant.

Drinking alcohol appears to be associated with stress levels, with those who drink more reporting higher stress. This may be partly explained by drinking behaviour being induced by stress rather that the other way around and, hence, is not further examined.

6.4.6.2 Table 6.40. The ranges include the point estimates for all the symptoms examined.

Table 6.40: Summary of estimated excess risks (%) associated with respiratory symptoms, perceptions of health and psychological variables for utilisation of health care and days off work and average effect of risk factors on each symptom and health perception

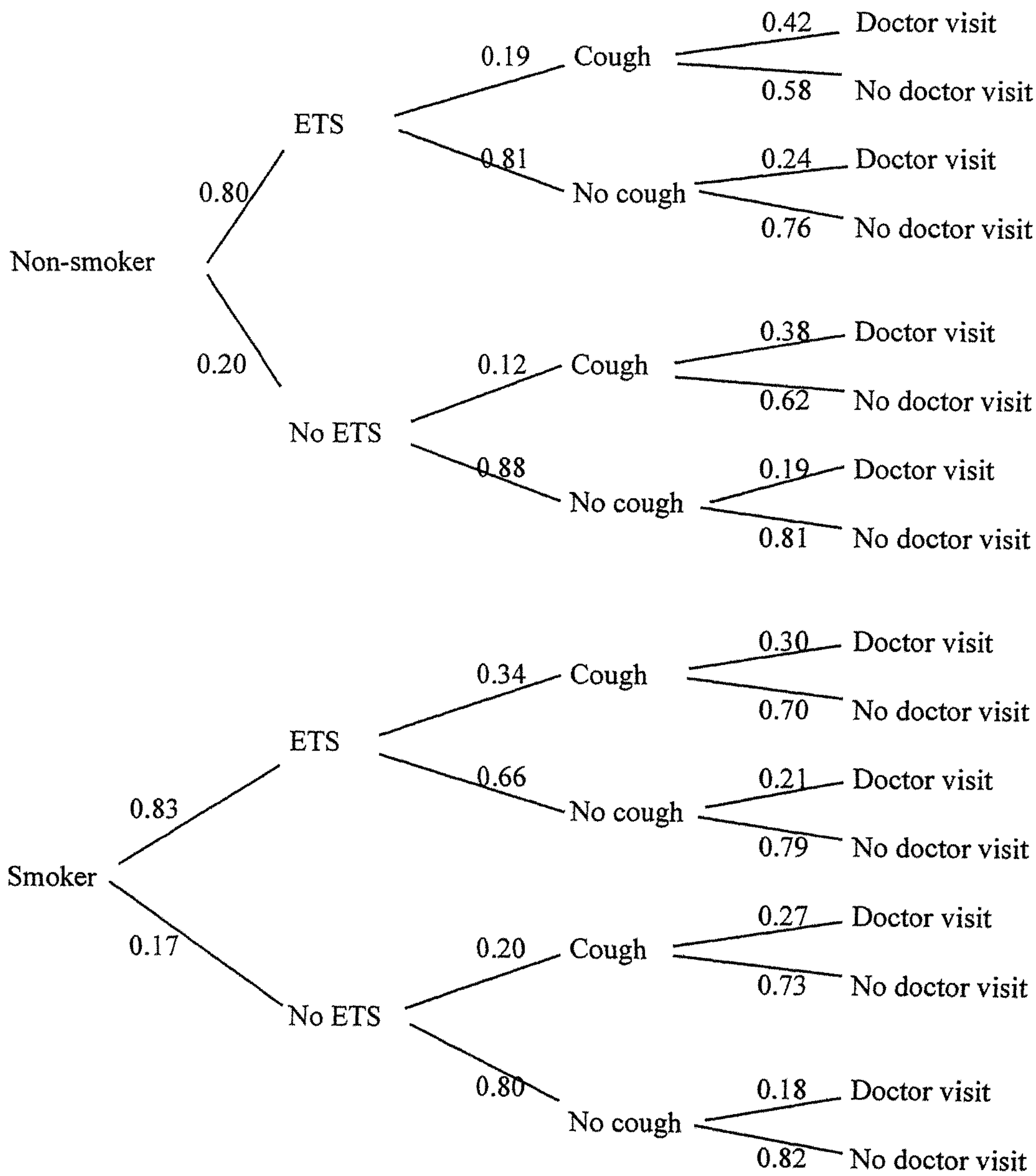
	Effect of respiratory symptoms	**Effect of poor general health**	**Effect of poor current health**	**Effect of poor psychological health**	**Effect of high stress level**
Attending the doctor	34 - 89		1839	97	60
Using medications	65 - 94		1934	154	116
Taking days off work	18 - 46	257		55	72
Average effect of risk factors (excess risk %) on the symptoms and health perceptions above					
Smoking	72				
ETS at work	81	72	83	32	35
Pollution variables	18				

By far the greatest effect on consultation with a doctor is associated with perception of current health. This is true also for use of medicines. For days off work, the greatest effect is associated with perception of general health. The symptoms rank third in size of effect on all three behaviours.

Taking the variables in Table 6.39 and Table 6.40 together, we get the results in the bottom half of Table 6.40. As can be seen, for symptoms, ETS and smoking produce excess risks of around 70-80% compared with around 20% for the pollution-related variables. Furthermore, ETS also appears to affect self-perceptions of health and stress levels. Since self-perceptions of health have by far the greatest effect on utilisation of health care, medicine and days off work, ETS exposure may be the greatest contributor to these among all the risk factors studied. However, symptoms do lead to utilisation too and, hence, smoking is also contributing to such health service use and lost working time. The much smaller effect of the air pollution variables on symptoms is still of concern and such symptoms are unpleasant for the officers concerned as well as a cost to the force in medical expenses and lost working time.

6.5 Calculation of avoidable visits to the doctor due to ETS exposure:

6.5.1 The following probability tree was created



Hence, in the 14 day period examined, the probability of a non-smoker exposed to ETS at work having a cough and visiting the doctor was 0.19 x 0.42 = 0.08 and the probability of not having a cough and visiting the doctor was 0.81 x 0.24 = 0.19. The total probability of making a doctor visit for a non-smoker who is exposed to ETS at work was 0.08 + 0.19 = 0.27.

In a similar way, the total probability of a non-smoker, not exposed to ETS at work, visiting a doctor was 0.05 + 0.17 = 0.22.

Hence those exposed to ETS were 5% more likely to visit a doctor.

If there are approximately 5,000 non-smokers, around 4,000 (5,000 x 0.80) are exposed to ETS at work. Hence they will make about 1080 (0.26 x 4,000) dr consultations in any two weeks. If they had the same risk of making a dr visit as those not exposed to ETS, they would make only 880 (0.22 x 4,000) visits, 200 less. Since there are around 20 two-week periods in a working year, this is a total of 4,000 visits which could potentially be saved if these 4,000 were not exposed to ETS at work.

For smokers exposed to ETS at work, in the 14 day period examined, the probability of having a cough and visiting the doctor was 0.34 x 0.30 = 0.10 and of not having a cough and visiting the doctor was 0.66 x 0.21 = 0.14. The total probability of a smoker, exposed to ETS, making a dr visit was therefore 0.10 + 0.14 = 0.24.

In a similar way, the total probability of a smoker, not exposed to ETS, visiting a doctor was 0.05 + 0.14 = 0.19. Again those exposed to ETS are 5% more likely to visit a doctor.

If there are also approximately 5,000 smokers, around 4,150 (5,000 x 0.83) are exposed to ETS at work. Hence they will make about 996 (0.24 x 4,150) dr consultations in any two weeks. If they had the same risk of making a dr visit as those not exposed to ETS at work, they would make only 789 (0.19 x 4,150) visits, 207 less. This gives a total of 4140 visits which could potentially be saved if these 4,150 were not exposed to ETS at work.

In total, around 8,140 visits to the doctor could be saved in a year if ETS exposure at work could be eliminated

6.5.2 Calculations

The probabilities used in the probability tree were calculated in the following way:

The prevalence of the symptom or behaviour in the group not having the risk factor was taken as the odds for the 'control group'. For example, for a non-smoker with no cough and no ETS exposure, the prevalence of doctor consultation is 19.2% from the survey. This gives an odds of 0.24 (0.192/1-0.192). With this odds for the 'control group', the odds for those with cough is calculated using the control group odds and the adjusted odds ratio. For non-smokers, with no ETS exposure, the adjusted odds ratio for visiting the doctor with cough is 2.51; hence the odds are 2.51 x 0.24 = 0.60. These odds can now be turned into probabilities using the formula, probability = odds/1+odds. Hence, for a non-smoker with no ETS exposure, the probability of visiting the doctor when one has a cough is 0.60/1.60 = 0.38 and 0.24/1.24 = 0.19 when one has no cough.

6.6 Discussion

The data on utilisation of health services and days off work shows some interesting findings. The higher level of consultation with a doctor and use of medications for females and for older officers is what we find in the general population. This provides support for the validity of this self-reported data. Although female officers are also more likely to be admitted to hospital, older officers are less likely than younger officers to be admitted. However, in the general population, older age groups are admitted more often than younger age groups. The other interesting finding is that the rate of admission to hospital, even allowing for some over-reporting, is higher than in the general population. Taking these two findings together, one may conclude that a high proportion of the admissions may be due to accidents and injuries which are more common among younger people due to their activities. This could be examined by looking at the principal reasons for admissions. This analysis is proceeding at present with the data collected in the survey.

There is also an apparent higher rate of officers attending a doctor when compared with the general population. However, this variable is subject to a lot of variation depending on time of year and whether an upper respiratory viral infection is circulating. For those who did visit the doctor, the rate of attendance in two weeks is very similar to that in the general population so this perhaps indicates that police officers do not have substantially different consultation patterns from other population groups. The similarity in reasons for visiting the doctor further supports this suggestion.

As already discussed, there is a high prevalence of self-reported allergic conditions and some of these lead to increased visits to the doctor and to using medication. They do not, however, lead to higher levels of admission to hospital. The prevalence of these conditions may not be higher than in the healthy general population. However, they are a significant cause of minor ill health, discomfort and use of health care services.

When we examine the reasons why officers visit the doctor and use medications, it appears that self-reported health perceptions are the over-riding factor, with those who perceive their current health as very poor being around twenty times more likely to visit the doctor and use medicines compared with those who think their health is very good. Even those who think their current health is good are around three times more likely to use these services than those with very good health. These activities could represent a high cost both in terms of the medical care costs and in the time spent on such visits, although it is possible that the lost working time is small if officers attend doctors outside of their working hours. This is very possible given that shift patterns allow them to be free during normal office hours.

Of interest, however, are the factors which lead to poorer perceptions of health. These have been discussed in Section 3 which deals with perceptions of health and, briefly, are sleep quality, exercise, exposure to ETS and drinking alcohol, as well as gender in smokers only. Effects of some of these factors, for example, exposure to ETS, are potentially preventable. The associated cost is therefore to some extent preventable. The cost in terms of visits to the doctor, much of which will be borne by the force is not necessarily a small amount.

Visits to the doctor are also associated with symptoms, for example, cough leads to an excess risk of around 90% for visiting the doctor (Table 6.3). The symptoms are also affected by preventable risk factors (Table 6.39), particularly smoking behaviour and exposure to ETS.

To give some idea of the size of the preventable cost, we can model the indirect effect of, for example, exposure to ETS on visits to the doctor, through the effect of ETS on the symptom of cough. The appendix gives details of the calculation using the data from the survey.

Briefly, this calculation assumes that 50% of the whole force are non-smokers of whom 80% are exposed to ETS at work and another 50% are smokers with 83% exposed to ETS at work. Since we now know the excess risk of symptoms (in this case cough) associated with ETS exposure at work and we also know the excess risk of visiting a doctor if one has a cough, we can build a probability model to allow us to calculate the probability of visiting a doctor for those with ETS exposure and those without. The calculations estimate that 27% of the 4,000 non-smokers who have ETS exposure at work will visit the doctor in two weeks compared with 22% of those who have no ETS exposure at work. This amounts to an excess of around 200 visits in two weeks for those exposed to ETS at work. Over a year this amounts to around 4,000 visits which could be saved if ETS exposure in this group could be reduced to the level of those with no exposure at work. The saving for smokers amounts to 4,140 visits in a year. Thus the potential saving is 8,140 visits to the doctor a year with all the attendant costs to the force and the officers themselves. A fuller appraisal could be made to estimate the actual monetary cost of visits but this would require further data.

Sickness absence was used as a measure of the effect of ill health on productivity. The descriptive results showing that females take more time and longer time off for illness are similar to the general population. The apparently higher proportion of officers taking more than 4 days off in the last 6 months, when compared with the general population, is interesting, especially given the previously noted higher rate of admissions. In this case, it is unlikely that the excess days off are due to a higher rate of injuries since the comparison is days off for illness for the force and days off for illness or injury for the general population. The difference is, however, small, and the estimates themselves are also subject to seasonal variation just like visits to the doctor.

The effects of the respiratory symptoms examined as well as psychological morbidity on days off work are less than the effects of these factors on visiting the doctor and taking medications; however, they are consistently associated with around 40 to 50% excess risk. Studies in other countries show an association between smoking and absenteeism and there is same evidence that stopping smoking reduces absenteeism. Again perceptions of health have a greater effect on days off work but, in this case, poor general health has a smaller effect on taking time off work than poor current health has on visiting the doctor. Both general health and current health are important measures and, as shown in Table 6.39, both are affected by ETS exposure although the pattern between smokers and non-smokers may be different. ETS exposure therefore also increases the likelihood that officers take time off work and it could also be the case that reducing ETS exposure would reduce absenteeism.

The question of whether pollution may be causing more use of health care services, medications or days off work is an interesting one. From these analyses, it does appear that some aspect of outdoor work, as opposed to only indoor work, usually at headquarters, is associated with an excess of respiratory symptoms although a clear pattern of differences between regions could not be found. However, there is no apparent association with perceptions of health or psychological variables. Given the association between symptoms and health care utilisation and symptoms and days off work, there is probably also an indirect effect of type of police work on visits to the doctor, use of medications and days off work with those carrying out active duties having more of all three than those who work in an administrative post. This effect may be due, at least to some extent, to working in a polluted atmosphere. There may also be other contributing factors which may be associated with outdoor duties themselves or which may be associated with the type of people who carry out outdoor activities. For example, those working in headquarters are likely to be older, more senior and have a higher income which may be protective against ill health.

We can conclude that there is evidence that working in a polluted environment is leading to officers having a higher utilisation of doctors and medicines and taking more days off work. The other avoidable risk factors, smoking and ETS exposure, also lead to increases in utilisation and days off work. This increase is substantial, being of the order of 8,000 extra visits to the doctor in a year for ETS exposure alone. This represents a large potential saving in cost, ill health and lost productivity.

The apparent higher rates of admission among officers also merit further investigation.

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APPENDICES

Appendix A	Background
Appendix B	Information sheet provided to RSRO, DSRO and PSUC at briefing session prior to health survey commencement
Appendix C	Diary used in the trial of Mini-Wright Peak Expiratory Flow Rate Meter
Appendix D	Trial of the *Respro* Mask: data from individual officers

APPENDIX A - Background

General Information on The Royal Hong Kong Police

Charter *(taken from RHKP Traffic Headquarters, Traffic Brief 1995, Pol.642A)*

- The primary aim of traffic policing in Hong Kong is to reduce the toll of deaths, injuries and damage to property on the roads pursuant to the Police statutory duty of preventing injury to life and property.

- The secondary aim is to keep the traffic flowing as quickly and smoothly as is compatible with safety.

- The third aim is to prevent and detect traffic offences.

Organisation of Traffic Headquarters

Line of command

- Commissioner of Police, Support
  ↓
- Chief Superintendent of Police, Traffic
  ↓
- Senior Superintendent of Police
- Traffic Management Bureau,
- Administration Bureau,
- Central Traffic Prosecutions Bureau

(taken from The Police, Hong Kong· The Facts October 1994)
The Traffic Headquarters is responsible for formulating force priorities, policies and basic procedures on traffic matters, coordinating the implementation and execution of such policies and procedures and monitoring their effects. It processes traffic prosecutions, and collects and maintains selected traffic data, including traffic conviction records. In consultation with regions, the Traffic Headquarters formulates road safety programmes, including education and enforcement action and the monitoring of such activities.

Organisation of Regional Traffic

Line of command

- Senior Superintendent of Police, Regional Traffic
  ↓
- Superintendent of Police
  ↓
- Enforcement & Control,
- Accident & Investigation,
  Headquarters

Organisation of Enforcement and Control

Line of command

- Superintendent of Police, E&C
  ↓
- Chief Inspector of Police, E&C
  ↓
- Patrol Sub Units,
- Task Force,
- Road Management,
- SIP Operations,
- SIP Support
- Auxiliary

Traffic Enforcement &Control (E&C) Duty List

- E&C is split into several units, including; PSU, TF, Operations/Support, Road Management and Auxiliary with the majority of officers being assigned into Patrol Subunits (PSU) and /or Taskforce (TF).

- Patrol Subunits → 1,2 & 3 responsible for maintaining law and order on the respective road transport network designated by their regional boundaries.
  Regular duties include:
  M/C patrol district/zone/beat
  Tai Lau (TL)
  Peak hour posts (PHP)
  Zulu cars (Z)
  Traffic console (TC)
  Vehicle removal team (VRT)
  Court attendance

- Taskforce → Intelligence Liaison office, Selective enforcement/Special Duties
  Selective Enforcements/Special Duties include;
  Radar/speed checks
  Laser gun/vascar
  Mobile vascar
  Snap check
  Weight check
  Traffic lights
  Jay walking
  Disobey traffic sign
  Vehicle defects
  Smoke check
  Illegal parking
  Carpark check
  Zebra crossing
  Taxi check
  Keep Left enforcement
  Primary offence enforcement
  Double white line
  Illegal CB radios

- Operations/Support → Transport team, Duty room, Motorcycle Assistance
- Road management → Road work, Road sign
- Auxiliary → Part-time officers who otherwise are in engaged in employment elsewhere and only work for example on weekend shifts or during busy periods.

