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by

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Table of Contents

List of Tables

SUMMARY

The occupational exposure and health status of police officers involved with identification procedures was investigated across Canada. Subjects and controls were recruited from the various Canadian law enforcement agencies. A personal questionnaire was send out to each participant and included questions regarding exposures to fingerprint powders and other chemicals used in ident work, hobbies, drinking and smoking habits, as well as previous occupations. This section of the questionnaire was returned by mail and followed by a personal interview with a physician who administered a health questionnaire and classified the diseases according to their ICD code. Information from 311 subjects (study group) and 205 controls (control group) was obtained. The study group had a highest prevalence of diseases of the respiratory system, 21.5%; skin, 17.4%; digestive system, 11.3%; and hormonal system 9.0%. The controls showed highest prevalence rates for diseases of skin 13.7%; musculoskeletal system 13.7%; respiratory system 11.7%; hormone system 8.8% and digestive system 8.3%. Prevalence odds ratios (PORs) were elevated in ident personnel in five categories i.e. respiratory system, 1.96; skin 1.27; digestive system 1.56; nervous system 1.09 and cancer 4.51. Of these the POR for respiratory illness was statistically significant (95% confidence limits 1.17 – 3.27). Of the 98 specific fingerprint powders, the 9 powder categories based on appearance, and the 11 specific chemical agents; 15 specific powders, 5 powder categories and 9 chemicals showed a significant increase in POR for all respiratory disease. Only one of these, Driodine, showed a relationship which just failed to reach statistical significance (p=.085).

When the data were analysed for upper respiratory tract illness, 31 individual powders, 7 categories and 11 chemicals showed up with elevated POR values. Three specific powders, and only 2 chemicals showed a significant difference for the days of use. The lack of a clear relationship between exposure to specific powders and

chemicals to specific diseases could be due to potential secondary exposure as well as cross-contamination of powders.

It was recommended that, along with the use of personal protective equipment, individuals should also be made aware of the potential hazard of the agents used, secondary exposure should be controlled, a thorough survey should be conducted regarding powder ingredients, and medical surveillance should be initiated if required.

SOMMAIRE

On a mené une etude à l'échelle du Canada sur l'exposition professionnelle et l'état de santé des policiers affectés à l'identite judiciaire. Les sujets et les temoins, qui provenaient de divers corps policiers, ont rempli un questionnaire sur leur exposition à la poudre dactyloscopique et à d'autres produits chimiques utilisés en dactyloscopie, leurs loisirs, leurs habitudes de consommation d'alcool et de tabac, ainsi que leurs fonctions anterieures. Ils devaient le retourner par la poste. Ensuite ils ont rencontre un medecin qu'il leur a fait remplir un questionnaire sur leur état de santé et qui a classé les maladies relevées en fonction des codes CIMA. Des données ont été recueillies sur 3 11 sujets exposes et sur 205 temoins. Chez les sujets exposes, les maladies dont le taux d'incidence était le plus élevé Ctaient celles de l'appareil respiratoire (21,5 p. 100), de la peau (17,4 p. 100), de l'appareil digestif (11,3 p. 100) et du système hormonal (9 p. 100). Chez les temoins, les maladies dont le taux d' incidence était le plus élevé etaient celles de lapeau (13,7 p. 100), du système musculo-squelettique (13,7 p. 100), de l'appareil respiratoire (11,7 p. 100), du système hormonal (8,8 p. 100) et de l'appareil digestif (8,3 p. 100). Le personnel de l'identite judiciaire rapportait des risques relatifs élevés d'incidence pour cinq categories de maladies, soit les maladies de l'appareil respiratoire (1,96), de la peau (1,27), de l'appareil digestif (1,56) et du système nerveux (1,09), et le cancer (451). Le risque relatif d'incidence de maladies de l'appareil respiratoire Ctait statistiquement significatif (95 p. 100, limites de confiance : 1,17 - 3,27). Pour quinze sortes de poudres dactyloscopiques sur 98, 5 categories de poudres classées selon leur apparence sur 9, ainsi que 9 produits chimiques sur 11, le risque relatif d'incidence de toutes les maladies respiratoires augmentait de manière significative. Seul le Driodine ne présenait pas une augmentation significative du risque relatif d'incidence, mais de justesse (p=0,085).

L'analyse des données relatives aux maladies des voies respiratoires supérieures a révélé un risque relatif élevé d'incidence pour 31 sortes de poudres, 7 categories de poudres et 11 produits chimiques. Pour trois sortes de poudres et seulement deux produits chimiques, il y avait une difference significative selon le nombre de jours d'exposition. L'absence de rapports clairs entre l'exposition à certains produits chimiques et sortes de poudres, et certaines maladies pourrait être due à l'exposition indirecte et à la contamination des poudres par d'autres poudres.

On doit encourager les employés affectés à l'identite judiciaire à utiliser l'équipement individuel de protection, et on doit les renseigner sur les dangers des produits qu'ils utilisent et réduire l'exposition indirecte. On devrait aussi analyser le contenu des poudres et, au besoin, effectuer un contrôle medical.

INTRODUCTION

Canadian Law enforcement agencies all utilize the services of distinct groups of experts trained in the science of identification procedures. Within each force these individuals are often referred to as the "ident squad". The science of identification has become more sophisticated with time and at present can range from scanning electron microscopy to DNA fingerprinting.* Although some of the highly sophisticated procedures are not carried out by ident personnel, the day to day procedures are becoming more complex. Often ident squad personnel come up through the ranks and may not always be familiar with, or have training in, the health hazards associated with many of the agents and procedures that are used on a daily basis. Because of this lack of understanding of what an individual is exposed to, the proper precautions are not always taken. Suppliers of materials used by the ident squad do not always provide the user with the necessary information or the procedures that guarantee the user a safe work environment. Even today the Material Safety Data Sheets (MSDSs) provided by the manufacturers, as required by the Workplace Hazardous Materials Information System (WHMIS) legislation, are often incomplete. Because of these reasons ident squad personnel have been, and are at present, engaged in activities that could have harmful effects on the individual. Suspicion of the health hazards associated with ident procedures are often only raised, or triggered, when an individual or a group of individuals becomes ill and an exposure to a causative agent or agents can be established. Even then a direct relationship is often difficult to substantiate especially when there is a latency between the exposure and the onset of the disease. Identification of health problems in ident squad members is also hampered by the small number of individuals within each police unit and a particular health problem in one individual might be interpreted by the attending physician as an isolated event being unaware that similar problems exist in other regions and in other police units.

Serious occupational hazards may therefore not be recognized and eliminated because exposed individuals are not located in one area but are dispersed over a wide region. Unless there is excellent communication, along with individuals capable of recognizing occupational hazards, certain types of health problems will never be identified as being work related and consequently are not controlled or prevented. The occupational health physician associated with each police force is highly capable of making a diagnosis but is at a disadvantage because he or she does not always have the overview across a large enough population to observe trends in work related illness. The occupational health physician relies heavily on published information to make him or her aware of potential problems associated with certain procedures. Until recently only one case has been reported involving an ident member with lead poisoning due to fingerprint powder dust exposure.* Many other agents are currently used that could result in a variety of health problems314 and a thorough list of agents and conditions to which ident squad personnel are potentially exposed to has recently been compiled for the Quebec police force.516 As pointed out in that document, the extent of these potential exposures was not assessed and consequently it was difficult to identify which exposures presented hazards and which did not. Two other studies, one conducted on the Vancouver police force[7] and another on the Service de Police Communaute Urbain de Montreal have since addressed these questions and have resulted in a much better understanding of these exposures and corresponding hazards.8118 The results of this study indicate that exposures to heavy metals can be significant. Although exposure to polyaromatic hydrocarbons (PAHs) components in the 4 fingerprint powders tested was relatively low, other powders could be a potential source for PAHs. A pilot epidemiological study was also conducted on the Vancouver Police force in order to assess if any harm might have been done by past procedures and agents that have since been withdrawn from use.9 In this pilot study the health

status of ident squad members was compared to non ident squad police personnel and indicated a higher incidence of skin and visual disorders in ident squad personnel compared to controls. The latter could be a consequence of the unique type of work environment that ident squad members experience. They often work in poorly lit, out of the way places in an atmosphere where heavy metal and mineral dust of respirable size is floating in the air and where keen eyesight and close scrutiny are essential components of a successful search. Skin disorders were also identified as possible effects from exposure to these dusting agents which are designed to cling to anything, including skin and clothing, prolonging the exposure for much longer than is apparent from the time spent in active dusting. This phenomenon of secondary exposure was assessed in the Vancouver study[7] and found to be almost as high as primary exposure. The study also showed a trend towards an increased incidence of respiratory disorders however this could not be substantiated statistically because of the small number of people involved in the study.

In order to test whether these diseases are a problem in ident squad members a large exposed population needs to be investigated, the study group, and compared to the disease incidence of a similar population which has not been exposed, the control group. The Vancouver ident squad provided a small study group suitable only for a pilot investigation. This present study intends to examine the exposure and outcomes of ident squad members of the various law enforcement agencies nationwide.

Specific Aims

1. To compare the IO-year prevalence of chronic health disorders, as defined by the 12 body systems outlined in the International Classification of Diseases[10], (ICD) among ident and non-ident personnel i.e. the study and control groups.

2. To determine if, within the 12 ICD body systems, specific diseases appear to be associated with ident squad duties and therefore warrant further investigation.

3. To determine, if possible, if any particular ident squad exposures are associated with specific diseases.

PROCEDURE

The UBC ethics committee dictates that the initial contact with the potential participants must be made by letter inviting persons to participate in the study. If willing, they are asked to sign a consent form (appendix A) which, among other information, describes the nature of the study, the methods used, and ensures the confidentiality of all information including whether or not the person will be participating in the study. For these reasons the subjects and controls were recruited as described below.

Recruitment of Subjects

The Canadian Police Research Center (CPRC) in Ottawa approached the Chief of Police in each jurisdiction across the country with a letter explaining the nature and the reasons for this investigation. The letter, which also introduced the study team, invited each police force to participate in the study. Police departments that volunteered to participate replied to the CPRC by letter identifying a contact person. This letter was forwarded to the study team.

An investigator from the study team made arrangements with each contact person to visit the police unit and arrange for interviews with individual volunteers from the ident squad. These individuals were collectively referred to as the study group. The comparison or control group was selected from each police unit from the available shift at the time of visitation and consisted of police officers

who volunteered and who were not, or ever had been, involved with ident procedures or agents.

Selection Criteria for the Study Group

The study group in this investigation were volunteers from current ident members with at least one year's experience, as well as former members active for a minimum of one year since January 1980.

Although there was some variation in selection criteria in the different forces participating, the study group is likely to be representative of Canadian ident officers. Six forces (RCMP, Montreal Urban Community, Sûrete du Quebec, Edmonton, Regina, and Niagara Region) were expected to contribute about 75% of the study group. With the exception of the RCMP detachments in British Columbia, where telephone interviews were most cost effective, it was possible for study physicians to visit each of the forces. In these cases all ident officers, excepting those on vacation, were canvassed. Three officers on sick leave were followed up at a later time. In each location, all personnel available on the days of the physician's visit were approached regarding participation.

Selection Criteria for the Control Group

The comparison group (control group) for this investigation was obtained from volunteers from other members of each police force but who did not have exposure to identification procedures. Similar to the study group, all police officers with a minimum of one year's experience were eligible. This group was selected in an attempt to ensure comparability regarding place of employment, age, and sex. They were recruited by approaching all available officers on particular shifts in the other departments. In Edmonton, controls were randomly matched to ident officers by age.

All participants were volunteers and signed informed consent was obtained from each individual.

Data Acquisition, Questionnaire

The questionnaire consisted of self-administered and physician-administered sections.

A. Self-administered section of the questionnaire.

All participants were asked to fill out a brief questionnaire inquiring about age, place of birth, weight, height, and extent of police experience. (Appendix A).

Ident participants were then asked to document their ident experience, and filled out a usage survey, in which the pattern of use (categorized as daily, weekly, or monthly use), and duration of use (years) was reported for each of 78 fingerprint powders known to be in use in Canada during the past decade. They also indicated their pattern and duration of use for 9 categories of fingerprint powder classified by appearance (black, grey, etc.), and for use of any of 11 categories of other exposures to agents used in ident procedures (iodine, cyanoacrylates, hydrochloric and nitric acids, etc.).

Idnet participants indicated whether their use of these agents was mostly under field or laboratory conditions. For each individual an estimate of the number of cases they were involved in requiring dusting with fingerprint powders within an average month and the frequency of traveling in vehicles used by the ident squad, were also obtained.

Total **Days of Use (Exposure)**

Information concerning patterns of use for many of the individual agents (independent variables) was categorized as being daily, weekly, or monthly.

Information on duration of exposure (in years) was also obtained. For these variables, it was possible to derive an index which approximates the total number of days of use, which is needed to compare the overall amount of use among participants. Assuming a 5-day work week, and a 48-week work year, (11 months), a participant who indicated daily use of a particular agent could have used an agent on about 240 days per year, while those who indicated weekly and monthly use, could have used that agent about 48 and 11 times respectively. Note that this index is expected to result in a meaningful estimate of relative cumulative use of a substance over the years only. When used to determine whether associations with any health outcomes exists, it ignores the possibility that particular patterns of exposure (e.g. daily use for few years vs. monthly use for many years) with nearly identical indices may result in different health outcomes. Such a refinement was beyond the current scope of this study.

During the rest of this report the above mentioned index will be referred to as days of use.

B. Physician-administered section of the questionnaire.

This questionnaire was administered to all participants by one of two physicians with experience in occupational health. (Appendix B). For ident personnel, pattern and duration of use of vehicles dedicated to ident use was documented. Pattern (daily, weekly, monthly) and duration (years) of firing range use was also documented.

