OCCUPATIONAL EXPOSURES AND AIRWAYS DISEASE : A study to develop and evaluate a questionnaire for eliciting occupational exposure history for community based studies.

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À Frédéric, Myriam et Vincent

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Abstract

The role of occupational exposures in the genesis of airways disease may be underestimated in workforce studies because of the“ healthy ” worker effect, due either to those with more resistant airways entering a workplace or those with work related airways disease changing or quitting their job. Both effects are minimised in population-based studies which have the disadvantage that occupational exposures are of necessity self-reported. The overall goal of this research was to develop and validate an instrument to measure occupational exposures in epidemiologic research in general population studies of airways disease.

The study hypothesis was that self-reported exposure information pertinent to airway disease was as accurate a reflexion of exposure as information derived from industrial hygiene expertise. To examine the study hypothesis, use was made of occupational questionnaires completed by 338 adults participating in a Montreal community based study. A list of 927 reported jobs was submitted for coding of exposures to 2 industrial hygienists working independantly to code exposures.

Intra-subject reproducibility of questionnaire information, assessed using a test-retest approach in 33 subjects showed good overall concordance for most components of the work history. Inter-rater reliability (between hygienists) was also good for some categories of exposures.

Validity analysis of self-reported exposure, using as a reference criterion the exposure coding by either hygienist lead to poor values for sensitivity and phi-coefficients but not for specificity. Slight improvement in sensitivities and phi-coefficients was found for latest job.

While smoking, a family history and atopy were determinants of asthma in multivariate models, significant exposure response relationships were obtained only with self reported exposure, not with exposures coded by either hygienist. Nevertheless the coefficients and confidence intervals for self -reported exposures were, for most part, in the same direction and range as those for exposure coded by the 2 hygienists.

These results are consistent with the study hypothesis that self reported exposures perform comparably, possibly even better than exposures based on industrial hygiene expertise in characterising exposure response relationships for airway disease in community based studies.

Résumé

Le rôle des expositions professionnelles dans le développement des problèmes respiratoires de type asthmatique peut être sous-estimé dans les études en milieu de travail. Ces études peuvent être biaisées par le "syndrome du travailleur en santé" de 2 façons: par la sélection lors de l'embauche de travailleurs plus en santé que la moyenne, et par le départ de certains pour problèmes de santé. Les études de communautés questionnant l'association entre l'asthme et les expositions en milieu de travail permettent d'inclure les personnes qui auraient quitté leur emploi à cause de ces problèmes respiratoires. Cependant, ces études pourraient être entachées d'erreur de classification puisqu'elles puisent leurs informations professionnelles auprès des personnes faisant partie de l'étude. L'objectif de cette recherche était de développer et valider un instrument permettant de mesurer les expositions professionnelles dans les études épidémiologiques de communauté portant sur la santé respiratoire (asthme et conditions s'y rapportant).

L'hypothèse de recherche était que les informations concernant les expositions professionnelles, provenant des personnes concernées, constituaient des informations aussi justes que celles provenant d'une évaluation de l'histoire de travail par des hygiénistes industriels. Cette étude a permis de recueillir les informations nécessaires (n=338 sujets, 927 emplois) pour investiguer cette hypothèse.

Une assez bonne reproductibilité intra-sujet et entre hygiénistes fut trouvée pour certaines expositions. Les mesures de sensibilité et du

coefficient-phi se sont avérées décevantes pour les expositions professionnelles provenant des personnes concernées et utilisant comme référence les expositions codées par les 2 hygiénistes, Une légère amélioration fut détectée en analysant uniquement le dernier emploi.

Le tabagisme, l'histoire familiale et l'atopie se sont avérées être des variables significatives dans les modèles multivariés. L'exposition, quant à elle, s'est avérée significative uniquement lorsque rapportée par les sujets. Cependant, la majorité des rapports de cotes, générés par les expositions rapportées par les sujets ou par les hygiénistes, ainsi que leurs intervalles de confiance, se situaient dans les mêmes étendues. Les résultats de cette étude tendent à soutenir l'hypothèse que les expositions rapportées par le sujet sont valides dans l'estimation de l'association "expositions" - "maladie" pour les études de communautés portant sur les problèmes respiratoires de type asthmatique.

Originality

The elements of this thesis which constitute original contribution to knowledge are:

i) Validation of self-reported exposures information pertinent to the study of work related asthma and asthma-like conditions.

ii) Provision of exposure information potentially useful in a semi-quantitative exposure estimation in a Canadian context.

iii) Demonstration that inter-rater differences between industrial hygienists relate to different thresholds each providing complementary information.

iv) Demonstration of the advantages of a new measure of agreement, Aickin's alpha, versus the more usually used Kappa statistic in evaluating agreement.

INTRODUCTION

Chapter 1: Introduction and outline

1.1 Context

The role of occupational exposures in the genesis of airway disease may be underestimated in workforce studies because of the " healthy-worker effect "; due either to those with resistant airways entering a workforce or those with workrelated airways disease quitting their job. Both these effects are minimised in community or population-based studies, which however have the disadvantage that occupational exposures are of necessity self-reported.

1.2 Outline

The overall goal of the research reported in the thesis is to develop and validate an instrument to measure occupational exposures in epidemiologic research in general population (as opposed to workforce based) studies of airway disease. Such an instrument was expected to be useful in community or population-based studies designed 1) to estimate the population burden of airway disease (in particular asthma and asthma-like conditions) attributable to occupational exposures in the genesis of airway disease (including asthma and asthma-like conditions) in population and ii) to investigate the role of multiple exposures.

BACKGROUND

Chapter 2 Community based studies as a source of information about the workplace

2.1 Measurements of exposure in occupational epidemiology: argument for better objective exposure measurements

Most research, whether epidemiologic or clinical, involves comparisons among groups. Comparisons often also involve estimating and comparing the magnitude of an association between a putative causal factor and its effect in the group compared. The putative causal factor is usually referred to as the "exposure" and the effect as the "outcome" of interest. The strength of such associations, expressed quantitatively in the form of an exposure-outcome (response) relationship, is an important factor in establishing causality (Hill,1965). Nowhere is this more important than in the context of occupationally related airway disease, acute or chronic, the subject of this thesis. For example, chronic obstructive pulmonary disease (COPD) and asthma are both conditions which occur in the general population and with increased frequency in association with certain occupational exposures. The clinical features do not usually permit the work related case to be distinguished from the non work related case so that workrelatedness can only be established by demonstrating exposure response relationships for those with work exposure, either any vs those with no exposure, or by showing increasing rates with increasing exposure levels.

Gordis (1979) stated that "a major challenge in epidemiologic research today is to assure the quality of the "raw data" ... Improvements in study design or in analytic techniques cannot compensate for data of questionable quality generated by epidemiologic investigations". The validity of raw data used to estimate exposure and measure outcome can to a certain extent be assured by the use of standardised methods, validation of new and/or non standard methods and by verifying the reliability of questionnaires and interviews that are invariably used to gather information. Rothman (1986) echoes this view when he states that "an epidemiologic study is viewed as an exercise in measurement. The overall goal of an epidemiologic study is accuracy in measurement: to estimate the value of the parameter that is the object of measurement with little error".

Baumgarten and Oseasohn (1980) in reviewing 48 randomly selected articles dealing with occupational health reported that in only 17.5% was the exposure defined in terms of severity and duration; in only 57.1% of these articles were the methods used for environmental measurements described and in only 28.6% were these methods validated.

2.2 Occupational exposures and chronic airways disease (COPD)

The clinical syndrome of chronic obstructive pulmonary disease (COPD) is usually defined in life by lung function markers of irreversible airflow limitation, and at autopsy by the presence of emphysema with or without bronchitis and/or small airway disease. Despite the plausibility of airborne agents encountered in the workplace being implicated, only the role of tobacco smoke was generally accepted as being causal by as eminent an authority as the US Surgeon-General, even as recently as 1985 (Department of Health and Human Services: a report of the Surgeon-General 1985). Since then, evidence implicating occupational exposures in the genesis of chronic airways disease has come from community based studies which often have greater power, because of large study populations, compared for instance to the workforce based studies where the size of the workforce is often limited. (Oxman et al, 1993, Becklake, 1985, 1989a, 1989b; Lebowitz, 1977; Korn, 1987). In addition, community based studies are not compromised by the "healthy" worker effect which inevitably hampers the workforce based study. Nevertheless the consistency of the evidence from community based studies is surprising, given that exposure in such studies is invariably based on self-reported questionnaire information. This is likely to be incomplete for occupational exposures not readily detected by sight or smell, leaving imprecise exposure assessment and misclassification in respect to exposure. Standard statistical analysis is usually based on the assumption that the explanatory variables are known without or with little error, and it has long been realised that departures from this assumption will in most instances lead to underestimation of the true regression coefficients and of other measures of association and will thereby weaken these measure of association. (Armstrong, 1992)

2.3 Occupational exposures and asthma

2.3.1 Asthma and asthma like reactions: definitions

Asthma has been defined a "disorder of function characterized by widespread partial obstruction of the airways which varies in severity and is reversible, either spontaneously or as a result of treatment, and is not due to cardiovascular disease" (American Thoracic Society). Most subsequent definitions have retained the major emphasis on reversibility, though the terms "airway narrowing" or "air flow limitation" have replaced the term "airway obstruction" in keeping with the modern pathophysiologic concepts (cited in Becklake, 1990). A slightly different emphasis appeared in the American Thoracic Society's definition of asthma, first promulgated in 1962 and updated in 1987. That definition referred to the fact that asthma was a disease characterized by increased responsiveness of the trachea and bronchi to various stimuli (Becklake,1990). The nature of the condition, in particular the variability in its clinical manifestations, poses certain problems related to establishing its association with exposure: though the initiation of an asthmatic reaction may be dose related to exposure, its subsequent manifestations in the sensitised individual are classically provoked by much lower exposures.

2.3.2 Asthma and asthma-like reaction

There are a number of known and suspected determinants of asthma in populations. Some are host factors (age, gender, atopy);

others are environmental. The term "environmental factors" is broad and includes as well as community air pollution due to urbanization and industrialization, exposures encountered in the workplace and in the home. (Chang-Yeung and Malo 1995).

2.3.3 Agents implicated in occupational asthma

In contrast to COPD in which the pertinent exposures usually occurred many years previously and usually did not evoque acute airway reactions at work which would alert the individual to their cause, asthmagenic agents in the workplace are usually though not always recognised as workplace related by the affected individual. A large number of agents encountered in the workplace have been implicated as causes of occupational asthma. These have for the most part been identified in workforce based studies. They have usually been agent specific, related to particular processes or products for instances, isocyanate exposure in foam production and painters, flour exposure in bakers, trimellitic anhydride exposure in paint makers (Chang Yeung, 1990).

2.3.4 Secular trends in occupational asthma

Concern has been expressed in several recent reviews that occupational exposures may be contributing to what appears to be an increasing asthma incidence and mortality especially in younger persons (Wigle,1988). Estimates of prevalence of occupational asthma based on workplace studies are likely to lead to an underestimation of both its cumulative incidence and its prevalence because of health selection and turnover due to asthmatic symptoms. In fact, a great deal of attention has been given to the problem of the healthy worker effect which clearly operates in morbidity studies (Eisen,1995). According to Eisen (1995), at least two types of survivor bias can occur in morbidity studies: that due to leaving work because of health problem and due to transferring jobs. Compensation board case records, another source of information, also focus on established disease and may fail to identify early cases or cases occurring in workplaces not known to be at risk for exposure to recognised asthmagens. It has been estimated that in the United States in 1979 (Salvaggio,1979) 2% of asthmatics suffer from a work related disease, and in 1980 in Japan 15% (Kobayaski,1980). Of 228 new claims for occupational lung disease accepted in 1988 in Quebec, 81 (36%) were for occupational asthma (Malo, 1990). In the United Kingdom, in 1989 amongst the 2101 cases of work-related respiratory illnesses reported by physicians, 26% were classified as asthma (McDonald,1990).

Well over 200 substances encountered in the workplace have been reported to give rise to work related asthma (Chang-Yeung,1990). While many of these substances have been confirmed by detailed challenge studies in individual cases to be the agents responsible for occupational asthma, others have been less well studied (Chang-Yeung,1990). In four community based studies a statistically significant relationship was found between wheezing and exposure to specific pollutants and/or to a dusty environment in the workplace; odds ratios varied between 1.3

and 3.1 (Becklake,1990). A recent community based Canadian study has resulted in population proportion estimates of workrelated asthma among adults aged 20 to 44 years ranging from 23 to 29% (Becklake et al,1996).

2.4 Community based studies of asthma prevalence/incidence and role of environmental factors such as occupational exposures

Several conferences have pointed to the need for descriptive population studies of the distribution and determinants of asthma as a basis for public health planning; all have emphasized the importance of examining the contribution of environmental exposures. For example, in 1988, the Laboratory Centre for Disease Control (LCDC) of Health and Welfare Canada held a National Workshop on Asthma (Wigle,1988) to discuss research needs and priorities. It was concluded that mortality and morbidity studies of asthma were needed, as well as studies to investigate the role of environmental determinants of asthma. In 1990 a workshop, supported by EPA, NHLBI, NIOSH, NIEHS and ATSDR (Chest 1990, 98:5 Supp) on environmental and occupational asthma was held in California. In the Epidemiology and Surveillance committee there was a consensus on the need for community based research into the prevalence and/or incidence with a view to exploring environmental risk factors including occupational exposures. Such studies, it was thought, would be able to provide information on the frequency with which asthma and asthmalike symptoms are related to occupational exposure, in the same way as they have done for markers of chronic airflow limitations such as FEV_1 level or rate of annual decline.

Several community-based studies, not designed to answer the specific question of the contribution of professional exposures to the genesis of asthma, have nevertheless showed associations between asthma or asthma-like symptoms and various occupational exposures (Becklake,1989b). Community based studies in several European countries and in the US, most designed to evaluate the ill health consequences of community air pollution, have been completed (Kauffman, 1982; Lebowitz, 1977; Korn, 1987; Krzyzanowski, 1986,1988) and have also provided information on the role of occupational exposures. Community-based studies provided useful information to highlight relationship of asthma with occupational exposures and given that these studies are less compromised by the healthy worker effect, they should continue to contribute to knowledge in estimating the importance of those exposures in the genesis of asthma and asthma-like conditions in population. Nevertheless, improved tools to give a better estimate of occupational exposures to known or suspected to be asthmagenics would be of value in establishing the association of occupational exposures with asthma and asthma like conditions.

2.5 Synthesis

Community based studies have been able to establish significant exposure response relationships between symptoms of chronic airway disease (COPD) and occupational exposures. Less attention has been focussed on the asthma symptoms and their relation to known or suspected asthmagens encountered in the workplace.