Duty List District/Divisional Foot Patrol

- Patrol Subunits → 1, 2 &3
- Modes of transport: foot & mobile (vans, motorcycles)
- (PSUC & SSGT/SGT)
  Briefing officers on tour of duty
  Supervisory duties (clerical) eg: check police notebooks, summonses, fixed penalty tickets, organise manpower utilisation
  Supervisory duties (patrol) eg: check officer performance on beats, instruction of duties
  Deal with current incidents
  Manage special operations eg: high rise policing, road blocks
  Whenever possible attend scene of crime
  Check armoury, supervise drawing/loading and return/unloading of arms
  Check message books to ensure all necessary action has been taken over shift.
- (PC & WPC)
  Patrol designated beat eg: maintain law and order, deal with current incidents, effect arrest if laws are offended, issue summons/fixed penalty tickets
  Special operations eg: high rise policing, road blocks
  Familarise himself/herself with beat topography, population, crime, traffic
  Respond to calls for assistance
  1-2 officers will check remain present at all government hospitals (A&E dept) to screen patient arrivals of a criminal nature eg: assault victims
- Taskforce Subunit (or PSU 4)
  Responsible for miscellaneous operational duties and reinforcement to PSU's
- (PSUC)
  Liaise with PSUC to identify policing problems
  Supervisory duties (patrol) eg: check officer performance on beats, instruction of duties
  Supervise and direct personnel in high rise patrol and high risk premises patrol
  Briefing officers on tour of duty
  Supervisory duties (clerical) eg: check notebooks

- (SSGT, SGT, PC & WPC)
  Carry out high rise, high risk premises and anti crime patrols
  Familiarise himself with beat topography, population, crime, traffic
  Execute special operations as directed
  Effect arrest if laws offended

District Traffic Teams

- Mode of transport: small motorcycles

- Works A & B shifts only
  Control of traffic on secondary and minor roads, especially at congestion blackspots during peak hours
  Enforcement of traffic law within district
  Control and directing traffic during special operations or major events eg: fires and landslides
  Removal of traffic obstruction/s
  Issue of parking infringement notices (however this is main duty of traffic wardens)

Marine Police Duties

- Officers are assigned to launches and each tour of duty is 24 hours in duration.

- Duties are to maintain law and order in the marine region under their jurisdiction. One of the main duties is to intercept suspected illegal smuggling activities in Hong Kong waters.

APPENDIX B

Copy of the information sheet provided to RSRO, DSRO and PSUC at briefing sessions prior to health survey commencement.

香 港 大 學
THE UNIVERSITY OF HONG KONG

Department of Community Medicine

Royal Hong Kong Police Health Survey

Completion

* Completion of the survey will take 30 minutes and should be completed prior to commencement of normal shift duties.

* The survey must be completed in a controlled "examination" setting with no talking or collusion between officers.

* The Health Survey must be completed in black ball point pen only, as it is to be read by a scanning machine.

* All officers under you command should be present at the same session.

* A list of all officer UI numbers within your relevant policing unit should be provided to the university. A mark should be placed against an officer's UI number on completion of the survey.

* Completed Health Surveys should be kept together in a secured office by a nominated officer in charge till collection by a member of the university research team. (Friday afternoon of the same week)

* A member of the University research team will attend some of these survey sessions as an observer and will be available to answer any queries.

Potential Problems

* All officers should be encouraged to provide their UI number on the Health Survey as it is necessary for record linkage and the later follow-up of some officers.

* Please direct officer's attention to the first two pages of the Health Survey. All instructions are contained in this section. Pay particular attention to the examples of survey completion.

Attendance
* All nominated police officers should complete the Health Survey.

* These nominated officers are:
    All Traffic police officers (n = 1433)
    All officers involved in foot patrol/beat duties (eg: all PSU's) at district stations
        (n = approx 9200 from SIP to PC ranks)
    All District Traffic Enforcement Team officers (n = approx 200 - 250)
    All Marine police officers (n = 2429)

* The aim is to achieve 100% survey completion.

Non-attendance
* Officers who are absent from the main survey session for any reason (eg: shift allocation, weekly leave or sick leave) should be provided with a supervised follow-up session later during the same week.

Non-completion
* Any officer who has not completed the survey at the week's end should have the reason for non-completion placed next to his/her name on the list supplied by the relevant police unit.eg: sick leave longer than 1 week, vacation leave or training course attendance.

Stage One: Officer self completed bilingual health survey distribution and collection schedule.

Monday 27th November, 1995 (Distribution)

Kowloon West Regional Headquarters
Mongkok
9.30 am

Kowloon East Regional Headquarters
Tsueng Kwan O
2.30pm

All District Foot Patrol PSU's
(from SIP to PC level)

Yau Ma Tei	656
Kowloon City	610
Mongkok	383
Sham Shui Po	584
Total	2233

All District Foot Patrol PSU's
(from SIP to PC level)

Wong Tai Sin	581
Sai Mau Ping	395
Kwun Tong	404
Total	1380

All District Traffic Teams

Yau Ma Tei	?10
Kowloon City	?10
Mongkok	?10
Sham Shui Po	?10
Total	?40

All District Traffic Teams

Wong Tai Sin	?10
Sai Mau Ping	?10
Kwun Tong	?10
Total	?30

All disciplined officers of Regional Traffic

Command	1
Admin. Support & RSU	36
E&C	161
AI	95
Total	293

All disciplined officers of Regional Traffic

Command	1
Admin. Support & RSU	31
E&C	134
AI	61
Total	228

KW total 2566

KE total 1638

Friday 1st December, 1995 (Collection)

Kowloon West Regional Headquarters
2.00pm

Kowloon East Regional Headquarters
3.00pm

Monday 4th December, 1995 (Distribution)

NTS Regional Headquarters
Ma On Shan Pol. Station
9.30 am

NTN Regional Headquarters
Taipo Pol. Station
2.30pm

All District Foot Patrol PSU's (from SIP to PC level)		All District Foot Patrol PSU's (from SIP to PC level)	
Kowloon Tong	436	Tuen Mun	536
Tsuen Wan	555	Taipo	522
Shatin	551	Yuen Long	485
		Border	533
Total	1542	Total	2076
		(or 1543 excluding Border)	
All District Traffic Teams		All District Traffic Teams	
Kowloon Tong	?15	Tuen Mun	?15
Tsuen Wan	?15	Taipo	?15
Shatin	?15	Yuen Long	?15
		Border	?15
Total	?45	Total	?60
All disciplined officers of Regional Traffic		All disciplined officers of Regional Traffic	
Command	1	Command	1
Admin. Support & RSU	44	Admin. Support & RSU	37
E&C	190	E&C	184
AI	69	AI	68
Total	304	Total	290
NTS total	1891	NTN total	2426
		(or 1878 excluding Border)	

Wednesday 13th December, 1995 (Collection)

NTS Regional Headquarters 2.00pm	NTN Regional Headquarters 3.00pm

Monday 11th December, 1995 (Distribution)

Hong Kong Island Regional Headquarters		Traffic Headquarters United Centre, Admiralty	
9.30 am		2.30pm	
All District Foot Patrol PSU's (from SIP to PC level)		Disciplined Police Officers (all ranks)	
Western	507		
Central	558	Total	129
Wanchai	437		
Eastern	525		
Total	2027		
All District Traffic Teams			
Western	?15		
Central	?15		
Wanchai	?15		
Eastern	?15		
Total	?40		

All disciplined officers of Regional Traffic

Command	1
Admin. Support & RSU	35
E&C	194
AI	75
Total	305
HKI total	2372

Wednesday 20th December, 1995 (Collection)

HKI Regional Headquarters	Traffic Headquarters
2.00pm	3.00pm

Monday 15th January 1996 (Distribution)

All Marine Police including all launch crew And Marine Headquarters staff (n=2400)

Friday 26th January, 1996 (Collection)

All surveys should be returned to Marine Headquarters on the morning of the 26th January as a member from the Department of Community Medicine will be collecting the documents at 2.00pm.

APPENDIX C

Copy of the diary used in the trial of Mini-Wright Peak Expiratory Flow Rate Meter.

RHKP Health Survey - Peak Expiratory Flow Rate Diary (PEFR)

UI Number: _ _ _ _ _ _

When to use the Peak Flow Meter

All officers must use the Peak Flow Meter on four (4) occasions each day.

If on A shift → Time 1 = upon waking (eg: 0500)
(day) Time 2 = commencement of shift duties (eg: 0700)
Time 3 = end of shift duties (eg: 1530)
Time 4 = before retiring to bed (eg: 2300)

If on B shift → Time 1 = upon waking (eg: 1100)
(afternoon) Time 2 = commencement of shift duties (eg: 1530)
Time 3 = end of shift duties (eg: 2300)
Time 4 = before retiring to bed (eg: 0200)

If on C shift → Time 1 = upon waking (eg: 2000)
(evening) Time 2 = commencement of shift duties (eg: 2300)
Time 3 = end of shift duties (eg: 0730)
Time 4 = before retiring to bed (eg: 1130)

Note: On days of weekly leave, please record your peak flow readings at the same times as you would have if on duty.

How to use the Peak Flow Meter

1) Fit the mouthpiece to the Peak Flow Meter.
2) Ensure the pointer is set at zero.
3) Hold the Peak Flow Meter so that your fingers are clear of the scale.
4) Stand up, take a deep breath, place the Peak Flow Meter in the mouth horizontally, closing the lips around the mouthpiece.
5) Blow as hard and fast as you can.
6) Write into diary the number on the scale indicated by the pointer.
7) Return the pointer to zero and repeat the procedure twice more to obtain three readings.
8) If the initial three readings vary by more than 5% (or 30 points) then please blow twice more and record your reading on the diary.

Example Only

Date: 16/01/96 Shift: A	Time: 1 0530 hours	Time: 2 0700 hours	Time: 3 1530 hours	Time: 4 2300 hours
1st PEFR	550	480	530	520
2nd PEFR	540	550	540	520
3rd PEFR	550	540	540	540
4th PEFR		550		
5th PEFR		530		

Copy of the fieldwork data sheets used for the physiological tests .

UI Number: __ __ __ __ __

Region: __ __ __

Police Type: Traffic: __ Foot Patrol: __

PSU: __

Questionnaire data available: __ yes __ no

Age: __ __ (years) **Height: __ __ __** (cm)

Smoker status:
Current Smoker: __ yes __ no
Ex-smoker: __ yes __ no

Test Completion Record:

Date (day/month/year)	**Pre-shift test** (Please tick when completed)	**Post-shift test** (Please tick when completed)

Copy of the fieldwork data sheets used for the physiological tests .

UI Number: __ __ __ __ __ Date: __ __ /__ __ /__ __

Pre-shift	Post-shift
HKU Staff Name:	HKU Staff Name:
Respiratory symptoms experienced since waking: Cough Yes __ No __ Phlegm Yes __ No __ Sore throat Yes __ No __	Respiratory symptoms experienced during shift: Cough Yes __ No __ Phlegm Yes __ No __ Sore throat Yes __ No __
No. of cigarettes smoked since waking: __ __	No. of cigarettes smoked during shift: __ __
Time exposed to ETS (2nd hand smoke) since waking: __ __:__ __ (hours:mins)	Time exposed to ETS (2nd hand smoke) during shift: __ __:__ __ (hours:mins)
Time spent outdoors since waking: __ __ (hours)	Time spent outdoors during shift: __ __ (hours)
PEFR Test time: __ __ : __ __(hours:mins) Meter used: __	PEFR Test time: __ __ : __ __(hours:mins) Meter used: __
1st	1st
2nd	2nd
3rd	3rd
4th	4th
5th	5th

Please label the Vitalogram chart and printout in the following way:

- today's date
- your initials
- pre or post shift test
- spirometer number
- UI number

Please attach these forms to the back of this data sheet.

APPENDIX D - Trial of the *Respro* Mask.

Figure 5.11: Mean pre-shift and post-shift peak expiratory flow rate for individval (NTS=New Territories South; KW=Kowloon West; S=Smoker; NS=Non-smoker; and age in year) officers taking shift A & B and in group: sport-city-placebo

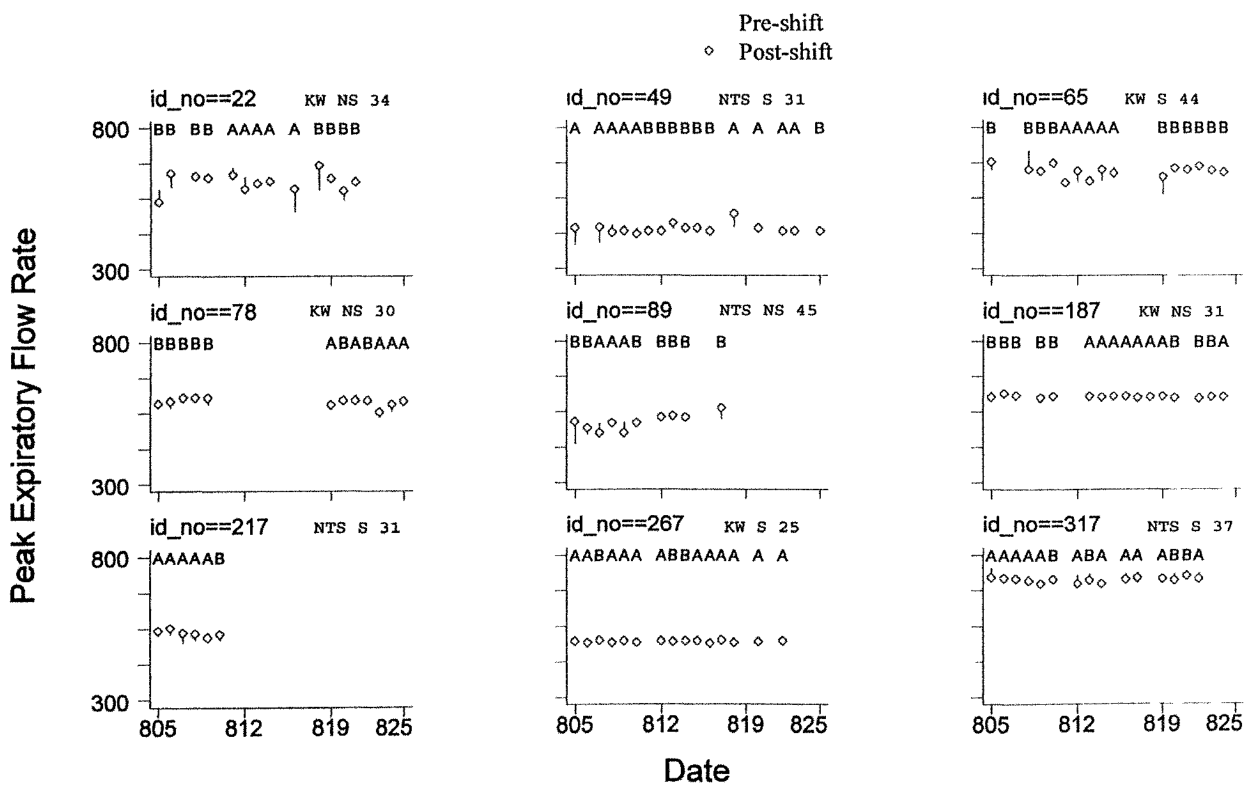

Figure 5.12: Mean pre-shift and post-shift peak expiratory flow rate for individval (NTS=New Territories South; KW=Kowloon West; S=Smoker; NS=Non-smoker; and age in year) officers taking shift A & B and in group: city-placebo-sport

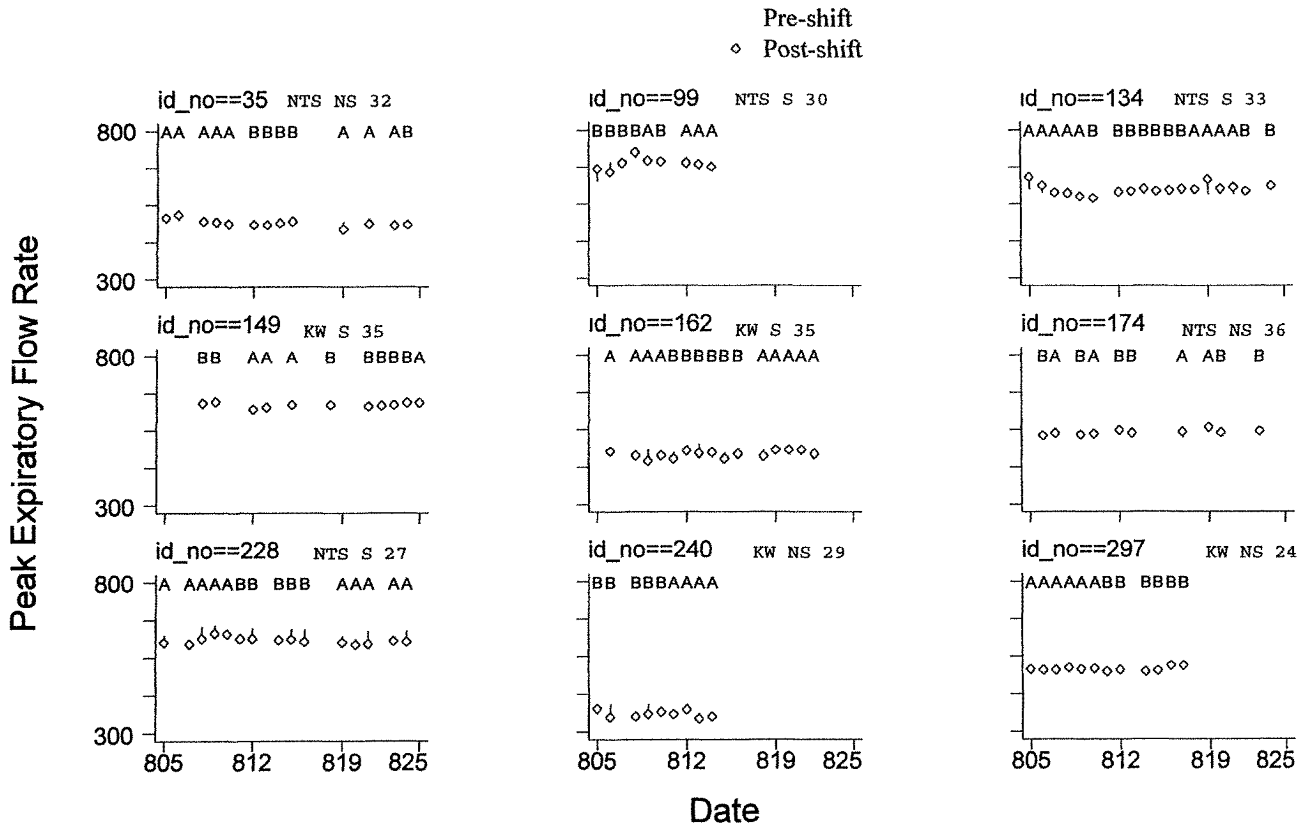

Table 5.25: Summary statistics of peak expiratory flow rate (PEFR) for individual officers

PSC=Placebo-Sportsta-City, SCP=Sportsta-City-Placebo, CPS=City-Placebo-Sportsta;
S=smoker, NS=non-smoker; NTS=New Territories South, KW=Kowloon West

ID no.: 8; NTS, NS, PSC, 30 years, 172 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	15	401.1	25.9	354	444
Pre-shift adjusted*	15	404.0	25.9	356.9	446.9
Post-shift	15	407.7	14.7	382	436
Post-shift adjusted*	15	409.8	14.7	384.1	438.1
Post-pre %	15	1.9	5.5	-5.9	12.4
Pre-shift max	15	422.7	28.9	380	480
Post-shift max	15	434	19.6	400	480
Post-pre max %	15	2.9	4.7	-2.3	13.2