Pattern and duration of exposures to chemicals and other possible hazards associated (i.e. model building, painting, furniture restoration) were enumerated. Prior occupational exposure to metal fumes or dusts, pesticides, solvents etc., was documented as well by class of exposure.

Smoking history was determined for all smokers and ex-smokers. Their use of cigarettes in packs per day as well as the years they started and quit was recorded.

Alcohol consumption, in terms of drinks per day, was also enumerated.

To determine the prevalence of various disorders, participants were asked whether they had sought attention from a medical doctor for conditions of various organ systems during the previous ten years. The systems were chosen to correspond to those of the International Classification of Diseases, 1975 Revision (ICD-9)7. A condition had to be present for greater than a six month period to be counted in prevalence estimates. Only conditions for which medical attention had been sought and obtained were enumerated. The physician interviewers did not formulate their own diagnoses. Based on participants' descriptions, the interviewers classified the complaints using either a three or four digit ICD code, as appropriate. In cases where the specific diagnosis was not certain, the three digit code was assigned. The specific four digit code was assigned when the physician was reasonably certain of that specific diagnosis. For example, a patient might indicate that he experienced a cardiac rhythm disturbance that required medication. Depending on the extent of the description available, it might be possible to classify this as a conduction disorder (ICD 3-digit classification 426), or, more specifically, as a complete A-V block (ICD 4-digit classification 426.0). The ICD-9 procedure groups the conditions by the organ systems affected. The above case, for example, would be classified in the general category of 'diseases of the circulatory system', which includes all ICD diagnoses given codes between 390 and 459 inclusive.

Finally, all participants were asked how many children they had, whether they had a child with a birth defect, and whether spouses had miscarriages. Where appropriate, further information about the nature of the birth defects was collected.

Data Analyses

P-Values. Analysis of the results of a study such as this one often involves comparison of data from two or more groups. For example, we may compare the ages of ident and control subjects: since increasing age is often associated with higher disease rates, it may be important to determine if the age structure of the two groups is similar. Depending on the nature of the comparisons made, various tests are used to test a hypothesis. For example, in the case of the Mann-Whitney test applied in this study, we may explore the following situation: for a population of ident officers, we have determined for each officer 1, whether the officer has respiratory disease; and 2, the days of use for Powder X for each officer. If Powder X causes respiratory disease, we expect that officers who have respiratory disease may have histories of greater use of Powder X, and will have more days of use than officers who have not used the powder.

There is a finite probability, due to chance alone, even if Powder X is not associated with the disease, that the officers who used Powder X will be shown to have more days of use. In this case, the statistical test chosen, the Mann-Whitney rank-sum test would test the following hypothesis, known as the null hypothesis: i.e. "the days of use for Powder X are the same for ident officers who have respiratory disease and those who do not have disease". The P-value is the probability that a chance error of the type discussed above will occur. If the P-value is 0.50, for example, there is a 50% chance that, if the hypothesis is actually true, we will be wrong in rejecting the null hypothesis. The smaller the P-value the more confident we can be that the observed difference did not arise from chance alone. A P-value of less than 0.05 is generally seen by statisticians as the point at which the result is unlikely to be due to chance, i.e. 1 in 20. So, if we see that ident officers with respiratory disease have higher days of use, but the P-value of the test is 0.25,

we cannot be sufficiently sure that the increase did not arise by chance alone, and we conclude that the increase or difference is not statistically significant.

Odds-ratio and Confidence Intervals.

The confidence interval around a prevalence - odds ratio is closely related to the above. Imagine that we are comparing the prevalence of respiratory disease in 10 ident and 10 control subjects. We find that 4 out of 10 ident subjects have respiratory disease, while 2 of 10 control subjects do. This is summarized in the following table:

RESPIRATORY DISEASE?	YES	NO
IDENT	4	6
CONTROL	2	8

In this situation the prevalence of respiratory disease in the ident subjects is 0.4 or 40%, and the prevalence for control subjects is 0.2 or 20%. The odds of respiratory disease for ident subjects are 4 to 6, and the odds for control subjects are 2 to 8. The prevalence odds ratio (abbreviated POR) for respiratory disease for ident subjects is the ratio of these odds i.e. 4/6 divided by 2/8. In this case the POR is 2.64. It can be seen that the POR will be greater than 1.0 if the prevalence is higher for ident subjects. But, as in the above comparisons, it is possible that an increased odds ratio could be due to chance alone. A statistical test of the situation might test the null hypothesis that “the odds ratio is 1.0”. It can be seen from the table that if the odds ratio is 1 there is no difference between the case and control population values. A 95% confidence interval for the odds ratio is specified by two numbers, the first being its lower bound and the second the upper bound. For example if the odds ratio is 2.3 and the 95% confidence interval is 2.0 - 5.0 we know that 95% of the time the

value of the odds ratio is greater than 2.0 and less than 5.0. So if the value of the odds ratio is greater than 1.0 (indicating a difference between the case and control groups) the corresponding 95% confidence interval does not include 1.0, then the odds ratio is statistically significant.

In cases where the results show no statistical significance, i.e. the 95% confidence interval includes the value of 1.0, the range of the confidence interval can be useful in interpreting the results. A narrow confidence interval supports the conclusion that there really is no true increased risk. A wide interval would tend to indicate that the results could be due to a true increased risk but that the sample size was too small to exclude chance as a possible explanation of the observed results.

All statistical analyses were done using algorithms available as part of a statistical software package called BMDP11. Odds ratios based on crude prevalence rates and the appropriate bivariate test of association (Pearson chi-square) for each outcome (respiratory system, circulatory system etc.) were obtained. Prevalence odds ratios adjusted for pack-years history of smoking and age were obtained using logistic regression.

For upper respiratory tract illness and all respiratory tract illness, where a significant association was found with ident status, multivariate logistic regression was used to explore the association between use of individual classes of powder or types of agent and respiratory status, as well as possible effects of other independent variables, such as number of years spent as an ident officer. A non-parametric test (Mann-Whitney rank-sum) was used to determine if ident officers with respiratory disease had a history of possible exposure to agents, as measured by the days of use, that was different from that of ident officers who had not used the particular agents.

Ethical Review and Confidentiality

All information obtained from each participating individual was kept confidential and a statement to that effect was given to each the participant at the time of the interview as required by the UBC ethics committee. Only the interviewer and the investigators were aware of the names of the participants. The questionnaire from each participant was given a number and from there on the information was used collectively. The responses of the individual participants were not released to any other agency including the various police departments.

RESULTS

Personnel Participation.

A total of 311 ident squad members across Canada who volunteered met the inclusion criteria and made up the study group. Table 1 identifies the geographical location of the participating law enforcement agencies as well as the number of volunteers. The observed participation rates were 60% for the RCMP in British Columbia and the Metro Toronto police, greater than 75% in Edmonton (Municipal police), Montreal Urban Community, and Sûreté du Quebec, and greater than 90% in Regina (municipal police force) and Niagara (Regional police force). Similarly a total of 205 volunteers who met the inclusion criteria for the control group is identified in Table 1. Four departments (Montreal Urban Community, Sûreté du Quebec, Edmonton, and Regina) contributed about 80% of the control subjects.

The observed participation rates reflect the difficulty of contacting many officers who were on assignment elsewhere or were on other shift schedules.

Table 1: Summary of Regional Participation

Region	Police Force	# of Subjects	# of Controls
Alberta			
Calgary	municipal	12	18
Edmonton	municipal	41	46
Calgary	RCMP*	7	0
British Columbia	RCMP	52	0
Manitoba	RCMP	3	15
Winnipeg	municipal	3	0
New Brunswick	RCMP	2	0
Nova Scotia	RCMP	14	0
Dartmouth, Halifax	municipal	4	0
Ontario	OPP**	16	0
Durham	regional	5	0
Halton	regional	8	8
London	municipal	3	6
Niagara	regional	16	0
Peel	regional	4	0
Peterborough	municipal	3	0
Toronto	metropolitan	28	0
Waterloo	regional	4	0
Ottawa	RCMP	2	0
Prince Edward Island	RCMP	1	0
Province Québec			
Province	Sûreté du Quebec	24	31
Ville de Québec	municipal	8	10
Montréal	CUM***	19	30
Saskatchewan			
Saskatoon	municipal	16	13
Regina	municipal	16	28
Total		311	205

* RCMP, Royal Canadian Mounted Police
** OPP, Ontario Provincial Police
***CUM, Communauté Urbaine de Montréal

Characteristics of the Study and Control Groups.

The biographical indices used to compare the study (ident) and control groups have been summarized in table 2.

Table 2: Summary of biographical indices used to compare the study and control groups.

	Study Group	Control Group
Number of subjects,	311	205
Age in years, mean, (SD)	42.0 (6.5)	40.3 (7.4)
Years of police work, mean, (SD)	19.0 (6.4)	17.8 (7.6)
Smoking habits		
non-smoker, %	50.8	44.9
ex-smoker, %, (mean pack years)	35.0q (18.1)	30.7(23.1
current - smoker, %, (mean pack years)	14.2 (25.2)	24.4(26.4)
Alcohol use		
non, %	58.2	50.2
1 drink/day,	29.6	35.6
2-5 drinks/day %	12.2	14.1
Hobbies, exposure		
no exposure, %	70.1	69.8
some exposure, %	29.1	30.2
range in days (mean)**	20-17250 (1150)	30-7250 (980)
Firing range		
no exposure, %	62.1	38.5
some exposure, %	37.9	61.5
range in days, (mean)**	10-4750 (350)	lo-6250 (650)
Previous occupation		
no exposure, %	69.8	65.4
some exposure, %	30.2	34.6
range in days (mean)*+	lo-2956 (575)	1 O-5000 (908)

*SD, Standard Deviation

** Over a ten year period between 1982-1992.

Age and years as police officer.

Examination of the age distributions and distribution of numbers of years as police officers of ident and control subjects revealed that the mean age of control subjects was 40.3 years and that of ident subjects 42.0 years (table 2). In the control group there were more subjects less than 30 years of age and more with less than 10 years on the force. Comparison of ages using the Mann-Whitney test revealed a probability of 0.03, and it cannot be concluded, therefore, that these groups had

probability of 0.03, and it cannot be concluded, therefore, that these groups had similar age distributions; consequently, all prevalence-odds ratios reported were adjusted for age.

Smoking.

Examination of the smoking histories of ident and control subjects, revealed that more control subjects were current or ex-smokers (55.1% vs. 49.2%). Because a nearly significant difference in pack-years was apparent (Mann- Whitney P = 0.06); all prevalence-odds ratios reported were adjusted for pack-year history of smoking. Control ex-smokers had a mean pack-year history of 23.1 pack-years, while ident ex-smokers had a mean pack-year history of 18.1 pack-years. Among current smokers, there was also a tendency for control subjects to have a history of greater use, with control smokers having a mean pack-year history of 26.4 pack-years, while ident smokers had a mean pack-year history of 25.2 pack-years.

Alcohol consumption.

Ident and control subjects were found to be comparable in history of alcohol use, 87.8% of ident subjects and 85.8% of control subjects reported alcohol use of one drink per day or less. P value for Pearson Chi - square statistic was 0.20.

Hobby exposure.

The overall days of use for all hobby exposures combined were comparable in ident and control groups. Among ident officers, 29.1% reported some potential exposure, with a mean days of use of 1150, while 30.2% of control officers reported some potential exposure, with a mean days of use of 980. No significant difference in days of use was apparent (Mann-Whitney P = 0.85).

Reported participation in individual hobbies is reported in table 3. It can be seen that in 5 categories control subjects reported greater participation in various hobby activities. For photography, ident subjects reported greater participation; however, only 9 of 311 ident subjects reported daily activity (from 4 to 17 years duration, median 8 years). This difference in levels of participation was not felt to be great enough to warrant including this variable as a potential confounder in outcome modeling.

Table 3: Breakdown of hobby exposures of study and control groups.

Type of hobby	Study group %	Control group %
Shooting	**7.8**	**4.8**
Photography	**11.3**	**2.9**
Stained glass	1.6	**0.5**
Model building	2.9	**3.9**
Boat building	0	**0.5**
Electronics	1.3	**2.0**
Painting	4.2	**4.9**
Auto restoration	2.3	1.0
House restoration	8.4	11.8
Furniture restoration	0	0

Firing Range exposure.

Only 37.9% of ident subjects reported some firing range exposure, while 61.5% of control subjects did (table 2). Among subjects who did report exposure, days of use were higher for controls than for ident personnel: the mean days of use for control subjects was 650, and the mean days of use for ident subjects was 350. A significant difference in days of use was apparent (Mann-Whitney $P = <0.01$). However, the differences are due to a small group of control officers with high firing range exposure. Less than 5% of the control group had exposures above 500 days. Because of the low prevalence of high exposures among the control group, and the

conservative nature of any resulting bias resulting from exclusion, firing range exposure was not included as a variable in outcome modelling.

Previous Occupational Exposure (non-police).

As indicated in table 2, 30.2% of ident subjects and 34.6% of control subjects reported previous occupational exposures. Control subjects reported greater days of use for all previous occupations combined, with a mean of 908, while the mean for ident subjects was 575. This difference in days of use was not statistically significant (Mann-Whitney P = 0.11).

Table 4: Breakdown of other past occupational exposures (non police) of the study and control groups.

Type of Exposure	Study Group %	Control Group %
Metal fumes or dust	10.0	**15.1**
Pesticides and herbicides	**2.9**	**3.4**
Wood preservatives	**0**	**0**
Solvents	**10.6**	**16.6**
Paints	**2.3**	**2.9**
Combustion products	**3.3**	**3.9**
Tar and tar products	**1.9**	**3.9**
Asbestos	**0.6**	**0.5**
Intense vibration or cold	**0.3**	**1.5**
Other	**0**	**0**

A detailed breakdown of the type of occupational exposure prior to becoming a police officer in the study and control groups is shown in table 4. Control subjects reported more previous occupational exposures. These were generally of brief duration, and the overall patterns of exposure were not felt to be great enough to warrant including this variable as a potential confounder in outcome modeling.