Community based studies avoid selection bias into and out of jobs with exposure, giving the opportunity to estimate more adequately the associations between workplace exposures and asthma and asthma-like symptoms. Nervertheless, reducing selection bias will not necessarely lead to reduction in misclassification errors. Objective, valid and easily applied measurements are needed for future community-based studies.

Chapter 3: Sources of exposure information in occupational epidemiology

3.1 General comments

In population based (as opposed to workforce based) studies, detailed information on specific exposures is rarely available, and to overcome this lack of information other methods are used to characterize the exposure of the individuals who make up the population under study. These include questionnaires, used to establish the presence of current or previous exposures, and an estimation of exposure by means of "job exposure matrix" in qualitative and semiquantative terms (Rosenstock, 1984; Hoar,1980; Gérin, 1985; Siemiatycki, 1986) . Both are discussed below.

The validity of exposure information so gathered, ie the extent to which it agrees with a "gold standard", can be analysed in terms of the commonly used concepts of construct, content, and criterion validity (Last, 1995). Construct validity refers to a wide range of approaches used when what we are trying to measure is a "hypothetical construct". Content validity, refers to the representation of the dimensions and domain of the concept of interest and criterion validity, refers to the correlation of a scale with some other measure, ideally a "gold standard" which has been used and accepted in the field (Last, 1995; Streiner and Norman, 1989). Of these, criterion validity is the most important in the present context. These concepts are described in greater detail below in section 3.3.3 and definitions are given.

3.2 Measurements of exposure by questionnaires

Many epidemiological studies of the relationship of disease to work use information on work history obtained by questionnaire from study subjects. The objective is usually to obtain an estimate of a person's occupational exposures based on a detailed occupational history (categorisation of job titles or types of industry). The criterion validity of self reported work history, eg the agreement between self reported occupational history and employer or governmental records has been addressed in several studies. Baumgarten et al. (1983), Bourbonnais et al. (1988) and Brisson et al (1991) all found general agreement to be of the order of 80% between these different sources.

However, Rona and Mosbech (1989) showed less repeatability in the process of coding the occupational status for previous jobs than for current jobs, and considered that the main component of disagreement was in coding of the job rather than lack of consistency in the subject's own description of his-her job. They felt that better training in the process of coding variables related to occupation would increase the reliability of the coded information.

In addition, information on exposure cannot usually be obtained directly from the work history and job titles have to be processed in some way to obtain an estimation of a worker's exposure to specific agents. For this reason, some researchers (Rosenstock et al, 1984; Joffe, 1990) favor the use of questionnaires containing lists of the specific contaminants of interest, as a way to obtain estimates of past and current exposure. Certain difficulties have also been identified using this approach.

Despite the evidence of criterion validity of a self-reported occupational history, referred to above (good agreement between reported occupational histories and company records (Baumgarten et al,1983; Bourbonnais et al,1988)), less satisfactory information appears to be provided by questionnaires that were designed to characterize the exposure directly, eg from check lists with specific chemical exposures on which the subject is asked to check whether or not she or he was exposed to the given contaminant Thus Rosenstock et al (1984) found a sensitivity of 75% and a specificity of 70% for self completed questionnaire compared with hygienist assessment of exposures based on work history analysis. The positive predictive value was 83% for exposures in the current jobs, when compared to the estimates made by an occupational hygienist. However it may be less easy to assess cumulative lifetime exposure, usually the focus of interest in occupational studies particularly for chronic conditions. Bond et al (1988) in a retrospective study of validation of work histories obtained by telephone interviews, found that respondents (the subject himself, or, if he was deceased or otherwise incapacitated, a spouse, an off-spring, a sibling, another relative, or a friend, was contacted, in that order) recalled overall only 2.6% of the chemicals they had ever worked with during their employment period. Respondents were prompted to list chemical exposures they ever worked with. At no time did the interviewers suggests specific agents. It was also found that recall for agents was different ranging from 0.5% for heat to 10.7% for chlorine. Joffe (1990) found results slightly different in a structured questionnaire used in a printing industry; sensitivity ranged from 26.3% to 53.3% and specificity from 52.4% to 99.7% with certain agents being less readily identified or recalled by respondents than others. None of these questionnaires, using lists of chemical agents, have been validated in Quebec where labour unions have shown major concern with workers education. In other words, conclusions concerning validation carried out in other work forces may not be pertinent to the reality of Quebec's workers.

3.3 Methods for validation of questionnaire information

3.3.1. Overview

According to Streiner and Norman (1989) " the act of measurement is an essential component of scientific research ... ". Once the measuring instrument is constructed, it is necessary to inquire whether the instrument is useful scientifically. This exercise is usually spoken of as determining the reliability and validity of the instrument.

3.3.2 Reliability

Before assessing the evidence that an instrument is measuring what it is intended to measure i.e. its validity, it is first necessary to gather evidence that the instrument yields measurements in reproducible fashion. That is, a first step in providing evidence of the value of an instrument is to demonstrate that measurements obtained in individuals on different occasions, or by different observers produce the same or closely similar results. Importance of reliability of measurements was described by Fleiss (1981) "The elegant design of a clinical study will not overcome the damage caused by unreliable or imprecise measurement. The requirement that one's data be of high quality is at least as important a component of proper study design as the requirement for randomization, double blinding, controlling when necessary for prognostic factors, and so on". The concept of reliability is further refined in measurement theory. Observed scores contain both " real " variation between subjects and error. Reliability is the proportion of the observed variance that is attribuable to the true score differences between subjects. According to Streiner and Norman (1989), there are number of ways in which reliability measures can be obtained. Some broad definitions are given by these authors as follows:.

Internal consistency: Measures of internal consistency are based on a single administration of the measurement tool so it is reasonable to expect that scores on each item would be correlated with scores on all other items. Different coefficients can be used to describe this agreement, for example Cronbach's alpha, the Kuder-Richardson coefficient, or split halve correlations. All those coefficients yield similar results. Since the method involves only a single administration of the test, such coefficients are easy to obtain. They are more useful in psychometric instruments that contain a large number of items , which is not the case in this study. However, such coefficients do not take into account the variation from day to day or from observer to observer, and thus lead to an optimistic interpretation of the true reliability of the test.

Stability: There are a variety of ways of examining the reproducibility of a measure administered on different occasions. Inter-observer and intra-subject can be investigated. As a minimum, any decision regarding the value of a measure should be based on some information regarding stability of the instrument. Internal consistency, in its many guises, is not a sufficient basis upon which to make a reasoned judgment (Streiner and Norman,1989).

As stated previously, reliability is usually quoted as a ratio of variability between individuals to the total variability in the scores; in other words, the reliability is a measure of the proportion of the variability in scores which is due to true differences between individuals. Thus, the reliability is expressed as a number between 0 and 1, with 0 indicating no reliability, and 1 indicating perfect reliability.

One difficulty with the reliability coefficient is that it is simply a number between 0 and 1. Several authors have made different recommendations regarding the minimum accepted level of reliability. According to Streiner and Norman (1989), internal consistency (described before) should exceed 0.8, while stability of a measure, which is examined in this particular study, should produce indices of Kappa (see below section **on Measures of agreement for categorical variables** for definition of Kappa) greater to 0.5 to be consider reliable. Feinstein gives guidelines that differ slightly from those given by Streiner and Norman. In fact, according to Feinstein a value of kappa between 0-.20 shows slight agreement; between .21-.40 fair agreement; .41-.60 moderate; .61-.80 substantial and finally between .81-1.00 almost perfect agreement. Fleiss (1982) uses values proposed by Landis and Koch (1977): values greater than 0.75 or so may be taken to represent excellent agreement beyond chance, values below 0.40 or so may be taken to represent poor agreement beyond chance, and values between 0.40 and 0.75 may be taken to represent fair to good agreement beyond chance.

Measures of agreement for categorical variables

Several indices, whether for categorical or numerical variables, have been proposed for the quantification of reproducibility (Nunally, 1970; Fleiss,1982; Kelsey, 1986; Streiner and Norman, 1989; Aickin, 1990). Indices that are pertinent in this study (indices applicable in the context of categorical variables) will be discussed in greater details. Others will be briefly examined in the next section.

Overall agreement

Overall agreement or observed agreement (Kelsey, 1986) is the proportion of subjects classified as having or not the characteristic according to both raters. This measure is very strongly influenced by the relative frequencies of positives and negatives. If there is a preponderance of normal or abnormal cases, there will be a high agreement by chance alone. As some authors (Streiner and Norman, 1989) stated, this expression of reproducibility as a percentage overall agreement does not take into account chance agreement, this may lead to erroneous conclusions about the quality of measurement.

	Observer A	
Observer B	a	b
	c	d

% overall agreement= (a + d) / (a + b + c + d)

Cohen's Kappa

The kappa coefficient (Cohen,1965) is appropriate for categorical variables. This coefficient has the important characteristic of correcting for chance agreement that would be expected to occur if the two classifications were totally unrelated. As described by Kelsey (1986), chance-expected agreement for a binary variable is given by $p_1p_2 + (1 - p_1)(1 - p_2)$, where p_1 is the proportion classified as having the characteristic by the first imperfect classification, and where *p2* is the corresponding proportion for the second imperfect classification. The kappa coefficient is defined as follows:

		Observer A +	Observer A -
Observer B	+	P_{11}	P_{12}
	-	P_{21}	P_{22}

where " observed agreement " = $P_{11}+P_{22}$

and " expected agreement " =

$$((P_{11} + P_{12}) * (P_{11} + P_{21})) + ((P_{21} + P_{22}) * (P_{12} + P_{22})) / (P_{11} + P_{12} + P_{21} + P_{22})^2$$

K= (Observed agreement - Expected agreement)/(1 - expected agreement)

When the two measurements agree only at the chance level, the value of kappa is zero. When the two measurements agree perfectly, the value of kappa is one. A criticism of the Kappa coefficient was made by Aickin (1990) "this chance-corrected measure introduced by Scott (1955) and extended by Cohen (1960) penalizes raters who tend to agree, because it uses their observed marginal probabilities to correct for chance agreement, and this correction term will be larger as the two marginal distributions tend to agree".

Alpha agreement parameter

The alpha agreement parameter (Aickin, 1990) is a new measure of agreement and provides a clearer view of the population characteristic of "agreement for cause". This parameter is defined by Aickin (1990) as the proportion of a population of items that are classified identically " for cause " by two classifiers, the remaining items being classified at random. Aickin (1990) argues that in the basic formulation of kappa-like statistic $(P_o - P_e) / (1 - P_e)$, there are logical inconsistencies in defining and then estimating the components P_o (observed agreement) and P_e (expected agreement). Usually P_o is taken to be a sum of probabilities over cells where agreement is defined to occur. P_e is then taken to be similarly defined, under the assumption that the classifying mechanisms are acting independently. However, P_e is generally defined in terms of certain marginal probabilities that occur in a model in which both chance and causal agreement are present. Consequently, P_e tends to include not only the random agreement that is intended to be captured, but in addition some of the agreement for cause, which is not intended. Part of the purpose of this new predictive model is to separate these two sources and to include only the former in the definition and estimation of P_e.

Computational details given by Aickin (1990) are given in appendix 1.

Methods for numerical data

The Pearson product-moment correlation

The Pearson product-moment correlation is based on regression, and is a measure of the extent to which the observations made by two observers can be fitted on a straight (regression) line. Streiner and Norman (1989) argue that Pearson's correlation is an inappropriate and liberal measure of reliability because even if the intercept is not equal to 0.0 and the slope not equal to 1.0, the value of the correlation could be 1.0 (if the predominant source of error is not random error).

Analysis of variance and Intraclass correlation coefficient

In order to examine variability in between subjects, and/or observers and random error, the technique of analysis of variance (ANOVA) is commonly used. The variability due to subjects can be calculated by determining how much the mean score for each subject differs from the grand mean (the mean of all scores of all subjects). Variance due to the observers can be calculated by subtracting the grand mean from the mean of each observer, and squaring the difference. An error variance is also calculated. Estimates of the various parameters of variation are then made by appropriate subtractions. The reliability coefficient is defined as the ratio of variance between subjects to error variance and variance between subjects and observers (or raters) and is expressed as an intraclass correlation coefficient.

Generalizability theory

Generalizability theory is an extension of the ANOVA in such a way that instead of making the simplistic assumption that all variance in scores can be divided into first 2 components of true and error variance, it tries to obtain the most precise estimate of the score that person should have if there were no sources of error contamination in results. Streiner and Norman (1989) summarize the concept of Generalizability theory as follows: "Although generalizability theory is difficult to comprehend, the value of the methods lies in the reinterpretation of the nature of measurement afforded by the theory. Instead of conceptualizing a measurement as a sum of "true" score and "error" score, generalizability theory forces a critical examination of the sources of measurement error. In addition, the effects of particular strategies to reduce error, based on multiple observations, can be directly estimated". Soeken et al (1986) argue that the use of an approach such as G-study would allow for the identification of multiple sources of variability. Incorporating the several identified facets in the design of the generalizability study could improve understanding and interpretation of a rating index and assist reseachers to design the most efficient procedures for the use of the index. Although measures of reliability such as kappa or weighted kappa have important uses with observational or rating data, it should be clear that examination of the sources of variability relevant to the conditions under which a measure will be used are also needed . According to Streiner and Norman (1989), this theory first devised by Cronbach et al. (1972), is an elegant and practical way to approach issues of reliability and will probably be used more frequently in the future.

3.3.3 Validity

Validity of measurements is defined by Miettinen (1985) as a lack of bias. Kelsey (1986) stated that "in order to obtain something more than an impressionistic idea of the quality of one's measurement of a given variable, it is useful to calculate quantitative indices of the accuracy (validity) of measurement". According to Last (1995), validity expresses the degree to which an instrument measures what is purports to measure. The three major types of validity are described: content, construct and criterion.

Content validity refers to whether the items in the scale adequately represent the dimensions and domain of the concept of interest. An example could be derived from psychology with techniques intended to measure IQ. The decision is basically a judgmental one, but the plan and procedures of instrument construction help to assure its validity (Nunnally, 1970). Defining the domains and dimensions of the concepts begin with a thorough search of the literature. The process may also include a systematic questioning of experts. The large pool of potential items is gradually narrowed to produce an instrument that is sufficiently comprehensive and of an appropriate length to be practical.

Construct validity: Last (1995) defines construct validity in terms of correspondance of the measurement to theoretical concepts (constructs) related to the phenomenon under study._

Criterion validity: Beyond content development, it is nessary to further demonstrate the extent to which the instrument under consideration, measures what it was intended to measure. One way to do this is to assess the degree to which an instrument performs relative to other measures or in situations that are consistent with theoretical expectations. The most convincing evidence of the validity of a new instrument would be to show a strong correlation or concordance between the results based on that instrument with results on an existing "gold standard", preferably a universally accepted valid measure, provided such a standard exists. Often this is not so, and when a less than gold standard is used, this must be taken into account in the interpretation of the findings. Criterion validity is usually divided into concurrent and predictive validity. Concurrent validity refers to the correlations of the new "scale" with the criterion measure, both of which are given at the same time (Streiner and Norman,1989). Predictive validity is expressed in terms of the ability of the new score to predict the criterion (Last,1995). In the present study, concurrent validity has been investigated.