ID no.: 22; KW, NS, SCP, 34 years, 167 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	13	603.1	43.5	504	658
Pre-shift adjusted*	13	606.6	43.5	507.5	661.5
Post-shift	13	608.4	33.3	538	666
Post-shift adjusted*	13	613.6	33.3	543.2	671.2
Post-pre %	13	1.3	7.7-7.2	16.0	
Pre-shift max	13	659.2	26.6	590	690
Post-shift max	13	654.3	43.1	550	706
Post-pre max %	13	-.7	6.6	-16.7	8.5

ID no.: 35; NTS, NS, CPS, 32 years, 163 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	13	497.8	11.9	488	530
Pre-shift adjusted*	13	530.4	11.1	520.6	562.6
Post-shift	13	489.8	12.1	468	518
Post-shift adjusted*	13	527.3	12.1	505.4	555.4
Post-pre %	13	-1.6	1.5	5.3	.4
Pre-shift max	13	506.2	14.5	500	550
Post-shift max	13	497.7	13.6	480	530
Post-pre max %	13	-1.7	1.3	-4	0

ID no.: 49; NTS, S, SCP, 31 years, 178.5 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	16	435.4	20.4	384	454
Pre-shift adjusted*	16	403.5	20.4	352.1	422.1
Post-shift	16	441.4	16.7	422	494
Post-shift adjusted*	16	404.0	16.7	384.6	456.6
Post-pre %	16	1.6	6.6	5.7	15.5
Pre-shift max	16	443.1	17.4	400	460
Post-shift max	16	450	17.5	430	500
Post-pre max %	16	1.8	6.8	4.4	17.5

ID no.: 65; KW, S, SCP, 44 years, 178 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	15	639.7	36.4	558	716
Pre-shift adjusted*	15	538.5	36.4	456.8	614.8
Post-shift	15	643.7	20.4	604	678
Post-shift adjusted*	15	534.7	20.4	495.0	569.0
Post-pre %	15	.8	4.8	9.2	11.8
Pre-shift max	15	660	34.0	570	730
Post-shift max	15	672	25.7	640	750
Post-pre max %	15	2.0	4.9	4.1	12.3

ID no.: 78; KW, NS, SCP, 30 years, 174 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	12	581.2	22.7	538	614
Pre-shift adjusted*	12	575.1	22.7	531.9	607.9
Post-shift	12	588.7	14.6	552	604
Post-shift adjusted*	12	580.4	14.6	543.7	595.7
Post-pre %	12	1.4	2.5	2.6	5.5
Pre-shift max	12	602.5	23.8	570	650
Post-shift max	12	610	13.5	600	650
Post-pre max %	12	1.3	2.8	3.2	7.0

ID no.: 89; NTS, NS, SCP, 45 years, 164 cm

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	10	506	31.2	438	538
Pre-shift adjusted*	10	462.5	31.2	394.5	494.5
Post-shift	10	513	27.7	474	562
Post-shift adjusted*	10	471.0	27.7	432.0	520.0
Post-pre %	10	1.6	7.1	7.4	17.4
Pre-shift max	10	536	27.6	470	570
Post-shift max	10	539	22.8	510	570
Post-pre max %	10	.8	6.0	5.6	14.9

ID no.: 99; NTS, S, CPS, 30 years, 167.5 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	9	684.7	26.3	628	710
Pre-shift adjusted*	9	707.9	26.3	651.3	733.3
Post-shift	9	684.9	18.7	656	722
Post-shift adjusted*	9	710.4	18.7	681.5	747.5
Post-pre %	9	.1	3.3	4.4	6.4
Pre-shift max	9	714.4	18.1	690	750
Post-shift max	9	718.9	17.6	700	750
Post-pre max %	9	.7	3.3	-4	5.7

ID no.: 110; KW, NS, PSC, 36 years, 170 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	13	588	10.6	572	602
Pre-shift adjusted*	13	567.0	10.6	551.0	580.9
Post-shift	13	589.2	11.1	568	604
Post-shift adjusted*	13	567.4	11.1	546.2	582.2
Post-pre %	13	.2	1.4	1.7	2.4
Pre-shift max	13	598.5	10.7	580	610
Post-shift max	13	599.2	13.2	580	620
Post-pre max %	13	.1	1.5	1.7	3.4

ID no.: 121, NTS, S, PSC, 32 years, 163 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	9	520.9	5.9	512	530
Pre-shift adjusted*	9	553.4	5.9	544.6	562.6
Post-shift	9	516.2	5.3	506	526
Post-shift adjusted*	9	553.6	5.3	543.4	563.4
Post-pre %	9	-.9	.9	1.9	.8
Pre-shift max	9	528.9	9.3	520	550
Post-shift max	9	522.2	8.3	510	540
Post-pre max %	9	-1.3	1.6	3.6	1.9

ID no.: 134; NTS, S, CPS, 33 years, 170 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	18	587.8	10.4	570	602
Pre-shift adjusted*	18	583.2	10.4	565.5	597.5
Post-shift	18	599.1	17.1	570	640
Post-shift adjusted*	18	594.5	17.1	565.4	635.4
Post-pre %	18	1.9	2.3	1.3	7.9
Pre-shift max	18	602.2	15.2	580	650
Post-shift max	18	609.4	18.3	580	650
Post-pre max %	18	1.2	2.3	1.6	8.3

ID no.: 149; KW, S, CPS, 35 years, 173 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	11	635.5	9.4	614	648
Pre-shift adjusted*	11	606.4	9.4	584.9	618.9
Post-shift	11	636.4	7.6	622	646
Post-shift adjusted*	11	604.7	7.6	590.3	614.3
Post-pre %	11	.1	.5	.5	1.3
Pre-shift max	11	640.9	7.7	630	650
Post-shift max	11	640.5	7.6	630	650
Post-pre max %	11	-.1	.5	-.8	.8

ID no.: 162; KW, S, CPS, 35 years, 170 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	15	481.6	9.8	466	502
Pre-shift adjusted*	15	466.0	9.8	450.4	486.4
Post-shift	15	467.9	11.5	446	482
Post-shift adjusted*	15	451.8	11.5	429.9	465.9
Post-pre %	15	-2.8	2.4	-7.5	2.2
Pre-shift max	15	492.7	17.9	480	550
Post-shift max	15	476	13.0	450	490
Post-pre max %	15	-3.3	3.6	12.7	2.1

ID no.: 174; NTS, NS, CPS, 36 years, 163 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	10	534	7.9	524	550
Pre-shift adjusted*	10	544.5	7.9	534.5	560.5
Post-shift	10	540.2	8.4	530	558
Post-shift adjusted*	10	554.8	8.4	544.6	572.6
Post-pre %	10	1.2	1.5	1.5	3.4
Pre-shift max	10	550	29.4	530	630
Post-shift max	10	550	10.5	540	570
Post-pre max %	10	.2	3.9	9.5	5.7

ID no.: 187; KW, NS, SCP, 31 years, 167 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	16	604.5	5.2	598	620
Pre-shift adjusted*	16	624.5	5.2	618.0	640.0
Post-shift	16	601.3	4.1	596	614
Post-shift adjusted*	16	623.6	4.1	618.4	636.4
Post-pre %	16	-.5	.9	3.2	1.00
Pre-shift max	16	610.6	6.8	600	630
Post-shift max	16	608.8	5	600	620
Post-pre max %	16	-.3	1.2	3.2	1.7

ID no.: 198; KW, S, PSC, 28 years, 176 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	5	582.4	20.0	570	618
Pre-shift adjusted*	5	578.3	20.0	565.9	613.9
Post-shift	5	637.2	7.3	626	644
Post-shift adjusted*	5	630.0	7.3	618.8	636.8
Post-pre %	5	9.5	3.3	3.9	12.2
Pre-shift max	5	602	21.7	590	640
Post-shift max	5	656	5.5	650	660
Post-pre max %	5	9.1	4.3	1.6	11.9

ID no.: 207; KW, NS, PSC, 37 years, 166 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	14	536.7	7.5	524	548
Pre-shift adjusted*	14	528.2	7.5	515.5	539.5
Post-shift	14	541.9	8.3	526	554
Post-shift adjusted*	14	535.1	8.3	519.3	547.3
Post-pre %	14	1.0	1.9	1.8	5.3
Pre-shift max	14	542.9	8.3	530	550
Post-shift max	14	549.3	9.2	530	560
Post-pre max %	14	1.2	2.0	1.9	5.7

ID no.: 217; NTS, S, SCP, 31 years, 176.5 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	6	516	11.9	498	532
Pre-shift adjusted*	6	493.1	11.9	475.1	509.1
Post-shift	6	534.7	11.5	518	552
Post-shift adjusted*	6	507.7	11.5	491.0	525.0
Post-pre %	6	3.6	2.4	.4	7.2
Pre-shift max	6	531.7	13.3	510	550
Post-shift max	6	550	14.1	530	570
Post-pre max %	6	3.5	2.9	0	7.8

ID no.: 228; NTS, S, CPS, 27 years, 174.5 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	15	628.9	18.4	594	656
Pre-shift adjusted*	15	637.1	18.4	602.2	664.2
Post-shift	15	607.6	10.8	594	630
Post-shift adjusted*	15	613.9	10.8	600.3	636.3
Post-pre %	15	-3.3	2.5	6.3	.3
Pre-shift max	15	645.3	18.9	600	670
Post-shift max	15	622	11.5	610	650
Post-pre max %	15	-3.6	2.8	6.2	1.2

ID no.: 240; KW, NS, CPS, 29 years, 164 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	9	372.2	12.7	358	392
Pre-shift adjusted*	9	416.8	12.7	402.6	436.6
Post-shift	9	359.1	11.0	344	376
Post-shift adjusted*	9	408.5	11.0	393.4	425.4
Post-pre %	9	-3.4	3.9	10.7	.8
Pre-shift max	9	388.9	20.3	370	420
Post-shift max	9	378.9	10.5	370	400
Post-pre max %	9	-2.4	5.3	11.9	5.3

ID no.: 252; NTS, S, PSC, 29 years, 175 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	15	656	14.7	638	686
Pre-shift adjusted*	15	650.9	14.7	632.9	680.9
Post-shift	15	672	11.1	648	690
Post-shift adjusted*	15	664.2	11.1	640.2	682.2
Post-pre %	15	2.5	2.5	1.2	5.6
Pre-shift max	15	672.7	19.4	650	700
Post-shift max	15	685.3	13.6	660	720
Post-pre max %	15	2.0	3.2	2.9	6.2

ID no.: 267; KW, S, SCP, 25 years, 172 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	15	494.4	3.7	488	500
Pre-shift adjusted*	15	524.9	3.7	518.5	530.5
Post-shift	15	494.3	3.3	488	500
Post-shift adjusted*	15	524.9	3.3	518.7	530.7
Post-pre %	15	-.0	1.1	1.6	2.5
Pre-shift max	15	504	6.3	500	520
Post-shift max	15	502	4.1	500	510
Post-pre max %	15	-.4	1.7	3.8	2

ID no.: 283; NTS, NS, PSC, 23 years, 166.5 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	17	433.6	6.0	426	446
Pre-shift adjusted*	17	499.9	6.0	492.3	512.3
Post-shift	17	427.9	6.8	414	442
Post-shift adjusted*	17	498.6	6.8	484.7	512.7
Post-pre %	17	-1.3	1.6	4.2	1.4
Pre-shift max	17	440.9	7.1	430	460
Post-shift max	17	434.7	7.2	420	450
Post-pre max %	17	-1.4	1.6	4.5	2.3

ID no.: 297; KW, NS, CPS, 24 years, 167 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	12	510.7	5.0	504	520
Pre-shift adjusted*	12	569.2	2.0	562.5	578.5
Post-shift	12	507	6.8	498	520
Post-shift adjusted*	12	569.3	6.8	560.3	582.3
Post-pre %	12	-.7	.9	2.4	.8
Pre-shift max	12	518.3	3.9	510	520
Post-shift max	12	512.5	6.2	500	520
Post-pre max %	12	-1.1	1.3	3.8	0

ID no.: 306; KW, S, PSC, 29 years, 172 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	6	503	6.2	492	510
Pre-shift adjusted*	6	511.4	6.2	500.4	518.4
Post-shift	6	500	7.5	490	508
Post-shift adjusted*	6	507.8	7.5	497.8	515.8
Post-pre %	6	-.6	1.3	2.8	.8
Pre-shift max	6	521.7	13.3	500	540
Post-shift max	6	520	16.7	500	550
Post-pre max %	6	-.3	3.0	3.8	3.8

ID no.: 317; NTS, S, SCP, 37 years, 171.5 cm

PEFR	Observation no.	Mean	Std.Dev.	Min	Max
Pre-shift	15	724.8	13.0	702	754
Pre-shift adjusted*	15	691.5	13.0	668.7	720.7
Post-shift	15	711.3	8.4	696	724
Post-shift adjusted*	15	676.0	8.4	660.7	688.7
Post-pre %	15	-1.8	1.6	4.5	.8
Pre-shift max	15	737.3	13.9	710	760
Post-shift max	15	724	10.6	710	750
Post-pre max %	15	-1.8	1.8	4.1	0

* Adjusted for age and height.

Table 5.26: Summary statistics of peak flow rate (PEFR) by region, smoker, shift and filter

S=smoker, NS=non-smoker; NTS=New Territories South, KW=Kowloon West

NTS, S, Shift A, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	13	620.9	107.0	442	734
Pre-shift adjusted	13	611.9	119.1	410.1	727.3
Post-shift	13	619.8	108.0	434	716
Post-shift adjusted	13	608.9	123.0	396.6	713.5
Post-pre %	13	-.2	1.9	-2.5	4.0
Pre-shift max	13	636.2	110.7	450	740
Post-shift max	13	633.8	113.0	440	730
Post-pre max %	13	-.4	1.7	-2.8	2.9

NTS, S, Shift A, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	28	568.4	101.3	384	754
Pre-shift adjusted	28	558.1	103.7	352.1	720.7
Post-shift	28	571.3	93.2	422	720
Post-shift adjusted	28	559.2	95.7	384.6	684.7
Post-pre %	28	.9	5.5	-6.3	15.5
Pre-shift max	28	582.5	103.6	400	760
Post-shift max	28	584.3	93.2	430	730
Post-pre max %	28	.8	5.8	-6.2	17.5

NTS, S, Shift A, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	19	636.6	72.7	444	734
Pre-shift adjusted	19	629.3	72.3	412.1	733.3
Post-shift	19	637.8	58.6	494	718
Post-shift adjusted	19	628.9	58.0	456.6	721.5
Post-pre %	19	.5	4.3	-6.1	11.3
Pre-shift max	19	652.6	75.3	450	750
Post-shift max	19	652.1	61.1	500	750
Post-pre max %	19	.3	4.4	-6.2	11.1

NTS, S, Shift B, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	19	591.5	74.5	436	732
Pre-shift adjusted	19	594.9	66.6	404.1	698.7
Post-shift	19	584.9	71.1	434	724
Post-shift adjusted	19	588.6	61.4	396.6	688.7
Post-pre %	19	-1.0	2.5	-6.2	2.5
Pre-shift max	19	602.6	76.5	440	740
Post-shift max	19	593.7	73.4	440	730
Post-pre max %	19	-1.4	2.5	-6.1	3.0

NTS, S, Shift B, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	10	610.8	84.1	428	716
Pre-shift adjusted	10	598.5	89.7	396.1	682.7
Post-shift	10	621.8	84.0	434	712
Post-shift adjusted	10	607.0	91.0	396.6	676.7
Post-pre %	10	1.9	2.4	-1.2	5.6
Pre-shift max	10	625	85.3	440	720
Post-shift max	10	632	85.6	440	720
Post-pre max %	10	1.2	2.9	-2.9	6.2

NTS, S, Shift B, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	14	586.4	117.6	442	732
Pre-shift adjusted	14	580.9	137.5	410.1	731.3
Post-shift	14	587.4	117.8	434	722
Post-shift adjusted	14	580.2	141.4	396.6	747.5
Post-pre %	14	.2	3.0	-4.4	6.4
Pre-shift max	14	604.3	126.8	450	750
Post-shift max	14	608.6	130.9	440	750
Post-pre max %	14	.6	3.0	-4	5.7

NTS, NS, Shift A, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	8	434.5	45.7	354	524
Pre-shift adjusted	8	485.9	53.7	356.9	534.5
Post-shift	8	436.3	46.0	384	542
Post-shift adjusted	8	491.3	47.9	386.1	556.6
Post-pre %	8	.5	3.9	-4.2	8.5
Pre-shift max	8	446.3	41.0	380	530
Post-shift max	8	451.3	44.5	430	560
Post-pre max %	8	1.2	5.5	-2.3	13.2

NTS, NS, Shift A, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	14	463.6	47.2	398	550
Pre-shift adjusted	14	472.5	49.8	400.9	560.5
Post-shift	14	453.9	46.7	402	558
Post-shift adjusted	14	464.8	54.8	404.1	572.6
Post-pre %	14	-2.0	3.2	-7.4	2.8
Pre-shift max	14	487.1	61.3	410	630
Post-shift max	14	475.7	46.5	420	570
Post-pre max %	14	-2.0	3.1	-9.5	2.4

NTS, NS, Shift A, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	13	475.8	41.9	416	530
Pre-shift adjusted	13	515.6	34.6	418.9	562.6
Post-shift	13	471.3	45.9	402	536
Post-shift adjusted	13	515.3	39.3	404.1	555.4
Post-pre %	13	-1.0	1.6	-3.4	1.9
Pre-shift max	13	5	43.4	435	550
Post-shift max	13	480.8	45.5	430	550
Post-pre max %	13	-.9	1.7	-3.6	1.9

NTS, NS, Shift B, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	10	457.8	69.3	356	534
Pre-shift adjusted	10	474.1	79.2	358.9	544.5
Post-shift	10	465.8	58.0	382	548
Post-shift adjusted	10	484.5	69.1	384.1	562.6
Post-pre %	10	2.3	5.2	-2.8	12.4
Pre-shift max	10	470	63.6	380	550
Post-shift max	10	476	54.4	400	560
Post-pre max %	10	1.6	4.2	-2	10.5

NTS, NS, Shift B, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	11	463.5	47.3	402	540
Pre-shift adjusted	11	480.8	52.2	394.5	550.5
Post-shift	11	472.4	51.0	418	544
Post-shift adjusted	11	492.8	41.5	420.1	558.6
Post-pre %	11	2.0	5.7	-3.7	17.4
Pre-shift max	11	480.9	50.5	420	560
Post-shift max	11	488.2	57.9	420	570
Post-pre max %	11	1.5	5.6	-4.5	14.9