In general the reported frequencies of exposures were rather small in all categories. As can be noticed from table 4 the breakdown of past occupational exposures in both groups is very similar, with the controls generally reporting a slightly higher involvement.

Ident Personnel Use of Agents Associated with Identification Procedures

The results of the self-administered questionnaire have been summarized in table 5. This table shows how the different fingerprint powders, differentiated by **trade** name, are used by the ident participants. The magnetic powders, i.e. Magna, black magnetic, jet black magnetic and silver magnetic were utilized by the highest percentage of ident personnel (68, 57 and 53%) respectively. Although these powders were used by more people, they were not used as often as is reflected in their days of use. The agents that were used most often, in some cases by only a few individuals, as reflected by the mean days of use were Model 296 Super-Sensitive Black (1800 days), heavy grey (1600 days), Model 302 analytical grey (1600 days), Jet Black (1600 days), Lightning Black (1500 days).

Table 5: IDENT` PERSONNEL EXPOSURE

Fingerprint vowders. by Me name`	% Ident using	Total Davs of use for individuals median	min.	max.	mean
LIGHTNING					
1. Lightning Black	49	1000	30	6000	1500
2. Lightning Silver/Black	33	830	10	5800	1300
3. Silver / Grey Magnetic Powder	30	750	10	6000	1200
4. Lightning Magnetic Bi-Chromatic	4	340	20	3300	710
MAGNA, Model 300 Magna Latent					
5. Black Magnetic	68	500	10	6300	820
6. Jet Black Magnetic	57	400	10	5500	780
7. Silver Magnetic	53	350	20	5500	740
8. Grey Powder	41	500	10	5000	800
FAUROT, Latent					
9. Model 295 Banta Grey	17	500	10	4500	880
10. Model 296 Super-Sensitive Black	31	1130	10	6300	1800
11. Model 297 White	10	180	30	4300	800
12. Model 300 Chemist Grey	36	850	10	6300	1500
13. Model 302 Analytical Grey	44	1000	10	6000	1600
ATOMIC, High Intensity					
14. Blue Black	0.3	0	0	0	0
15. Porcelain White	0.7	400	50	750	400
16. Mars Red	1	50	50	70	57
17. Space Blue	0.0	0	0	0	0
TRIPLE A Grade					
18. Jet Black	4	1300	100	1600	1600
19. Sky Grey	0.7	930	10	1800	930
20. All White	3	1300	10	1800	960
21. Brilliant Silver	0.3	0	0	0	0
22. Pure Gold	0.0	0	0	0	0
23. Metallic Red	0.0	0	0	0	0
HEAVY Latent					
24. Heavy Black	7	730	10	3300	1100
25. Heavy Grey	3	750	250	3300	1500
26. Heavy White	0.7	350	200	500	350

Table 5: continued

Fingerprint powders, **by trade name**	% Identified	Total days of use for individuals			
		median	min	max.	mean
27. Heavy Red	0.3	0	0	0	0
ATOMIC Latent					
28. Velvet Black	8	300	10	1800	600
29. Ash Grey	2	1500	40	1800	1200
30. Pure White	3	500	30	2000	830
31. Philadelphia Red	0.0	0	0	0	0
32. Silver Metallic	2	380	200	1300	550
33. Gold Metallic	0.3	0	0	0	0
34. Copper Metallic	0.3	0	0	0	0
35. Fire-red Bronze	0.3	0	0	0	0
PEARLPRINT, Latent					
36. Silver-Black	2	530	20	1000	560
37. Silver-Red	0.0	0	0	0	0
MAGNETIC Latent					
38. Silver-Black Magnetic	2	470	100	1000	510
39. Silver-Red Magnetic	2	190	180	850	350
FLUORESCENT Latent					
40. Fluorescent Black	2	75	10	2000	540
41. Fluorescent White	9	110	10	850	160
CRP, Magnetic Latent					
42. Black Magnetic	3	100	30	1000	340
43. White Magnetic	1	100	60	750	300
44. Grey Magnetic	1	160	30	400	200
45. Red Magnetic	0.0	0	0	0	0
46. Silver Magnetic	0.3	0	0	0	0
47. Gold Magnetic	0.0	0	0	0	0
CRP, Ioprint Latent					
48. Ioprint Black	0.3	0	0	0	0
49. Ioprint Brown	0.3	0	0	0	0
50. Ioprint Red	0.3	0	0	0	0
COIN BOX, Latent					

Table 5: continued

Fingerprint powders, by trade name	% Ident using	Total days of use for individuals: median	min.	max.	mean
51. Coin Box Powder	4	50	10	3300	410
52. Galvanic Latent	3	40	10	3300	400
REDWOP					
53. Redwop	24	20	10	3300	93
SIRCHIE, HiFi Volcano Latent					
54. Silk Black	41	1000	20	5800	1300
55. Silver Black	7	525	40	4000	940
56. Grey	20	650	20	5000	1100
57. Indestructible White	13	600	30	4800	950
58. Brilliant Red	5	100	10	3000	520
59. Silver Metallic	6	550	10	3000	920
60. Gold Metallic	0.7	340	180	500	340
61. Copper Metallic	1	100	10	2500	900
62. Analytical Grey	30	950	20	5800	1300
63. Galvanic	0.3	0	0	0	0
VOLCANO Heavy Latent					
64. Heavy Black	7	380	20	3300	740
65. Heavy Grey	3	1500	20	3300	1600
VOLCANO SAFE CRACKER, Latent					
66. Safe Cracker	0.0	0	0	0	0
MISCELLANEOUS					
67. Dragon's Blood (available from Lightning)	3	90	20	170	77
68. *Driodine	13	95	10	1100	162
69. *Fluorescent #781	12	100	10	3500	330
70. *Malachite Green	20	120	10	2300	160
POWDER & PASTE					
71. *Ultraviolet #831	6	170	50	850	190
72. *Ultraviolet Fabric Marking #374C	5	180	20	250	160
73. *Coin Lacquer #359CL	3	200	10	2300	490
74. *Ultraviolet Paste *359P	2	180	20	230	150
75. *Ultraviolet Clue Spray	3	150	10	200	120

Table 5: continued

	Fingerprint powders, by trade name	% Ident using	Total days of use for individuals median	min.	max.	mean
76.	*Ultraviolet White Powder #747UV	3	170	20	230	140
77.	*Ultraviolet Neutral Paste #748UV	2	95	20	200	100
78.	*Ultraviolet Neutral Paste #749U	2	200	20	700	230
	Use of Fingerprint Powders, by Appearance					
79.	Black	88	1300	10	7000	1900
80.	Grey	80	1000	10	7000	1700
81.	Magnetic	69	500	10	6300	820
82.	White	37	1300	30	7000	1800
83.	Fluorescent	29	90	10	2800	190
84.	Metallic Silver	24	680	20	5800	1100
85.	Red	11	50	10	4300	240
86.	Non metallic	3	500	40	4300	880
87.	Orange	1	350	40	750	370
	Agents other than fingerprint Powders					
88.	Ninhydrin	83	250	10	5300	490
89.	Cyanoacrylate	77	200	10	3000	350
90.	Photographic chemicals	73	700	10	6300	1170
91.	Silver nitrate	52	130	10	3800	330
92.	Iodine	42	100	10	1500	200
93.	Gentian violet	31	50	10	1300	90
94.	Dental plaster	29	80	10	850	120
95.	Hydrochloric and nitric acids	20	100	10	5000	360
96.	Molybdenum disulfide	17	40	10	4300	130
97.	Sulfur	15	65	10	600	110
98.	Lacquer alcohol	5	115	10	700	160

In order to identify those agents that were used most often by most officers one can calculate a general use index which is defined as the product of the percentage of the study group using the agent multiplied by the mean days of use divided by 100. A list of the nine most utilized fingerprint powders, by trade name, is shown in table 6.

Table 6: List of the nine most utilized fingerprint powders.

Agent	General Use Index*
Lightning Black (Lightning)	**735**
Model 302, Analytical Grey (Faurot)	**704**
Model 296, Supersensitive Black (Faurot)	**558**
Model 300, Chemistry Grey (Faurot)	**540**
Silk Black (Sirchie)	**533**
Lightning Silver /Black	**429**
Analytical Grey (Sirchie)	**390**
Silver/Grey Magnetic powder (Lightning)	**360**
Grey (Sirchie)	**220**

*General Use Index = $\frac{\%\text{ using X mean days of use.}}{100}$

Among the top powders, based on appearance, with the highest general use index were black (1672), grey (1360), white (666), and magnetic (565).

The highest general use index for agents, other than fingerprint powders, were photographic chemicals (854), ninhydrin (407), cyanoacrylate (270),and silver nitrate (172).

Potential Secondary Exposure.

During the interviews it became readily apparent that all ident individuals used ident and non ident vehicles daily, whereas non-ident (control) individuals only used non ident vehicles. It was not possible for ident personnel to narrow down on the type of vehicle use i.e. ident versus non ident.

Disease Prevalence in the Study and Control Groups

The results of the health questionnaire indicating the disease prevalence in the study and control groups over a 10 year period are summarized in table 7. The disease prevalence has been categorized using the twelve body systems as defined by ICD-9.

Table 7. **Summary of Disease Prevalence in Study and Control Groups**

System	ICD Code Code #	Ident (n = 311) %	# of Cases	Control (n=205) %	# of Cases	POR (95% C.I.)a
Respiratory	460-519	21.5	67	11.7	24	1.96 (1.17-3.27)*
Upper	460-478	15.8	49	5.4	11	3.41 (1.70-6.86)*
Lower	480-519	5.8	18	6.3	13	0.80 (0.38-1.69)
Skin	680-709	17.4	54	13.7	28	1.27 (0.767-2.11)
Digestive	520-529	11.3	36	8.3	17	1.56 (0.828-2.90)
Musculoskeletal	71 o-739	11.3	35	13.7	28	0.68 (0.394-1.18)
Hormonal	240-279	9.0	28	8.8	18	0.96 (0.510-1.84)
Nervous	320-389	7.4	23	5.9	12	1.09 (0.523-2.29)
Circulatory	390-459	5.8	18	5.9	12	0.93 (0.430-2.01)
Genitourinary	580-629	5.8	18	5.9	12	0.93 (0.430-2.01)
Mental Diseases	290-319	4.2	13	5.4	11	0.74 (0.319-1.74)
Neoplasms	140-239	2.3	7	0.5	1	4.51 (O-539-37.8)
Poisoning	960-999	1.0	3	1.0	2	0.96 (0.154-6.06)
Blood	280-289	0.3	1	1.0	2	0.39 (0.032-4.87)

a Adjusted for age and smoking
* statistically significant

Among ident personnel, the 5 highest prevalence rates were seen for diseases of the respiratory system (21.5%) skin (17.4%), digestive system (11.3%) musculoskeletal system (11.3%) and hormonal system (9.0%).

The 5 highest prevalence rates among controls were skin (13.7%), musculoskeletal system (13.7%), respiratory system (11.7%),` hormonal system (8.8%), and digestive system (8.3%).

Increased POR's for ident subjects compared to controls were evident in five of twelve categories: respiratory system (1.96), skin (1.27), digestive system (1.56), nervous system (1.09), and cancer (4.51). Only the POR for respiratory illness was statistically significant with 95% confidence limits about the POR of 1.96 were 1.17 and 3.27. All PORs were adjusted for age and smoking history using logistic regression.

ICD-9 diagnostic categories for respiratory illness may be further grouped into those pertaining to the upper respiratory tract (460 - 478) and those pertaining to the lower respiratory tract (480 - 519). The POR for upper respiratory illness also showed a statistically significant increase, with a POR of 3.41 and 95% confidence limits of 1.70 and 6.86.

Table 8 shows the prevalence of the various categories of illness within each of the 12 organ systems.

Examination of these was done to see if prevalence of any specific illnesses appeared to be increased. Prevalence odds ratios adjusted for age and smoking history were determined for specific categories with apparent increases.