Sensitivity, specificity, phi-coefficient

Criterion validity as described by Streiner and Norman (1989) is the correlation of a scale with some other measure, ideally a "gold standard" which has been used and accepted in the field. In fourfold tables where criterion validity is examined with dichotomous variables, analysis can be made using either the indices of sensitivity and specificity, or some measure of correlation such as the phi-coefficient. Sensitivity is defined as the proportion of those who "truly" have the characteristic that are correctly classified as having it by the measurement technique (sensitivity = a/ (a+c). Specificity is defined as the proportion of those who "truly" do not have the characteristic that are correctly classified as not having it by the measurement technique (specificity = d/ (b+d). Phi-coefficient (Fleiss,1981) which is a measure of correlation derived from a 2X2 table is related to the Chi-square and, can be calculated in a 2X2 table using the equation:

$$\phi = ad - bc \ / \sqrt{[(a+b)(c+d)(a+c)(b+d)]}$$

	" Gold standard "	
Instrument	a	b
	c	d

Phi coefficient was derived because the Chi-square statistic is a statistical test and is affected by sample size (ie Chi-square is increased if we simply double all entries in the 2X2 table, but leaves the sensitivity and specificity unchanged). Values of Phi close to zero indicate little if any association, whereas values close to unity indicate almost perfect predictability, and as a rule of thumb, any value less than 0,30 or 0.35 may be taken to indicate no more than trivial association (Fleiss,1981).

3.4 Job exposure matrix or Occupational title-based system

3.4.1 Definition and uses

A job exposure matrix or JEM is a term used to describe a data base containing occupations and/or job titles linked to the exposures likely to be experienced in particular jobs in various industrial sectors. Occupational job titles, often stratified by industry, are defined independently of exposures (Heederik,1990). The JEM then enables the researcher to place probabilities that specific occupational exposure(s) occur(s) in a certain job in a certain sector of industry. The JEM has a 2 dimensional structure with industry specific occupation groups or jobs (or job titles) on one axis and specific exposures on the other axis (Heederik,1990). A JEM provides an alternative to self-reported exposure. According to Hoar et al. (1980,1983) the JEM allows reserchers to translate job and industry data into exposure data.

Job exposure matrices have been used to test (Pannett et al, 1985) as well as to develop hypotheses (Siemiatycki et al, 1981; Gérin et al,1985) in workforce studies. For instance, Pannett et al (1985) in a case-control study of cancer of 312 patients with carcinoma of the bronchus and 1221 patients with other types of cancer (controls), compared estimates of exposure to five known or suspected carcinogens generated by the British JEM with those obtained by detailed review of individual occupational histories by 2 hygienists blind to the case-control status of the subjects. When the matrix was used, exposures were attributed to jobs more frequently than on the basis of individual histories. Lung cancer was significantly more common among subjects classifed by the matrix as having potential exposures to one chemical (chromates), but neither method of assigning exposures produced statistically significant associations with asbestos or polycyclic aromatic hydrocarbons. The authors concluded that the greater accuracy of exposures inferred directly from individual histories was reflected in steeper dose response curves for asbestos, chromates, and polycyclic aromatic hydrocarbons. But, when looking at associations between exposures and carcinoma of the bronchus, tighter 95% confidence intervals were obtained with the matrix than when exposures were estimated directly from the original histories. They also concluded that direct exposure estimation obtained by an expert reviewing individual job histories have little advantage over JEM in population based studies.

Researchers in several countries have developed their own JEM (Heederik et al,1989; Hoar et al,1980,1983; Pannet et al,1985; Siemiatycki et al,1981), based on the industry profile and the use to be made of the matrix. However, Gérin et al. (1985) and Kromhout et al. (1992) pointed out that "a matrix approach is necessarily limited by the fact that, even within narrowly defined occupational groups, exposures may vary widely from worker to worker, owing to differences in processes and specific tasks, from country to country, from plant to plant, and from era to era". In other words, a matrix of this sort may also easily misclassify individuals on basis of exposures, compromising even within plant comparisons of exposure estimates, let alone between industry, and between country comparison of exposure estimates.

3.4.2 Methological issues

The initial optimism about exposures derived from a JEM (Hoar et al,1980,1983) has been tempered by experience, according to several authors, including Pannett et al (1985) , Hinds et al (1985) and Gérin et al (1985). Current knowledge has been summarized by Heederik (1990) and Kromhout (1994). Amongst the important methodologic issues raised are the following:

i) **concerning exposure**: selection of agents included is often arbitrary; inclusion of broad categories is sometimes necessary because single chemical coumponds cannot be distinguished within one occupational group; cut off points of grades of exposure are arbitrary; and there is a need to include patterns in the exposure over time;

ii) **concerning outcome**: the effects may be modified if there is more than one biological route of entry eg via the skin as well as the lungs;

iii) **concerning validity** : validation has not been done for some matrices; in addition, researchers warn against the use of JEM in countries other than the country for which they were developed.

Some of these methodological problems are inherent to the JEM approach, while others such as the validity issue can be addressed. For instance, the validity of JEM's was studied in two small scale surveys in the Netherlands (Heederik,1990). In one study, results using the US Job exposure matrix were compared with results using a Dutch field investigation by 3 hygienists, and with field results obtained in the Occupational Health Service in the construction industry (de Haan,1989). The authors concluded that "only 13 to 38% of the exposures generated by the US job exposure matrix were mentioned in the Dutch survey reports or estimated by at least one of the hygienists. Exposures mentioned by the hygienists or in the survey reports were generally also generated by the job exposure matrix. There were indications that if specific exposures were grouped in broader categories, such as "dusts"or "solvents", the agreement between estimates using the matrix with those of the hygienists increased. In the second study, Kromhout and Heederik (1989) compared the results obtained with the British matrix and the US matrix for the occupations held in 1960 by participants of the Zutphen study. This community based study was started as the Netherlands contribution to a prospective European study of risk factors for heart disease in men. Measurements of respiratory status and an occupational questionnaire were added in the second biannual examination. The agreement between the two matrices, measured with Cohen's Kappa, was generally under 0.4, except for chromium (0.44), cold (K=0.55), pesticides (K=0.44), styrene (K=0.52) and wood dust which was 0.9.

3.5 Semi-quantitative exposure estimation or exposure-based systems

3.5.1 Definition and uses

Semi-quantitative estimation is the process of estimating a subject's exposure on a ranking scale or quantitatively by examining work history. This is usually done by a team of trained coders who use their own expertise and other sources of information to infer the exposure of each subject (Gérin et al,1985). From a list of chemical exposures relevant to the outcome under study, <u>the coder is required to indicate the mode, extent and probability of exposure</u>. This approach can be considered as a refinement of a JEM. It implies more nuances and, in the example quoted, linked the occupational history to a probability of exposure to different chemicals; in this way the exposure index for each subject is personalized. Siemiatycki (1989) analysed the costs and statistical power associated with 5 methods of collecting occupational exposure information (based on job titles) for population based case-control studies of cancer. He concluded that the use of the interview and review of job history by a chemist (semi-quantitative exposure estimation) appears to be more attractive than the alternatives examined, with the use of the interview and a JEM being a good competitor, provided an appropriate JEM was available for the sector of interest.

3.5.2 Methodological issues

Occupational information obtained by interviews and translated into lists of exposures thus appears to be a promising way of evaluating a person's history of professionnal exposures. Gérin (1985) does however refer to the difficulty in validating the process of exposure assessment. One approach to validation would be the replication of the findings by others. Gérin et al (1985) reported substantial agreement between different exposure raters. These results were confirmed by Goldberg et al (1986). In the experience of Kromhout (1989), the agreement between exposure measurements and estimates made by hygienists (adjusted R^2 ranged from 0.25 to 0.67), and between different estimators was no more than modest (intrarater agreement K ranged from 0.23 to 0.50). For instance, comparison between occupational hygienists yielded a kappa value of about 0.5 and a value under 0.5 for all other combinations of estimators (employees, supervisors and occupational hygienists). The major disadvantage of this method is the high cost; Siemiatycki (1989) noted though this method had the greatest statistical power it was also the most expensive. His evaluation was based on its usefulness in explaining cancers, an outcome for which past exposures in particular those which occurred more than 20 years prior to the diagnosis of the cancer are pertinent.

3.6 Synthesis

Different sources of information are available to provide estimates of occupational exposure for epidemiology studies, questionnaire information, JEM and semi-quantitative exposure information. Methodological issues regarding their usage as well as the study outcome are important considerations in interpreting the results they generate.

To date, most JEM's have been developed for use in the study of occupational cancers (Siemiatycki, 1986). Given the incubation time for cancers, emphasis has been on remote and usually sustained exposures to agents known or thought to be carcinogenic. JEM's have also been used in the study of chronic airways disease (Heederik,1989) with emphasis on long term and past exposures, though the pertinent agents may be different.

The methods used to study the exposures relevant to asthma and asthma-like conditions have received less attention. The present project has been developed with a view to improving the procedures for classification and characterisation of exposure in community-based studies airway disease with emphasis on acute airway responses in particular asthma and asthma-like reactions. Diminishing exposure misclassification is an important goal of the present research in the expectation that it will lead to better estimation of exposure-outcome relationships and eventually to better control of exposure.

Chapter 4: Airways responses in occupational epidemiology

4.1 General

Methods for studying respiratory outcomes in relation to exposure have evolved over the last 30 years, and include respiratory symptoms questionnaires and the measurement of lung function level by spirometry and of airway responsiveness to nonspecific stimuli. These will be briefly discussed in sections 4.2 and 4.3. There are difficulties however in studying asthma and asthma-like conditions because, given their reversible nature (the study definition of asthma and asthma-like conditions will be discussed under 5.2), all disease markers (other than history) may be absent at any one point in time. The chest radiograph, developed for and widely used in the study of parenchymal lung diseases such the pneumoconioses, is not useful in the study of asthma and asthma-like conditions because it does not reflect the functional status of the airways (see 2.2). Morever it has limited usefulness in the study of COPD except if emphysema is a major component. Even then, the sensitivity of the chest radiograh has been surpassed by Computerized Tomography a method not applicable to field studies. This method of evaluation will therefore not be further discussed here.

4.2 Lung function

Lung function measurements, in particular those derived from spirometry, are widely used in epidemiological studies of airways disease because they are a direct measure of airway function at the time of test. They measure impairment, not what caused the impairment, so they are nonspecific for the underlying disease process. However certain patterns of impairment are more commonly seen with certain disease processes, e.g. a restrictive lung function profile with interstitial lung disease. While in acute conditions which remit, such as asthma, such measurements may be within the expected range at any one point in time, this is not so for chronic conditions in which airflow limitation is either not reversible or only partially reversible. Spirometric measurements involve the recording of flow or volume in relation to time, during maximal respiratory maneuvers. The volume recorded in the maximal forced expiration maneuver is termed the Forced Vital Capacity (FVC). The volume measured in the first second of the maneuver is the Forced Expiratory Volume (FEV1). The FVC, FEV1 and the ratio FEV1/FVC are the most commonly reported spirometric variables in workforce and community based surveys. According to the World Health Organisation (WHO, 1982) these two variables are the simplest, most repeatable and valid of the various lung function variables which can be measured. Protocols have been developed by the American Thoracic Society and the European Community (Quanjer et al, 1989) for standardisation of spirometric test procedures.

4.3 Questionnaires

In epidemiologic workforce or population based studies, questionnaires are the key instrument for registering respiratory symptoms, including their relationship to work, especially in diseases of variable nature such as asthma. Two of the most widely used questionnaires, the British Medical Research Council questionnaire and the American Thoracic Society - Division of Lung Disease questionnaire- were originally developed with a focus on chronic bronchitic symptoms, in particular cough and mucus hypersecretion, in order to test the hypothesis that chronic bronchitis leads to chronic airflow limitation (Fletcher et al, 1977). Subsequently, there have been international efforts to develop and test an asthma questionnaire for the specific purpose of measuring the prevalence of asthma in community based epidemiologic studies. This questionnaire, sponsored by the International Union Against Tuberculosis and Lund Diseases (IUATLD) as the Bronchial Symptoms Questionnaire, has been tested in international studies (Burney et al,1989). A French version of this questionnaire has also been developed (Perdrizet,1984; Neukirch,1990). This questionnaire (IUATLD, english and french version) was used in the present sudy.

METHODS

Chapter 5. Objectives, definitions and design

5.1 Overall objective and study hypothesis

• The overall objective of this study was to develop and evaluate a questionnaire for gathering information on occupational exposures for use in epidemiologic research in community based studies of airway disease with emphasis on asthma and asthma-like conditions.

Hypothesis: Exposure information pertinent to airway disease directly provided by the subject is as accurate reflection of exposure as exposures derived indirectly from other sources including health department records, company and union sources and industrial hygiene expertise in identifying workrelated airway disease. The latter represents the usual, but costly way of evaluating exposure.

5.2 Study definitions:

For the purpose of the study, the following definitions are given for the terms used in the statement of objectives.

develop: refers to the process of elaborating and testing an occupational questionnaire, including assessment of the comprehensibility of the questions and their modification in light of the comments offered by the subjects in whom it was tested.

evaluate: refers to the process of verifying the reproducibility and validity of occupational exposure information obtained by questionnaire.

Response (outcome) variable:

In the present study, the outcome variable " asthma and asthma-like conditions " was defined on the basis of questionnaire information as current or ever as follows:

1) The condition was diagnosed as current on the basis of positive answers to one **or** more of the following question on the respiratory symptom questionnaire :

   - Have you ever had asthma? Was it confirmed by a doctor? Did you have an attack of asthma in the last 12 months? **and/or**

   - Have you had wheezing or whistling in your chest at any time in the last 12 months? Have you been at all breathless when the wheezing noise was present? **and/or**

   - Have you had an attack of shortness of breath that came on during the day when you were at rest at any time in the last 12 months? **and/or**

   - Have you been woken by an attack of shortness of breath at any time in the last 12 months?

2) The condition was diagnosed as ever present on the basis of positive answers to both of the following questions:

- Have you ever had asthma? **and**
- Was it confirmed by a doctor?

These or very similar definitions have been used in previous community based studies of asthma (Becklake,1990). The term " asthma-like " was included in the definition to recognize that a questionnaire definition such as this, used in epidemiologic studies, would not necessarily attract a clinical diagnosis. Nevertheless for convenience in this thesis, the term will be shortened to describe the outcome measure asthma.

Exposure variables:

occupational exposures refer to information provided by 1) the subject on exposure in occupations to agents known or suspected of evoking asthma and asthma-like conditions; 2) the hygienists evaluation of work history.