NTS, NS, Shift B, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	9	492.4	62.1	402	540
Pre-shift adjusted	9	476.4	53.9	404.9	550.5322
Post-shift	9	496.2	61.4	404	562
Post-shift adjusted	9	481.5	52.9	406.1	546.6
Post-pre %	9	.9	3.6	-1.5	7.5
Pre-shift max	9	5	61.0	420	570
Post-shift max	9	512.2	55.2	430	570
Post-pre max %	9	.6	2.5	-1.8	7.1

KW, S, Shift A, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	15	550.3	56.8	480	634
Pre-shift adjusted	15	548.4	44.3	464.4	613.9
Post-shift	15	567.9	74.2	460	644
Post-shift adjusted	15	564.3	63.3	443.9	636.8
Post-pre %	15	3.0	5.3	-4.2	12.2
Pre-shift max	15	565.7	57.2	500	645
Post-shift max	15	582	74.8	470	660
Post-pre max %	15	2.7	5.7	-6	11.9

KW, S, Shift A, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	11	516.4	53.6	484	642
Pre-shift adjusted	11	512.7	40.9	468.4	612.9
Post-shift	11	511.5	57.0	468	644
Post-shift adjusted	11	506.8	45.8	451.9	612.3
Post-pre %	11	-1.0	1.5	-3.3	.8
Pre-shift max	11	525.9	53.5	490	645
Post-shift max	11	523.6	65.8	470	660
Post-pre max %	11	-.6	3.00	-4.1	6.5

KW, S, Shift A, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	13	527.8	67.1	466	656
Pre-shift adjusted	13	503.6	33.4	450.4	554.8
Post-shift	13	527.4	76.1	446	648
Post-shift adjusted	13	500.7	39.3	429.9	539.0
Post-pre %	13	-.2	3.8	-7.5	6.6
Pre-shift max	13	546.9	81.2	480	680
Post-shift max	13	543.1	86.2	450	680
Post-pre max %	13	-.8	3.1	-8.2	3.1

KW, S, Shift B, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	14	562.4	80.7	472	658
Pre-shift adjusted	14	512.6	48.2	456.4	604.9
Post-shift	14	561.1	87.3	452	662
Post-shift adjusted	14	507.5	48.6	435.9	604.3
Post-pre %	14	-.3	4.00	-6.0	11.8
Pre-shift max	14	576.1	79.7	480	670
Post-shift max	14	572.9	89.4	460	670
Post-pre max %	14	-.7	5.2	-12.7	12.3

KW, S, Shift B, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	9	637	58.7	496	716
Pre-shift adjusted	9	582.5	34.2	526.5	614.9
Post-shift	9	631.9	52.8	498	678
Post-shift adjusted	9	572.8	32.9	528.7	613.3
Post-pre %	9	-.7	3.5	-9.2	4.0
Pre-shift max	9	645	61.7	500	730
Post-shift max	9	651.7	65.1	510	750
Post-pre max %	9	1.1	4.4	-4.1	11.9

KW, S, Shift B, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	5	550.8	86.4	474	648
Pre-shift adjusted	5	548.2	67.6	458.4	618.9
Post-shift	5	546	91.2	452	646
Post-shift adjusted	5	542.4	73.6	435.9	614.3
Post-pre %	5	-1.0	2.0	-4.6	0
Pre-shift max	5	558	84.7	480	650
Post-shift max	5	552	90.9	460	650
Post-pre max %	5	-1.2	1.9	-4.2	0

KW, NS, Shift A, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	17	534.1	84.5	358	610
Pre-shift adjusted	17	536.0	67.7	402.6	624.0
Post-shift	17	535.4	87.7	344	602
Post-shift adjusted	17	538.0	68.6	393.4	624.4
Post-pre %	17	.1	2.4	-5.0	5.5
Pre-shift max	17	547.1	86.2	370	630
Post-shift max	17	551.8	84.9	370	610
Post-pre max %	17	1.0	2.7	-3.2	7.0

KW, NS, Shift A, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	2	603	77.8	548	658
Pre-shift adjusted	2	600.5	86.3	539.5	661.5
Post-shift	2	6	58.0	552	634
Post-shift adjusted	2	592.2	66.4	545.3	639.2
Post-pre %	2	-1.5	3.1	-3.6	.7
Pre-shift max	2	620	99.0	550	690
Post-shift max	2	630	99.0	560	700
Post-pre max %	2	1.6	.3	1.4	1.8

KW, NS, Shift A, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	26	556.5	58.2	368	626
Pre-shift adjusted	26	572.0	50.7	412.6	629.5
Post-shift	26	558.4	56.2	360	610
Post-shift adjusted	26	576.0	44.9	409.4	624.4
Post-pre %	26	.4	3.8	-7.0	15.5
Pre-shift max	26	573.1	61.0	390	660
Post-shift max	26	571.9	60.2	380	660
Post-pre max %	26	-.2	2.6	-7.7	5.7

KW, NS, Shift B, Placebo

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	14	566.9	48.6	504	634
Pre-shift adjusted	14	590.4	30.4	545.5	637.5
Post-shift	14	564.9	45.1	500	622
Post-shift adjusted	14	590.3	24.8	558.2	627.2
Post-pre %	14	-.3	2.0	-2.9	5.9
Pre-shift max	14	582.1	55.9	510	680
Post-shift max	14	582.9	57.8	510	670
Post-pre max %	14	.1	2.8	-2.9	8.5

KW, NS, Shift B, Sportsta

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	23	585.1	32.2	528	640
Pre-shift adjusted	23	583.2	40.4	519.5	643.5
Post-shift	23	585.9	33.8	526	638
Post-shift adjusted	23	584.6	40.7	519.3	643.2
Post-pre %	23	.2	2.9	-7.2	8.1
Pre-shift max	23	604.8	45.1	530	690
Post-shift max	23	602	45.7	530	706
Post-pre max %	23	-.4	4.1	-16.7	4.6

KW, NS, Shift B, City

PEFR	Observation no.	Mean	Std. Dev.	Min	Max
Pre-shift	7	4	82.8	363	574
Pre-shift adjusted	7	465.7	74.2	407.6	577.5
Post-shift	7	423.7	118.8	350	666
Post-shift adjusted	7	468.6	105.9	399.4	671.2
Post-pre %	7	-1.3	8.6	-10.7	16.0
Pre-shift max	7	452.9	103.7	370	660
Post-shift max	7	441.4	122.9	370	700
Post-pre max %	7	-3.1	6.1	-11.9	6.1

Table 5.27a: Summary statistics of peak expiratory flow rate (PEFR) by sequence group in successive week of the trial

Filter	Placebo			Sportsta			City		
	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR Pre-shift	8	524.4167	89.07687	6	523.8056	90.87345	5	528.22	104.7776
Post-shift	8	533.35	93.32251	6	525.5	98.86354	5	534.56	113.3388
Pre-shift adjusted	8	533.3488	78.34185	6	534.9918	76.09367	5	535.1331	89.08425
Post-shift adjusted	8	542.656	79.54001	6	537.8142	82.91743	5	541.8537	95.37874
Post-pre%	8	1.780237	4.076731	6	.1505457	1.528631	5	1.014017	1.904315
Age	8	30.5	4.503967	6	31.16667	5.115336	5	31	5.700877
Height	8	170.0625	4.570382	6	168.75	4.401704	5	169.9	3.781534
Smoker	8	.5	.5345225	6	.3333333	.5163978	5	.2	.4472136
Pre-shift any symptoms %	8	.45	.4985694	6	.3611111	.4172219	5	.2	.4472136
Post-shift any symptoms %	8	.375	.5175492	6	.3194444	.442269	5	.2	.4472136
Observation no.	8	5	.9258201	6	5.333333	1.032796	5	4.4	.5477226

Filter	Sportsta			City			Placebo		
	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR Pre-shift	9	568.6815	94.54036	7	572.768	92.69452	7	582.3857	94.34794
Post-shift	9	570.3748	87.49085	7	576.4503	87.13175	7	582.3177	92.53468
Pre-shift adjusted	9	548.1272	94.53476	7	550.4789	92.92763	7	565.4449	90.35064
Post-shift adjusted	9	548.0667	88.93224	7	552.8072	88.01656	7	563.4962	89 69738
Post-pre %	9	.6477466	1.917762	7	.8964727	2.198677	7	.1075318	1.261007
Age	9	34.22222	6.64789	7	35.28571	7.273566	7	33.14286	6.039552
Height	9	172.0556	5.204832	7	171.1429	5.58804	7	172.5714	4.658581
Smoker	9	.5555556	.5270463	7	.5714286	.5345225	7	.5714286	.5345225
Pre-shift any symptoms %	9	.3851852	.460106	7	.3714286	.4820591	7	.4387755	.4525599
Post-shift any symptoms %	9	.3259259	.3751954	7	.2904762	.4366176	7	.3112245	.4219298
Observation no.	9	5.555556	.5270463	7	5.285714	1.112697	7	4.428571	1.718249

Filter	City			Placebo			Sportsta		
	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR Pre-shift	9	548.6603	96.31282	9	546.5899	97.95492	6	562.6167	65.1108
Post-shift	9	544.1831	101.2903	9	542.2833	99.14437	6	558.5222	68.16876
Pre-shift adjusted	9	562.9259	87.90994	9	560.8556	89.25354	6	562.9583	58.23302
Post-shift adjusted	9	560.0751	91.58078	9	558.1753	89.40484	6	559.4979	59.29595
Post-pre %	9	-.971721	1.956668	9	-.8312654	2.133175	6	-.7631244	2.53762
Age	9	31.22222	4.055175	9	31.22222	4.055175	6	33	3.286335
Height	9	168	4.220486	9	168	4.220486	6	168.9167	4.90323
Smoker	9	.5555556	.5270463	9	.5555556	.5270463	6	.6666667	.5163978
Pre-shift any symptoms %	9	.3333333	.4330127	9	.3492063	.4398725	6	.3138889	.3801194
Post-shift any symptoms %	9	.3148148	.4746669	9	.3214286	.4545686	6	.125	.3061862
Observation no.	9	5.222222	1.481366	9	4.333333	1.414214	6	4.333333	.8164966

Table 5.27b: Summary statistics of peak expiratory flow rate (PEFR) by region in successive week of trial

New Territories South

	Week 1			Week 2			Week 3		
	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR Pre-shift	13	543.7051	105.6866	12	554.6202	102.7604	9	547.4667	110.8832
Post-shift	13	547.2051	101.0488	12	553.1639	100.652	9	545.9593	112.4938
Pre-shift adjusted	13	546.398	105.7832	12	559.4438	98.56012	9	552.5341	100.7988
Post-shift adjusted	13	550.2645	99.93248	12	558.7269	95.66195	9	551.0601	101.8284
Post-pre %	13	.9749342	2.559769	12	-.175586	2.211475	9	-.3016942	2.364489
Age	13	32	5.291503	12	32.08333	5.517877	9	30.88889	4.342938
Height	13	169.6154	5.519488	12	169.0417	5.344744	9	170.4444	5.387743
Smoker	13	.6153846	.5063697	12	.5833333	.5149287	9	.5555556	.5270463
Pre-shift any symptoms	13	.4820513	.4308939	12	.3257937	.3999418	9	.2925926	.3922081
Post-shift any symptoms	13	.3974359	.4437762	12	.2577381	.3751343	9	.0833333	.25
Observation no.	13	5.538462	.6602253	12	4.833333	1.337116	9	4.222222	.6666667

Kowloon West

	Week 1			Week 2			Week 3		
	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR Pre-shift	13	552.5571	79.0634	10	541.6076	81.87922	9	574.0333	56.53715
Post-shift	13	552.6273	85.54514	10	543.0736	88.22588	9	576.2804	58.44942
Pre-shift adjusted	13	551.0073	61.62548	10	539.7677	64.92337	9	559.8581	49.04804
Post-shift adjusted	13	550.8527	68.42542	10	541.5391	69.96696	9	561.2432	50.36155
Post-pre %	13	-.1036934	3.200158	10	.1804227	1.960171	9	.4399233	1.486307
Age	13	32.07692	5.469027	10	33	5.962848	9	34.11111	5.254628
Height	13	170.4615	4.175631	10	169.4	4.115013	9	170.7778	3.898005
Smoker	13	.4615385	.5188745	10	.4	.5163978	9	.4444444	.5270463
Pre-shift any symptoms	13	.2923077	.4590961	10	.4	.4743416	9	.3690476	.4559695
Post-shift any symptoms	13	.2769231	.4437602	10	.375	.4894725	9	.3531746	.4504973
Observation no.	13	5	1.290994	10	5	1.247219	9	4.555556	1.509231

Table 5.27c: Summary statistics of peak expiratory flow rate (PEFR) by smoker status in successive week of trial

Non-smoker

		Week 1			Week 2			Week 3		
		Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR	Pre-shift	12	513.3897	83.31768	11	508.4788	77.14648	9	532.3296	71.42162
	Post-shift	12	512.9129	82.29948	11	509.9727	82.74232	9	533.5582	74.07087
	Pre-shift adjusted	12	526.6991	77.71902	11	523.5516	67.23582	9	543.4573	61.88281
	Post-shift adjusted	12	528.3436	74.11639	11	527.5597	71.50695	9	546.3921	62.66841
	Pre-post %	12	.0376043	2.612699	11	.2095562	1.845666	9	.2263021	1.512099
Age		12	32.25	5.971523	11	32.45455	6.21874	9	32.11111	4.342938
Height		12	166.9583	3.493229	11	166.3182	2.830837	9	167.6111	3.756476
Smoker		12	0	0	11	0	0	9	0	0
Pre-shift any symptoms		12	.15	.35291	11	.219697	.3948852	9	.3227513	.4330309
Post-shift any symptoms		12	.1472222	.3201825	11	.1969697	.4001262	9	.2698413	.4370848
Observation no.		12	5.166667	1.029857	11	4.727273	1.190874	9	4.444444	1.236033

Smoker

		Week 1			Week 2			Week 3		
		Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.	Subject no.	Mean	Std. Dev.
PEFR	Pre-shift	14	577.9095	90.42599	11	588.932	90.7207	9	589.1704	94.71074
	Post-shift	14	581.6333	90.09272	11	587.182	89.88816	9	588.6815	96.91568
	Pre-shift adjusted	14	567.5628	88.90751	11	577.4487	92.58439	9	568.9349	91.66065
	Post-shift adjusted	14	569.6	89.70077	11	574.2688	91.21461	9	565.9111	93.92552
	Pre-post %	14	.7767771	3.167927	11	-.237084	2.321779	9	-.0880731	2.401511
Age		14	31.85714	4.81755	11	32.54545	5.22233	9	32.88889	5.754226
Height		14	172.6786	4.24086	11	172.0909	4.515629	9	173.6111	3.150176
Smoker		14	1	0	11	1	0	9	1	0
Pre-shift any symptoms		14	.5904762	.4267605	11	.4993507	.4272056	9	.3388889	.4211426
Post-shift any symptoms		14	.5	.4714045	11	.4251082	.4349673	9	.1666667	.3307189
Observation no.		14	5.357143	1.081818	11	5.090909	1.375103	9	4.333333	1.118034

Table 5.28: Grouped variables (no. of cigarettes smoked, time spent waring mask, comfortability of mask, removed mask >1 hour) by filter types

NTS

pre-shift no. of ciga. smoke	filter type						Total	
	Placebo		Sportstata		City			
	No.	%	No.	%	No.	%	No.	%
None	25	50 00	32	50.79	34	61.82	91	54.17
1-2	8	16.00	18	28.57	10	18.18	36	21.43
3+	17	34.00	13	20.63	11	20.00	41	24.40
Total	50	100.00	63	100.00	55	100.00	168	100.00

Pearson $\chi^2 = 6.0356$ (df = 4) P = 0.197

KW

pre-shift no.of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	46	76.67	34	75.56	44	86.27	124	79.49
1-2	8	13.33	8	17.78	5	9.80	21	13.46
3+	6	10.00	3	6.67	2	3.92	11	7.05
Total	60	100.00	45	100.00	51	100.00	156	100.00

Pearson $\chi^2 = 3.0312$ (df = 4) P = 0.553

NTS

post-shift no.of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	18	36.00	26	41.27	22	40.00	66	39.29
1-9	11	22.00	8	12.70	11	20.00	30	17.86
10+	21	42.00	29	46.03	22	40.00	72	42.86
Total	50	100.00	63	100.00	55	100.00	168	100.00

Pearson $\chi^2 = 2.0300$ (df = 4) P = 0.730

KW

Post-shift no. of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	34	56.67	29	64.44	38	74.51	101	64.74
1-9	19	31.67	12	26.67	10	19.61	41	26.28
10+	7	11.67	4	8.89	3	5.88	14	8.97
Total	60	100.00	45	100.00	51	100.00	156	100.00

Pearson $\chi^2 = 3.9136$ (df = 4) P = 0.418

NTS

time spent wearing mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
0-3 hours	16	32.65	35	55.56	30	56.60	81	49.09
4-5 hours	19	38.78	8	12.70	3	5.66	30	18.18
6-8 hours	14	28.57	20	31.75	20	37.74	54	32.73
Total	49	100.00	63	100.00	53	100.00	165	100.00

Pearson $\chi^2 = 21.5678$ (df = 4) P = 0.000

KW

time spent wearing mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
0-3 hours	10	16.67	10	22.73	7	13.73	27	17.42
4-5 hours	26	43.33	15	34.09	26	50.98	67	43.23
6-8 hours	24	40.00	19	43.18	18	35.29	61	39.35
Total	60	100.00	44	100.00	51	100.00	155	100.00

Pearson $\chi^2 = 3.0735$ (df = 4) P = 0.546

NTS

post-shift time spent outdoor	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
1-5 hours	18	36.00	27	42.86	18	32.73	63	37.50
6 hours	20	40.00	28	44.44	24	43.64	72	42.86
7+ hours	12	24.00	8	12.70	13	23.64	33	19.64
Total	50	100.00	63	100.00	55	100.00	168	100.00

Pearson $\chi^2 = 3.4628$ (df = 4) P = 0.484

KW

post-shift time spent outdoor	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
1-5 hours	17	28.33	13	28.89	15	29.41	45	28.85
6 hours	30	50.00	20	44.44	24	47.06	74	47.44
7+ hours	13	21.67	12	26.67	12	23.53	37	23.72
Total	60	100.00	45	100.00	Y51	100.00	156	100.00

Pearson $\chi^2 = 0.4529$ (df = 4) P = 0.978

NTS

Comfortability of mask	filter type: Placebo No.	%	Sportsta No.	%	City No.	%	Total No.	%
comfortable	12	31.58	18	33.33	20	51.28	50	38.17
uncomfortable	26	68.42	34	62.96	14	35.90	74	56.49
very uncomfortable	0	0.00	2	3.70	5	12.82	7	5.34
Total	38	100.00	54	100.00	39	100.00	131	100.00