Table 8: Details of Disease Prevalence in Ident and Control Groups

System	ICD Code Codes#	Ident (n=311) %	Ident (n=311) #of Cases	Control (n=205) %	Control (n=205) # of Cases	POR (95% CI)
Respiratory	460-519	21.5	67	11.7	24	1.96 (1.17-3.27)'
Upper		15.8	49	5.4	11	3.41 (1.70-6.86)*
Nasal polyps	471		2		1	
Chronic rhini tis	472.0		14		0 (*)	
Chronic nasopharyngitis	472.2		3		0 (*)	
Chronic sinusitis NOS	473.9		4		1	
Allergic rhinitis	477		24		9	
Other disease of upper respiratory tract	478.9		2		0	
Lower		5.8	18	6.3	13	0.80 (0.38-1.69)
Pneumonia						
viral	480		1		0	
pneurnococcal`	481		1		1	
other bacteria1	482		1		1	
organism unspecified	486		0		2	
Bronchitis NOS	490		0		1	
Chronic bronchitis	491		2		1	
Asthma	493		4		3	
extrinsic	493.0		2		2	
intrinsic	493.1		1		0	
unspecified	493.9		2		1	
Chronic non-specific lung disease	496		1		0	
Asbestosis	501		1		0	
Pneumoconiosis due to silica or silicates	502		1		0	
Unspecified condition due to external agent	508.9		1		0	
Pleurisy	511		0		1	
Shortness of breath	786.0		0		1	
Shin	680-709	17.4	54	13.7	28	1.27 (0.767-2.11)
Dermatophytosis of						
nails	110.1		0		1	
hands	110.2		0		1	
groin	110.3		2		0	
Atopic dermatitis	691		4		1	
Dermatitis NOSs, eczema NO!S, and contact dermatitis	692		28		8 (*)	
Erythema multiforme	695.1		1		0	
Rosacea	695.3		2		0	
Psoriasis	696		5		4	
Pityriasis rosea	696.3		0		1	
Pruuritus NOS	698.9		1		1	
Ichthyosis	701.9		0		1	
Acne NOS	706.1		2		1	
Urticaria	708		2		4	
Vitiligo	709.0		1		0	
Disorder of skin, unspecified	709.9		6		5	

Table 8: Details of Disease Prevalence in Ident and Control Groups (continued)

System	ICD Code Code #	Ident (n-3111 %	Ident (n-3111 #of Cases	Control (n=205) %	Control (n=205) # of Cases	POR (95% CI)
Nervous	320-389	7.4	23	5.9	12	1.09 (0.535-2.29
Tension headache	307.8		1		0	
Bacterial meningitis	320		1		0	
Multiple sclerosis	340		1		0	
Epilepsy	345		1		1	
Migraine	346		5		2	
Cluster headache	346.2		0		1	
Disorder of nervous system-unspecified	349		1		0	
Bell's Palsy	351.0		1		2	
Anosmia	352		1		0	
Carpal tunnel sydrome	354.0		2		0	
Guillain-Barre syndrome	357.0		1		1	
Retinal detachment	361		1		0	
Glaucoma NOS	365.9		1		0	
Keratoconus	371.6		1		0	
Mastoiditis	383		0		1	
Vertiginous syndrome, unspecified	386.9		2		1	
Noise-induced hearing loss	388.12		2		0	
Hearing loss NOS	389.9		1		0	
Cerebral infarction NOSs	434.9		0		1	
Transient cerebral ischaemia	435		0		1	
Stroke	436		0		1	
Circulatory	390-459	5.8	18	5.9	12	0.930 (0.430-2.01
Rheumatic fever	390		1		0	
Disease of mitral valve	394		0		1	
Essential hypertension	401		13		15	
Acute myocardial infarction	410		5		4	
Old myocardial infarction	412		2		0	
Angina pectoris	413		1		1	
Pulmonary embolism	415.1		1		0	
Acute pericarditis	420		1		0	
Cardia dysrhythmia	427		2		0	
Genitourinary	580-629	5.8	18	5.9	12	0.930 (0.430-2.01
Other venereal disease	99		1		2	
Hydronephrosis	591		0		1	
Calculus of kidney and ureter	592		9		3 (*)	
Traumatic urethral stricture	598.1		0		2	
Hyperplasia of prostate	600		0		1	
Chronic prostatis	601.1		2		0	
Prostatitis NOS	601.9		2		0	
Chronic epididymitis	604		1		1	
Sperma tocele	608.1		2		0	
Varicocele	608.8		0		1	
Hypertrophy of breast	611.1		1		0	
Polycystic kidneys	753.1		0		1	
Mental **Diseases**	290-319	4.2	13	5.4	11	0.746 (0X9-1.74
Alcohol dependence syndrome	303		1		4	
Acute reaction to stress	308		1		5	
Depression NOS	311		11		2	

Table 8: Details of Disease Prevalence in Ident and Control Groups (continued)

System	ICD Code Code #	Ident (n=311) %	Ident (n=311) # of Cases	Control (n=205) %	Control (n=205) # of Cases	POR (95% CI)
Digestive	520-529	113	36	8.3	17	1.56 (1.828-2.90
Internal haemorrhoids	455.1		1		0	
Esohageal reflux	530.1		4		3	
Duodenal ulcer	532		12		6	
Peptic ulcer, site unspecified	533		8		3	
Gastritis	535		1		0	
Dyspepsia	536.8		0		1	
Inguinal hernia	550		1		0	
Hiatal hernia	553.3		1		1	
Crohn's disease	555		1		0	
Diverticular of intestine	562		1		0	
Irritable colon	564.1		1		1	
Disorder of intestine, unspecified	569.9		0		1	
Alcoholic cirrhosis of liver	571.2		0		1	
Cholelithiasis	574		4		0	
Musculoskeletal	710-739	11.3	35	13.7	28	0.682 (0.394-1.18
Infective arthritis, unspecified	711.9		0		1	
Gouty arthritis	712		1		0	
Psoriatic arthropathy	713.3		0		1	
Rheumatoid arthritis	714.0		0		1	
Osteoarthritis	715		3		5	
Chondromalacia patella	717.7		0		1	
Ankylosing spondylitis	720.0		1		1	
Intervertebral disc disorder	722		12		6	
Torticollis, unspecified	723.5		0		1	
Low back syndrome	724.2		16		8	
Polymyalgia rheumatica	725		1		0	
Tennis elbow	726.32		0		2	
Bursitis NOS	727.3		0		1	
Rei ter's sydrome	099.3		1		0	
Hormonal	240-279	9.0	28	8.8	18	0.969 (0.510-1.84
Hyperthyroidism NOS	242.9		1		0	
Acquired hypothyroidism	244		3		1	
Diabetes mellitus	250		11		1 (*)	
Hypoglycemia, unspecified	251.2		2		0	
Hyperpara thyroidism	252.0		1		0	
Hypertriglyceridemia	272		2		1	
Hypercholesterolemia	272		6		12	
Gout	274		2		3	

Table 8: Details of Disease Prevalence in Ident and Control Groups (continued)

System	ICD Code Code#	Ident (n=311) %	Ident (n=311) #of Cases	Control (n=205) %	Control (n=205) # of Cases	POR (95% CI)
Neoplasms	140-239	2.3	7	0.5	1	4.51 (0.539-37.8)
Malignant neoplasm of stomach	151		1		0	
Malignant neoplasms of lung and thyroid	162 193		1		0	
Malignant neoplasm of kidney	189		1		0	
Benign neoplasm of oral cavity	210		1		0	
Benign neoplasm of bronchus and lung	2123		1		0	
Benign neoplasm of auditory nerve	225.1		0		1	
Benign neoplasm of brain	225.9		1		0	
Neoplasm of bladder, uncertain behaviour	236.7		1		0	
Neuroendoaine neoplasm of pancreas	157.9		1		0 (*)	
Poisoning	960-999	1.0	3	1.0	2	0.967 (0.154-6.06
Toxic effect of lead	984		3		1	
Toxic effect of other gas	987.9		0		1	
Blood		0.3	1	1.0	2	0.393 (0.032-4.87
Primary thrombocytopenia	287.3		1		0	
Secondary polycythemia	289.0		0		1	
Postoperative infection	998.5		0		1	

Breakdown of Disease Prevalence within Each System.

Respiratory System

Two categories of respiratory illness with greatly increased prevalence in the ident group, 472 (chronic pharyngitis and nasopharyngitis) and 477 (allergic rhinitis), were analyzed statistically. An increase in chronic pharyngitis and nasopharyngitis among ident subjects (17 ident cases vs. 0 control cases) was statistically significant, although a POR is not available because the prevalence in controls was zero. An apparent increase in category 477 (allergic rhinitis), with 24 ident cases and 9 control cases (POR = 1.87) was not statistically significant (95% C.I. = 0.834, 4.20). No other categories appear to have differences warranting further analysis.

Skill

Category 692 (Contact dermatitis and other eczema) shows an increased prevalence, with 28 ident cases vs. 8 control cases, but the POR of 1.96 is not significantly increased (95% C.I. = 0.889,4.31).

Digestive System

No categories had differences warranting further analysis.

Musculoskeletal System

No categories showed differences warranting further analysis.

Hormonal System

An increase in category 250 (diabetes mellitus) was apparent, with 11 ident cases and 1 control case. The POR is 6.96 but the increase was not significant (95% C.I. = 0.885, 54.8).

Nervous System

No categories had differences warranting further analysis.

Circulatory System

No categories had differences warranting further analysis.

Genitourinary System

An increase in category 592 (calculus of kidney and ureter) was apparent, with 9 ident cases and 3 control case. The POR is 2.07 but the increase was not significant (95% C.I. = 0.541,7.94).

Mental Disease

An increase in category 311 (depression) was apparent, with 11 ident cases and 2 control cases. The POR was 2.78 but the increase was not significant (95% C.I. = 0.591, 13.0). The appropriateness of using a distinction between the diagnoses of depression and acute reaction to stress is doubtful. Individuals who would be judged as being depressed by one physician may be diagnosed as having primarily an acute reaction to stress by another. Depression may be precipitated by stress and the diagnostic category of acute reaction to stress may be used in the case of a depressed individual as it may be a more socially acceptable label. Conclusions about these categories of illness should probably not be made without a closer examination of individual case records, and such an examination was not done in this study.

Neoplasms

All reported neoplasms except benign neoplasms of the skin are listed in Table 8. The POR for all neoplasms was 4.51, with a 95% confidence interval from 0.539 to 37.8. Three of the neoplasms (cancers> among ident personnel, one each of

lung, kidney, and stomach, were apparently malignant. One cancer, a tumour of the bladder, was of uncertain behaviour. The investigators became aware of one other malignant neoplasm among a current ident member through a report by another ident member. This member was contacted and found to have a metastatic pancreatic neuroendocrine tumour with predominant glucagonoma features. This case was not included in prevalence estimates because the method by which the investigators became aware of it would result in biased selection.

Three benign neoplasms were seen among the ident subjects, among them tumours of the lung, brain, and oral cavity.

No increases were apparent for neoplasms of particular sites or etiologic classes.

It should be noted that prevalence rates for neoplasms are usually not informative about the underlying incidence rates because the occurrence of some cancers tend to remove people from the workforce.

Poisoning

No categories had differences warranting further analysis.

It should be noted that the case of lead poisoning among the control group involved a firing range instructor. The three cases among the ident group were not instructors.

Blood

No categories had differences warranting further analysis.

A more detailed examination of respiratory illness.

As outlined previously, all POR's for respiratory illness were obtained by multivariate logistic regression, adjusting for age and smoking history. It is known

that age and smoking history are related to the probability of having respiratory illness. Thus, if two populations are compared to see if some other factor is causing respiratory illness, we should be reasonably certain that the two groups are similar in terms of age and smoking history. We have seen some evidence that this condition was not met for the ident and control subjects. Including these variables in the logistic regression model used to determine POR's in effect compares the amount of respiratory illness among ident and control subgroups in which age and smoking history is similar, thus adjusting for the differences. The effects of inclusion of other independent variables such as days of use for occupation, hobby, and firing range exposure, as well as modeling of interactions, was tested using backward elimination followed by forward selection, as outlined by Hosmer and Lemeshow[12] and did not reveal other statistically important variables. The inclusion of variables is severely constrained by the small size of the current study. All models were tested using all respiratory illness and upper respiratory illness alone as dependent variables.

Relationship between number of cases utilizing powders and respiratory illness.

All ident personnel indicated their overall exposure to powders in terms of cases (i.e. number of investigations requiring the use of fingerprint powders) per month, as well as the number of years during which they experienced this level of use. We can thus roughly determine the total number of cases involving use of powders an individual has experienced. This is likely to be directly associated with the degree of actual exposure to powders, and can be used to compare the exposure histories of groups of subjects. If increased powder use is associated with an increased prevalence of respiratory illness, we might expect that the group of officers involved with the highest number of cases involving powdering would have a higher POR for respiratory disease than the group of officers involved in the least

number of cases. This possibility was explored by comparing the PORs for both all respiratory disease and upper respiratory disease for officers in the highest exposure category, i.e. the top 25%, known as the upper quartile, with the POR for those in the lowest 25% exposure category of total cases, known as the lower quartile. No increase in prevalence is discernible among the highest exposure group, based on the number of powdering cases, when compared to the lowest exposure group (Table 9). The POR values for digestive tract and skin are shown in this table since these are also elevated but, in contrast, are not statistically significant.

Table 9. Prevalence of Selected Disease Categories in the Lowest and Highest Ident Exposure Groups based on Number of Cases requiring the use of Powders.

System	Lowest 25%		Highest 25%	
	POR	195% CI)	POR	(95% C.I)
All respiratory tract	**2.81***	**1.41-5.62**	**2.66***	**1.26-5.63**
Upper respiratory tract	**5.13***	**2.22-1 1.8**	**3.32'**	**1.21-9.87**
Digestive tract	**1.41**	**0.54-3.66**	**0.85**	**0.26-2.78**
Skin	**1.31**	**0.62-2.78**	**1.38**	**0.63-3.02**

***statistically significant**

Relationship between number of years as an ident officer and respiratory illness

Likewise, no trend to increasing prevalence can be seen among the longest serving ident officers when compared to the shortest serving officers (Table 10).

Table 10. Prevalence of Selected Disease Categories in the Lowest and Highest Ident Exposure Groups based on the Total Number of Years with Ident.

System	Lowest 25%		Highest 25%	
	POR	(9 5 %	POR	C.I)%
All respiratory tract	**2.28***	**1.18-4.43**	**2.16***	**1.00-4.63**
Upper respiratory tract	**5.13***	**2.25-11.7**	**4.70***	**1.72-12.8**
Digestive tract	**1.34**	**0.56-3.20**	**1.02**	**0.35-2.94**
Skin disorders	**1.07**	**0.52-2.20**	**1.26**	**0.57-2.78**

* **statistically significant**

Association between Use of Particular Agents and Respiratory Illness

As outlined previously, all ident officers indicated their pattern and extent of use for classes of agents and for specific powders. The type of agent used, powders by appearance and specific chemicals, and their associations with respiratory illness are outlined in table 11. The type of agent by appearance as well as trade name, and the length of time that agent was used and their association with respiratory illness are shown in tables 12 and 13 respectively. In these tables, results are presented first for associations with all respiratory illness, followed by associations with upper respiratory illness.