5.3 Specific objectives

To test the study hypothesis, use was made of data gathered on adults participating in a community based study of chidhood asthma.

Exposure information and exposure response relationships for asthma and asthma like conditions were compared using i) exposure information provided by the subject in a questionnaire and ii) information derived from an industrial hygiene analysis of work history.

The specific objectives were

1) to gather health information, and information on occupational history and exposures in a population of Montreal adults,

2) to assess the repeatability of the information on occupational history and exposures so gathered,

3) to submit a comprehensive list of all job titles and industries derived from the occupational questionnaires to analysis by two industrial hygienists working independently and blind to exposure information given by the subject,

4) to examine the concordance between the two industrial hygienists exposure coding of work history,

5) to compare the self-reported exposure information with that furnished by each hygienist,

6) to compare the exposure response relationship for asthma and asthma-like conditions generated from self reported exposure with those generated from each hygienist's evaluation.

5.4 Study plan

Different strategies were used to evaluate reliability of information. Reproducibility of questionnaire information was assessed using a test-retest approach, which yielded an evaluation of intra-subject reliability. Concordance between two industrial hygienists evaluation derived from work history, which represents inter-rater reliability, was also examined. Validity was assessed by a comparison of exposure information obtained with questionnaire (self reporting exposure) and exposure information derived by industrial hygienists on the basis of the reported job industry history. The information was gathered in the context of a community based survey that was in progress at that time (for information about the survey, see 5.5).

The study hypothesis was tested by comparing (i) concordance between self-reported exposures and each hygienist's evaluation of exposure and (ii) exposure-response relationships obtained in the same individual using the subject's reporting of exposure and the hygienist's estimation of exposure.

5.5 Source of the study material

The study population in which the questionnaire was validated was a sample of adults participating as parents in a community based survey of childhood asthma in progress in Montreal at the time. The source study was being conducted in the Respiratory Epidemiology Unit, McGill University, and is described in more detail below. The material for the present thesis comprised questionnaire information on health and occupational exposures in 338 adults (126 men and 212 women) aged

23 to 59, all parents or guardians of the grade 1, 3 and 5 of children examined in that survey.

5.6 Rationale

The adult population tested was a convenience sample, not a random sample of the general population of Montreal: for an adult to be in the study, he/she had to have been the parent or guardian of a grade 1, 3 or 5 school child. The major advantage in using these parents as a study population for validation of the occupational questionnaire is that the sample is community-based, and so reflects the circumstances in which the questionnaire would be applied and it would be useful, if validated. An even more important feature is that, being community based, it includes ex or shorterm workers who changed jobs for health reasons. In other words, the sample is not subject to selection bias from the "healthy" worker effect, either from selection of nonsusceptibles into the workplace or from loss of susceptibles, including those affected from the workplace (Becklake 1992, Eisen 1995). In addition parents of children of this age were likely to be under age 45 and work related asthma or asthma like conditions tends to occur earlier rather than later in an individual's working life. Nor is the over-sampling of parents of children with asthma necessarily be a disadvantage for the purposes of the present study since this sample is likely to provide a larger number of outcomes for study than the 5 to 7% prevalence of asthma subjects (defined as doctor diagnosed asthma) expected in a general population study.

Chapter 6. Source of the study material

6.1 Target population for the study of childhood asthma within the context of which the questionnaire data used for the present study was gathered

The purpose of the study of childhood asthma was to investigate the epidemiology of asthma in Montreal school children; a prevalence survey design was used. Details are described elsewhere (Ernst et al 1995, Demissie et al 1995). Children were enrolled from 18 schools of various school commissions across the island of Montreal, selected to cover a range of socioeconomic status, based on postal codes and pertinent Statistics Canada data (Wilkins,1985). In the schools selected for study, students of grades 1, 3 and 5 (one class per grade) were given a letter explaining the study to take home to their parents together with a consent form. Questionnaires were completed for 989 out of 1274 eligible students (77.6%) who also completed a free running test in the school gymnasium to identify those with exercise induced bronchospasm. A subset of children (n=226, see section 6.2) were examined at home and at that time their parents (n=340) also completed a health questionnaire and the occupational questionnaire for this study. A much smaller number also completed a lung function test. These parents represent the source of the material used for the present study. These parents are not a random sample of Montrealers, they represent a sample of parents of asthmatic children, this sample is probably " enriched " against atopy, compared to the adult population. For this reason, the parents so selected can be considered as a convenience sample of Montreal adults identified in a community survey.

6.2 Selection of children for home visits

Visits were conducted to the homes of children whose parents agreed for home visits, selected as cases of asthma on the basis of a 10% or greater fall of FEV_1 at 5 or 10 minutes post exercise exercise induced bronchospasm and/or on the basis of a reported history of asthma diagnosed by a doctor. Visits were also made to the homes of controls selected as the next child on the class list of the same gender as the case without either exercise induced bronchospasm or a history of asthma. The purpose of the home visit was to conduct environmental mesurements in the child's home, to carry out allergy skin tests and methacoline tests on the child as well as to gather questionnaire and lung function data, including response to a bronchodilatator, on the parents; 226 home visits were carried out.

6.3 Administration of the questionnaire to the parents

For those subjects studied in the first year of the present project, the questionnaire was self-administered with interviewer assistance if necessary. Those studied in the second year of the project were interviewed. This change in the administration procedure was felt to be necessary because the population in the second year consisted of a large number of parents for whom neither English nor French was the mother tongue. Thus although almost all had a good understanding of spoken French or English, most experienced difficulty in reading. To administer the questionnaire, the interviewer read the questions and let the parent to answer. If some precision was needed, the interviewer gave additional information to the participant in the same way as in year 1.

Chapter 7. Measurement instruments

7.1 Respiratory questionnaire for parents

As already mentionned, the IUATLD sponsored international efforts to develop and test a respiratory questionnaire for identifying asthma in community based studies (Burney et al, 1989). Several language versions of this questionnaire, including a French version, were compared in a European Community study (Burney et al,1989). In order to preserve comparability with studies elsewhere, this questionnaire was used in the present study, with only minimal modifications appropriate to use in North America. One is the replacement of the term "sifflements" with "sillements" in the French version, shown to be a necessary adaptation in the Québec context (Osterman et al,1989).

A copy of the questionnaire used in the present study is included in Appendix 2. The respiratory health questions analysed for the present study, concerned the following symptoms:

- Wheeze and tightness in the chest in the last 12 months ;
- Shortness of breath in the last 12 months ;
- Cough and phlegm from the chest in the last 12 months ;
- Trouble in breathing ;
- Personal history of asthma ;

- Other personal conditions (other allergies) ;

Questionnaire covariates

- Age
- Family history: the questionnaire included questions on whether the adults own parents or siblings ever had asthma;
- Personal and their parents smoking habits.

7.2 Occupational questionnaire

The second part of the questionnaire dealt with occupational history and exposures. The occupational questionnaire developed (by SdG) for use in this study was a new instrument designed to gather information essentially on **types** of exposure, even if the exposure level was characterized by the subject. A detailed job history was sought covering each job ever held, starting with the most recent and working backwards. Information was requested on the name of each company, type of industry, job title, short job description and dates. This detailed information on work history was necessary for the validation analysis. A copy of the occupational questionnaire is given in Appendix 3.

Information was also sought concerning the sector of industry and work processes, with emphasis on industries and processes previously implicated in the genesis of asthma and asthma-like conditions studies. Detailed lists of contaminants, divided into "families" of exposures, were also incorporated. These exposures were chosen because of their potential to produce asthma and asthma-like reactions (Chang-Yeung, 1990). In separate questions, the subject was asked to indicate whether he/she was exposed to any of these different contaminants as well as the frequency of exposure (occasionnally or regularly) and the intensity (low, moderate and high).

Elements in the questionnaire were:

A: Have you ever been exposed to fumes at work?

Included in those then listed were exposures to paint, varnish, thinners, hardeners, glues, resins, epoxy and accelerators, benzene, toluene, xylene, degreaser, turpentine, plastic, polyurethane, polystyrene, tar, rubber, gasoline, petrochemical products and other vapors or fumes.

B: Have you ever been exposed to chemicals at work?

Included in those then listed were exposures to acids, alkali, ammonia, pharmaceuticals, formaldehyde, dyes, insecticides.

C: Have you ever been exposed to organic dusts at work?

Included in those then listed in the questionnaire were exposures to dusts of grain, flour, wood, fur, coffee, animal food and other dusts.

D: Have you ever been exposed to inorganic dusts at work?

Included in those then listed in the questionnaire were exposures to asbestos, fiberglass, silica, construction site dust, coal dust and other dusts.

E: Have you ever been exposed to fumes or dust from metals or metal compounds (salts) at work?

Included in those then listed in the questionnaire were exposures to aluminum, platinum, nickel, chromium, cobalt, cadmium and iron.

F: Miscelleaneous exposures. Included in the questionnaire were exposures to pyrolysis products, passive smoking, excess cold and heat.

Information on levels and frequency of exposure was also gathered.

This questionnaire was developed for the present study and pretested (by SdG) as follows. The occupational part of the questionnaire was designed and first pretested in 12 outdoor patients in a Montreal adult hospital in order to check the comprehensibility and length of the questionnaire. Modifications were made according to the patients comments and to the interviewer perceptions. Once the questionnaire was designed and pretested, it was validated as said before in a convenience sample of adults provided by a community based prevalence survey in the Respiratory Epidemiology Unit.

7.3 Population specific semi-quantitative exposure estimation

In order to provide an independent assessment of exposures associated with the jobs and industries reported by the study subjects, two industrial hygienists, working independently from exactly the same data base, were invited to generate a population specific semi-quantitative exposure estimation as follows:

From each questionnaire a detailed list of industries, department, job titles, short job description and years worked was extracted. A list of workplace contaminants thought to be asthmagens was given to the industrial hygienist. Based on existing knowledge as well as on pertinent information recorded in DSC's and CLSC's as part of their program to measure exposures "dans le cadre de l'élaboration du programme de prévention", the hygienists were asked to assign a probability of a subject having had exposure to the contaminants included in the list (1= possible: could be found in some persons in that particular workplace ; 2= definite exposure, over 50% probability that this person would have been exposed). They were also asked about the intensity of such exposure (1= trace/low; 2= higher than trace/low). Exposures were classified into the same 6 main groups as in the subject's exposure reporting: A:fumes; B:other chemicals; C:organic dusts, D:inorganic dusts; E:metals as vapours or dusts and

F:miscellaneous. These categories have been used elsewhere for grouping known or suspected asthmagens (Chan-Yeung and Lam, 1990). This procedure was carried out with the hygienists blind to the corresponding information provided by the subject in the questionnaire.

Chapter 8: Methods used to evaluate the occupational questionnaire

Two methods were used to evaluate the occupational questionnaire, first an analysis of the reproducibility of the information was assessed to evaluate intra-subject reliability (within subjects) and inter-rater reliability (between hygienists) (see 8.1.1). Secondly, an evaluation of its validity assuming hygienists are " gold standard " was obtained by comparing self-reported exposures with those derived from 2 industrial hygienists evaluation working independently, as described in section 7.3 above.

8.1 Reproducibility of information from different sources

The concept of reliability lies in the ability of an instrument or a tool to measure something in a reproducible and consistent fashion. Intra-subject reliability, focussed on the *reproducibilty* of the information given by the subjects, which is often the basis in all community or population-based studies. Inter-rater reliability refers to the *agreement* that 2 observers, representing our gold standard, can offer.

8.1.1 Within subjects: intra-subject reliability

Reproducibility of the information gathered in the occupational questionnaire in terms of jobs and exposure history was assessed in a test-retest design. In this way, the stability of the questionnaire information was examined. The objective was to verify to what extent subjects were able to report in a reproducible fashion their occupational history as well as their occupational exposures to potential asthmagens. Subjects first answered the questionnaire on the occasion of the home visits when their child was examined, and a subsample of those parents or guardians who answered the adult questionnaire on that occasion were re-contacted approximately 1 year latter to reanswer the questionnaire. The sub-sample chosen to evaluate the reproducibility of the questionnaire was selected on the basis of subject's self-reported exposure to organic fumes (no exposure, med-low exposure, high exposure) on the first occasion when they answered the questionnaire. Organic fumes was chosen because of the potential difficulty in evaluating exposure to such contaminants. Organic solvents are often part of other compounds, and, olfaction threshold level can be altered in exposed workers making them less able to detect exposures (Kromhout, 1991).

All individuals reporting any current exposures to organic fumes (n=32), as well as a random sample of those working and reporting no such exposure (n=271), were contacted by phone to solicit their participation. Amongst the subjects reporting current exposures, 10 were lost to follow-up and 4 refused to participate. Those who agreed to be interviewed (n=18 in the exposed group and 15 in the non-exposed group) were visited at home and answered the occupationnal section of the questionnaire a second time. This procedure was undertaken between March and June 1993.

Factors likely to influence reproducibility such as gender, number of jobs, past versus more recent job, were examined. The reproducibility of each of the different elements of the work history (name of company, type of industry, department, job title, description, duration) was analysed separately as indicated below. Analyses conducted to evaluate intra-subject reliability are described below under section 9.1.

8.1.2 Between hygienists: inter-rater reliability

The original intention was to combine the findings by the two hygienists. As a preliminary to this step, concordance between the 2 hygienists in estimating exposures based on the analysis of work history was examined. The objective was to verify to what extent hygienists agreed in their evaluation of a subject's past and present exposures. Inter-observer reliability of hygienists coding was also carried out to verify factors likely to influence reproducibility of coding, such as gender, and past versus more recent jobs.

8.2 Validity

Content validity (whether the items represent adequately the dimension and domain of interest) was evaluated as described in section 3.3.3 (Thorough search of the literature, questioning experts, questionnaire sufficiently comprehensive and of an appropriate length to be practical). Criterion validity, the objective of this part of the study was to determine to what extent subjects were able to report in a valid manner their occupational exposures for all jobs held for more than 3 months consecutively. Reliance had to be placed on the subject's work history since no independent source such as company records can be consulted. However, other studies that have addressed that particular issue concluded that self-reported work histories were on the whole satisfactory (Baumgarten, 1983; Bourbonnais, 1988; Brisson, 1991).

To test the study hypothesis that "exposure information pertinent to airway disease directly provided by the subject are as accurate reflection of exposure as exposures derived indirectly from other sources", self-reported exposures were compared to exposure information generated from other sources estimates, based on the analysis of the work history by 2 occupational hygienists, working independently. Industrial hygienists coding for exposure represented the "gold standard" against which the comparison was made. The expertise of the industrial hygienist includes recognition of occupational exposures likely to be encountered in a given job, and a job evaluation by a hygienist is a common way of assessing occupational exposure in community-based studies. Factors such as number of jobs, past versus most recent job, likely to influence validity were also examined. The analysis was structured to examine concordance between self-reported exposure and that derived from the analysis of work history by the industrial hygienists, looking at the effect of number of jobs and latest vs past jobs.