Pearson χ^2 = 13.1886 (df = 4) P = 0.010

KW

comfortability of mask	filter type: Placebo No.	%	Sportsta No.	%	City No.	%	Total No.	%
comfortable	4	7.27	0	0.00	1	2.00	5	3.33
uncomfortable	47	85.45	44	97.78	41	82.00	132	88.00
very uncomfortable	4	7.27	1	2.22	8	16.00	13	8.67
Total	55	100.00	45	100.00	50	100.00	150	100.00

Pearson χ^2 = 10.4435 (df = 4) P = 0.034

NTS

removed mask >1 hr	filter type: Placebo No.	%	Sportsta No.	%	City No.	%	Total No.	%
yes	37	78.72	49	83.05	45	90.00	131	83.97
no	10	21.28	10	16.95	5	10.00	25	16.03
Total	47	100.00	59	100.00	50	100.00	156	100.00

Pearson χ^2 = 2.3494 (df = 2) P = 0.309

KW

removed mask >1 hr	filter type: Placebo No.	%	Sportsta No.	%	City No.	%	Total No.	%
yes	41	68.33	33	75.00	42	82.35	116	74.84
no	19	31.67	11	25.00	9	17.65	39	25.16
Total	60	100.00	44	100.00	51	100.00	155	100.00

Pearson χ^2 = 2.8783 (df = 2) P = 0.237

Non-smoker

pre-shift no. of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	49	100.00	50	100.00	55	100.00	154	100.00
Total	49	100.00	50	100.00	55	100.00	154	100.00

Smoker

pre-shift no. of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	22	36.07	16	27.59	23	45.10	61	35.88
1-2	16	26.23	26	44.83	15	29.41	57	33.53
3+	23	37.70	16	27.59	13	25.49	52	30.59
Total	61	100.00	58	100.00	51	100.00	170	100.00

Pearson $\chi^2 = 7.3699$ (df = 4) P = 0.118

Non-smoker

post-shift no. of ciga. smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	49	100.00	49	98.00	53	96.36	151	98.05
10+	0	0.00	1	2.00	2	3.64	3	1.95
Total	49	100.00	50	100.00	55	100.00	154	100.00

Pearson $\chi^2 = 1.7950$ (df = 2) P = 0.408

Smoker

post-shift no. of ciga. moke smoke	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
None	3	4 92	6	10.34	7	13.73	16	9.41
1-9	30	49.18	20	34.48	21	41.18	71	41.76
10+	28	45.90	32	55.17	23	45.10	83	48.82
Total	61	100.00	58	100.00	51	100.00	170	100.00

Pearson $\chi^2 = 4.6451$ (df = 4) P = 0.326

Non-smoker

time wearing mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
0-3 hours	14	28.57	21	42.86	20	37.74	55	36.42
4-5 hours	23	46.94	16	32.65	18	33.96	57	37.75
6-8 hours	12	24.49	12	24.49	15	28.30	39	25.83
Total	49	100.00	49	100.00	53	100.00	151	100.00

Pearson $\chi^2 = 3.2395$ (df = 4) P = 0 519

Smoker

time wearing mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
0-3 hours	12	20.00	24	41.38	17	33.33	53	31.36
4-5 hours	22	36.67	7	12.07	11	21.57	40	23.67
6-8 hours	26	43.33	27	46.55	23	45.10	76	44.97
Total	60	100.00	58	100.00	51	100.00	169	100.00

Pearson $\chi^2 = 12.1322$ (df = 4) P = 0.016

Non-smoker

post-shift time spent outdoor	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
1-5 hours	14	28.57	18	36.00	14	25.45	46	29.87
6 hours	28	57.14	17	34.00	23	41.82	68	44.16
7+ hours	7	14.29	15	30.00	18	32.73	40	25.97
Total	49	100.00	50	100.00	55	100.00	154	100.00

Pearson $\chi^2 = 7.9783$ (df = 4) P = 0.092

Smoker

post-shift time spent outdoor	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
1-5 hours	21	34.43	22	37.93	19	37.25	62	36.47
6 hours	22	36.07	31	53.45	25	49.02	78	45.88
7+ hours	18	29.51	5	8.62	7	13.73	30	17.65
Total	61	100.00	58	100.00	51	100.00	170	100.00

Pearson $\chi^2 = 10.2120$ (df = 4) P = 0.037

Non-smoker

omfortability of mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
comfortable	8	18.18	10	21.28	9	17.31	27	18.88
uncomfortable	32	72.73	36	76.60	32	61.54	100	69.93
very uncomfortable	4	9.09	1	2.13	11	21.15	16	11.19
Total	44	100.00	47	100.00	52	100.00	143	100.00

Pearson $\chi^2 = 9.3309$ (df = 4) P = 0.053

Smoker

comfortability of mask	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
comfortable	8	16.33	8	15.38	12	32.43	28	20.29
uncomfortable	41	83.67	42	80.77	23	62.16	106	76.81
very uncomfortable	0	0.00	2	3.85	2	5.41	4	2.90
Total	49	100.00	52	100.00	37	100.00	138	100.00

Pearson $\chi^2 = 7.5085$ (df = 4) P = 0.111

Non-smoker

removed mask >1 hr	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
yes	42	89.36	43	93.48	46	88.46	131	90.34
no	5	10.64	3	6.52	6	11.54	14	9.66
Total	47	100.00	46	100.00	52	100.00	145	100.00

Pearson $\chi^2 = 0.7813$ (df = 2) P = 0.677

Smoker

removed mask >1 hr	filter type						Total	
	Placebo		Sportsta		City			
	No.	%	No.	%	No.	%	No.	%
yes	36	60.00	39	68.42	41	83.67	116	69.88
no	24	40.00	18	31.58	8	16.33	50	30.12
Total	60	100.00	57	100.00	49	100.00	166	100.00

Pearson $\chi^2 = 7.2695$ (df = 2) P = 0.026

Table 5.29a: Modelling for post-shift peak expiratory flow rate (Mini Wright) - all subjects

Post-shift PEFR	Coefficient	Std. Err.	z	P>|z|	[95% Conf.Interval]	
Pre-shift PEFR	.3781479	.0381133	9.922	0.000	.3034473	.4528485
Age	3.19771	1.906443	1.677	0.093	-.5388493	6.93427
Height	1.897231	2.679835	0.708	0.479	-3.355149	7.149611
Smoker	37.57645	25.66116	1.464	0.143	-12.71849	87.87139
Week 2	-2.193319	2.273232	-0.965	0.335	-6.648771	2.262133
Week 3	.612575	2.061003	0.297	0.766	-3.426916	4.652066
Shift B	1.804553	1.522063	1.186	0.236	-1.178634	4.787741
Sportsta	.4127166	1.849706	0.223	0.823	-3.212642	4.038075
City	4.089401	1.862587	2.196	0.028	.4387976	7.740005
Kowloon West	5.560785	20 36564	0.273	0.785	-34.35514	45.47671
Pre-shift any symptoms	-6.287659	2.593529	-2.424	0.015	-11.37088	-1.204435
Temperature	-3.33135	1.468573	-2.268	0.023	-6.2097	-.4529999
Hudmidity	-.4757013	.3183597	-1.494	0.135	-1.099675	.1482722
Constant	29.56549	458.0069	0.065	0.949	-868.1115	927.2425

Table 5.29b: Modelling for post-shift peak expiratory flow rate (Mini Wright) - only those who had received three filter types

Post-shift PEFR	Coefficient	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Pre-shift PEFR	.3586217	.0449684	7.975	0.000	.2704852	.4467582
Age	5.047832	2.602125	1.940	0.052	-.0522382	10.1479
Height	-1.671108	4.004256	-0.417	0.676	-9.519305	6.177088
Smoker	47.99163	36.23385	1.324	0.185	-23.02542	119.0087
Week 2	-3.518103	2.650277	-1.327	0.184	-8.712549	1.676344
Week 3	-.0304813	2.249	-0.014	0.989	-4.43844	4.377477
Shift B	.8538865	1.849458	0.462	0.644	-2.770984	4.478757
Sportsta	.95764	2.041509	0.469	0.639	-3.043644	4.958924
City	3.819632	2.134998	1.789	0.074	-.3648868	8.004151
Kowloon West	2.862007	25.47856	0.112	0.911	-47.07504	52.79906
Pre-shift any symptoms	-6.325775	2.89095	-2.188	0.029	-11.99193	-.6596163
Temperature	-3.90252	1.738833	-2.244	0.025	-7.310569	-.4944707
Hudmidity	-.6504158	.3800703	-1.711	0.087	-1.39534	.0945082
Constant	615.7514	675.7039	0.911	0.362	-708.6039	1940.107

Table 5.30a: Modelling for pre-shift expiratory flow rate (Mini Wright) - all subjects

Pre-shift PEFR	Log-odd-ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age	4.854222	2.969476	1.635	0.102	-.965845	10.67429
Height	.9125623	4.193455	0.218	0.828	-7.306459	9.131584
Smoker	64.71356	39.97078	1.619	0.105	-13.62773	143.0548
Week 2	4.193282	3.42037	1.226	0.220	-2.51052	10.89708
Week 3	4.435139	3.098283	1.431	0.152	-1.637385	10.50766
Shift B	2.85303	2.289965	1.246	0.213	-1.635218	7.341278
Sportsta	3.647357	2.782222	1.311	0.190	-1.805698	9.100412
City	4.307257	2.798581	1.539	0.124	-1.177861	9.792375
Kowloon West	9.359266	31.86678	0.294	0.769	-53.09848	71.81701
Pre-shift any symptoms	-5.483174	3.900548	-1.406	0.160	-13.12811	2.16176
Temperature	2.130941	2.211724	0.963	0.335	-2.203959	6.465841
Hudmidity	.2052868	.4800532	0.428	0.669	-.7356001	1.146174
Constant	116.9596	716.1882	0.163	0.870	-1286.743	1520.663

Table 5.30b: Modelling for pre-shift expiratory flow rate (Mini Wright) - only those who had received three filter types

Pre-shift PEFR	Log-odd-ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age	7.259862	4.033188	1.800	0.072	-.6450418	15.16477
Height	-3.976493	6.249717	-0.636	0.525	-16.22571	8.272728
Smoker	86.69329	56.28042	1.540	0.123	-23.6143	197.0009
Week 2	2.47179	3.925914	0.630	0.529	-5.222859	10.16644
Week 3	3.786646	3.324863	1.139	0.255	-2.729966	10.30326
Shift B	1.84777	2.739325	0.675	0.500	-3.521207	7.216748
Sportsta	4.007307	3.014982	1.329	0.184	-1.901948	9.916563
City	2.113405	3.16228	0.668	0.504	-4.08455	8.311359
Kowloon West	6.267402	39.80304	0.157	0.875	-71.74513	84.27993
Pre-shift any symptoms	-5.668278	4.271067	-1.327	0.184	-14.03941	2.702859
Temperature	1.765047	2.575357	0.685	0.493	-3.282561	6.812654
Hudmidity	.1963806	.5633529	0.349	0.727	-.9077707	1.300532
Constant	880.5935	1053.15	0.836	0.403	-1183.542	2944.729

Table 5.31: Modelling on degree of discomfort (comfortable to very uncomfortable)

Comfortable	Log-odd-ratio	Std. Err.	z	P>|z|	[95% CI]	
Age	.0071412	.0300056	0.238	0.812	-.0516687	.065951
Height	-.1921819	.0444669	-4.322	0.000	-.2793353	-.1050284
Smoker	.73012	.3708074	1.969	0.049	.0033508	1.456889
Sportsta	.282282	.3512248	0.804	0.422	-.406106	.97067
City	.0503406	.3629523	0.139	0.890	-.6610327	.761714
Kowloon West	2.317987	.4850475	4.779	0.000	1.367312	3.268663
Humidity	-.0036317	.0664728	-0.055	0.956	-.133916	.1266526
Temperature	.1749779	.2861624	0.611	0.541	-.38589	.7358458
SO_2	-.0099579	.0163265	-0.610	0.542	-.0419572	.0220414
NO_2	.0269809	.0233167	1.157	0.247	-.0187189	.0726808
TEOM	-.0437014	.029663	-1.473	0.141	-.1018397	.014437
_cut1	-28.53344	15.45236	(Ancillary parameters)			
_cut2	-23.49483	15.40037				

Table 5.32: Modelling on having removed mask for more than one hour

Remove	Log-odd-ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Age	-.1168695	.0632219	-1.849	0.065	-.2407821	.0070431
Height	.0563281	.0853664	0.660	0.509	-.1109871	.2236432
Smoker	-1.791645	.9115524	-1.965	0.049	-3.578255	-.0050353
Shift B	.4542947	.2509546	1.810	0.070	-.0375672	.9461566
Sportsta	.3651887	.2904677	1.257	0.209	-.2041176	.934495
City	.8608956	.3174872	2.712	0.007	.2386322	1.483159
Kowloon West	.2647841	.7034377	0.376	0.707	-1.113928	1.643497
Pre-shift symptom	-.0812326	.3566615	-0.228	0.820	-.7802764	.6178112
Temperature	-.360764	.2364841	-1.526	0.127	-.8242643	.1027364
Humidity	-.0307241	.0536256	-0.573	0.567	-.1358283	.0743801
SO_2	-.0087063	.0131047	-0.664	0.506	-.0343909	.0169784
NO_2	-.011098	.0198624	-0.559	0.576	-.0500277	.0278316
TEOM	.0218622	.0250075	0.874	0.382	-.0271517	.0708761
Constant	8.528717	17.85189	0.478	0.633	-26.46034	43.51777

Table 5.33: Modelling on any symptoms post-shift

Independent variabales	Log-odd-ratio	Std. Err.	z	P>|z|	[95% CI]	
Age	.0493753	.0714555	0.691	0.490	-.0906748	.1894254
Height	-.0759228	.0988584	-0.768	0.442	-.2696817	.1178362
Smoker	2.259004	1.008199	2.241	0.025	.2829715	4.235037
Shift B	-.204836	.1763429	-1.162	0.245	-.5504617	.1407898
Sportsta	-.3977922	.2206848	-1.803	0.071	-.8303266	.0347421
City	.0246536	.2097147	0.118	0.906	-.3863797	.4356869
Kowloon W	.2337416	.766781	0.305	0.760	-1.269122	1.736605
Temperature	.1839141	.169597	1.084	0.278	-.1484899	.5163182
Humidity	.0126999	.0383126	0.331	0.740	-.0623915	.0877913
SO_2	-.0123129	.0096019	-1.282	0.200	-.0311323	.0065066
NO_2	.043209	.0146807	2.943	0.003	.0144354	.0719827
TEOM	-.046546	.0181926	-2.559	0.011	-.0822028	-.0108893
Constant	3.113594	18.38594	0.169	0.866	-32.92218	39.14937

Table 5.34a: Analysis to show any between group difference for any post shift symptoms

Independent variable	Log-odd-ratio	Std. Err.	z	p-value	[95% CI]	
Age	.0480269	.0697103	0.689	0.491	-.0886028	.1846565
Height	-.2012967	.1204231	-1.672	0.095	-.4373217	.0347283
Smoker	2.857247	1.117418	2.557	0.011	.6671474	5.047347
Shift B	-.2417011	.1937752	-1.247	0.212	-.6214935	.1380913
Group SCP	-.2549748	.9186653	-0.278	0.781	-2.055526	1.545576
Group CPS	-1.049583	.9472218	-1.108	0.268	-2.906103	.8069378
Kowloon W	.1919451	.7400176	0.259	0.795	-1.258463	1.642353
Temperature	.1852313	.1894572	0.978	0.328	-.1860979	.5565605
Humidity	.0161069	.0430656	0.374	0.708	-.0683001	.1005138
SO_2	-.0110517	.0105362	-1.049	0.294	-.0317022	.0095988
NO_2	.0454418	.0163781	2.775	0.006	.0133413	.0775424
TEOM	-.0495447	.0203361	-2.436	0.015	-.0894028	-.0096867
Constant	24.35655	21.87235	1.114	0.265	-18.51247	67.22557

Table 5.34b: Analysis to show any between group difference for post shift PEFR

Post-shift PEFR	Log-odd-ratio	Std. Err.	z	p-value	[95% CI]	
Pre-shift PEFR	.3961473	.0386485	10.250	0.000	.3203976	.4718971
Age	3.017398	1.987648	1.518	0.129	-.8783203	6.913117
Height	1.812146	2.960313	0.612	0.540	-3.989962	7.614253
Smoker	34.15014	26.20603	1.303	0.193	-17.21274	85.51302
Shift B	1.179446	1.505444	0.783	0.433	-1.77117	4.130063
Group CPS	1.426238	25.52576	0.056	0.955	-48.60334	51.45581
Group PSC	-1.234688	24.6054	-0.050	0.960	-49.46039	46.99102
Kowloon West	6.41846	19.90126	0.323	0.747	-32.58729	45.42421
Temperature	-3.0924	1.44168	-2.145	0.032	-5.918042	-.266759
Humidity	-.4814464	.3384432	-1.423	0.155	-1.144783	.18189
SO_2	-.0325638	.0826548	-0.394	0.694	-.1945642	.1294366
NO_2	-.0389655	.1187266	-0.328	0.743	-.2716652	.1937343
TEOM	.0839667	.1492564	0.563	0.574	-.2085705	.3765038
Constant	32.90609	513.1066	0.064	0.949	-972.7643	1038.577

Table 5.34c: Analysis to show any between group difference for pre-shift PEFR

Pre-shift PEFR	Lod-odd-ratio	Std. Err.	z	p-value	[95% CI]	
Age	4.579012	3.174593	1.442	0.149	-1.643076	10.8011
Height	1.043111	4.74626	0.220	0.826	-8.259388	10.34561
Smoker	60.61755	41.85112	1.448	0.148	-21.40914	142.6442
Shift B	3.102858	2.222869	1.396	0.163	-1.253885	7.459602
Group SCP	16.32998	40.91679	0.399	0.690	-63.86545	96.52541
Group CPS	15.65207	39.44012	0.397	0.691	-61.64915	92.95328
Kowloon West	8.80243	31.893	0.276	0.783	-53.70669	71.31155
Temperature	-.7646132	2.135023	-0.358	0.720	-4.949182	3.419956
Humidity	-.2424941	.5011206	-0.484	0.628	-1.224673	.7396843
SO_2	.1576703	.1220985	1.291	0.197	-.0816383	.396979
NO_2	-.3793918	.174515	-2.174	0.030	-.7214349	-.0373488
TEOM	.3049633	.2203925	1.384	0.166	-.1269981	.7369247
Constant	216.783	821.4928	0.264	0.792	-1393.313	1826.879

Table 5.34d: Analysis to show any between group difference for post shift - pre shift PEFR percentage

Post-pre %	Log-odd-ratio	Std. Err.	z	p-value	[95% CI]	
Age	.0633122	.0844184	0.750	0.453	-.1021448	.2287692
Height	.220914	.1277437	1.729	0.084	-.029459	.471287
Smoker	-.645892	1.130486	-0.571	0.568	-2.861604	1.56982
Shift B	-.1202092	.390792	-0.308	0.758	-.8861475	.6457291
Group SCP	-1.154479	1.098746	-1.051	0.293	-3.307982	.9990238
Group CPS	-1.835315	1.06973	-1.716	0.086	-3.931947	.2613167
Kowloon West	-.106096	.9392357	-0.113	0.910	-1.946964	1.734772
Temperature	-.4054965	.3766991	-1.076	0.282	-1.143813	.3328201
Humidity	-.0573292	.0884743	-0.648	0.517	-.2307356	.1160771
SO_2	-.0301295	.0215488	-1.398	0.162	-.0723644	.0121054
NO_2	.036231	.0308111	1.176	0.240	-.0241576	.0966196
TEOM	-.0207529	.0389292	-0.533	0.594	-.0970527	.055547
Constant	-21.55916	28.63238	-0.753	0.451	-77.67759	34.55927

Table 5.35: Analysis on mask wearing time (3 categories)

Independent variable	Log-odd-ratio	Std. Err.	z	p-value	[95% CI]	
Age	-.2401048	.0285389	-8.413	0.000	-.29604	-.1841697
Height	.1057412	.0315627	3.350	0.001	.0438793	.167603
Smoker	.8418909	.3066942	2.745	0.006	.2407814	1.443
Sportsta	-.083014	.2818301	-0.295	0.768	-.6353908	.4693628
City	-.1570179	.2806824	-0.559	0.576	-.7071452	.3931095
Kowloon W	1.446464	.3595336	4.023	0.000	.7417911	2.151137
Shift B	-.090047	.2382607	-0.378	0.705	-.5570295	.3769355
Humidity	.0319722	.0540534	0.591	0.554	-.0739706	.137915
Temperature	.0880352	.2314897	0.380	0.704	-.3656762	.5417466
SO2	.0253457	.013081	1.938	0.053	-.0002927	.0509841
NO_2	-.0158639	.0185044	-0.857	0.391	-.0521318	.020404
TEOM	.0178894	.0233821	0.765	0.444	-.0279388	.0637175
_cut1	16.0467	12.35407	(Ancillary parameters)			
_cut2	17.81897	12.36352				

Copy of the data collection forms used in the Pilot Respiratory Function Tests on 19th December 1995.