In table 11, the prevalence of respiratory illness in control subjects is compared to the prevalence in ident officers who either used or did not use classes of agents. Assume that one agent was causing an increase in respiratory illness among ident officers. We might then expect to see an increased prevalence of respiratory illness among the ident subjects who used the agent, but no increase among ident subjects who have not used the agent. The situation will become more complicated although similar trends may be apparent, if more than one agent is causing disease, or if subjects who use the agent causing disease are much more likely to also use other agents that do not cause disease. The latter situation will be discussed below. Examination of table 11 reveals that, for many classes of agent, large increases in respiratory disease prevalence (in %) are evident for ident

Table 11:

Comparison of the prevalence of all respiratory tract illness between ident officers not using certain agents and ident officers using the agent indicated.

Type of Agent	% of Ident using	Prevalence of all Respiratory Illness			Prevalence of Upper Respiratory Illness		
		% Ident Non-users	% Ident users	P-Value of Chi-square	% Ident Non-users	% Ident users	P-Value of Chi-square
Fingerprint Powders:							
Black	88.3	13.9	22.8	0.157	12.8	16.2	0.591
Grey	81.7	19.7	22.0	0.692	14.8	16.0	0.811
Magnetic	69.8	16.1	24.2	0.090	9.4	18.6	0.039*
White	38.6	18.5	26.9	0.071	13.0	20.2	0.093
Fluorescent	29.5	22.6	19.8	0.627	16.4	14.3	0.647
Metallic silver	24.0	21.4	23.0	0.732	14.8	18.9	0.392
Red	11.4	20.5	31.4	0.131	14.9	22.9	0.221
Non metallic	2.9	21.7	22.2	0.960	15.6	22.2	0.589
Orange	1.2	21.7	25.0	0.866	15.6	25.0	1.000
Ninhydrin	83.8	16.0	22.9	0.210	9.4	17.1	0.166
Cyanoacrylate	77.9	22.1	21.7	0.923	12.7	16.7	0.418
Photographic chemicals	73.7	11.1	25.6	0.005’	8.3	18.5	0.029”
Silver nitrate	51.0	20.5	22.9	0.548	16.2	15.3	0.819
Iodine	42.2	18.0	26.9	0.051*	13.8	18.5	0.267
Gentian violet	31.2	20.8	24.0	0.489	14.9	17.7	0.528
Dental plaster	28.9	21.5	22.5	0.801	14.4	19.1	0.305
Hydrochloric and nitric acids	20.1	18.7	33.9	0.008	14.0	24.1	0.065
Molybdenum disulfide	17.5	19.7	31.5	0.051’			
Sulfur	15.6	22.3	18.8	0.609	15.6	16.7	0.851
Lacquer alcohol	4.5	21.8	21.4	0.992	15.5	21.4	0.551

personnel who have not used the agents as well as among ident personnel who have. This is seen both with respect to all respiratory illness and with respect to upper respiratory illness. The Pearson chi-square tests reported in table 11 test for a difference in the proportion of those having respiratory illness between ident users and ident non-users of classes of agent. Four of the powders (black, magnetic, white, and red) and four of the other agents, (photo chemicals, iodine, hydrochloric and nitric acids, and molybdenum disulfide) have p-values of 0.20 or less when the association with all respiratory illness is tested. Results with respect to upper respiratory illness alone generally parallel those for all respiratory illness. The relationship between this subset of agents and respiratory illness was explored further using logistic regression analysis.

Association Between Days of use of Agents and Respiratory Disease.

Table 12 indicates the prevalence odds ratios for respiratory tract disease and 95% confidence limits for prevalence odds ratios for ident officers who have used specific categories of powders and those who did not, relative to control group. PORs are adjusted for age and smoking. The P-value of the Mann-Whitney test

Table 12: Comparison of Ident officers and the length of time they used specific agents and those who did not, to the prevalence of respiratory disease.

	ALL RESPIRATORY DISEASE			UPPER RESPIRATORY DISEASE		
	Iden t Non-Users	Ident Users		Iden t Non-Users	. Ident Users	
Agent	POR	POR	p-value of total days	POR	POR	p-value of total days
Fingerprint Powder:						
Black	1.07 (0.381, 3.02)	*1.98 (1.18, 3.31)	0.971	2.87 (0.920, 8.97)	“3.46 (1.71, (7.02)	0.859
Grey	1.69 (0.785, 3.62)	‘1.89 (1.12, 3.19)	0.365	‘3.22 (1.24, 8.36)	‘3.44 (1.68, 7.01)	0.598
Magnetic	1.29 (0.641, 2.60)	‘2.11 (1.24, 3.59)	0.253	1.98 (0.774, 5.05)	‘4.01 (1.96, 8.18)	0.211
White	1.50 (0.855, 2.63)	‘2.50 (1.38, 4.53)	0.600	‘2.68 *(1.26, 5.71)	‘4.75 (2.18, 10.3	0.278
Fluorescent	*1.98 (1.13, 3.28)	1.65 (0.840, 3.26)	0.243	‘3.48 (1.69, 7.16)	*3.17 (1.33, 7.57)	0.594
Metallic Silver	*1.80 (1.06, 3.06)	1.99 (0.997, 3.99)	0.807	‘3.15 (1.53, 6.50)	‘4.20 (1.78, 9.91)	0.410
Red	*1.70 (1.01, 2.86)	*3.37 (1.43, 7.95)	0.568	*3.13 (1.54, 6.36)	‘6.98 (2.43, 20.0)	0.191
Non metallic	*1.84 (1.11,	1.92 (0.373, 9.94)	0.079	‘3.34 (1.66, 6.74)	5.38 (0.966, 30.0)	0.565
Grange	‘1.84 (1.11,	2.22 (0.219, 22.4)	0.180	‘3.37 (1.67, 6.78)	5.87 (0.540, 63.8)	0.601
Ninhydrin	1.32 (0.553,	● 1.96 (1.17, 3.30)	0.832	2.14 (0.694, 6.58)	“3.63 (1.79, 7.36)	0.672
Cyanoacrylate	1.99 (0.973, 4.07)	*1.81 (1.06, 3.07)	0.969	‘2.95 (1.15, 7.62)	‘3.52 (1.172, 7.19)	0.474
Photographic chemicals	0.833 (0.369, 1.88)	‘2.32 (1.37, 3.92)	0.391’	1.64 (0.607,	“4.18 (2.04, 8.55)	‘0.017
Silver nitrate	*1.80 (1.06, 3.08)	“1.96 (1.01, 3.82)	0.907	‘3.31 (1.55 7.04)	‘3.51 (1.61, 7.63)	0.474
Iodine	1.42 (0.803, 2.53)	‘2.61 (1.44, 4.71)	0.619	‘2.73 (1.28, 5.79)	“4.80 (2.17, 10.6)	0.350
Genetian violet	*1.76 (1.02, 3.02)	‘2.05 (1.09, 3.88)	0.962	*3.25 (1.56, 6.78)	‘3.70 (1.63, 8.38)	0.487
Dental plaster	1.69 (0.944, 3.01)	‘2.02 (1.14, 360)	0.525	‘3.00 (1.45, 6.22)	‘4.69 (2.03, 10.8)	0.280
Hydrochloric and nitric acids	1.54 (0.906, 2.63)	‘3.51 (1.75, 7.03)	0.517	‘2.96 (1.44, 6.08)	‘(6.00 (2.45, 14.7)	0.087
Molybdenum disulfide	1.63 (0.959, 2.75)	‘3.11 (1.51, 6.39)	0.450	‘2.95 (1.43, 6.05)	“5.80 (2.38, 14.1)	‘0.048
Sulfur	‘1.90 (1.13,	1.55 (0.658, 3.63)	0.721	● 3.31 (1.63, 6.73)	‘3.97 (1.45, 10.9)	0.847
Lacquer alcohol	“1.85 (1.11, 3.07)	1.86 (0.474, 7.30)	0.274	‘3.32 (1.64,	‘5.84 (1.35, 25.3)	0.530

statistic compares total days of potential exposure of Ident officers with and without any respiratory disease who used specific of powders. In table 12 the statistically significant PORs as well as P values have been identified by an asterisk and indicate that the days of use of that agent for people that had respiratory illness was different from the days of use for people who did not have respiratory illness. With respect to all respiratory illness, 14 of 20 classes of agent show statistically significantly elevated POR's for ident users, i.e. the confidence intervals do not include 1.00 but none of the classes of agents show significant difference among days of use for affected and unaffected ident subjects (i.e. P values). With respect to upper respiratory illness 18 of 20 classes of agent show statistically significantly elevated POR's for ident users, and two (photographic chemicals and molybdenum disulfide) show significant differences in days of use. The confidence intervals for ident users also overlap those of ident non-users for each agent.

An elevated prevalence odds ratio for a particular agent is evidence of an association between use of an agent and the outcome being studied, in this case, respiratory illness. However, this association may be causal or non-causal. Consider workers in a shipyard who use asbestos as well as various kinds of paints. Although there is some variation in the numbers and kinds of paints each individual uses, if questioned about occupational exposures, each will indicate use of asbestos as well as various paints. Assume that the prevalence of some lung disease is increased due to the asbestos the workers used. A prevalence study similar to the present study is likely to indicate associations between use of many paints and the disease as well as asbestos and the disease, when the effects of particular agents are examined singly. However, by examining these exposures together we may or may not be able to discriminate the actual independent effect of asbestos, depending on the degree to which use of asbestos will also indicate use of several other paints, with much overlap of responses.

In this study, multivariate logistic regression was used to attempt to determine if use of any of the subset of 8 classes of agents, identified in table 11, was particularly helpful in predicting respiratory illness. Variables are removed or added to a mathematical model which is used to predict the outcome, and statistical tests are used to see if this removal or addition improves our ability to predict the outcome. The choice of particular method used depends in part on what is known about the biological relationship between the independent and dependent variables, and other considerations such as sample size. Fingerprint powders of different classes (e.g. black and grey) are likely to share many constituents which may contribute to demonstrated health effects. No information was available to indicate that specific agents were less likely to be causally associated with the outcome. A collection of variables which are weakly associated with an outcome, can be important in predicting outcome when taken together[12]. It was felt that inclusion of all the agents in the initial model was necessary. Unfortunately, this may result in other numerical problems if the number of subjects involved is relatively small, as was the case in this study.

In this study, no independent variable remaining in models chosen by backward-stepping elimination[19,20] passed the tolerance test used. The degree of intercorrelation between uses of the various classes of agents was such that possible independent effects on the outcome could not be judged.

Association of specific powder usage and respiratory illness.

Table 13 presents findings for specific powders and is based on 86% (268 of 311) of the ident subjects who were able to provide information concerning use of specific powders. With respect to all respiratory illness, 15 powders showed statistically significant increases in POR, but only one, Driodine (#68 table 13), shows

Table 13

FINGERPRINT POWDER EXPOSURE and RESPIRATORY ILLNESS

Trade name	All respiratory tract disease			Upper respiratory tract disease		
	POR	(95%CI)	P-value exposure days	POR	(95% C.I)	P-Value exposure days
LIGHTNING						
1. Black	1.39	(0.73, 2.62)	0.470	0.971	(0.945, 0.997)	0.580
2. Silver/Black	1.60	(0.79, 3.21)	0.111	*3.04	(1.29, 7.16)	*0.040
3. Silver/Gray Magnetic	1.32	(0.62, 2.79)	0.108	‘2.81	(1.14, 6.93)	0.229
4. Magnetic Bi-Chromatic	‘5.06	(1.30, 19.6)	0.201	*8.32	(1.82, 38.2)	0.210
MAGNA, Model 300 Magna La tent						
5. Black Magnetic	‘2.36	(1.36, 4.12)	0.871	*3.92	(1.87, 8.19)	0.782
6. Jet Black Magnetic	1.36	(0.73, 2.53)	0.758	‘5.18	(2.42, 11.1)	0.594
7. Silver Magnetic	‘2.21	(1.22, 3.99)	0.554	‘4.12	(1.90, 8.90)	0.142
8. Gray	1.65	(0.85, 3.19)	0.360	‘2.92	(1.26, 6.79)	0.531
FAUROT, La tent						
9. Model 295 Banta Gray	‘3.37	(1.57, 7.26)	0.897	‘5.75	(2.25, 14.7)	0.797
10. Model 296 Super-sensitive black	‘2.20	(1.12, 4.34)	0.917	‘3.91	(1.66, 9.22)	0.657
11. Model 297 White	‘2.95	(1.10, 7.95)	0.213	‘5.42	(1.65, 17.9)	0.415
12. Model 300 Chemist Gray	1.90	(0.97, 3.71)	0.495	‘3.62	(1.55, 8.44)	0.497
13. Model 302 Analytical Gray	1.76	(0.92, 3.33)	0.854	• 3.10	(1.36 7.06)	0.452
ATOMIC High Intensity						
14. Blue Black	4.35	(0.34, 55.2)	0	0		0
15. Porcelain White	0		1.000	0		1.000
16. Mars Red	0		0.480	0		1.000
17. Space Blue	0	0	0	0		0
Triple A Grade						
18. Jet Black	1.75	(0.33, 9.05)	0.895	4.18	(0.756, 23.1)	0.895
19. Sky Gray	6.17	(0.367, 104	0.317	12.3	(0.694, 217)	0.317