Chapter 9 Approach to analysis

9.1 Measures of agreement used in the reliability analysis

Indices proposed for the quantification of reproducibility (Nunally, 1970; Fleiss,1982; Kelsey, 1986; Streiner and Norman, 1989; Aickin, 1990) were reviewed in Chapter 3.3.2. Those used in the analysis of the intra-subject reliability and inter-rater reliability, were overall agreement, the Kappa statistic and the alpha agreement parameter. These results are reported in chapters 11 and 12.

9.1.1 Overall agreement

Overall agreement or observed agreement was calculated to investigate reproducibility. This statistic was used to describe the proportion classifed as having or not having the characteristic according to both raters (Kelsey, 1986). Overall agreement so calculated does not take into account chance agreement.

9.1.2 Cohen's Kappa

The measure of the degree of nonrandom agreement between two measurements of the same categorical variable was computed using the Kappa statistic, whenever possible. (Last, 1995; Fleiss,1981). This statistic was used to describe the concordance of questionnaire information reported by the subject on the different items of the job and exposure history. Concordance between hygienists (inter-rater agreement) was also measured using the Kappa statistic. Feinstein's guidelines were followed to interpret the results with a value of Kappa superior to 0.40 considered as a moderate agreement. Cohen's kappa was compared with the estimate of agreement (alpha agreement parameter) .

9.1.3 Alpha agreement parameter

The alpha agreement parameter was calculated to describe the agreement of questionnaire information and between hygienists exposure evaluation. According to Aickin (1991) this new estimation of agreement provides a clearer view of the population characteristic of "agreement for cause". In absence of other guidelines, Feinstein's guidelines were also applied to Aickin's alpha parameter.

9.2 Validity analysis

The validity analysis focused on criterion validity i.e. the agreement between self-reported information and, as the reference or " gold standard ", the information generated by the analysis of the work history by 2 industrial hygienists. For the validity analysis, the sensitivity, specificity and phi-coefficient were calculated using self-reported exposure data and these indices were compared with those obtained using the exposure data generated by each of the industrial hygienist's evaluations. These results are reported in chapter 13.

9.2.1 Sensitivity

Sensitivity was calculated comparing results obtained by industrial hygiene evaluation ("gold standard" against self-reported exposures.

9.2.2 Specificity

Specificity was calculated comparing results obtained by industrial hygiene evaluation ("gold standard") against self-reported exposures.

9.2.3 Phi-coefficient

As stated previously, phi-coefficient is a measure of correlation derived from a two by two table. Phi-coefficient was calculated comparing results obtained by industrial hygiene evaluation ("gold standard") against self-reporting exposures.

9.3 Effect estimates using different estimates of exposure

Exposure response relationships were examined using logistic regression for the two binary outcome (response) measures described in section 5.2, namely current and ever asthma. The strength of exposure response relationships using exposure generated from 3 sources was then compared: i) exposure derived from questionnaire, ii) exposure from each of two hygienists estimation (generating 3 different OR's, these results are presented in chapter 14). The analysis was conducted separately for the two outcomes. Each logistic regression analysis took into account the pertinent covariables, age, smoking, atopy and family history of atopy as well as gender. The odds ratios derived from using the 2 methods of assessing exposures were compared using the GLMStat for Macintosh (copyright ©K.J. Beath 1994-6).

9.4 Synthesis

Different analyses are described, all of which allowed us to examined intra-subject and inter-rater reliability and validity. These include Kappa statistic, Aickin's alpha parameter and overall agreement (refering to reliability assessment) and sensitivity, specificity and phi-coefficient (refering to validity assessment). Finally, analyses concerning exposure response relationship are described.

RESULTS

Chapter 10 Descriptive information on study subjects

10.1 Personal characteristics of study subjects

Three hundred and thirty eight parents took part in the study, of these, 126 were men and 212 were women. Only two questionnaires were unusable, this very small number is explained by the fact that the questionnaire, either self or researcher administered was carefully verified, and completed before the research team left the subjects home.

Their ages ranged from 23 to 59 years; the highest percentage was in the age stratum 30-39 (65% for men and women combined). The mean age for men was 36.8 compared with 34.7 for women (see table 10.1.a and 10.1.b). Amongst participants, 40.2% were current smokers, 44.4% for men compared to 37.7% for women. 44.4% reported family history of allergies and 42.3% reported atopy (see table 10.1.a).

Overall, 48.5% of parents worked in unskilled occupations, 29.3% in semiskilled occupations and professional workers (eg physicians, teachers, professors, etc.) constituted 28.1% of the sample. There was a clear gender difference in the distribution of occupations. Men reported more frequently being currently employed as a professional (54.0%) compared to women (12.7%). Semi-skilled workers (technicians) represented 36.5% of men in the sample, compared to 25.0% of women. The remaining parents felt into the unskilled category, a category which included 25.4% of men compared to 62.1% of women. Thirty-five persons

Table 10.1 a Personal characteristics of study subjects

	Men		Women		Total	
	Nb	%	Nb	%	Nb	%
• n=	126	100%	212	100%	338	100%
• current smokers	56	44.4%	80	37.7%	136	40.2%
• atopy	38	30.2%	105	49.5%	143	42.3%
• family history of allergy	46	36.5%	104	49.1%	150	44.4%
• mean age (SD)	36.8 (5.5)		34.7 (4.9)			
• never worked	2	1.6%	33	15.6%	35	10.4%
• unskilled workers*	32	25.4%	132	62.3%	164	48.5%
• semi-skilled workers*	46	36.5%	53	25.0%	99	29.3%
• professional*	68	54.0%	27	12.7%	95	28.1%
• number of jobs : average (SD)	3.5 (2.1)		2.8 (1.8)		3.1 (2.0)	
• number reporting being exposed (**) in their current job or most recent job	44	34.9%	59	27.8%	103	30.5%

* according to current or latest job

** either to solvents or other chemicals or dusts or metals or other miscellaneous products as listed in the questionnaire

Table 10.1 b Age distribution of study subjects

	Men		Women		Total	
	n=	%	n=	%	n=	%
20-29	6	5%	24	11%	30	9%
30-39	73	58%	147	69%	220	65%
40-49	43	34%	39	18%	82	24%
50-59	4	3%	2	1%	6	2%
Total	126	100%	212	100%	338	100%

reported no work history (2 men and 33 women). Men had also held slightly more jobs than women (3.5 vs 2.8) and more men reported being exposed to chemicals or dusts in their current job (34.9% vs 27.8%) (see table 10.1.a).

10.2 Prevalence of reported asthma related symptoms and respiratory history

Table 10.2 shows the distribution of asthma related symptoms used in constructing the two outcome variables, current and ever asthma. There were very few missing values. A greater proportion of women than men reported symptoms more. These included wheezing or whistling in their chest (16.7% (21/126) vs 25.5% (54/212)) being breathless when wheezing (60% vs 66.7%), attack of shorthness of breath at rest during the day (4% vs 12.3%), attack of shortness of breath following a strenuous activity (21.4.0% vs 33.5%), attack of shortness of breath at any time (6.3% vs 9%), attack of caughing (17.5% vs 40.6%), trouble with breathing (15.1% vs 28%). Asthma was more often reported in women than in men (men:4% compared to 15.6% for women) with diagnosis of asthma confirmed by a doctor in 5/5 for men and 26/33 for women.

Table 10.2 Prevalence of reported asthma related symptoms in study subjects

Q #	Questions	Yes			No			Missing value	Total		
		Men	Women	Sub-total	Men	Women	Sub-total		Men	Women	Total
1	Have you had wheezing or whistling in your chest at any time in the last 12 months?	21	54	75	105	158	263	0	126	212	338
	% of total			*22.2%*			*77.8%*				
	gender specific %	16.7%	25.5%		83.3%	74.5%					
1.1	Have you been at all breathless when the wheezing noise was present?	12	34	46	8	17	25	3	20	51	74
	% of total			*62.2%*			*33.8%*				
	gender specific %	60.0%	66.7%		40.0%	33.3%					
3	Have you had an attack of shortness of breath that came on during the day when you were at rest at any time in the last 12 months?	5	26	31	120	186	306	1	125	212	338
	% of total			*9.2%*			*90.5%*				
	gender specific %	4.0%	12.3%		96.0%	87.7%					
4	Have you had an attack of shortness of breath that came on following strenuous activity ?	27	71	98	99	141	240	0	126	212	338
	% of total			*29.0%*			*71.0%*				
	gender specific %	21.4%	33.5%		78.6%	66.5%					

Table 10.2 Prevalence of reported asthma related symptoms in study subjects

Q #	Questions	Yes			No			Missing value	Total		
		Men	Women	Sub-total	Men	Women	Sub-total		Men	Women	Total
5	Have you been woken by an attack of shortness of breath at any time in the last 12 months?	8	19	27	118	193	311	0	126	212	338
	% of total			*8.0%*			*92.0%*				
	gender specific %	6.3%	9.0%		93.7%	91.0%					
6	Have you been woken by an attack of coughing at any time in the last 12 months?	22	86	108	104	126	230	0	126	212	338
	% of total			*32.0%*			*68.0%*				
	gender specific %	17.5%	40.6%		82.5%	59.4%					
11	Do you ever have trouble with your breathing?	19	59	78	107	152	259	1	126	211	338
	% of total			*23.1%*			*76.6%*				
	gender specific %	15.1%	28.0%		84.9%	72.0%					
13	Have you ever had asthma?	5	33	38	121	179	300	0	126	212	338
	% of total			*11.2%*			*88.8%*				
	gender specific %	4.0%	15.6%		96.0%	84.4%					
13.1	Was it confirmed by a doctor?	5	26	31	0	5	5	2	5	31	38
	% of total			*81.6%*			*13.2%*				
	gender specific %	100%	83.9%		0.0%	16.1%					

10.3 Characteristics of the subgroups of subjects who took part in the study to assess the reproducibility of exposure information provided by the questionnaire.

Thirty-three parents were re-contacted for and agreed to participate in the reproducibility study. Their age ranged from 26 to 54 years, with the highest percentage for the age strata 30-39 (58% for men and women combined). The mean age for men was 39.4 compared to 36.3 for women (see tables 10.3.a, b).

Overall, 42.4% (14/33) of these parents worked in unskilled occupations, 18.2% (6/33) in semiskilled occupations and professional workers (eg physicians, teachers, professors,...) constituted about 36% (12/33) of the sample. These parents reported having held 3.6 jobs on average with men having held slightly more jobs than women (3.9 vs 3.1). Most men and women reported being exposed in their present or most recent job : 85.7% (18/21) and 91.7% (11/12) respectively (see table 10.3.b).

Table 10.3 a **Age distribution of subgroup of subjects who took part in the study of reproductibility**

Age	Men		Women		Total	
	n=	%	n=	%	n=	%
20-29	1	5%	1	8%	2	6%
30-39	10	48%	9	75%	19	58%
40-49	9	43%	2	17%	11	33%
50-59	1	5%		0%	1	3%
Total	21	100%	12	100%	33	100%

Table 10.3 b **Characteristics of the subgroups of subjects who took part in the study of reproducibility of information provided by questionnaire**

	Men	Women	Total
n=	21	12	33
Age : mean (SD)	39,4 (5,4)	36,3 (4,6)	
Unskilled workers	8	6	14
Semi skilled workers	4	2	6
Professionals	8	4	12
Number of jobs in average (SD)	3,9 (2,1)	3,1 (2,3)	3,6 (2,2)
Number reporting being exposed in their current or most recent job	18	11	29

Chapter 11 Reproducibility of self-reported job history and exposure information provided by the occupational questionnaire

The results of the study of the reproducibility of job and exposure history gathered in a test-retest design on 33 study subjects re-contacted one year after first administration are presented in this section. Items included in the occupational questionnaire were grouped for analysis as follows: job history (reproducibility of which was expressed as overall concordance) sector of activity, work processes and exposure history (reproducibility of which was expressed as intra-subject agreement, using kappa statistic and Aickin's alpha parameter).

11. 1 Overall concordance of information on job history

Information analysed for reproducibility in the job history included company, department, job title, job description and duration for each job held. Table 11.1 presents the results for overall agreement. For this comparison, neither Kappa nor Aickin indices were computed, because both examine the proportion of responses in two agreement cells (presence/presence and absence/absence) in relation to the proportion of responses in these cells which would be expected by chance, given the marginal distributions. The nature of questions such as "what companies did you work for? i.e. not a question with a yes/no answer

Table 11.1 Overall concordance of information supplied by 33 subjects

	Men (n=21)		Women (n=12)		Total (n=33)	
• number of jobs reported (first and second administration)	92 *		35 *		127 *	
• number of jobs in average	4.4		2.9			
• number of concordances: (first and second administration)	Nb	% of 92	Nb	% of 35	Nb	% of 127
company name	66	71.7%	24	68.6%	90	70.9%
type of industry	67	72.8%	25	71.4%	92	72.4%
department	48	52.2%	20	57.1%	68	53.5%
job title	65	70.7%	25	71.4%	90	70.9%
job description	62	67.4%	23	65.7%	85	66.9%
date at hire	58	63.0%	21	60.0%	79	62.2%
date at end of job	58	63.0%	23	65.7%	81	63.8%

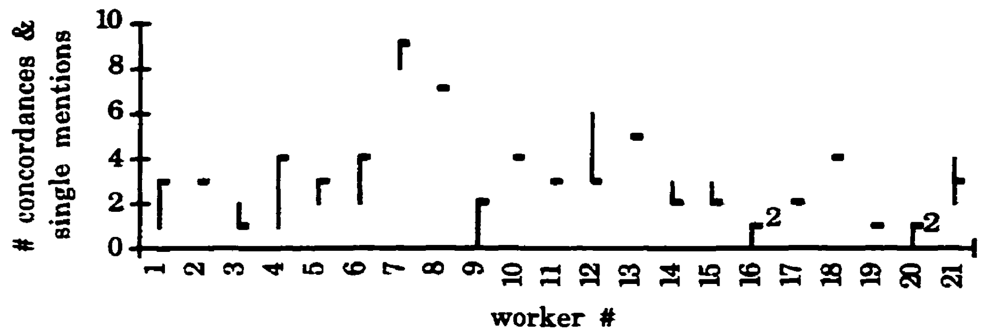
* Total number of companies reported in the first and/or second administration of questionnaire.

(dichotomous information) resulted in an absence/absence cell and any resulting index being not meaningful.

The 33 subjects reported 127 different jobs (table 11.1). Men reported on average slightly more jobs than the women (4.4 jobs versus 2.9). Thus the 21 men in the sample reported 92 different jobs in the first and second administration of the questionnaire comparated with 35 for the 12 women. The overall agreement ranged from 52.2 % to 72.8% for men with the lowest percentage agreement for "department". Concordance was the highest for " type of industry ". Similar results were found for women, with overall agreement ranging from 57.1% to 71.4% with lowest percentage agreement for " departments " (57.1%) and highest percentage agreement for " companies " (71.4%) and " job title " (71.4%).