香 港 大 學
THE UNIVERSITY OF HONG KONG

Department of Community Medicine
Royal Hong Kong Police Health Survey

1 Do you smoke?
__ yes __ no (go to Question 2)
↓
1A How long since you smoked your last cigarette?
__ __ mins or __ __ hours

2 Do you have any respiratory symptoms today?
__ yes __ no (go to Question 3)
↓
2A Please list your respiratory symptoms:

____

3 Have you taken any medication today?
__ yes __ no (go to Question 4)
↓
3A Please list the medication/s you have taken:

____

4 Do you wear a mask whilst on motorcycle duties?
__ yes __ no
↓
4A How many hours did you wear your mask yesterday?
__ __ hours

4B On average how many hours per day did you wear your mask on last week's shift?
__ __ hours

4C What type of filter is fitted in your mask?
__ city filter (gaseous) __ sports filter (particulate)

DATE: __ __ / __ __ / __ __ (dd/mm/yy)

STUDY NUMBER: __ __ __ __ __ __ __ __ (office use only)

RHKP UI NUMBER: __ __ __ __ __

AGE: __ __ years

HEIGHT: __ __ __ cm

WEIGHT: __ __ __ kg

EXPIRED AIR CARBON MONOXIDE:

	Pre-shift	Post-shift
	__ __ ppm	__ __ ppm
	__ __ % COHb	__ __ % COHb

Please staple all vitalograms and printouts to this form.

50281

香 港 大 學
THE UNIVERSITY OF HONG KONG

Department of Community Medicine

社會醫學系

and

及

Royal Hong Kong Police

香港皇家警察

Health Survey

健康調查

This survey will measure aspects of the general health of officers within the Royal Hong Kong Police Force.

這項調查將會量度香港皇家警察中隊員各方面普遍的健康狀況。

All personal information obtained in this survey will remain STRICTLY CONFIDENTIAL and used for research purposes only.

這調查內所有的個人資料將會絕對保密，及只作研究之用。

Please check that you have received all 18 PAGES of the survey.

請核對清楚你已收妥整份共有18頁的調查問卷。

A number of these questions will be validated/repeated so please answer ALL questions as accurately and completely as possible.

為了使資料有充分根據，部份問題將會是重覆的；所以請儘量準確地及圓滿地回答所有的問題。

Study Number:
研究編號：

(Office use only)
請勿填寫

Please note that all the data will be held anonymously.

請留意所有資料將是不記名的。

The link between the Unique Identification (UI) number and the Study number will only be available to Professor AJ Hedley and the University Project Leader (currently Alison Lamb).

UI號碼及研究編號的關連將只會向賀達理教授及大學負責這項研究的統籌人（目前是Alison Lamb）透露。

We need to know your UI number so that the University research team can come back to some respondants for further help with the survey if necessary.

我們需要知道你的UI號碼是因爲大學的研究人員將來可能有需要再請部份的被訪者幫忙。

Please list your UI number below:
請在下面列出你的UI號碼：

↓

UI Number:
UI 號碼：

50281

Please fill in the most appropriate answer (○) or write in the boxes ( ) provided.
請把最適合的答案（○）填滿，或把答案寫在附上的方格（ ）內。

Example only
只作舉例

Your gender? 你的性別？ ● **Male** 男 ○ **Female** 女

Your date of birth: 你的出生日期：

1 1	0 9	6 2
Day 日	**Month** 月	**Year** 年

Shade circles like this: 請這樣填滿圓圈 ●

Not like this: 不是這樣 ⊗ ☑

Today's Date: 今天的日期： [ ][ ] / [ ][ ] / [ ][ ]
Day 日 Month 月 Year 年

Study Number: 研究編號： [ ]
(Office use only) 請勿填寫

PART A - YOUR CURRENT STATUS
A 部 — 你目前的職位

A1 What is your Royal Hong Kong Police rank?
你在香港皇家警隊中的官楷是甚麼？

- ○ Police Constable (PC)
- ○ Sergeant (SGT)
- ○ Station Sergeant (SSGT)
- ○ Inspector (IP)
- ○ Senior Inspector (SIP)
- ○ Chief Inspector (CIP)
- ○ Superintendent (SP)
- ○ Senior Superintendent (SSP)
- ○ other, please specify: 其他，請註明：[ ]

A2 To which Regional Formation of Royal Hong Kong Police do you belong?
你是隸屬香港皇家警隊中的甚麼警區？

- ○ Kowloon East 九龍東
- ○ Kowloon West 九龍西
- ○ New Territories South 新界南
- ○ New Territories North 新界北
- ○ Hong Kong Island 香港島
- ○ Marine 水警

A3 How many months have you been in your current policing formation?
你在目前的警區有多少個月了？

[ ] months
個月

A4 In what month and year did you commence employment with the Royal Hong Kong Police?
你在何年何月開始在香港皇家警隊中任職？

[ ] / [ ] / [ ] (month/year)
（月／年）

PART B - YOUR GENERAL HEALTH
B 部 — 你一般的健康狀況

	very good 很好	good 好	poor 差	very poor 很差
B1 In general, do you think your health is: 總括（一 般）來講，你認爲你自己的身體健康情況係：	○	○	○	○
B2 In the recent three months, do you think your health is: 最近三個月，你認爲你自己的身體健康情況係：	○	○	○	○
B3 Today, do you think your health is: 今日，你認爲你自己的身體健康情況係：	○	○	○	○

B4 How many times have you consulted a doctor (Western or Chinese style) during the past 14 days?
在過去１４日內，你曾看醫生（西醫或中醫師）多少次？

○ Yes 有 [ ] times 次

○ none→ go to B6
無→回答 B6

50281

B5 What is/are the reason/s you have consulted with a doctor? (You may have more than one answer)
你是為了甚麼原因去看醫生？ （你可以有多過一個答案）

- ○ cold/flu/upper respiratory tract infection 傷風／感冒／上呼吸道受感染
- ○ bronchitis 支氣管炎
- ○ other respiratory problem 其他呼吸系統問題
- ○ other, please specify: 其他，請註明：
- ○ muscle/joint problem 肌肉／關節問題
- ○ diabetes 糖尿病
- ○ hypertension 高血壓
- ○ accident/injury 意外／受傷
- ○ headache 頭痛
- ○ stomach problem 腸胃問題

B6 How many times have you taken medication and/or received treatment during the past 14 days?
在過去１４日內，你曾服用藥物及／或接受治療多少次？

○ Yes 有 ☐☐ times 次 ○ none→ go to B9 無→回答B9

B6a Please specify what the medication/s and/or treatment taken in the last 14 da ys was for? (You may have more than one answer)
請註明在過去１４日內所服的葯及／或接受的治療是爲了甚麼病？
（你可以有多過一個答案）

- ○ cold/flu/upper respiratory tract infection 傷風／感冒／上呼吸道受感染
- ○ bronchitis 支氣管炎
- ○ other respiratory problem 其他呼吸系統問題
- ○ other, please specify: 其他，請註明：
- ○ muscle/joint problem 肌肉／關節問題
- ○ diabetes 糖尿病
- ○ hypertension 高血壓
- ○ accident/injury 意外／受傷
- ○ headache 頭痛
- ○ stomach problem 腸胃問題

B7 How did you obtain the medication? (You may have more than one answer)
你怎樣得到那些葯物？（你可以有多過一個答案）

- ○ Prescribed by Western-trained doctor 由西醫所開
- ○ Prescribed by Chinese herbalist 由中醫師所開
- ○ Recommended by Pharmacist 由葯劑師推薦
- ○ Recommended by other health care provider 由其他醫護人員推薦
- ○ Medicine bought over the counter 自己從葯房購買
- ○ Recommended by friends and/or family 由朋友及／或家人推薦

B8 What was the total cost of all medication and/or treatment taken in the 14 days?
在過去 1 4 日內，你總共用了多少錢來買葯及／或接受治療？

- ○ nil 零
- ○ $001 - $100
- ○ $101 - $200
- ○ $201 - $300
- ○ $301 - $400
- ○ $401 - $500
- ○ $501 or more $ 501或以上

(The term "**usually**" used below is defined as 3 or more times per week)
（下面〝經常〞即一星期有 3 次或以上）

B9 Throat symptoms
B9 喉部病徵

	yes 是	no 否
B9 Do you usually have a sore or itchy throat or other throat discomfort? 你是不是經常喉嚨痛，或喉嚨癢，或有其他喉部不適？	○	○

B10 Cough
B10 咳嗽

	yes 有	no 没有
B10a Do you usually cought first thing (upon waking) in the morning? 你有没有經常在早上起床後咳嗽？	○	○

50281

B10b Do you usually cough either during the day or at night?
你有沒有經常在早上或晚上咳嗽？

	yes 有	no 沒有
	○	○

(If yes at B10a or B10b, then answer B10c)
（如在 B10a 或 B10b 回答〝有〞，續答 B10c ）

B10c Do you cough like this on most days for as much as three months each year?
你每年有沒有這樣地咳嗽超過三個月？

	yes 有	no 沒有
	○	○

B11 Phlegm
B11 痰

B11a Do you usually bring up any phlegm from your chest first thing (upon waking) in the morning?
你有沒有經常在早上起床後便要咳痰？

	yes 有	no 沒有
	○	○

B11b Do you usually bring up any phlegm from your chest during the day or at night?
你有沒有經常在日間或晚上咳痰？

	yes 有	no 沒有
	○	○

(If yes at B11a or B11b, then answer B11c)
（如在 B11a 或 B11b 回答〝有〞，續答 B11c ）

B11c Do you bring up phlegm like this on most days for as much as three months each year?
你每年有沒有這樣地咳痰超過三個月？

	yes 有	no 沒有
	○	○

B12 Periods of cough and phlegm
B12 咳嗽及有痰的期間

B12a In the past three years have you had a period of increased cough and phlegm lasting three weeks or more?
你在過去三年內曾否有一段期間持續三個星期或以上咳嗽及咳痰的次數較頻密或較嚴重？

○ yes 有

○ no→ go to B13
沒有→ 回答 B13

B12b Have you had more than one such <u>period</u> lasting three weeks or more?

這樣的情形有没有超過一次（每次超過三個星期）？

☐ yes 有 ☐ no →go to B13 没有→ 回答 B13

B12c What is the <u>total</u> number of cough <u>and</u> phlegm <u>periods</u> lasting three weeks or more you have experienced in the last three years?

在過去三年内，你<u>總共</u>曾經歷過多少次（每次超過三個星期）咳嗽<u>及</u>咳痰？

☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6
☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 or more 1 1 或以上

<u>B13 Breathlessness</u>

<u>B13 氣促</u>

B13a Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill?

當你在平地上匆忙地走過，或在微斜的路向上步行時會不會受氣促所困擾？

☐ yes 會 ☐ no→ go to B14 不會→ 回答 B14

B13b Do you get short of breath walking with other people of your own age on level ground?

你和跟你年紀相若的人在平地上步行會否感到氣促?

☐ yes 會 ☐ no→go to B14 不會→ 回答 B14

B13c Do you have to stop for breath when walking at your own pace on level ground?

當你用平常的速度在平地上步行，你會不會需要停下來喘氣？

☐ yes 會 ☐ no 不會

50281

B14 Wheezing
B14 扯哈或哮喘

B14a Does your chest ever sound wheezing or whistling?
你的胸部或肺部有沒有試過發出〝扯哈〞聲或〝哮喘聲〞？

☐ yes 有　☐ no→go to B14c 沒有→回答B14c

B14b Do you get this on most days - or nights?
你是否在多數的日子裏（日間或晚上）有這情形出現？

☐ yes 是　☐ no 否

B14c Have you ever had attacks of shortness of breath with wheezing?
你是否曾因爲扯哈或哮喘引起氣促或呼吸困難？

☐ yes 是　☐ no→go to B15 否→回答 B15

B14d Is/was your breathing absolutely normal between attacks?
沒有氣促或呼吸困難時，你的呼吸是否絕對正常？

☐ yes 是　☐ no 否

B15 Nasal Symptoms
B15 鼻部病徵

B15 Do you usually have a blocked or running nose?
你是否經常鼻塞或流鼻水？

☐ yes 是　☐ no 否

B16 Chest illness
B16 胸肺 疾病

B16a During the past three years have you had any chest illness which has kept you from your usual activities for as much as a week?
在過去三年內，你曾否因爲任何胸肺疾病而令你超過一星期不能進行你平日的活動？

☐ yes 曾經有　☐ no→ go to B17 沒有→回答B17

B16b Did you bring up more phlegm than usual in any of these illnesses?
在這疾病中你有沒有比平常咳出更多痰？

☐ yes 有　☐ no→ go to B17 沒有→ 回答B17

B16c Have you had more than one illness like this in the past three years?
在過去三年內，你曾否患上超過一次這種疾病？

☐ yes 曾經　☐ no 沒有

B17 Past illness
B17 過往病歷

	yes 曾經	no 沒有
B17a Has your doctor ever told you, you had an injury or operation affecting your chest? 你的醫生曾否告訴你，你的胸肺部曾受傷或曾做手術？	○	○
B17b Has your doctor ever told you, you had coronary heart disease? 你的醫生曾否告訴你，你有冠心病？	○	○
B17c Has your doctor ever told you, you had acute bronchitis? 你的醫生曾否告訴你，你有急性支氣管炎？	○	○
B17d Has your doctor ever told you, you had chronic bronchitis? 你的醫生曾否告訴你，你有慢性支氣管炎？	○	○
B17e Has your doctor ever told you, you had pneumonia? 你的醫生曾否告訴你，你有肺炎？	○	○
B17f Has your doctor ever told you, you had pleurisy? 你的醫生曾否告訴你，你有胸膜炎或肋膜炎？	○	○
B17g Has your doctor ever told you, you had pulmonary tuberculosis? 你的醫生曾否告訴你，你有肺結核或肺癆病？	○	○
B17h Has your doctor ever told you, you had bronchial asthma? 你的醫生曾否告訴你，你有哮喘病？	○	○

50281

	yes 曾經	no 沒有
B17i Has your doctor ever told you, you had other chest trouble? 你的醫生曾否告訴你，你有其他胸肺病？	○	○
B17j Has your doctor ever told you, you had hay fever? 你的醫生曾否告訴你，你有花粉病（由植物花粉或塵埃引起鼻與喉感染的病）？	○	○
B17k Has your doctor ever told you, you had allergic rhinitis? 你的醫生曾否告訴你，你有鼻敏感？	○	○
B17l Has your doctor ever told you, you had sinusitis? 你的醫生曾否告訴你，你有鼻竇炎？	○	○
B17m Has your doctor ever told you, you had eczema? 你的醫生曾否告訴你，你有皮膚濕疹？	○	○
B17n Has your doctor ever told you, you had skin allergies? 你的醫生曾否告訴你，你有皮膚敏感？	○	○
B17o Has your doctor ever told you, you had diabetes? 你的醫生曾否告訴你，你有糖尿病？	○	○
B17p Has your doctor ever told you, you had hypertension? 你的醫生曾否告訴你，你有高血壓？	○	○
B17q Has your doctor ever told you, you had stomach or duodenal ulcer syndrome? 你的醫生曾否告訴你，你有胃或十二指腸潰瘍？	○	○

B18 Tobacco smoking

B18 吸煙

B18a Do you smoke?
你吸煙嗎？

○ yes→ go to B18c
是→ 回答 B18c

○ no
否

B18b Have you ever smoked as much as one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as 6 months?