	All respiratory tract disease			Upper respiratory tract disease		
	POR	(95%CI)	P-value exposure days	POR	(C.I)½	P-Value exposure days
20. All White	3.15	(0.54, 18.4)	0.118	‘6.92	(1.12, 42.9)	0.118
21. Brilliant Silver	0		0	0		0
22. Pure Gold	0	0	0	0		0
23. Metallic Red	0	0		0		0
Heavy Latent:						
24. Heavy Black	0.921	(0.19, 433)	0.944	2.32	(0.46, 11.7)	0.944
25. Heavy Grey	3.49	(0.80, 15.2)	0.241	‘9.59	(2.01, 45.8)	0.241
26. Heavy White	6.71	(0.38, 116)	0.317	9.85	(0.54, 177)	0.317
27. Heavy Red	0		0	0		0
Latent						
28. Velvet Black	1.69	(0.51, 554)	0.254	2.85	(0.71, 11.4)	0.101
29. Ash Gray	0		1.000	0		1.000
30. Pure White	3.60	(0.82, 15.7)	0.154	‘8.83	(1.86, 41.8)	0.154
31. Philadelphia Red	0		0	0		0
32. Silver Metallic	0		1.000	0		1.000
33. Gold Metallic	0		0	0		0
34. Copper Metallic	0		0	0		0
35. Fire-red Bronze	0		0	0		0
PEARLPRINT, La tent				0		1.000
36. Silver-Black	0		1.000	0		0
37. Silver-Red	0		0	0		0
Magnetic Latent						
38. Silver-Black Magnetic	3.65	(0.62, 21.3)	0.100	3.57	(0.37, 34.3)	0.138
39. Silver-Red Magnetic	6.66	(0.87, 50.4)	0,683	6.30	(0.58, 67.5)	0.637
Fluorescent Latent						
40. Fluorescent Black	2.38	(0.23, 24.1)	0.180	5.68	(0.52, 61.3)	0.180
41. Fluorescent White	1.44	(0.44, 4.68)	0.349	2.65	(0.66, 10.5)	0.463

	All respiratory tract disease			Upper respiratory tract disease		
	POR	(95%CI)	P-value exposure days	POR	C.I)%	P-Value exposure davs
CRP, Magnetic Latent						
42. Black Magnetic	‘8.91	(1.86, 42.8)	0.480	*19.5	(3.81, 100)	0.480
43. White Magnetic	‘13.3	(1.14, 154)	0.221)	‘27.6	(2.26, 337)	• 0.221
44. Gray Magnetic	3.40	(0.29, 39.5)	0.221)	8.23	(0.67, 101)	0.221
45. Red Magnetic	0		0	0		0
46. Silver Magnetic	0		0	0		0
47. Gold Magnetic	0		0	0		0
CRP, Ioprint Latent						
48. Ioprint Black	**0**		**0**	**0**		**0**
49. Ioprint Brown	**0**		**0**	**0**		**0**
50. Ioprint Red	**0**		**0**	**0**		**0**
COIN BOX, La tent						
51. Coil Box Powder	1.36	(0.27, 6.65)	‘0.062	3.32	(0.63, 17.4)	0.062
52. Galvanic Latent	0.793	(0.09, 6.70)	0.431	1.69	(0.19, 14.9)	0.431
REDWOI’						
53. Redwop	‘2.34	(1.14, 4.78)	0.354	‘4.01	(1.65, 9.74)	0.684
SIRCHIE, HiFi Volcano Latent						
54. Silk Black	‘2.02	(1.07, 3.80)	0.218	‘3.47	(1.55, 7.77)	0.077
55. Silver Black	0.893	(0.19, 4.17)	‘0.035	2.06	(0.41, 10.3)	‘0.035
56. Gray	1.27	(0.52, 3.05)	0.645	1.41	(0.42, 4.69)	0.113
57. Indestructible White	1.66	(0.61, 4.48)	0.786	‘4.31	(1.44, 12.9)	0.786
58. Brilliant Red	2.28	(0.55, 9.38)	0.128	4.32	(0.79, 23.6)	0.553
59. Silver Metallic	2.59	(0.75, 8.92)	0.909	‘4.41	(1.06, 18.4)	0.447
60. Gold Metallic	5.71	(0.33, 98.0)	0.317	0		1.000
61. Copper Metallic	2.84	(0.23, 33.8)	0.480	8.86	(0.69, 112)	0.480
62. Analytical Gray	1.59	(0.77, 3.27)	0.419	‘2.59	1.03. 6.53)	0.965
63. Galvanic	0		0	0		0

	All respiratory tract disease			Upper respiratory tract disease		
	POR	(95%CI)	p-value exposure days	POR	C.I)%	P-Value exposure days
Volcano Heavy Latent						
64. Heavy Black	1.96	(0.57, 6.66)	0.750	‘5.49	(1.47, 20.5)	0.750
65. Heavy Gray	2.65	(0.46, 15.1)	0.845	“9.12	(1.47, 56.6)	0.845
Volcano Safe Cracker, Latent						
66. Safe Cracker	0	0	0	0		0
MISCELLANEOUS						
67. Dragon’s Blood	2.43	(0.42, 14.0)	0.688	3.23	(0.332, 31.4)	0.604
68. Driodinc	‘2.65	(1.09, 6.46)	0.085	‘5.27	(1.82, 15.2)	0.057
69. Fluorescent #781	*2.93	(1.20, 7.17)	0.878	*4.33	(1.44, 13.0)	0.482
70. Malachite Green	*2.44	(1.12, 5.31)	0.309	‘4.85	(1.87, 12.6)	0.852
POWDER & PASTE						
71. Ultraviolet #831	3.29	(0.99, 10.9	0.121	‘7.23	(1.85, 28.2)	‘0.035
72. Ultraviolet Fabric Marking #374C	*3.89	(1.18, 12.9)	0.686	“8.02	(2.07, 31.1)	1.000
73. Coin Lacquer #359CL	‘11.0	(2.57, 46.9)	0.712	‘15.1	(2.97, 76.8)	0.437
74. Ultraviolet Paste *359P	3.72	(0.63, 22.0)	0.348	‘11.5	(1.78, 73.9)	0.348
75. Ultraviolet Clue Spray	0.954	(0.11, 8.24)	0.275	2.63	(0.288, 24.0)	0.275
76. Ultraviolet White Powder #747UV	2.24	(0.41, 12.0)	0.734	0		1.000
77. Ultraviolet Neutral Paste #748UV	2.12	(0.21, 21.5)	0.655	4.63	(0.433, 49.6)	0.655
78. Ultraviolet Neutral Paste #749U	0		1.00	0		1.00

a significant association with days of use (P = 0.085). With respect to upper respiratory illness only, 31 powders showed statistically significant increases in POR, and three (Lightning Silver/Black, Sirchie Silver Black, and Powder and Paste Ultraviolet #831, numbers 2, 55, 71 in table 13 respectively) had a significant association with days of use. None of the classes of powders showed a statistical association with the days of use, and in view of the small numbers of subjects, further modeling was judged inappropriate.

Association of Ident Status and History of Congenital Malformation or Miscarriage Among Spouses of Ident Officers and Controls.

As outlined in Table 14, no association between ident status and numbers of offspring, history of congenital malformations among offspring, and history of spontaneous abortion among spouses of officers was evident.

Table 14. Comparison of Reproductive Parameters of Ident Personnel and Controls.

Parameter	% of Ident	% of Controls	P-value
Number of Children:			**0.142a**
0	**10.2**	17.1	
1	**11.3**	14.6	
2	**50.4**	41.2	
3	**23.0**	19.6	
4	**4.0**	6.5	
5	**1.1**	0	
6	**0**	0.5	
7	**0**	0.5	
Birth defects in offspring	**5.1**	**5.5**	0.841[b]
Spontaneous abortion by spouse	**15.7**	18.6	0.406[b]

a P-value of Mann-Whitney statistic
b P-value of Pearson chi-square statistic.

DISCUSSION

A previous study of the health of ident officers9 demonstrated an increase in risk of respiratory illness, but it involved a smaller number of participants and was not sufficiently powerful to demonstrate a statistical significance of plausible increases in illness. The present study showed a statistically significant elevated 10-year period prevalence for both all respiratory illness (POR 1.96) and upper respiratory illness (POR 3.41) in the group of ident officers studied.

The demonstrated increases in respiratory illness should be examined cautiously. Statistically significant increases were demonstrated in the PORs for all and upper respiratory illness, specifically chronic rhinitis and pharyngitis (ICD 472). This category and allergic rhinitis account for most of the increased respiratory prevalence of the group. However, what this really means is that this group of subjects is at increased risk of being given these diagnoses by their physicians. It is possible either that the subject's occupational exposure is causing these specific illnesses, or that the occupational exposure is causing a spectrum of illness in the subjects which leads to these diagnoses. A physician faced with a patient with a specific syndrome is likely to adopt the diagnosis which best fits the clinical picture seen. We may be seeing the effects of a specific association between use of these agents and diseases of the respiratory tract, classified using a system which does not recognize the association, which is being demonstrated for the first time here. In the ICD-9 system, category 472 is really a classification of a disease process based on its manifestations, with no implied mechanism. Category 477, allergic rhinitis, implies at least that the mechanism of the effect is known to be the described process we know as atopy i.e. it involves the immune system and the reaction may be distant from the region of contact. But we do not know whether objective corroboration of an allergic process exists for ident officers classified as having allergic rhinitis.

This study was undertaken primarily to investigate the relationship between prevalence of illness of eleven primary ICD 9 categories and use of classes of agents and powders. The bulk of the information collected pertained to the possibility of an association between use of powders and illness: the physical and chemical nature of the constituents of many powders lends biological plausibility to any association, and the nature of the exposure is such that pulmonary effects might be expected. However, ident officers with the highest apparent use of powders over the longest periods of time, did not exhibit a prevalence of respiratory illness higher than those with the least exposure, and evidence indicated increasing risk with increasing exposure to only a few particular agents. The possibility remains that an undemonstrated association with a constituent of some or many powders, or an association with an agent other than a powder exists. Alternatively, the biologically relevant exposure may be a combination of agents. The methodology of the present study could not determine whether such interactions are occurring. The present study cannot be taken as supporting either possibility.

The nearly significant association between ident status and diabetes mellitus, dermatitis, eczema and contact dermatitis must also be viewed with caution. These associations are some of many possible comparisons which may be made by examining some 125 subgroups of data, within primary disease categories. The association with dermatitis, eczema, and contact dermatitis is plausible but the present study should be seen as hypothesis generating rather than hypothesis testing for any but the twelve primary categories.

Although the POR values for the prevalence of skin and the digestive systems disorders were elevated, they were not found to be statistically significant. These values therefore indicate only a trend of health problems associated with these two systems. From an occupational hygiene point of view these trends would be consistent with the exposures observed. When one considers that respiratory

tract problems were shown to be significantly elevated and related to powder use one would anticipate respiratory tract clearance to take place resulting in the expectoration of powder contaminated mucous. This mucous is often ingested resulting in GI tract exposure. In addition oral ingestion of powders is also likely to result from hand to mouth transfer during eating and smoking especially since 50.8% of IDENT individuals, the study group, smoke.

In respect to skin exposure one would expect this also to be elevated considering the nature of the agents, i.e. powders designed to cling to skin sebaceous gland secretions. In view of the fact that it was clearly shown that secondary exposure was considerable in the Vancouver study[7], it would be likely that skin exposure would continue for periods extending well beyond the actual powdering procedures.

It was noted in the results that lead poisoning was reported in 2 individuals from the control group and 3 individuals from the IDENT group. None of these cases were overt lead poisoning incidents but rather individuals who had elevated blood lead levels. Both individuals in the control group were firing range instructors who, because of the known relationship of this activity to lead exposure[13-17], either decided, or were required, to have blood samples analyzed for this element. The 3 individuals in the study group decided on their own to have their blood analyzed. The statistics in this category (poisoning, lead ICD 984) are therefore not representative of what is present in both groups. It is not known, for instance, how many individuals in either group had blood samples analyzed for lead. In addition, it is not known how many persons in the control group were firing range instructors. It is possible that the source of lead in the 3 individuals from the IDENT group is from the use of lead containing finger print powders. Of the 4 powders analyzed for lead in the Vancouver Study[7], only one, Faurot Analytical Grey contained lead (41%). When the powder use of these 3 individuals was compared, it

was apparent that only 2 had used Faurot Analytical Grey regularly. All had used Black Magnetic, and jet black magnetic. In addition to these, each had used an array of other powder types. It would appear, therefore, that lead exposure is not necessarily only associated with Faurot Analytical Grey but could also be associated with regular use of other powders. It would be prudent therefore to analyze the other regularly used powders for lead content.

According to the information in table 6, Faurot Analytical Grey had the second highest use index and it is therefore not unreasonable to suspect this powder as one of the main contributors to IDENT lead exposure. It is recommended therefore that the use of lead containing Faurot Analytical Grey be phased out. At the SAME time other powders should be analyzed for lead content, starting with those which are used most often by more people, i.e. table 6. It would be prudent to check the blood lead levels in those individuals who regularly use Faurot Analytical Grey.

Secondary Exposure.

It might very well be that any particular agent cannot be directly linked to the observed respiratory illness because the reported exposures by each individual subject might not be a true reflection of actual exposure. In the Vancouver study7 it was clearly demonstrated that secondary exposure to aluminum powder from traveling in automobiles used for ident work was almost as high as primary exposure. The constituents found in an ident vehicle would likely be a mixture of all agents used by all individuals using such a vehicle. Such exposure would diminish the strength of the reported exposure to specific agents causing a general effect to be observed which is related to cumulative mixture of many agents and the total amount of time spent in ident vehicles.

This is perhaps one of the reasons why 14 out of 20 classes of agents (table 12) show a statistically significant elevated POR for ident users but none show a

significant difference regarding the reported days of use. This is further supported by the observation that certain chemicals that are not used in the field or are used in a restricted way, making it unlikely to be associated with contamination of ident vehicles i.e. photographic chemicals (used in the laboratory only) and molybdenum disulfide (applied in **a** water bath or aqueous spray), do show significant differences in days of use. It appears therefore that, for these chemicals that are unlikely to result in secondary exposure in ident vehicles, the reported days of **use** are perhaps more indicative of actual exposure than for the other agents used.