The results are also presented graphically (figures 11.1.1 to 11.1.7 for men and 11.1.8 to 11.1.14 for women) to indicate, for each subject, both concordance and discrepant areas. For example, results given in table 11.1 show that the 21 men in the sample reported 66 concordant *company names* out of a total 92 possibilities. Figure 11.1.1 indicates that 8 out of 21 (38.1%, workers 2,8,10, ...) reported exposures which were 100% concordant , for 5/21(23.8%) there was 1 discrepancy, for 6/21 (28.6%) 2 discrepancies, while for 2/21 (9.5%) there were more than 3 discrepancies. Among the 13 discrepancies, 8 occurred only in the second administration of the questionnaire (eg the companies names were only present in the second administration).

Figure 11.1.1
Company names (men)



reported only at first administration

concordances

reported only at second administration

Example

Worker #1 reported 3 concordant pairs but reported 2 other company name only in the second administration of questionnaire.

Worker # 3 reported one concordant pair but reported one other company name only in first administration. This could be illustrated as follow:

	Company name	
	1st administration	2nd administration
worker # 1	A B C	A B C D E
worker # 2	A B	A

Figure 11.1.2
Type of industry (men)

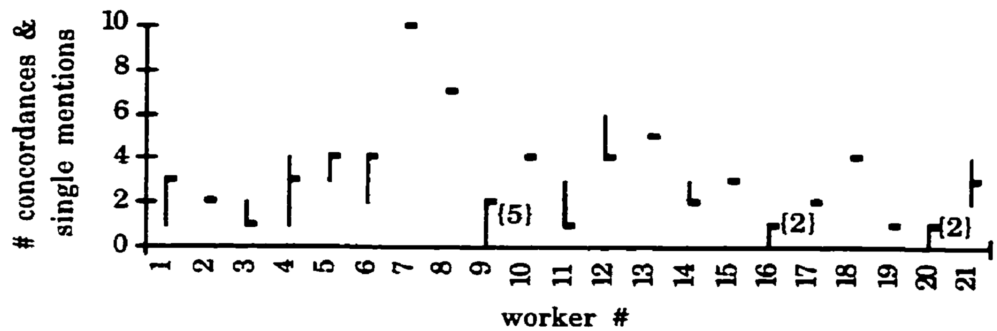


Figure 11.1.3
Departments (men)

Figure 11.1.4
Job Titles (men)

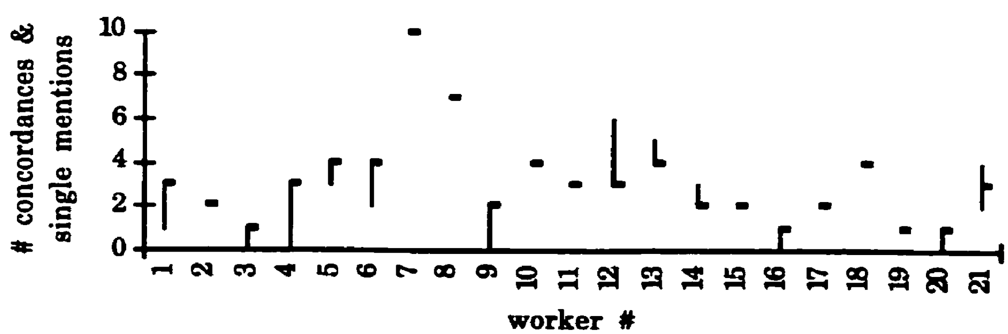
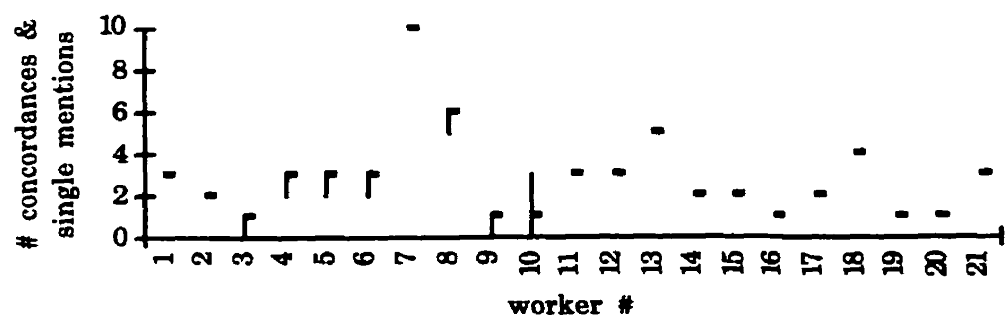


Figure 11.1.5
Work description (men)

Figure 11.1.6
Dates of hire (men)

Figure 11.1.7
Dates of end (men)



Overall concordance in men's reports was less for departments (5/21 were 100% concordant, figure 11.1.3) and work description (5/21 were 100% concordant, figure 11.1.5). The concordances found for the other components of the work history (type of industry, figure 11.1.2; job titles, figure 11.1.4) were similar to those reported for company names. Concordance was particularly good for dates of hire and end of jobs (14/21 for both were 100% concordant, figures 11.1.6 and 11.1.7 respectively). The discrepancies were not predominant in one administration of questionnaire. For instance, discrepancies were predominant in first administration of the questionnaire for dates of hire (5/7 of discrepancies) but were predominant in second administration of questionnaire for dates of end (6/7).

Concordance in reporting companies names in women showed a slightly different pattern from that in men: 6 subjects out of 12 (50%) were 100% concordant (figure 11.1.8). Distribution of discrepancies were also slightly different: 4/12 (33.3%) reported 1 discrepancy, while 2/12 (16.7%) reported more than 3. Among the discrepancies, 4 occurred in the first administration of the questionnaire i.e. the company names were only reported in the first administration.

Less concordance was found about departments in women's reports (only 4/12 were 100% concordant, figure 11.1.10). Other components of work history showed as good or better concordance as in reporting companies names (figures 11.1.9,11,12,13 and 14). More information was reported in the first administration of the questionnaire.

Figure 11.1.8
Company names (women)

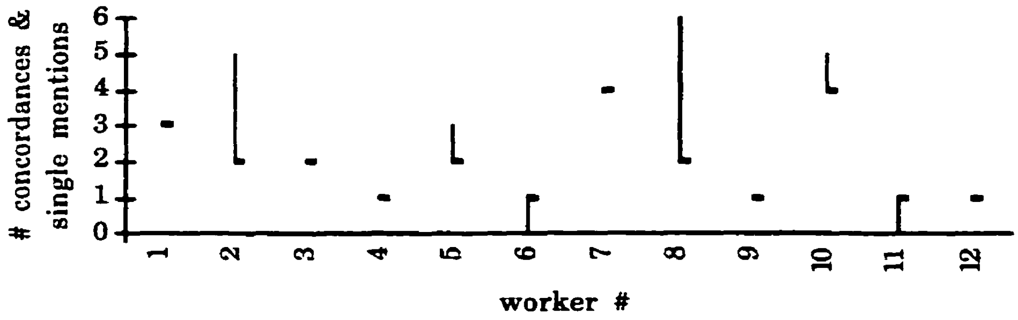


Figure 11.1.9
Types of industry (women)

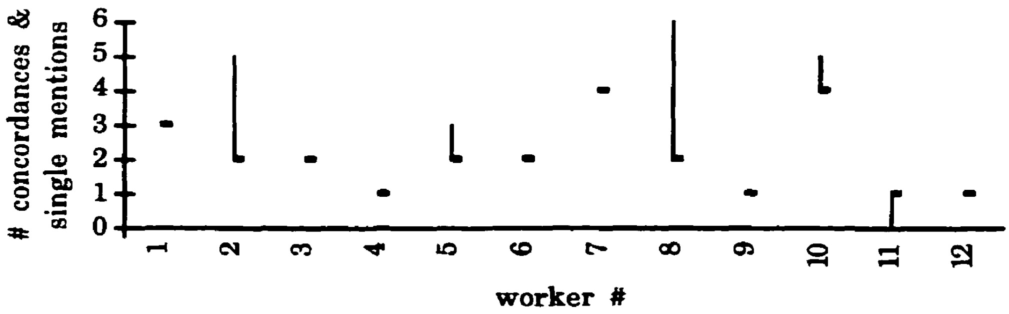


Figure 11.1.10
Departments (women)

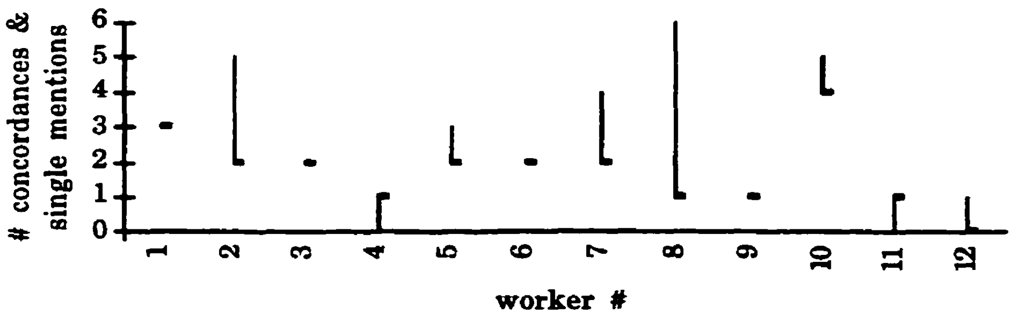


Figure 11.1.11
Job Titles (women)

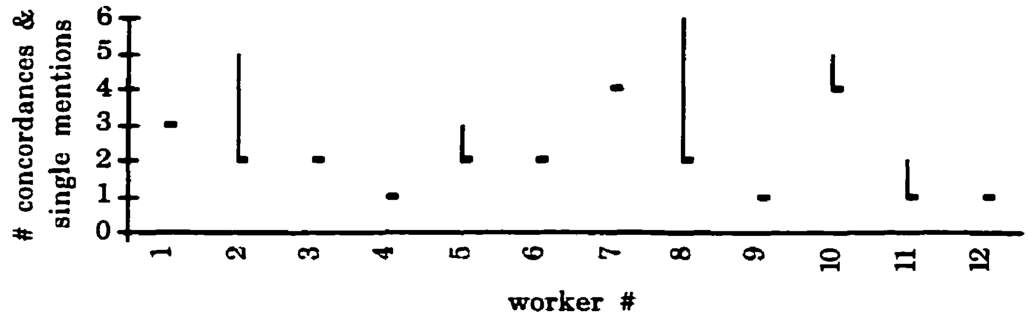


Figure 11.1.12
Work description (women)

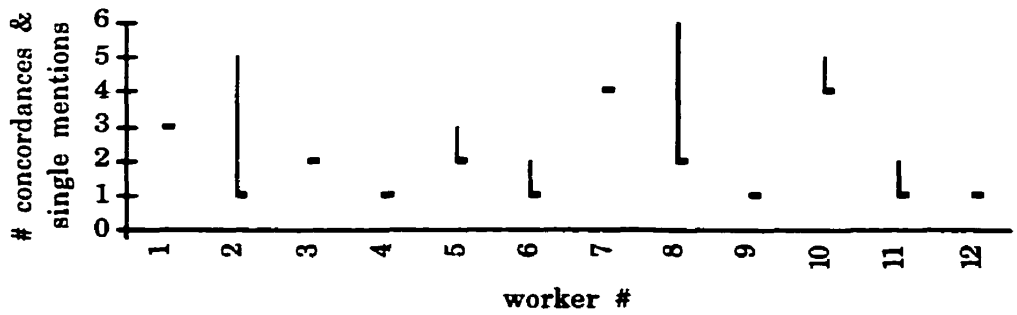


Figure 11.1.13
Dates of hire (women)

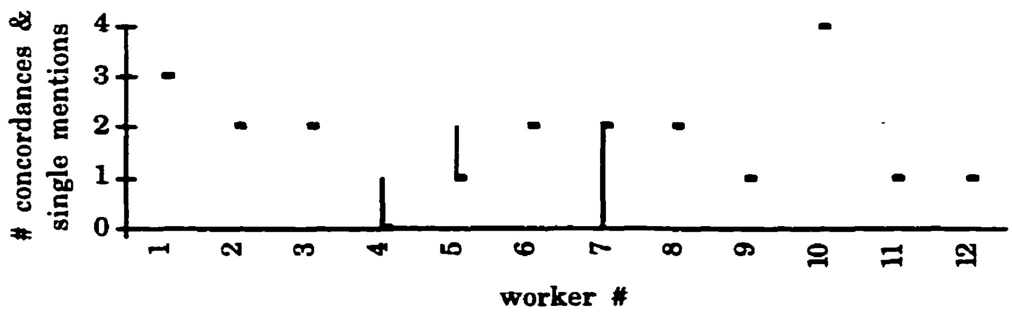


Figure 11.1.14
Dates of end (women)

11.2 Reproducibility of information on sector of activity and work processes

Table 11.2 summarizes the results of the reproducibility analysis. Those results represent pooled observations across sectors and processes. This had to be done because of the small numbers involved for any one sector or process. Counting the pairs as if they were independent is probably correct but could influence the real value of the confidence interval. Those would possibly be wider than calculated.

Agreement was moderate for men and fair for women in rating the sectors of activity (K=0.47 for men and 0.39 for women). In comparison, Aickin's alpha coefficient ranged from 0.76 to 0.89.

A majority of both men (11/21) and women (7/12) reported they had never worked in the sectors identified nor been involved in these work processes. Agreement varied for men and women in rating work processes (K = 0.45 for men and 0.39 for women). Aickin's alpha ranged from 0.67 to 0.89 for men and women respectively. In this comparison between the two measures of agreement, the alpha coefficient is likely to be a better reflection of the true agreement than Kappa which misses some of the agreement for cause captured by the alpha coefficient (see section 3.3.2).

Table 11.2 **Reproducibility of information on work processes**

		1st administration	
		presence	absence
2nd administration	presence	a	b
	absence	c	d

	Men		Women		Total	
•number of persons	21		12		33	
•number of sectors of activity	13		13		13	
•number of possible pairs	21*13		12*13		33*13	
	9	11	2	6	11	17
	7	246	0	148	7	394
• K	0.47	(.25, .69)	0.39	(.02, .76)	0.45	(.27, .63)
• Aickin's alpha: α	0.76	(.63, .88)	0.89	(.74, 1.04)	0.78	(.69, .88)
•number of work processes	9		9		9	
•number of possible pairs	9*21		9*12		9*13	
	12	17	1	3	12	14
	6	154	0	104	6	259
• K	0.45	(.25, .65)	0.39	(< 0, .92)	0.51	(.33, .69)
• Aickin's alpha: α	0.67	(.52, .81)	0.89	(.71, 1.01)	0.77	(.67, .88)

11. 3 Test-retest reliability for self-reported exposure to recognised occupational asthmagens.