你曾否每日吸 1 支香煙或以上（或每星期 1 支雪茄或每月 1 安士煙草）達6個月？

☐ yes 曾 ☐ no→ go to C1 否→ 回答 C1

B18c Do (did) you inhale the smoke?
你現在（或以前）有没有把煙吸入肺部？

☐ yes 有 ☐ no→ go to B18e 没有→ 回答 B18e

B18d Would you say you inhaled the smoke:
你怎樣形容你把多少煙吸入肺部：

☐ slightly? 微微地？ ☐ moderately? 中度地？ ☐ deeply? 深入地？

B18e How old were you when you started smoking regularly?
開始定期地（經常）吸煙時你的年紀是多少？

☐☐ years old when started smoking regularly
歲開始定期（經常）吸煙

B18f Do (did) you smoke manufactured cigarettes?
你現在（或以前）是否吸食（機器生產的）香煙？

☐ yes 是 ☐ no→ go to B18k 否→ 回答 B18k

B18g How many manufactured cigarettes do (or did) you usually smoke per day on weekdays?
你現在（或以前）在週日（星期一至五）經常每天吸食多少（機器生產的）香煙？

☐☐ manufactured cigarettes per weekday
支由（機器生產的）香煙

B18h How many manufactured cigarettes do (or did) you usually smoke per day at weekends?
週末每天吸食多少（機器生產的）香煙？

☐☐ manufactured cigarettes per weekend day
支（機器生產的）香煙

50281

B18i Do (or did) you usually smoke plain or filter tip cigarettes?
你現在（或以前）是否通常吸食沒有濾咀或有濾咀的香煙？

- ☐ plain 沒有濾咀
- ☐ filter tip 有濾咀

B18j What strength of plain or filter tip cigarettes do (or did) you usually smoke?
你現在（或以前）經常吸食的沒有濾咀或有濾咀的香煙有幾濃？

- ☐ high 高
- ☐ medium 中度
- ☐ medium/low 中度／低
- ☐ low 低
- ☐ don't know 不知道

B18k Do (or did) you smoke hand-rolled cigarettes?
你現在（或以前）是否吸食手捲香煙？

- ☐ yes 是
- ☐ no→ go to B18n 否→ 回答 B18n

B18l How many taels of tobacco do (or did) you usually smoke per week in this way?
你現在（或以前）經常每星期吸食多少兩煙草？

每星期 ☐☐ taels of tobacco per week 兩煙草

B18m Do (or did) you put filters in these hand-rolled cigarettes?
你現在（或以前）有沒有在這些手捲的香煙加放濾咀？

- ☐ yes 有
- ☐ no 沒有

B18n Do (or did) you smoke a pipe?
你現在（或以前）有沒有吸食煙斗？

- ☐ yes 有
- ☐ no→ go to B18p 沒有→ 回答 B18p

B18o How many taels of pipe tobacco do (or did) you usually smoke per week?
你現在（或以前）經常吸食多少兩煙絲？

每星期 ☐☐ taels of tobacco per week 兩煙絲

B18p Do (or did) you smoke <u>small cigars</u>?
你現在（或以前）有没有吸食<u>小雪茄</u>？

☐ yes 有　　☐ no→ go to B18r
没有→ 回答 B18r

B18q How many small cigars do (or did) you usually smoke per day?
你現在（或以前）每天經常吸食多少支小雪茄？

每天 ☐ small cigars per day
支小雪茄

B18r Do (or did) you smoke <u>other cigars</u>?
你現在（或以前）有没有吸食<u>其他雪茄</u>？

☐ yes 有　　☐ no→ go to B18t if a current smoker or go to B18y if an ex-smoker
没有→ 如果目前是吸煙者回答 B18t，
或如果以前曾是吸煙者回答 B18y

B18s How many of these other cigars do (or did) you usually smoke per week?
你現在（或以前）每星期經常吸食多少支其他雪茄？

每星期 ☐ other cigars per week
支其他雪茄

(For current smokers)
（現在仍是吸煙者）

B18t Have you been cutting down your smoking over the past year?
在過去一年內，你曾否減低你吸煙的數量？

☐ yes 曾經有　　☐ no 没有

B18u Have you ever tried to give up smoking?
你曾嘗試戒煙嗎？

☐ yes 曾經有　　☐ no→ go to B18x
没有→ 回答B18x

50281

B18v For what reason did you try to give up smoking? (Please answer only one)
甚麼理由令你以前曾嘗試戒煙？ （請只回答一項）

○ Health (without a doctor's advice)
健康理由 （無醫生給與意見）

○ Health (with a doctor's advice)
健康理由 （由醫生給與意見）

○ High price of cigarettes
香煙的價格太貴

○ Objection from family members or bad effects on them
家人反對或對他們有壞影響

○ Prohibited/discouraged at work/public places
工作／公衆地方禁止或不鼓勵吸煙

○ Changed to another form of smoking, please specify:
改變至另一種吸煙方法，請註明：

○ Government's anti-smoking publicity
政府反吸煙宣傳

○ Others, please specify:
其他，請註明：

B18w Do you want to give up smoking?
你想不想戒煙？

○ yes→ go to C1
想→ 回答 C1

○ no
不想

B18x For what reason are you not wanting to give up smoking? (Please answer only one)
甚麼理由令你不想戒煙： （請只回答一項）

- ○ Feeling psychologically/physiologically uncomfortable
  戒煙時產生心理上／生理上不適的感覺
- ○ Being not determined enough
  不夠決心
- ○ Too easy to get cigarettes
  太容易得到香煙
- ○ Not mature/stylish
  不成熟／沒有那麼有型
- ○ Necessary in social occasions
  社交應酬必需品
- ○ Most friends/colleagues are smokers
  多數朋友／同事都吸煙
- ○ Enhancing spirit
  提神
- ○ Habit/hobbies/to kill time
  習慣／嗜好／消磨時間
- ○ Others, please specify:
  其他，請註明：

(For ex-smokers)
（已戒煙者）

B18y When did you last give up smoking?
你上次在何時戒煙？

☐☐ / ☐☐ / ☐☐ (month/year)
（月份／年份）

50281

B14 Wheezing

B14 扯哈或哮喘

B14a Does your chest ever sound wheezing or whistling?
你的胸部或肺部有沒有試過發出〝扯哈〞聲或〝哮喘聲〞？

☐ yes 有 ☐ no→go to B14c 沒有→回答B14c

B14b Do you get this on most days - or nights?
你是否在多數的日子裏（日間或晚上）有這情形出現？

☐ yes 是 ☐ no 否

B14c Have you ever had attacks of shortness of breath with wheezing?
你是否曾因為扯哈或哮喘引起氣促或呼吸困難？

☐ yes 是 ☐ no→go to B15 否→回答 B15

B14d Is/was your breathing absolutely normal between attacks?
沒有氣促或呼吸困難時，你的呼吸是否絕對正常？

☐ yes 是 ☐ no 否

B15 Nasal Symptoms

B15 鼻部病徵

B15 Do you usually have a blocked or running nose?
你是否經常鼻塞或流鼻水？

☐ yes 是 ☐ no 否

B16 Chest illness

B16 胸肺 疾病

B16a During the past three years have you had any chest illness which has kept you from your usual activities for as much as a week?
在過去三年內，你曾否因為任何胸肺疾病而令你超過一星期不能進行你平日的活動？

☐ yes 曾經有 ☐ no→ go to B17 沒有→回答B17

B16b Did you bring up more phlegm than usual in any of these illnesses?
在這疾病中你有沒有比平常咳出更多痰？

☐ yes 有　　☐ no→ go to B17 沒有→ 回答B17

B16c Have you had more than one illness like this in the past three years?
在過去三年內，你曾否患上超過一次這種疾病？

☐ yes 曾經　　☐ no 沒有

<u>B17 Past illness</u>
<u>B17 過往病歷</u>

	yes 曾經	no 沒有
B17a Has your doctor ever told you, you had an injury or operation affecting your chest? 你的醫生曾否告訴你，你的胸肺部曾受傷或曾做手術？	○	○
B17b Has your doctor ever told you, you had coronary heart disease? 你的醫生曾否告訴你，你有冠心病？	○	○
B17c Has your doctor ever told you, you had acute bronchitis? 你的醫生曾否告訴你，你有急性支氣管炎？	○	○
B17d Has your doctor ever told you, you had chronic bronchitis? 你的醫生曾否告訴你，你有慢性支氣管炎？	○	○
B17e Has your doctor ever told you, you had pneumonia? 你的醫生曾否告訴你，你有肺炎？	○	○
B17f Has your doctor ever told you, you had pleurisy? 你的醫生曾否告訴你，你有胸膜炎或肋膜炎？	○	○
B17g Has your doctor ever told you, you had pulmonary tuberculosis? 你的醫生曾否告訴你，你有肺結核或肺癆病？	○	○
B17h Has your doctor ever told you, you had bronchial asthma? 你的醫生曾否告訴你，你有哮喘病？	○	○

		yes 曾經	no 沒有
B17i	Has your doctor ever told you, you had other chest trouble? 你的醫生曾否告訴你，你有其他胸肺病？	○	○
B17j	Has your doctor ever told you, you had hay fever? 你的醫生曾否告訴你，你有花粉病（由植物花粉或塵埃引起鼻與喉感染的病）？	○	○
B17k	Has your doctor ever told you, you had allergic rhinitis? 你的醫生曾否告訴你，你有鼻敏感？	○	○
B17l	Has your doctor ever told you, you had sinusitis? 你的醫生曾否告訴你，你有鼻竇炎？	○	○
B17m	Has your doctor ever told you, you had eczema? 你的醫生曾否告訴你，你有皮膚濕疹？	○	○
B17n	Has your doctor ever told you, you had skin allergies? 你的醫生曾否告訴你，你有皮膚敏感？	○	○
B17o	Has your doctor ever told you, you had diabetes? 你的醫生曾否告訴你，你有糖尿病？	○	○
B17p	Has your doctor ever told you, you had hypertension? 你的醫生曾否告訴你，你有高血壓？	○	○
B17q	Has your doctor ever told you, you had stomach or duodenal ulcer syndrome? 你的醫生曾否告訴你，你有胃或十二指腸潰瘍？	○	○

B18 Tobacco smoking

B18 吸煙

B18a Do you smoke?
你吸煙嗎？

○ yes→ go to B18c
是→ 回答 B18c

○ no
否

50281

B18b Have you ever smoked as much as one cigarette a day (or one cigar a week or an ounce of tobacco a month) for as long as 6 months?

你曾否每日吸 1 支香煙或以上（或每星期 1 支雪茄或每月 1 安士煙草）達6個月？

☐ yes 曾 ☐ no→ go to C1 否→ 回答 C1

B18c Do (did) you inhale the smoke?
你現在（或以前）有沒有把煙吸入肺部？

☐ yes 有 ☐ no→ go to B18e 沒有→ 回答 B18e

B18d Would you say you inhaled the smoke:
你怎樣形容你把多少煙吸入肺部：

☐ slightly? 微微地？ ☐ moderately? 中度地？ ☐ deeply? 深入地？

B18e How old were you when you started smoking regularly?
開始定期地（經常）吸煙時你的年紀是多少？

☐☐ years old when started smoking regularly
歲開始定期（經常）吸煙

B18f Do (did) you smoke manufactured cigarettes?
你現在（或以前）是否吸食（機器生產的）香煙？

☐ yes 是 ☐ no→ go to B18k 否→ 回答 B18k

B18g How many manufactured cigarettes do (or did) you usually smoke per day on weekdays?
你現在（或以前）在週日（星期一至五）經常每天吸食多少（機器生產的）香煙？

☐☐ manufactured cigarettes per weekday
支由（機器生產的）香煙

B18h How many manufactured cigarettes do (or did) you usually smoke per day at weekends?

週末每天吸食多少（機器生產的）香煙？

☐☐ manufactured cigarettes per weekend day
支（機器生產的）香煙

50281

B18z For what reason did you give up smoking? (Please answer only one)
甚麼理由令你戒煙？　（請只回答一項）

- ○ Health (without a doctor's advice)
  健康理由　（無醫生給與意見）
- ○ Health (with a doctor's advice)
  健康理由　（由醫生給與意見）
- ○ High price of cigarettes
  香煙的價格太貴
- ○ Objection from family members or bad effects on them
  家人反對或對他們有壞影響
- ○ Prohibited/discouraged at work/public places
  工作／公眾地方禁止或不鼓勵吸煙
- ○ Changed to another form of smoking, please specify:
  改變至另一種吸煙方法，請註明：
  [ ]
- ○ Government's anti-smoking publicity
  政府反吸煙宣傳
- ○ Others, please specify:
  其他，請註明：
  [ ]

PART C - YOUR MEDICAL HISTORY
C部 － 你的病歷

C1 In the last 6 months have you been admitted to hospital (spent at least one night)?
在過去 6 個月內，你曾否入住醫院（超過一晚）？

○ yes 曾經有　　○ no→ go to C4 沒有→ 回答 C4

C1a What was the reason/s for your most recent admission?
你對上一次住院是因爲甚麼原因？

C1b How many days did you spend in hospital on your most recent admission?
你對上一次住院共住了多少天？

days
天

C1c What is the name of the hospital to which you were admitted most recently?
你對上一次入住的醫院名稱是甚麼？

C2 In the last 6 months have you been admitted more than once to hospital?
在過去的 6 個月內，你曾否住院超過一次？

☐ yes
曾經有

☐ no→ go to C3
沒有→ 回答 C3

C2a What is the total number of admissions (including the most recent admission) you have had in the last 6 months?
在過去 6 個月內你總共曾住院多少次（包括對上一次）？

admissions
次

C2b What was the total number (including your most recent admission) of days spent in hospital over the last 6 months?
在過去 6 個月內你總共在醫院住了多少天（包括對上一次）？

days
天

C2c What was the reason/s for your previous admission/s?
你以前住院的原因是甚麼？

C2d What is the name of the hospital/s to which you were admitted?
你入住的醫院名稱是甚麼？

50281

C3 What was the total cost paid by yourself for hospital admissions in the last 6 months?
在過去的 6 個月內，你總共替自己付出多少住院費？

$ ______ hospital admission costs 住院費

C4 Do you have health/medical insurance?
你有沒有健康／醫療保險？

- yes, paid by self 有，由自己購買
- yes, paid by RHKP 有，由香港皇家警隊購買
- yes, paid by another agency 有，由其他機構購買
- no 沒有

C5 How many absences have you had from work due to injury in the last 6 months?
在過去的 6 個月內，你曾因為受傷而曠職（因傷請假）多少天？

- none 沒有
- less than 1 day 少於1天
- 1 - 4 days 1-4天
- 5 - 9 days 5-9天
- 10 or more days 10天或以上

C6 How many absences have you had from work due to illness in the last 6 months?
在過去 6 個月內，你曾因為疾病而曠職（因傷請假）多少天？

- none 沒有
- less than 1 day 少於1天
- 1 - 4 days 1-4天
- 5 - 9 days 5-9天
- 10 or more days 10天或以上

PART D - YOUR FAMILY HISTORY Were either of your natural parents ever told by a doctor that they had a chronic lung condition such as: D 部-你家人的病歷 你親生父母曾否經醫生診斷患上一些慢性胸肺疾病如：	**Father** 父親	**Mother** 母親
D1 Chronic bronchitis 慢性支氣管炎	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○
D2 Emphysema 肺氣腫	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○
D3 Asthma 哮喘	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○
D4 Lung cancer 肺癌	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○
D5 Other chest conditions 其他胸肺病	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○	yes 有 ○ / no 沒有 ○ / don't know 不知道 ○
Please give details about your father and mother below: 請在下面提供有關係父母的細節	**Father** 父親	**Mother** 母親
D6 Is your parent currently alive? 你父母目前健在嗎？	yes 是 ○ / no 否 ○ / don't know 不知道 ○	yes 是 ○ / no 否 ○ / don't know 不知道 ○
D7 Please specify parent's age (years) if he/she is still living: 若他們仍健在，請註明他們的年齡（歲）	☐☐ years 歲	☐☐ years 歲
D8 If parent is deceased please specify parent's age (years) at death and his/her cause of death: 請註明他們逝世時的年齡（歲）及他們逝世的原因：	☐☐ years 歲 Cause of death: 逝世的原因：	☐☐ years 歲 Cause of death: 逝世的原因：

PART E - YOUR OCCUPATIONAL HISTORY
E 部 - 你的工作經歷

E1 Have you ever worked full-time (30 hours or more per week) for 6 months or more prior to your employment with RHKP?

你在香港皇家警隊服務之前，曾否全職工作（每星期工作多於30小時）超過6個月？

○ yes 曾經
○ no → go to F1 沒有 → 回答 F1

E2 Have you ever worked for a year or more in any dusty job? 你曾否在滿是灰塵的環境下工作超過一年？ ○ yes 曾經有 ○ no → go to E3 沒有 → 回答 E3	Please specify the type of job and number of years worked job: 請註明那工作的類別及在職的時間：	Please specify your exposure: 請註明這接觸的情形：
1st dusty job 第一份在滿是灰塵的環境下的工作 →	Job Type: 工作類別： [ ][ ][ ][ ][ ][ ][ ][ ] [ ][ ][ ][ ][ ][ ][ ][ ] [ ][ ] years 年數	○ mild 輕微的 ○ moderate 中度的 ○ severe 嚴重的
2nd dusty job 第二份在滿是灰塵的環境下的工作 →	Job Type: 工作類別： [ ][ ][ ][ ][ ][ ][ ][ ] [ ][ ][ ][ ][ ][ ][ ][ ] [ ][ ] years 年數	○ mild 輕微的 ○ moderate 中度的 ○ severe 嚴重的

E3 Have you ever been exposed to gas or chemical fumes in your prior job? 在你以前的工作，你曾否接觸氣體或化學煙霧？ ○ yes 曾經 ○ no → go to F1 沒有→回答F1	Please specify the type of job and number of years worked job: 請註明那工作的類別及在職的時間：	Please specify your exposure: 請註明這接觸的情形：
1st job exposed to gas or chemical fumes → 第一份接觸氣體或化學煙霧的工作→	Job Type: 工作類別： ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ☐☐ years 年數	○ mild 輕微的 ○ moderate 中度的 ○ severe 嚴重的
2nd job exposed to gas or chemical fumes → 第二份接觸氣體或化學煙霧的工作→	Job Type: 工作類別： ☐☐☐☐☐☐☐☐ ☐☐☐☐☐☐☐☐ ☐☐ years 年數	○ mild 輕微的 ○ moderate 中度的 ○ severe 嚴重的

50281

PART F - YOUR LIFESTYLE
F 部 - 你的生活方式

F1 What is the name of the district in which you live?
你居住的區域名稱是甚麼？

Hong Kong Island 香港島

- ( ) Wanchai 灣仔
- ( ) Eastern 東區
- ( ) Central and Western 中西區
- ( ) Southern 南區

Kowloon 九龍

- ( ) Kwun Tong 觀塘
- ( ) Wong Tai Sin 黃大仙
- ( ) Kowloon City 九龍城
- ( ) Shamshuipo 深水埗
- ( ) Yaumati/Tsimshatsui 油尖區
- ( ) Mongkok 旺角

New Territories 新界

- ( ) Kwai Tsing 葵青
- ( ) Tsuen Wan 荃灣
- ( ) Tuen Mun 屯門
- ( ) Yuen Long 元朗
- ( ) Shatin 沙田
- ( ) Taipo 大埔
- ( ) Northern 北區
- ( ) Sai Kung 西貢
- ( ) Outlying Islands 離島

F1a How many years have you lived in this district?
你居住在此區有多少年？

- ( ) less than 1 year 少過一年
- ( ) longer than 1 year → 超過一年 → [ ] years 年

F2 If less than 1 year please specify the <u>previous</u> district in which you lived:
若少過一年請註明你以前曾居住的區域：