This is not as apparent in table 13 where the agents are addressed by trade name rather than classes. It is interesting to note that 3 out of 4 agents which had the highest general use index (based on appearance) i.e. black, grey, white and magnetic (page 25) were also identified as having p-values of 0.20 or less regarding their association with all respiratory illness (i.e. black, magnetic, white and red).

The Vancouver study also identified an additional complicating factor regarding exposure. It was observed that there is a certain amount of cross-contamination between finger print powder containers. After a certain period of use the contents of a bottle might not necessarily be a reflection of its label. The possibility also exists that the manufacturer might have changed the actual ingredients of a specific product in the past.

Previous Non-Police Occupational Exposures.

The possibility of previous non-police occupational exposure affecting the findings of this study should be addressed. As shown in table 4, the study and control groups were closely matched regarding previous occupational exposures. The controls were actually consistently slightly higher in all but one category i.e. asbestos 0.6% versus 0.5%. These differences were not statistically significant and, if anything, would tend to result in an underestimate of the effects found.

Powder constituents and observed effects.

Because of the potential and likelihood of secondary exposure and the corresponding exposure to mixture of agents it may be difficult to identify a relationship between health effects and specific agents. There is only one published report on a multi-elemental analysis of 4 powders[7]. Atomic Brand silver, Faurot Analytical Grey, Atomic Brand velvet black and Atomic Brand ash grey. All of these contained aluminum, calcium, zinc, iron, magnesium, manganese and nickel. In addition Faurot Analytical Grey contained 41% lead. Another study (unpublished)[18], showed that Atomic Brand velvet black, Atomic Brand magnetic black, and Atomic grey contained some microgram levels of polyaromatic hydrocarbons (PAHs) these were respectively; phenanthrene 12.7 ug <1 ug, cl ug; fluoranthene 98.4 ug, 1.7 ug and 6.3 ug; and pyrene 291 ug, 4.5 ug and 16.4 ug. Atomic Brand silver, Faurot Analytical Grey and lightning black did not contain PAHs. This study also indicated that, at least regarding the powders mentioned above, personal exposures to PAHs during the use of these agents was of little concern. Similar conclusions were obtained from a study in Montreal.8 Other powders were not investigated, some of these could pose a potential hazard regarding PAH exposure and need to be analyzed.

It should be mentioned that scanning electron microscope images of some powders** revealed the presence of, what appeared to be, small fragments of organic material that were of respirable seize. As only a few powders were tested it is not known how widespread this is among the powders and whether these contaminants have any possible relationship to the observed respiratory effects.

Driodine showed an almost significant P value which was close to being significant for the days of use. This agent is an iodine fuming powder and consist of porous ground glass impregnated with iodine which is poured over the item

suspected of carrying the fingerprint. This is left for 30 seconds and the ground glass is returned to the original container for future use. It is not known whether the ground glass is of respirable size and whether it is used in such a way to allow for respiratory exposure. If this is not the case the observed statistical significance might very well be a chance event.

Potential confounding effects and bias

The possibility that an "unhealthy worker effect" exists as a confounder of health status among ident officers is considered unlikely. Such an effect would occur if ident work was viewed as physically and emotionally less demanding than other police work, resulting in the transfer of officers who have become unhealthy elsewhere to the ident sections. Although ident work is perhaps less physically demanding than some other police work, experience with various forces indicated that Ident officers are often chosen from among officers who have been on general duties for ten years or more and the general perception is that they are chosen from **the** elite of such officers. The investigators consider it likely that ident officers are actually likely to be healthier than non-ident officers at the beginning of their ident careers, although it is emphasized that this is a conjecture. Another possibility, that we are under estimating the prevalence of illness among ident officers because ident officers become sick while in ident and consequently are transferred elsewhere, is also considered remote.

The possibility that a selection bias occurred must be considered. This would occur if ident officers with respiratory or other illness were more likely than ident officers without illness to volunteer for this study. If this were so, a statistical increase in prevalence might be demonstrated even if no such increase actually exists. Note, however, that only 6 of twelve categories of illness were elevated

among ident officers; increases in more categories would increase the suspicion that a significant bias in selection occurred. Examination of the number of organ systems

Table 15: Distribution of total number of organ systems affected by illness for 311 ident and 205 control subjects.

No. of ICD Systems reported	Ident	Control (%)
0	104 (33.4)	78 (38.1)
1	118 (37.94)	77 (37.6)
2	59 (19.0)	36 (17.6)
3	24 (7.7)	13 (6.3)
4	4 (1.3)	1 (0.5)
5	2 (0.6)	0 (0)

affected by illness reported for ident and control subjects (table 15) reveals that the two groups differ primarily in that a proportion of individuals, 38.1% versus. 33.4% who reported no illness in any system.

If we exclude response in the two systems where increases are plausible based on the nature of the exposure, the respiratory system and skin, then control subjects actually had a higher mean total number of complaints. (Table 16)

Table 16: Mean Total number of the 12 organ systems affected by illness for 311 ident and 205 control subjects, before and after exclusion of selected organ systems.

Group	Number of organ systems reported (mean)	
	Ident	Control
All systems	1.07	0.94
All systems except respiratory	0.86	0.82
All systems except respiratory & skin	0.69	0.70

This would suggest that most of the selection bias, if it is occurring, can be accounted for in these two systems. There is no reason to assume that a selection bias would in turn be biased in favour of these two systems.

CONCLUSIONS

Information from 311 subjects (study group) and 205 controls (control group) was obtained. The study group had a highest prevalence of diseases of the respiratory system, 21.5%; skin, 17.4%; digestive system, 11.3%; and hormonal system, 9.0%. The control group showed highest prevalence rates for diseases of the skin 13.7%; musculoskeletal system, 13.7%; respiratory system, 11.7%; hormone system, 8.8% and digestive system, 8.3%. Prevalence odds ratios were elevated in ident personnel (study group) in five categories i.e. respiratory system, 1.96; skin 1.27; digestive system 1.56; nervous system 1.09 and cancer 4.51. Of these the POR for respiratory illness was statistically significant (95% confidence limits 1.1 -7 3.27). Of the 98 specific fingerprint powders, the 9 powder categories based on appearance, and the 11 specific chemical agents, 15 specific powders, 5 powder categories and 9 chemicals showed significant increases in POR for all respiratory disease. Only one of these, Driodine, showed an almost significant increase in POR with days of use.

When the data was analysed for upper respiratory tract illness, 31 individual powders, 7 categories and 11 chemicals showed up with elevated POR values. Three specific powders, and only 2 chemicals showed a significant increase in POR with days of use.

The totality of evidence from this study supports the conclusion tha tident officers have an increased prevalence of all respiratory illness and upper respiratory illness due to some occupational exposure. Unfortunately, the nature of the exposure is such that this study was not able to demonstrate the involvement of any particular powder, agent, or other work exposure, in the etiology of this increase.

This difficulty in identifying specific agents as health hazards could possibly be related to a combination of effects including secondary exposure to mixture of powders when travelling i n ident vehicles , cross-contamination of powder containers, and unrecorded changes in powder constituents by the manufacturer.

RECOMMENDATIONS

It is difficult to make recommendations concerning measures that may be taken to reduce the risk of illness, in view of the lack of evidence about which agent or group of agents that may be involved . Powdering is done primarily at crime scenes. The nature of the evidence often dictates that no measures beyond personal protective gear such as wearing masks for respiratory protection and a dedicated laboratory type coat are really practical . In the lab situation, the possibility of protection against exposure via engineering measures such as fume hoods is obviously greater. Based on the interviews in this study, as well as direct observation and discussions with a large group o fident officers, most do not use the personal protective measures that are available, such as masks, when dusting in the field. Protection is generally much better and apparently adequate in the labs. The results of this study reinforce the wisdom of using personal protective measures that should be available under field conditions.

Along with providing individuals with personal protective equipment a parallel effort should be made to educat eident officers about the potential hazards associated with agents that they are using often on a daily basis.

Sinc e ident officers travel daily in vehicles that are potentially contaminated with mixtures of powders, care should be taken that these vehicles are thoroughly cleaned. It is quite possible that standard cleaning techniques might not be adequate when applied t o ident vehicles.

The use of the lead containing powder, Faurot Analytical Grey, should be eliminated. Individuals with known exposure to lead containing Faurot Analytical Grey should be checked for blood lead levels.

For those agents that show a significant POR for respiratory disease as well as those with the highest use index, it would be prudent to initiate a thorough survey for heavy metals, PAHs and mineral dusts of respirable size.

Several further avenues of investigation are suggested by our results. Evidence of increased prevalence of respiratory illness could be supported by objective evidence of temporary or permanent changes in lung function within subgroups of ident subjects and controls. One possibility would be to determine if ident subjects show alterations in pulmonary function before and after heavy exposures to agents at work. Alternatively, pulmonary function and screening chest x-rays could be examined for long-servin gident members and be compared to age and smoking matched controls.

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Appendix A

Self Administered Questionnaire

QUESTIONNAIRE

General information.

Name: _____

Date of birth: _____
day month year

Today's date: _____
day month year

Phone: _____

Address: _____

Postal Code _____

Country of birth _____

In what country did you spend the first 10 years of your life? _____

Weight _____ lbs.

Height _____ feet _____ inches

Member of the police force in (city) _____

Form 19 _____ to 19 _____ Ident squad from 19 _____ to 19 _____

Member of the police force in (city) _____

From 19 _____ to 19 _____ Ident _____ to 19 _____

Member of the police force in (city) _____

From 19 _____ to 19 _____ Ident _____ to 19 _____

A IDENT SQUAD EXPOSURE

1. Fingerprint powders, by trade name

Scan the following lists of fingerpint powders and agents. For agents you have used, please indicate with an "X" whether you used it daily, weekly, or monthly. Also indicate how many years you used this agent.

	daily	**weekly**	monthly	for how many years
LIGHTNING				
1. Lightning Black				
2. Lightning Silver/ Black				
3. Silver/Gray Magnetic Powder				
4. Lightning Magnetic Bi-Chromatic				
MAGNA, Model 300 Magna Latent				
5. Black Magnetic				
6. Jet Black Magnetic				
7. Silver Magnetic				
8. Gray Powder				
FAUROT, Latent				
9. Model 295 Banta Gray				
10. Model 296 Super-Sensitive Black				
11. Model 297 White				
12 Model 300 Chemist Gray				
13. Model 302 Analytical Gray				
ATOMIC High Intensity				
14. Blue Black				
15. Porcelain White				
16. Mars Red				
17. Space Blue				
Triple A Grade				
18. Jet Black				

19. Sky Gray				
20. All White				
21. Brilliant Silver				
22. Pure Gold				
23. Metallic Red				
Heavy Latent				
24. Heavy Black				
25. Heavy Gray				
26. Heavy White				
27. Heavy Red				
Atomic Brand Latent				
28. Velvet Black				
29. Ash Gray				
30. Pure White				
31. Philadelphia Red				
32. Silver Metallic				
33. Gold Metallic				
34. Copper Metallic				
35. Fire-red Bronze				
PEARLPRINT, Latent				
36. Silver-Black				
37. Silver-Red				
Magnetic Latent				
38. Silver-Black Magnetic				
39. Silver-Red Magnetic				
Fluorescent Latent				
40. Fluorescent Black				
41. Fluorescent White				
CRP, Magnetic Latent				
42. Black Magnetic				
43. White Magnetic				
44. Gray Magnetic				
45. Red Magnetic				
46. Silver Magnetic				

47. Gold Magnetic

CRP, Ioprint Latent

48. Ioprint Black
49. Ioprint Brown
50. Ioprint Red

COIN BOX, Latent

51. Coil Box Powder
52. Galvanic Latent

REDWOP

53. Redwop

SIRCHIE, HiFi Volcano Latent

54. Silk Black
55. Silver Black
56. Gray
57. Indestructible White
58. Brilliant Red
59. Silver Metallic
60. Gold Metallic
61. Copper Metallic
62. Analytical Gray
63. Galvanic

Volcano Heavy Latent

64. Heavy Black
65. Heavy Gray

Volcano Safe Cracker, Latent

66. Safe Cracker

MISCELLANEOUS

67. Dragon's Blood (available from Lightning)
68. Driodine
69. Fluorescent #781
70. Malachite Green

POWDER & PASTE

71. Ultraviolet #831
72. Ultraviolet Fabric Marking #374C
73. Coin Lacquer #359CL
74. Ultraviolet Paste #359P
75. Ultraviolet Clue Spray
76. Ultraviolet White Powder #747UV
77. Ultraviolet Neutral Paste #748UV
78. Ultraviolet Neutral Paste

2. Fingerprint powders by appearance

1.	Black	daily	c	l	**weekly**	☐	monthly	c	l	for how long _____(y)
2.	Grey	daily	c	l	weekly	☐	monthly	c	l	for how long _____(y)
3.	White	daily	○		**weekly**	☐	monthly	☐		for how long _____(y)
4.	Red	daily	c	l	weekly	☐	monthly	☐		for how long _____(y)
5.	Orange	daily	☐		**weekly**	☐	monthly	☐		for how long _____(y)
6.	Metallic Silver	daily	c	l	**weekly**	☐	monthly	c	l	for how long _____(y)
7.	Non metallic	daily	☐		**weekly**	☐	monthly	☐		for how long _____(y)
8.	Magnetic	daily	c	l	**weekly**	☐	monthly	☐		for how long _____(y)
9.	Fluorescent, what color? (_____)	daily	☐		**weekly**	☐	monthly	c	l	for how long _____(y)
10.	Other (_____)	daily	c	l	**weekly**	☐	monthly	c	l	for how long _____(y)