Reproducibility analysis of exposure information could only be assessed for concordant jobs reported in the first and second administration of the questionnaire. For men, 68 concordant jobs were examined, compared to 25 for women. Overall concordance, Cohen's Kappa coefficient and Aickin's alpha index were computed for each block of contaminants listed in the questionnaires (vapors/fumes, chemical substances, organic dusts, inorganic dusts, metals, other exposures), as described in the questionnaire. The small number of subjects as well as the low frequency of reported exposures did not allow analysis of each contaminant separately.

Overall concordance ranged from 0.63 to 0.91 for men and women combined. Reported exposures by men were reasonably reproducible for vapors/fumes, chemical substances, organic dusts, inorganic dusts (K ranged from 0.42 to 0.66 see table 11.3) but was considerably lower for metals and miscellaneous exposures (K= 0.21 and 0.15 respectively). Women reported exposures to vapors/fumes, inorganic dusts and miscelleneous exposures in an even more reproducible fashion (K= 0.91, 0.70 and 0.45 respectively). Not surprisingly, given its caracteristics, (see section 3.3.2), Aickin's alpha index gave a more optimistic evaluation of reproducibility for all these exposure categories in men and women, except miscelleneous exposures in men and chemical substances in women.

Table 11.3 **Reproducibility of self reported exposures to recognised occupational asthmagens**

		1st administration	
		presence	absence
2nd administration	presence	a	b
	absence	c	d

	Men		Women		Total	
• number of concordant job names (first and second administration)	68*		25**		93	
Vapors/fumes	13	9	8	0	21	9
	8	38	1	16	9	54
Overall	0.75		0.96		0.81	
K	0.42	(.19, .66)	0.91	(.75, 1.07)	0.56	(.38, .74)
• Aickin's alpha: α	0.46	(.23, .68)	0.90	(.72, 1.07)	0.58	(.41, .76)
Chemical substances	6	3	1	3	7	6
	2	57	5	16	7	73
Overall	0.93		0.68		0.86	
K	0.66	(.39, .93)	0.01	(< 0, .40)	0.44	(.19, .70)
• Aickin's alpha: α	0.79	(.61, .96)	0.06	(< 0, .77)	0.61	(.40, .81)

Table 11.3 **Reproducibility of self reported exposures to recognised occupational asthmagens**
(continued..)

	Men			Women			Total		
Organic dusts	2	2		0	3		2	5	
	2	62		1	21		3	83	
Overall	0.94			0.84			0.91		
K	0.47	(.02, .92)		.06	(<0, .04)		0.29	(< 0, .64)	
• Aickin's alpha: α	0.76	(.52, 1.0)		0.41	(.10, 1.0)		0.64	(.34, .93)	
Inorganic dusts	10	7		3	1		13	8	
	6	45		1	20		7	65	
Overall	0.81			0.92			0.84		
K	0.48	(.25, .72)		0.70	(.31, 1.09)		0.53	(.31, .75)	
• Aickin's alpha: α	0.55	(.33, .77)		0.77	(.48, 1.0)		0.61	(.44, .80)	
Metals	2	6		0	0		2	6	
	4	56		0	25		4	81	
Overall	0.85			1.00			0.89		
K	0.21	(< 0, .41)		0.00			0.23	(< 0, .56)	
• Aickin's alpha: α	0.46	(< 0, .54)		0.88	(.51, .88)		0.54	(.21, .88)	

Table 11.3 **Reproducibility of self reported exposures to recognised occupational asthmagens**
(continued..)

	Men		Women		Total	
Miscelleneous	29	13		11	6		40	19	
	14	12		1	7		15	19	
Overall	0.60		0.72		0.63	
K	0.15	(< 0, .39)	0.45	(.14, .76)	0.23	(.03, .43)
• Aickin's alpha: α	0.16	(< 0, .41)	0.49	(.15, .83)	0.24	(.04, .45)

* For calculation of K's, 68 jobs were taken into account; 2 companies names were missing, but all other information was present giving then the possibility of evaluating concordance on 68 jobs.

** For calculation of K's, 25 jobs were taken into account; 1 company name was missing, but all other information was present given then the possibility of evaluating concordance on 25 jobs.

11.3.1 Intra-subject agreement to self-reported exposure to recognised occupational asthmagens in latest job

Reproducibility of self-reported exposures in latest job was also assessed. A total of 33 jobs were examined. Cohen's Kappa coefficient and Aickin's alpha index were computed. The small number of subjects as well as the low frequency of reported exposures did not allow analysis of each contaminant separately, or of gender differences.

Overall concordance ranged from 0.64 to 0.94. Reported exposures were reasonably reproducible for vapors/fumes, chemical substances, inorganic dusts and metals (K ranged from 0.53 to 0.62; see table 11.3.1) but was considerably lower for organic dusts and miscellaneous exposures (K= 0.35 and 0.27 respectively). Aickin's alpha parameter was higher than 0.50 for all categories, except miscelleneous exposures (alpha=0.34).

Table 11.3.1 **Reproducibility of self reported exposure to recognised occupational asthmagens in latest job**

		1st administration presence +	1st administration absence -
2nd administration	presence (+)	Women / Total / Men	Women / Total / Men
	absence (-)	Women / Total / Men	Women / Total / Men

• **number of concordant company names (first and second administration)** **33**

A- Vapors/fumes

	+	-
+	6 / 14 / 8	2 / 2
-	1 / 5 / 4	5 / 12 / 7

Overall	0.79
K (C I)	0.58 (0.31 , 0 .85)
Aickin's alpha (α)	0.58 (0.30 , 0 .85)

D- Inorganic dusts

	+	-
+	3 / 8 / 5	1 / 4 / 3
-	1 / 3 / 2	7 / 18 / 11

Overall	0.79
K	0.53 (0.24 , 0.82)
Aickin's alpha (α)	0.54 (0.25 , 0.83)

B- Chemical substances

	+	-
+	2 / 6 / 4	1 / 3 / 2
-	3 / 3	6 / 21 / 15

Overall	0.82
K	0.54 (0.23 , 0.85)
Aickin's alpha (α)	0.58 (0.23 , 0.88)

E- Metals

	+	-
+	2 / 2	2 / 2
-	0	12 / 29 / 17

Overall	0.94
K	0.62 (0.15 , 1.09)
Aickin's alpha (α)	0.79 (0.49 , 1.09)

C- Organic dusts

	+	-
+	1 / 1	1 / 2 / 1
-	1 / 1	10 / 29 / 19

Overall	0.91
K	0.35 (-0.22 , 0.92)
Aickin's alpha (α)	0.65 (0.25 , 1.06)

F- Miscelleneous

	+	-
+	6 / 13 / 7	3 / 8 / 5
-	4 / 4	3 / 8 / 5

Overall	0.64
K	0.27 (-0.04 , 0.58)
Aickin's alpha (α)	0.34 (0.04 , 0.64)

Chapter 12 Concordance between hygienists in the coding of exposures

12.1 Inter-rater agreement coding exposures in 927 jobs reported by 121 men and 182 women

Before evaluating criterion validity (self-reported exposures compared to the criterion used in this study, ie the hygienist's evaluation), the concordance between the two hygienists themselves in estimating exposure was assessed using the Kappa statistic and Aickin's alpha index.

Concordance was first investigated product by product within each category (Table 12.1). With a few exceptions, hygienist A assessed more jobs to be at risk for exposures than hygienist B (number in cell " c " always higher than in cell " b "). Results varied within each category. For category A:fumes at work, concordance between hygienists was reasonable (moderate agreement) for 3 of the 7 products listed, paint-vapors (K=0.52), glue (K=0.43) and tars (K=0.52).

For category B (other chemicals not listed in A) concordance was reasonable for only 2 of the 8 products listed: dyes (K=0.54) and pharmaceutical products (K=0.88).

Table 12.1 **Concordance between 2 hygienists in coding exposures in 927 jobs (men and women)**

A- Solvents

n=927		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	108	20	13	22	28	6	28	68	32	16	99	14	11	51
	-	121	678	79	813	60	833	19	812	129	750	120	694	66	799
overall		0.85		0.89		0.93		0.91		0.84		0.86		0.87	
K		0.52	(.46, .58)	0.16	(.06, .26)	0.43	(.31, .55)	0.35	(.25, .45)	0.25	(.17, .32)	0.52	(.46, .58)	0.09	(.01, .17)
α		0.69	(.64, .75)	0.53	(.39, .67)	0.81	(.75, .87)	0.69	(.61, .77)	0.60	(.51, .68)	0.72	(.67, .77)	0.34	(.15, .53)

B- Other chemicals not in group A (gases, vapours, mists or dusts)

n=927		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical		Other chemicals	
		Hygienist A															
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	25	35	8	17	23	23	36	78	42	9	6	2	61	0	13	2
	-	122	745	153	749	108	773	213	600	53	823	85	834	15	851	267	645
overall		0.83		0.82		0.86		0.69		0.93		0.91		0.98		0.71	
K		0.17	(.09, .24)	0.04	<0, .10)	0.20	(.12, .28)	0.04	(<0, .10)	0.54	(.45, .64)	0.11	(.03, .19)	0.88	(.82, .94)	0.06	(.02, .10)
α		0.43	(.32, .55)	0.28	(.05, .51)	0.54	(.43, .64)	0.09	(<0, .22)	0.82	(.77, .88)	0.73	(.59, .87)	no convergence		0.52	(.38, .66)

Table 12.1 **Concordance between 2 hygienists in coding exposures in 927 jobs (men and women)**
(continued...)

C- Organic dusts

n=927		Flour		Wood		Coffee		Feed		Other dusts	
	Hygienist A	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	27	1	14	5	7	1	2	1	142	6
	-	22	877	23	885	27	892	0	924	141	638
overall		0.98		0.97		0.97		1.00		0.84	
K		0.69	(.57, .81)	0.49	(.33, .64)	0.32	(.15, .5)	0.80	(.41,1.19)	0.57	(.51, .63)
α		0.95	(.91, .98)	0.87	(.82, .93)	0.90	(.83, .97)	0.99	(.96,1.02)	0.76	(.71, .81)

D- Inorganic dusts

n=927		Asbestos		Fiberglass		Silica		Plaster Concrete cement		Carbon Coal Charcoal		Other inorganic dusts	
	Hygienist A	+	-	+	-	+	-	+	-	+	-		
Hygienist B	+	9	2	17	6	29	8	9	2	0	1	24	19
	-	84	832	164	740	94	796	68	848	20	906	82	802
overall		0.91		0.82		0.89		0.92		0.98		0.89	
K		0.16	(.06, .25)	0.13	(.07, .19)	0.32	(.22, .42)	0.19	(.07, .31)	0.00	(0 , 0)	0.27	(.18, .37)
α		0.76	(.65, .88)	0.59	(.47, .70)	0.73	(.65, .80)	0.80	(.69, .90)	0.65	(<0, 1.40)	0.64	(.55, .73)

Table 12.1 **Concordance between 2 hygienists in coding exposures in 927 jobs (men and women)**
(continued...)

E- Metals as vapours or dusts

n=927		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron		Other metals	
		Hygienist A															
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	1	3	0	0	3	1	4	1	2	0	2	1	21	4	49	49
	-	61	862	1	926	65	858	86	836	7	918	47	877	47	855	36	793
overall		0.93		1.00		0.93		0.91		0.99		0.95		0.94		0.91	
K		0.02	(<0, .08)	...		0.08	(0, .15)	0.08	(0, .15)	0.36	(< 0, .73)	0.07	(< 0, .17)	0.43	(.31, .55)	0.49	(.39, .58)
α		0.53	(.11, .95)	0.96	(.85, 1.07)	0.77	(.60, .94)	0.75	(.59, .91)	0.96	(.90, 1.03)	0.78	(.60, .97)	0.85	(.79, .91)	0.71	(.73, .80)

F- Miscellaneous exposures

n=927		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
		Hygienist A							
		+	-	+	-	+	-	+	-
Hygienist B	+	47	5	23	1	6	26	36	14
	-	104	771	148	755	47	848	96	781
overall		0.88		0.84		0.92		0.88	
K		0.41	(.34, .49)	0.20	(.12, .28)	0.10	(.01, .20)	0.34	(.25, .44)
α		0.77	(.71, .83)	0.75	(.67, .84)	0.48	(.27, .69)	0.69	(.61, .76)

For category C (organic dusts), concordance was on the whole satisfactory for 4 out of 5 dusts listed with K ranging from 0.49 for wood dust to 0.8 for feed dust, but for coffee dust concordance was low K=0.32.

For category D (inorganic dusts) concordance between hygienists was on the whole poor with values for K below 0.32 for all dusts listed. Likewise for category E (metals) K was below 0.4 for 6 out of the 8 metals; iron (K=0.43) and other metals (K=0.49) were the exception. The rating of pyrolysis products generated a satisfactory K value (K =0.41) while all others in the miscelleneous exposures section led to poor values of K, ranging from 0.10 to 0.34.

Aickin's alpha index were always higher than the Kappa coefficient. Nevertheless, even using this index, and the same guidelines for interpretation as for Kappa coefficient poor agreement was also found in category A, for benzene (alpha=0.34), and in category B, for base and formaldehyde (alpha=0.28 and 0.09 respectively). No convergence was reached within the criterion given in the program for pharmaceutical products.

12.2 Inter-rater agreement for coding exposure in 421 jobs reported by men and 506 jobs reported by women

Inter-rater agreement did not change substantially when exposure estimates for jobs reported by men and jobs reported by women were analysed separately (see tables 12.2 a and b). Results described in

Table 12.2 a Concordance between 2 hygienists in coding exposures in the 421 jobs reported by men

A- Solvents

		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
n=421		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	64	10	11	10	18	1	23	13	23	7	82	9	11	41
	-	95	252	49	351	34	368	53	332	90	301	65	265	48	321
Overall		0.751		0.86		0.92		0.84		0.77		0.82		0.79	
K		0.41	(.33, .49)	0.21	(.08, .35)	0.47	(.34, .61)	0.33	(.22, .45)	0.24	(.14, .33)	0.58	(.50, .65)	0.08	(<0, .20)
α		0.52	(.46, .62)	0.55	(.40, .70)	0.84	(.76, .92)	0.59	(.48, .70)	0.53	(.41, .65)	0.69	(.61, .76)	0.20	(<0, .42)

B- Other chemicals not in group A (gases, vapours, mists or dusts)

		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical		Other chemicals	
n=421		Hygienist A															
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	20	9	5	9	11	16	16	24	13	5	4	1	19	0	28	5
	-	75	317	78	329	50	344	135	246	31	372	50	366	5	397	114	274
Overall		0.80		0.79		0.84		0.62		0.91		0.88		0.99		0.72	
K		0.24	(.15, .34)	0.05	(-.03, .13)	0.18	(.06, .30)	0.02	(<0, .10)	0.38	(.23, .54)	0.12	(0, .23)	0.88	(.78, .98)	0.22	(.14, .30)
α		0.54	(.41, .66)	0.28	(<0, .57)	0.46	(.29, .63)	0.06	(<0, .25)	0.75	(.64, .85)	0.70	(.52, .89)	0.97	(.94, 1.01)	0.52	(.41, .58)

Table 12.2 a **Concordance between 2 hygienists in coding exposures in the 421 jobs reported by men**
(continued...)