Hong Kong Island 香港島
- ○ Wanchai 灣仔
- ○ Eastern 東區
- ○ Central and Western 中西區
- ○ Southern 南區

Kowloon 九龍
- ○ Kwun Tong 觀塘
- ○ Wong Tai Sin 黃大仙
- ○ Kowloon City 九龍城
- ○ Shamshuipo 深水埗
- ○ Yaumati/Tsimshatsui 油尖區
- ○ Mongkok 旺角

New Territories 新界
- ○ Kwai Tsing 葵青
- ○ Tsuen Wan 荃灣
- ○ Tuen Mun 屯門
- ○ Yuen Long 元朗
- ○ Shatin 沙田
- ○ Taipo 大埔
- ○ Northern 北區
- ○ Sai Kung 西貢
- ○ Outlying Islands 離島

F2a How many years did you live in your previous district?
你以前居住在此區域有多少年？

[|] years 年

F3 What type of housing do you live in ?
你居住的屋宇類別是甚麼？

- ○ government (police) quarters 政府（警察）宿舍
- ○ home ownership scheme 居者有其屋計劃
- ○ private housing 私人屋宇
- ○ public housing 公共屋邨
- ○ temporary housing 臨時房屋
- ○ other 其他

F4 What is the size (useable area) of your household (living quarter)?
你居住的地方（實用面積）有多大？

[| | |] square feet useable area 平方呎實用面積

50281

F5 How many people live in your household?
有多少人跟你一起居住？

☐ people living in household
人一齊居住

F5a How many people living in your household are over 18 years of age?
有多少跟你一起居住的人是超過18歲？

☐ people over 18 years old in household
人超過18歲一齊居住

F6 Do you share your household with any animals/pets? (You may have more than one answer)
你有畜養任何動物/寵物嗎？（你可以選擇多過一個答案）

- ☐ yes, cat/s 有，貓
- ☐ yes, dog/s 有，狗
- ☐ yes, bird/s 有，雀鳥
- ☐ Yes, other pet/s, please specify: 有，其他寵物，請註明：
- ☐ no pets in household 沒有畜養寵物

F7 What fuel is most used for cooking in your home? (Please answer only one)
你家裡最常用甚麼燃料煮食？（請只回答一項）

- ☐ coal or coke 煤或焦炭，焦煤
- ☐ wood 木材
- ☐ Towngas 煤氣
- ☐ Liquid petroleum gas (LPG) 液體石油氣
- ☐ electricity 電力
- ☐ kerosene 火水
- ☐ other 其他

F8 What method of cooling is most used in your home?
你家裡最常用甚麼方法降溫？

- ☐ air conditioning (A/C) 冷氣機
- ☐ fan 風扇
- ☐ other 其他

F9 In the past month (30 days) did you participate in any sport or exercise?
(Each sport/exercise session must be of 30 minutes duration or longer)

在過去1個月內（30日）你有沒有參與體育活動？
（每次體育活動的時間必須是超過30分鐘或以上）

- ☐ yes 有
- ☐ no → go to F10 沒有 → 回答F10

F9a How many times in the last month (30 days) have you exercised or played sport? (If a session lasts for 30 minutes or more, count as one time)
在過去一個月（30日）內你曾運動多少次？
（每次運動時間超過30分鐘，作一次計算）

☐ times 次

F9b What type of sport/exercise did you participate in ? (You may have more than one answer)
你是參與甚麼類型的體育活動？（你可以選擇多過一個答案）

- ○ aerobic exercise 健康舞
- ○ running/jogging 跑步/緩步跑
- ○ brisk walking 快速步行
- ○ swimming 游泳
- ○ cycling 騎腳踏車
- ○ racquet sports (eg: badminton, tennis, squash, table tennis) 球拍類運動（例如：羽毛球，網球，壁球，乒乓球）
- ○ basketball/netball 籃球
- ○ soccer/rugby 英式足球/欖球
- ○ social dancing 社交舞
- ○ tai chi/yoga 太極/瑜珈
- ○ others, please specify : 其他，請註明：☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

F10 On average how many hours sleep would you get each day?
平均來說你每日有多少小時睡眠？

- ○ 0 - 3 hours 0-3小時
- ○ 6 hours 6小時
- ○ 9 hours 9小時
- ○ 4 hours 4小時
- ○ 7 hours 7小時
- ○ 10 hours 10小時
- ○ 5 hours 5小時
- ○ 8 hours 8小時
- ○ more than 10 超過10小時

F10a How would you rate the quality of your sleep?
你會如何評論你睡眠的質素？

- ○ very good 非常好
- ○ good 好
- ○ poor 差
- ○ very poor 非常差

F11 Do you consume alcohol?
你飲酒嗎？

- ○ Yes 飲
- ○ no → go to F12 不飲 →回答F12

50281

F11a How often do you have alcoholic drinks?

你每隔多久飲一次含酒精的飲料？

- ○ daily/most days (4 to 7 days a week) 每日或差不多每日（每星期有4至7日飲）
- ○ 1 to 3 days a month 每月飲1至3日
- ○ 1 to 3 days a week 每星期飲1至3日
- ○ less than once a month (eg: special occasions only) 每月少過1次（例如只在特別的情況之下）

F11b What is your usual alcoholic drink?

你通常飲用甚麼含酒精的飲料？

- ○ beer 啤酒
- ○ western table wine 西式餐酒
- ○ western spirits (eg: whisky, rum, gin, vodka, brandy) 西式烈酒（例如：威士忌、冧酒、毡酒、伏特加白蘭地）
- ○ chinese rice wine 中式米酒
- ○ other, please specify: 其他，請註明：
- ○ no specific preference 沒有特別的偏好

F11c How many cans or bottles or glasses of this do you drink on any one occasion? (Please answer only one)

你每次飲這些酒時飲多少罐、或瓶、或杯？（請只回答一項）

- ○ ☐☐ cans 罐
- ○ ☐☐ bottles 瓶
- ○ ☐☐ glasses 杯

F11d During the past month, have you ever had 5 or more drinks on any one occasion? (A drink is 1 can/small bottle of beer, 1 glass of wine or 1 measure (peg) of spirits)

在過去一個月內，你曾否在某次飲酒時飲用超過5個或以上單位的飲料？（一個單位的飲料可以是一罐/小瓶啤酒，一杯餐酒，或一PEG烈酒）

- ○ no 沒有
- ○ yes, on one occasion 有，有一次
- ○ yes, on two occasion 有，有二次
- ○ yes, on three or more occasions 有，有三次或以上

F12 What is your usual mode of transport outside work hours? (Please answer only one)

你在工作時間外經常使用的交通工具是甚麼？（請只回答一項）

- ○ walking 步行
- ○ private motorcycle 私家電單車
- ○ private vehicle 私家車
- ○ public transport 公共交通工具

PART G - YOUR EXPOSURE TO ENVIRONMENTAL TOBACCO SMOKE

G 部-你接觸二手煙的情形

G1 Do any members of your household smoke? (This does not include yourself)
跟你同住的人有没有任何一位是吸煙的？（這不包括你自己）

- ○ I do not live with anyone → go to G2 我没有和其他人同住→回答 G2
- ○ none smoke → go to G2 無人吸煙→回答 G2
- ○ yes, 1 person smokes 有，1個人吸煙
- ○ yes, 2 persons smoke 有，2個人吸煙
- ○ yes, 3 persons 有，3個人吸煙
- ○ yes, 4 persons smoke 有，4個人吸煙
- ○ yes, 5 persons smoke 有，5個人吸煙
- ○ yes, 6 persons smoke 有，6個人吸煙
- ○ yes, 7 persons smoke 有，7個人吸煙
- ○ yes, more than 7 persons smoke 有，多過7個人吸煙

↓

(Please specify number of smokers: ☐☐)
請註明吸煙者的人數：

50281

G1a Please complete the following table for each member of your household that smokes:
請爲每一位跟你同住的吸煙者塡妥下面的表：

(If there are more than 7 smokers in your household, please tell the staff supervising this questionaire session)

（如果你有多過7個跟你同住的人是吸煙者的話，請通知在場監督這次問卷調查的工作人員。）

What is your relationship to the smoker? 你與吸煙者的關係是甚麼？	How many cigarettes does he/she smoke per day at home? 他/她每日在家吸食多少支香煙？	Does he/she smoke near you? 他/她在你附近吸煙嗎？	For how many years have you been exposed to his/her second-hand smoke? 你接觸他/她的二手煙有多少年了？
The 1st smoker is: 第一個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐ years exposure 年 or 或 ○ nil exposure 從來沒有
The 2nd smoker is: 第二個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐ years exposure 年 or 或 ○ nil exposure 從來沒有
The 3rd smoker is: 第三個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐ years exposure 年 or 或 ○ nil exposure 從來沒有

What is your relationship to the smoker? 你與吸煙者的關係是甚麼？	How many cigarettes does he/she smoke per day at home? 他/她每日在家吸食多少支香煙？	Does he/she smoke near you? 他/她在你附近吸煙嗎？	For how many years have you been exposed to his/her second-hand smoke? 你接觸他/她的二手煙有多少年了？
The 4th smoker 第四個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐☐ years exposure 年 or 或 ○ nil exposure 從來沒有
The 5th smoker 第五個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐☐ years exposure 年 or 或 ○ nil exposure 從來沒有
The 6th smoker 第六個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐☐ years exposure 年 or 或 ○ nil exposure 從來沒有
The 7th smoker 第七個吸煙者是： ○ Spouse 配偶 ○ Sibling 兄弟姊妹 ○ Parent 父母親 ○ Other 其他 ○ Child 子女	○ 1 to 5 1至5 ○ 6 to 10 6至10 ○ 11 to 15 11至15 ○ 16 or more 16或以上	○ never 永不 ○ seldom 很少 ○ sometimes 有時 ○ always 常常	☐☐ years exposure 年 or 或 ○ nil exposure 從來沒有

50281

G2 Whilst indoors at work do any of your co-workers smoke near you?
當你在室內工作時，有沒有任何同事在你附近吸煙？

- ○ yes 有
- ○ no → go to H1 沒有 →回答H1

G2a Usually for how long are you exposed to second-hand smoke from your co-workers each day?
通常每天你在工作的地方接觸你的同事的二手煙大約多少時間？

- ○ no exposure 沒有接觸
- ○ exposed less than 1 hour 接觸少過一小時
- ○ exposed 1 to 2 hours 接觸一至二小時
- ○ exposed 3 to 4 hours 接觸三至四小時
- ○ exposed 5 to 6 hours 接觸五至六小時
- ○ exposed 7 to 8 hours 接觸七至八小時
- ○ exposed more than 8 hours 接觸超過八小時

G2b How many co-workers smoke near you?
有多少同事在你附近吸煙？

- ○ 沒有同事吸煙 no co-workers smoke
- ○ 有一位同事吸煙 1 co-worker smokes
- ○ 有二位同事吸煙 2 co-workers smoke
- ○ 有三位同事吸煙 3 co-workers smoke
- ○ 有四位同事吸煙 4 co-workers smoke
- ○ 有五位同事吸煙 5 co-workers smoke
- ○ 有六位同事吸煙 6 co-workers smoke
- ○ 有七至十位同事吸煙 7-10 co-workers smoke
- ○ 超過十位同事吸煙 more than 10 co-workers smoke

G2c Please estimate how many cigarettes are smoked near you in total each day by your co-workers:
請你估計，你的同事在你附近，總共大約每天吸多少枝煙？

- ○ 1 - 5 1至5枝
- ○ 6 - 10 6至10枝
- ○ 11 - 15 11至15枝
- ○ 16 - 20 16至20枝
- ○ 21 - 40 21至40枝
- ○ more than 40 超過40枝

G2d In your present working environment, how long have you been exposed to co-workers second-hand smoke?
在現時這工作環境中，你接觸同事或其他人的二手煙霧有多久？

- ○ no exposure 沒有接觸
- ○ exposed less than 1 year 接觸少過一年
- ○ exposed more than 1 year 接觸超過一年 ↓

Please specify how many years exposed to co-workers second-hand smoke:
請填上吸二手煙的年數： [|] years 年

Please answer these questions as honestly as possible. Remember this questionnaire is **STRICTLY CONFIDENTIAL**.

請儘量誠實地回答這些問題。記著這個問卷是 絕對保密的。

PART H - YOUR GENERAL LIFE SITUATION
H部 - 你生活的一般情況。

MMPI

		yes 是	no 否
H1	I worry over money and business. 最近你是不是擔心錢銀和生意（或工作）？	○	○
H2	Sometimes some unimportant thought will run through my mind and bother me for days. 有時你會想起一些不重要的事，但你會因而煩惱多天，是不是？	○	○
H3	I get anxious and upset when I have to make a small trip away from home. 當你出門幾天時，你會覺得擔心和煩躁。	○	○
H4	I have difficulty in starting to do things. 最近你覺得難以去開始做一些事。	○	○
H5	I have more trouble concentrating than others seem to have. 比起大多數人，你覺得難以集中精神。	○	○
H6	I frequently find myself worrying about something. 你因爲經常擔心一些事情而覺得煩惱。	○	○
H7	I am more sensitive than most other people. 你因爲自己的性格比大多數人敏感而覺得煩惱。	○	○
H8	I have been disappointed in love. 當你想起自己一生，你明顯地曾經對愛情失望。	○	○
H9	Once in a while I feel hate toward members of my family who I usually love. 雖然你通常都愛你的家人，但有時你會憎恨他們。	○	○
H10	Sometimes I become so excited that I find it hard to get to sleep. 有時你因爲覺得太興奮而睡不著。	○	○

50281

CHQ		Never 一點也不	As usual 和平時差不多	Some of the time 比平時較覺得	Most of the time 比平時更覺得
H11	Have you recently been suffering from headache or pressure in your head? 近日你有沒有覺得頭痛或是頭部有壓迫感？	○	○	○	○
H12	Have you recently had palpitation and worried that you might have heart trouble? 近日你有沒有覺得心悸或心跳加快，擔心可能得了心臟病？	○	○	○	○
H13	Have you recently had discomfort or a feeling of pressure in your chest? 近日你有沒有感到胸部不適或有壓迫感？	○	○	○	○
H14	Have you recently been suffering from shaking or numbness of your limbs? 近日你有沒有覺得手腳發抖或發麻？	○	○	○	○
H15	Have you recently lost much sleep through worry? 近日你有沒有因擔心而睡眠不好？	○	○	○	○
H16	Have you recently been taking things hard? 近日你有沒有覺得許多事情對你是個負擔？	○	○	○	○
H17	Have you recently been getting along well with your family or friends? 近日你跟家人，親友相處得很好，是嗎？	○	○	○	○
H18	Have you recently been losing confidence in yourself? 近日你有沒有覺得對自己失去信心？	○	○	○	○
H19	Have you recently been feeling nervous and strung-up all the time? 近日你有沒有覺得經常神經緊張？	○	○	○	○
H20	Have you recently been feeling hopeful about the future? 近日你有沒有感到對未來充滿希望？	○	○	○	○
H21	Have you recently been worried about your family or close friends? 近日你有沒有爲家人或好友擔心？	○	○	○	○
H22	Have you recently felt that life is entirely hopeless? 近日你有沒有覺得生活毫無希望？	○	○	○	○

PSS

		Never 無	Almost never 幾乎無	Sometimes 有時	Fairly often 幾常有	Very Often 常常有
H23	In the last month, how often have you been upset because of something that happened unexpectedly? 過去一個月内，你有没有因爲突發的事情而不安 ？	○	○	○	○	○
H24	In the last month, how often have you felt that you were unable to control the important things in your life? 過去一個月内，你有没有感覺自己不能控制生活上的重要事情？	○	○	○	○	○
H25	In the last month, how often have you felt nervous and "stressed"? 過去一個月内，你有没有感覺緊張及有壓力？	○	○	○	○	○
H26	In the last month, how often have you dealt successfully with irritating life hassles? 過去一個月内，你有没有成功地解決一些生活上的煩惱 ？	○	○	○	○	○
H27	In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life? 過去一個月内，你有没有感覺自己能有效地應付一些你生活上的重要變化？	○	○	○	○	○
H28	In the last month, how often have you felt confident about your ability to handle your personal problems? 過去一個月内，你有没有覺得自信有能力去處理個人問題？	○	○	○	○	○
H29	In the last month, how often have you felt that things were going your way? 過去一個月内，你有没有感覺事情往往如你所願？	○	○	○	○	○
H30	In the last month, how often have you found that you could not cope with all the things that you had to do? 過去一個月内，你有没有發覺自己不能應付所有你應做的事情？	○	○	○	○	○
H31	In the last month, how often have you been able to control irritations in your life? 過去一個月内，你有没有不能控制你生活上的煩惱？	○	○	○	○	○

50281

	Never 無	Almost never 幾乎無	Sometimes 有時	Fairly often 幾常有	Very Often 常常有
H32 In the last month, how often have you felt that you were on top of things? 過去一個月內，你有没有感覺自己能掌握一切事情？	○	○	○		○
H33 In the last month, how often have you been angered because of things that were outside of your control? 過去一個月內，你有没有因爲一些非自己能控制的事情而憤怒？	○	○	○	○	
H34 In the last month, how often have you found, yourself thinking about things that you have to accomplish? 過去一個月內，你有没有想起一些要做而未完成的事情？	○	○	○	○	○
H35 In the last month, how often have you been able to control the way you spend your time? 過去一個月內，你有没有能夠依照自己的方式去運用時間？	○	○	○	○	○
H36 In the last month, how often have you felt that difficulties were piling up so high that you could not overcome them? 過去一個月內，你有没有感覺難題越積越多，而無法克服？	○	○	○	○	○

PART I - YOUR PERSONAL INFORMATION

I 部 - 你的個人資料

II Your date of birth:
你的出生日期：

☐ / ☐ / ☐ (day/month/year)
（日/月/年）

I2 Your gender?
你的性別：

○ male 男 ○ female 女

I3 Your marital status?
你的婚姻狀況？

○ single 未婚 ○ married 已婚 ○ widowed 喪偶 ○ separated 分居 ○ divorced 離婚 ○ other 其他

I4 Into what ethnic category do you best fit?
你屬於那一個種族類別？

- ○ Chinese 中國人
- ○ Caucasian 白種人
- ○ Other Asian 其他亞裔人仕
- ○ Other 其他

I5 What is the highest level of education you have achieved?
你的教育程度是？

- ○ below Form 5 中五以下
- ○ Tertiary non degree course 專上非學位
- ○ Secondary (Form 5) 中學（中五）
- ○ Tertiary degree course 大學學位
- ○ Matriculation (Form 6 or 7) 預科（中六至七）

Please check that you have answered all the questions.

請核對清楚你已回答所有的問題。

Thank you for your cooperation and participation in this survey.
多謝你的合作及參與這項研究。