3. Other exposures

1.	Iodine	daily	☐		**weekly**	☐	monthly	☐		for how long _____(y)
2.	Cyanoacryylates(crazy glue)	daily	☐		weekly	☐	monthly	c	l	for how long _____(y)
3.	Ninhydrin	daily	☐		weekly	☐	monthly	☐		for how long _____(y)
4.	Crystal violet **(gentian violet)**	daily	☐		weekly	c	l	monthly	c	l	for how long _____(y)

5. Sulfur daily ☐ weekly ☐ monthly ☐ for how long (y)____

6. Silver nitrate daily ☐ weekly ☐ monthly ☐ for how long (y)____

7. Molybdenum disulfide daily ☐ weekly ☐ monthly ☐ for how long_____(y)

8. Dental plaster daily ☐ weekly ☐ monthly ☐ for how long (y)____

9. Lacquer alcohol daily ☐ weekly ☐ monthly ☐ for how long (y)____

10. Hydrochloric and nitric acids daily ☐ weekly ☐ monthly ☐ for how long (y)____

11. Agents used in developing and printing photographs. daily ☐ weekly ☐ monthly ☐ for how long_____(y)

12. Other (_____) daily ☐ weekly ☐ monthly ☐ for how long _____(y)

13. In your estimation, in the past 10 years, was your exposure to all of the above agents mostly under field or lab conditions? field ☐ lab ☐

14. In your estimation, how many cases requiring dusting have you been involved with, on the average, per month? _____

B. General Exposures

1. Firing Range never ☐ daily ☐ weekly ☐ monthly c l for how long _____(y)

2. Do you often travel in vehicles used by the ident squad.

daily c l **weekly** ☐ monthly c l for how long _____(y)

Hobbies

1. Shooting daily c l **weekly** ☐ monthly c l for how long _____(y)
2. Body building daily c l **weekly** ☐ monthly ☐ for how long _____(y)
3. Stained glass daily c l **weekly** ☐ monthly c l for how long _____(y)
4. Model builder daily c l **weekly** ☐ monthly c l for how long _____(y)
5. Boatbuilding daily c l **weekly** ☐ monthly c l for how long _____(y)
6. Electronics daily ☐ **weekly** ☐ monthly ☐ for how long _____(y)
7. Painter daily c l **weekly** ☐ monthly ☐ for how long _____(y)
8. Automobile restoration daily c l **weekly** ☐ monthly ☐ for how long _____(y)
9. House restoration daily c l **weekly** ☐ monthly c l for how long _____(y)
10. Furniture restoration daily c l **weekly** ☐ monthly c l for how long _____(y)
11. Photography daily c l **weekly** ☐ monthly c l for how long _____(y)
12. Other_____ daily c l **weekly** ☐ monthly c l for how lon(y)_____

Personal habits

Smoker _____# packs/day ☐ _____since_____19_____
to present

Ex-smoker_____# packs/day ☐ _____between 19_____to19_____

Since not smoking, how many hours per week, on the average, have you spent in a smoky atmosphere _____

Non _____ Time spend in a smoky atmosphere on the average over the past 10 years _____Hrs /week

Alcohol consumption

5. c l 10-15 drinks/day
4. c l 5-10 drinks
3. ☐ 2-5 drinks/day
2. c l 1 drink/day
1. c l never

Vitamin use
Normal _____ #pills/day what kind _____

Vitamins 1 ☐ complex 2 ☐ A 3 ☐ B6 4 ☐ B12 5 ☐ C 6 ☐ D 7 ☐ E

Megavitamins _____ # pills / day c l what kind _____

QUESTIONNAIRE

Renseignements generaux

Nom: _____

Date de naissance: _____
jour mois annee

Date d'aujourd'hui: _____
jour mois annee

Téléphone: _____

Addresse: _____

Code postal: _____

Pays d'origine _____

Dans quel pays avez-vous passé les dix premiè res années de votre vie? _____

Poid: _____ kg.

Taille: _____ an

Membre du Service de police de la ville de _____

De 19 _____ a19 _____ Membre d'une section ou escouade de l'identité de

19 _____ a19 _____

Membre du Service de police de la ville de _____

De19 _____ 819 _____. Membre d'une section ou oscouade de l'identité de 19 _____

à 19 _____

Membre du Service de police de la ville de _____

_____

De19 _____ a19 _____. Membre d'une section ou escouade de l'identité de

19 _____ 819 _____.

A) Exposition Dans Une Escouade ou une Section

1. Poudres dactyloscopiques, par nom de marquer de commerce.
Examinez les listes des poudres dactyloscopiques suivant Pour les agents que vous avez employé, veuillez indiquez avec une "X" si vous les avez employ&s quotidiennement, hebdomadairement ou mensuellement. Aussi indiquez pendant combien des années vous les avez employ&.

	quot	hebdo	mensue	pende[1]
LIGHTNING				
1. Lightning Black				
2. Lightning Silver/Black				
3. Silver/Gray Magnetic Powder				
4. Lightning Magnetic Bi-Chromatic				
MAGNA, Model 300 Magna Latent				
5. Black Magnetic				
6. Jet Black Magnetic				
7. Silver Magnetic				
8. Gray Powder				
FAUROT, La tent				
9. Model 295 Banta Gray				
10. Model 296 Super-Sensitive Black				
11. Model 297 White				
12 Model 300 Chemist Gray				
13. Model 302 Analytical Gray				
ATOMIC High Intensity				
14. Blue Black				

[1]quot - quotidiennement
hebdo - hebdomadairement
mensue - mensuellement
pende - pendent combine de temps (années)

	quot	hebdo	mensue	pende
15. Porcelain White	----	----	----	----
16. **Mars** Red	----	----	----	----
17. Space Blue	----	----	----	----
Triple A Grade				
18. Jet Black	----	----	----	----
19. Sky Gray	----	----	----	----
20. All White	----	----	----	----
21. Brilliant Silver	----	----	----	----
22. Pure Gold	----	----	----	----
23. Metallic Red	----	----	----	----
Heavy Latent				
24. Heavy Black	----	----	----	----
25. Heavy Gray	----	----	----	----
26. Heavy White	----	----	----	----
27. Heavy Red	----	----	----	----
Atomic Brand Latent				
28. Velvet Black	----	----	----	----
29. Ash Gray	----	----	----	----
30. Pure White	----	----	----	----
31. Philadelphia Red	----	----	----	----
32 Silver Metallic	----	----	----	----
33. Gold Metallic	----	----	----	----
34. Copper Metallic	----	----	----	----
35. Fire-red Bronze	----	----	----	----
PEARLPRINT, Latent				
36. Silver-Black	----	----	----	----
37. Silver-Red	----	----	----	----
Magnetic Latent				
38. Silver-Black Magnetic	----	----	----	----
39. Silver-Red Magnetic	----	----	----	----

	quot	hebdo	mensue	pende
Fluorescent Latent				
40. Fluorescent Black	- - - -	- - - -	- - - -	- - - -
41. Fluorescent White	- - - -	- - - -	----	----
CRP, Magnetic Latent				
42. Black Magnetic	----	----	- - - -	----
43. White Magnetic	----	----	----	----
44. Gray Magnetic	----	----	----	----
45. Red Magnetic	----	----	----	----
46. Silver Magnetic	- - - -	----	----	----
47. Gold Magnetic	- - - -	----	----	----
CRP, Ioprint Latent				
48. Ioprint Black	----	----	----	----
49. Ioprint Brown	----	----	----	----
50. Ioprint Red	----	----	----	----
COIN BOX, Latent				
51. Coil Box Powder	----	----	----	----
52. Galvanic Latent	- - - -	----	----	----
REDWOP				
53. Redwop	----	----	----	----
SIRCHIE, HiFi Volcano Latent				
54. Silk Black	- - - -	----	--_-	----
55. Silver Black	- - - -	----	----	----
56. Gray	----	----	----	----
57. Indestructible White	----	----	----	----
58. Brilliant Red	----	- - -	----	----
59. Silver Metallic	----	----	----	----
60. Gold Metallic	- - - -	----	- - - -	----
61. Copper Metallic	----	----	----	----
62. Analytical Gray	----	----	----	----
63. Galvanic	----	----	----	----

Volcano Heavy Latent

	quot	hebdo	mensue	pende
64. Heavy Black	____	____	____	____
65. Heavy Gray	____	____	____	____

Volcano Safe Cracker, Latent

66. Safe Cracker	____	____	____	____

Divers

67. Dragon's Blood (available from Lightning)	____	____	____	____
68. *Driodine	____	____	____	____
69. *Fluorescent #781	____	____	____	____
70. *Malachite Green	____	____	____	____

Poudre et Pate

71. 'Ultraviolet #831	____	____	____	____
72. *Ultraviolet Fabric Marking #374C	____	____	____	____
73. *Coin Lacquer #359CL	____	____	____	____
74. *Ultraviolet Paste *359P	____	____	____	____
75. *Ultraviolet Clue Spray	____	____	____	____
76. *Ultraviolet White Powder #747UV	____	____	____	____
77. *Ultraviolet Neutral Paste #748UV	____	____	____	____
78. *Ultraviolet Neutral Paste #749U	____	____	____	____

2 POUDRES DACTYLOSCOPIQUES CLASSÉES SELON LEUR APPARENCE

1. Noire	quot c l	hebdo c l	mensue ☐	pende_____(a)
2. Grise	quot ☐	hebdo ☐	mensue ☐	pende_____(a)
3. Blanche	quot ☐	hebdo c l	mensue ☐	pende_____(a)
4. Rouge	quot ☐	hebdo ☐	mensue ☐	pende_____(a)
5. Orange	quot ☐	hebdo c l	mensue ☐	pende_____(a)

6. Métallique	quot	☐	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
7. Non métallique	quot	c l	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
8. Magnétique	quot	☐	hebdo	c l	mensue	☐	**pende**	_____	**(a)**
9. Fluorescente, quelle1 couleur? (_____)	quot	☐	hebdo	c l	mensue	c l	**pende**	_____	**(a)**
10. Autres(_____)	quot	c l	hebdo	c l	**mensue**	☐	**pende**	_____	**(a)**

3. AUTRES EXPOSITIONS

1. lode	quot	☐	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
2. Cyano-acrylates (crazy glue)	quot	c l	hebdo	☐	mensue	c l	**pende**	_____	**(a)**
3. Ninhydrine	quot	☐	hebdo	☐	mensue	c l	**pende**	_____	**(a)**
4. Violet de cristal	quot	☐	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
5. Soufre	quot	c l	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
6. Nitrate d'argent	quot	c l	hebdo	☐	**mensue**	c l	**pende**	_____	**(a)**
7. Disulfide de molybdene	quot	n ☐	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
8. Platre dentaire et alcool de laque	quot	c l	hebdo	c l	**mensue**	☐	**pende**	_____	**(a)**
10. Acids hydrochlorique et nitrique	quot	c l	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**
11. Agents utilizés à dévélopper et empreinter les photographs	quot	c l	hebdo	c l	**mensue**	☐	**pende**	_____	**(a)**
12. Autres	quot	☐	hebdo	☐	**mensue**	☐	**pende**	_____	**(a)**

13. Depuis 1981 est-ce que votre exposition aux agents **indiqués** en haut **était** pour la **pluspart** dans le terrain ou la laboritoire?

14. A votre avis, **dans combien** de cas **avez** vous **participé** qui requis la poudre: en moyenne, par mois?

Appendix B

Physician Administered Questionnaire

C. OCCUPATIONAL **EXPOSURE SINCE, OR** PRIOR TO, **JOINING** THE **POLICE FORCE. (EXCLUDING IDENT EXPOSURE)**

Occupation # _____ (Use separate sheet for each occupation)

Location _____

From 19 _____ to19 _____

Occupation # _____ (Use separate sheet for each occupation)

Location _____

From 19 _____ to 19 _____

Class of Exposure	Maior component	Extent of Exposure daily	weekly	monthly	# of Years
1. Metal fumes or dusts	_____	☐	c l	☐	☐
2. Pesticides **incl** herbicides	_____	❑	c l	☐	☐
3. wood preservatives	_____	c l	c l	☐	☐
4. Soivents	_____	c l	c l	☐	☐
5. Paints	_____	☐	☐	☐	☐
6. Combustion products	_____	☐	c l	☐	☐
7. Tar and tar products i.e. creosote.	_____	☐	☐	☐	☐
8. Asbestos	_____	☐	c l	☐	☐
9. Intense vibration **Intense** cold	_____	☐	☐	☐	☐
10 Other	_____	❑	❑	☐	☐

D. **Health** Status

Have you ever sought the advice of a medical doctor for any of the following conditions, and which was present for at least 6 months.

Diseases of the:

1. Circulatory system Yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

2. Respiratory system yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

3. Digestive system yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

4. Urinary tract and reproductive system Yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

5. Nervous system yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

6. Hormonal and metabolic system yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

7. Blood and blood forming organs. yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

8. Skin and subcutaneous tissue Yes ☐ no c l

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

9. Musculoskeletal and connective tissue yes ☐ no c l

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

10. Have you ever had mental disorders? Yes c l no c l

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

11. Have you ever had, or have been diagnosed as having cancer? yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

12. Have you ever been seriously injured or poisoned, requiring medical help. yes ☐ no ☐

If yes, specify: _____, duration from _____ to _____

ICD Code # ☐☐☐☐☐

13. Can you recall any other condition(s) which lasted for a minimum of 6 months and which has not been dealt with? Yes c l no c l

If yes, specify: _____, duration from _____ to _____

ICD Code #

14. How many children do you have? c l

15. Have you had a child with a birth defect? Type_____

Sex: _____

Date: _____

16. Has your spouse, or you, ever had a miscarriage?

Number.

Date: _____