C- Organic dusts

n=421		Flour +	Flour -	Wood +	Wood -	Coffee +	Coffee -	Feed +	Feed -	Other dusts +	Other dusts -
		Hygienist A									
Hygienist B	+	10	1	13	5	1	1	1	1	37	4
	-	9	401	17	386	10	409	0	419	75	305
Overall		0.98		0.95		0.97		1.00		0.81	
K		0.66	(.46, .85)	0.52	(.34, .69)	0.15	(<0, .40)	0.67	(.06,1.27)	0.40	(.30, .50)
α		0.92	(.86, .94)	0.82	(.74, .91)	0.82	(.62, 1.02)	0.97	(.91, 1.03)	0.68	(.59, .77)

D- Inorganic dusts

n=421		Asbestos +	Asbestos -	Fiberglass +	Fiberglass -	Silica +	Silica -	Plaster Concrete cement +	Plaster Concrete cement -	Carbon Coal Charcoal +	Carbon Coal Charcoal -	Other inorganic dusts +	Other inorganic dusts -
		Hygienist A											
Hygienist B	+	9	16	16	6	27	7	9	2	0	1	24	16
	-	77	91	91	308	79	308	55	355	16	404	69	312
Overall		0.52		0.77		0.80		0.86		0.96		0.80	
K		0.15	(.05, .24)	0.18	(.08, .28)	0.30	(.20, .40)	0.21	(.09, .32)	0.00	(0, .01)	0.26	(.15, .38)
α		-0.11	(<0, .15)	0.51	(.37, .65)	0.59	(.48, .69)	0.70	(.56, .83)	0.53	(<0, 1.46)	0.49	(.37, .61)

Table 12.2 a **Concordance between 2 hygienists in coding exposures in the 421 jobs reported by men**
(continued...)

E- Metals as vapours or dusts

n=421 — Hygienist A (columns) × Hygienist B (rows)

		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron		Other metals	
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	1	1	0	0	3	1	4	1	2	0	2	1	20	4	45	43
	-	56	363	1	420	54	363	57	359	5	414	44	374	42	355	29	304
Overall		0.86		1.00		0.87		0.86		0.99		0.89		0.89		0.83	
K		0.03	(<0, .08)	...		0.08	(<0, .18)	0.10	(.1, .11)	0.44	(.03, .85)	0.07	(<0, .17)	0.41	(.27, .55)	0.45	(.35, .55)
α		0.52	(.1, .95)	0.94	(.78,1.1)	0.66	(.44, .89)	0.51	(.27, .76)	0.95	(.87, 1.03)	0.66	(.40, .92)	0.75	(.66, .92)	0.58	(.48, .67)

F- Miscellaneous exposures

n=927 — Hygienist A (columns) × Hygienist B (rows)

		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
		+	-	+	-	+	-	+	-
Hygienist B	+	46	6	0	0	6	25	19	11
	-	78	291	33	388	30	360	47	344
Overall		0.80		0.92		0.87		0.86	
K		0.42	(.32, .52)	...		0.11	(-.03, .25)	0.33	(.19, .47)
α		0.65	(.56, .74)	0.65	(<0, 1.40)	0.36	(.11, .61)	0.62	(.50, .73)

Table 12.2.b **Concordance between 2 hygienists in coding exposures in the 506 jobs reported by women**

A- Solvents

		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
n=506		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	44	10	2	12	10	5	5	6	9	9	18	6	0	10
	-	26	426	30	462	26	465	16	479	39	449	55	427	18	478
Overall		0.93		0.92		0.94		0.96		0.91		0.88		0.94	
K		0.67	(.57, .77)	0.05	(<0, .17)	0.37	(.14, .54)	0.29	(.08, .51)	0.23	(.10, .37)	0.32	(.21, .44)	0.03	(<0, <0)
α		0.82	(.76, .88)	0.37	(<0, .76)	0.78	(.68, .88)	0.76	(.63, .89)	0.64	(.5, .78)	0.69	(.59, .80)	-0.24	<0, 2.12)

B- Other chemicals not in group A (gases, vapours, mists or dusts)

		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical		Other chemicals	
n=506		Hygienist A															
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	5	26	3	9	12	8	20	59	29	5	2	1	42	0	138	4
	-	47	428	75	419	59	427	75	352	22	450	36	467	10	454	1	363
Overall		0.86		0.83		0.87		0.74		0.95		0.93		0.98		0.99	
K		0.05	(<0, .15)	0.03	(<0, .13)	0.22	(.08, .35)	0.07	(<0, .17)	0.65	(.54, .77)	0.09	(<0, .21)	0.88	(.82, .94)	0.98	(.96, 1.0)
α		0.22	(<0, .54)	0.24	(<0, .62)	0.61	(.47, .74)	0.16	(<0, .33)	0.86	(.80, .92)	0.73	(.51, .95)	0.97	(.94, 1.0)	0.98	(.96, 1.0)

Table 12.2.b **Concordance between 2 hygienists in coding exposures in the 506 jobs reported by women**

(continued...)

C- Organic dusts

n=506; columns: Hygienist A (+ / -); rows: Hygienist B (+ / -)

		Flour		Wood		Coffee		Feed		Other dusts	
		+	-	+	-	+	-	+	-	+	-
Hygienist B	+	17	0	1	0	6	0	1	0	105	2
	-	13	476	6	499	17	483	0	505	66	333
Overall		0.97		0.99		0.97		1.00		0.87	
K		0.71	(.61, .87)	0.25	(<0, .64)	0.40	(.19, .62)	1.00		0.67	(.59, .74)
α		0.95	(.91, 1.0)	0.94	(.83, 1.05)	0.93	(.88, 1.0)	0.97	(.92, 1.03)	no convergence	

D- Inorganic dusts

n=506; columns: Hygienist A (+ / -); rows: Hygienist B (+ / -)

		Asbestos		Fiberglass		Silica		Plaster Concrete cement		Carbon Coal Charcoal		Other inorganic dusts	
		+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	0	0	1	0	2	7	0	6	0	0	0	3
	-	8	498	73	432	16	487	13	493	4	502	14	489
Overall		0.98		0.86		0.96		0.96		0.99		0.97	
K		...		0.02	(<0.,06)	0.13	(<0, .31)	...		...		.010	(<0, .01)
α		0.86	(.5, 1.2)	0.70	(.36, 1.04)	0.64	(.39,.89)	0.66	(<0, 1.76)	0.90	(.64, 1.16)	0.37	(<0, 1.6)

Table 12.2.b **Concordance between 2 hygienists in coding exposures in the 506 jobs reported by women**
(continued...)

E- Metals as vapours or dusts

		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron		Other metals	
n=506		Hygienist A															
		+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	0	2	0	0	0	0	0	0	0	0	0	0	1	0	4	6
	-	6	498	0	506	11	495	29	477	2	504	3	503	5	500	7	489
Overall		0.98		1.00		0.98		0.94		1.00		0.99		0.99		0.97	
K		0.01	(<0, 0)	....		...		...		...		...		0.28	(<0, .71)	0.37	(.09, .64)
α		0.65	(<0, 1.35)	0.98	(.9, 1.0)	0.83	(.42, 1.24)	0.71	(.06, 1.36)	0.93	(.74, 1.12)	0.91	(.69 ,1.14)	0.94	(.84, 1.01)	0.83	(.71, .94)

F- Miscellaneous exposures

		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
n=506		Hygienist A							
		+	-	+	-	+	-	+	-
Hygienist B	+	1	0	23	1	0	1	17	3
	-	26	479	115	367	17	488	49	437
Overall		0.95		0.77		0.96		0.90	
K		0.07	(<0,.19)	0.22	(.14,.30)	0.00	(<0, 0)	0.36	(.22, .5)
α		0.85	(.63, 1.07)	0.67	(.57,.77)	0.56	(<0, 1.4)	0.77	(.67,.86)

section 12.1 and table 12.1 were similar to those in tables 12.2.a and b except for few exposures listed below.

For men's jobs (see table 12.2.a) the K value increased slighty for glue, tars, wood, pyrolysis product but decreased for paint, dyes, pharmaceutical, flour, animal food and other organic dusts, iron and other metals. The confidence interval of all those K's were within the same range.

For women's jobs (see table 12.2.b) the K value increased slightly for paint, dyes, flour, coffee, animal food, other dusts but decreased for glue, tars, wood, iron, other metals and pyrolysis products.

The same pattern was found for Aickin's alpha index. The gender of the job holder seems to have little effect on the inter-rater agreement.

12.3 Inter-rater agreement for coding at least one exposure in 927 jobs (men and women combined)

This analysis was conducted because in other population-based studies (Lebowitz,1977) an association was found between asthma and asthma-like symptoms and occupational exposures defined in broad exposure categories, similar to those used in this study. For this analysis, therefore, concordance was examined by combining all the results obtained for each product in the different categories (A,B,C,D and E) into one column. For instance, whenever a hygienist coded a

Table 12.3 **Concordance between 2 hygienists for coding the presence of at least one exposure in 922 jobs**

n=922

A- Solvents

Hygienist B	Hygienist A +	Hygienist A -
+	188	14
-	118	602

Overall	0.86	
K (C I)	0.65	(.59, .71)
Aickin's alpha (α)	0.75	(.71, .80)

B- Other chemicals

Hygienist B	Hygienist A +	Hygienist A -
+	192	36
-	179	515

Overall	0.77	
K	0.43	(.37, .49)
Aickin's alpha (α)	0.57	(.51, .63)

C- Organic dusts

Hygienist B	Hygienist A +	Hygienist A -
+	202	18
-	101	601

Overall	0.87	
K	0.69	(.63, .75)
Aickin's alpha (α)	0.76	(.72, .81)

D- Inorganic dusts

Hygienist B	Hygienist A +	Hygienist A -
+	55	4
-	195	668

Overall	0.78	
K	0.28	(.22, .34)
Aickin's alpha (α)	0.67	(.60, .74)

E- Metals (vapour or dusts)

Hygienist B	Hygienist A +	Hygienist A -
+	59	35
-	53	775

Overall	0.90	
K	0.52	(.44, .60)
Aickin's alpha (α)	0.72	(.66, .78)

participant as being exposed either to paint **and/or** varnish **and/or** thinners **and/or** hardeners **and/or** glues **and/or** to any substances included into the "A" category, this participant was assigned as exposed to category A.

The results of this analysis are shown in table 12.3. As expected, this lead to an increase of the Kappa statistic, with values above 0.4 in all categories except inorganic dusts which still showed low agreement (K=0.28) The Aickin's alpha index for all categories exceeded 0.5, ranging from 0.57 to 0.76.

12.4 Inter-rater agreement for coding exposure in the latest job

This analysis was conducted because, on biological grounds, exposure which precipitated asthma in the subjects studied is more likely to have been recent than remote. The results of this analysis are presented in table 12.4 and are different from those in table 12.1 (ever exposed). There was a very slight increase in the Kappa statistic for some products, amongst which were glue, plastics, tars, flour, wood, other organic dusts, cobalt and iron. The Kappa statistic decreased for paint, pharmaceutical and pyrolysis products.

Table 12.4 **Concordance between 2 hygienists in estimating exposures in latest job**

A- Solvents

		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
n=303								Hygienist A							
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	27	8	3	9	8	2	9	6	10	7	29	5	3	20
	-	36	232	16	275	15	278	15	273	42	244	33	236	15	265
Overall		0.85		0.92		0.94		0.93		0.84		0.87		0.88	
K		0.47	(.34, .61)	0.15	(<0, .35)	0.46	(.24, .68)	0.43	(.23, .62)	0.22	(<0, .36)	0.54	(.42, .66)	0.09	(<0, .24)
α		0.67	(.56, .77)	0.54	(.27, .81)	0.83	(.72, .93)	0.75	(.63, .87)	0.54	(.38, .71)	0.73	(.64, .83)	0.35	(.01, .70)

B- Other chemicals not in group A (gases, vapours, mists or dusts)

		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharma-ceutical	
n=303								Hygienist A							
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	6	9	4	6	8	10	8	31	8	6	1	1	18	0
	-	37	251	45	248	34	251	68	196	17	272	34	267	5	280
Overall		0.85		0.83		0.85		0.67		0.92		0.88		0.98	
K		0.14	(.01, .28)	0.09	(<0, .203)	0.20	(.04, .36)	-0.04	(<0, .06)	0.37	(.18, .57)	0.04	(<0, .14)	0.87	(.75, .99)
α		0.45	(.22, .67)	0.40	(.12, .68)	0.44	(.23, .65)	-0.10	(<0, .21)	0.72	(.59, .85)	0.57	(.16, .97)	0.97	(.93, 1.0)

Table 12.4 **Concordance between 2 hygienists in estimating exposures in latest job (continued...)**

C- Organic dusts

n=303; Hygienist A (columns) vs Hygienist B (rows)

		Flour		Wood		Coffee		Feed		Other dusts	
		+	-	+	-	+	-	+	-	+	-
Hygienist B	+	15	0	3	1	3	0	0	0	54	1
	-	7	281	5	294	12	288	0	303	43	205
Overall		0.98		0.98		0.96		1.00		0.85	
K		0.80	(.66, .94)	0.49	(.14, .84)	0.32	(.05, .60)	...		0.62	(.53, .74)
α		0.96	(.91, 1.0)	0.80	(.80, 1.0)	0.90	(.78, 1.0)	0.97	(.87, 1.1)	no convergence	

D- Inorganic dusts

n=303; Hygienist A (columns) vs Hygienist B (rows)

		Asbestos		Fiberglass		Silica		Plaster Concrete cement		Carbon Coal Charcoal		Other inorganic dusts	
		+	-	+	-	+	-	+	-	+	-		
Hygienist B	+	2	0	6	1	10	0	1	0	0	0	6	4
	-	25	276	56	240	27	266	22	280	4	299	22	271
Overall		0.92		0.81		0.91		0.93		0.99		0.91	
K		0.13	(.05, .21)	0.14	(.04, .24)	0.39	(.21, .57)	0.08	(<0, .214)	-		0.28	(.09, .48)
α		0.82	(.62, 1.02)	0.64	(.45, .82)	0.86	(.76, .96)	0.81	(.55, 1.0)	0.87	(.53, 1.0)	0.70	(.54, .85)

Table 12.4 **Concordance between 2 hygienists in estimating exposures in latest job (continued...)**

E- Metals as vapours or dusts

n=303		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron	
Hygienist A		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Hygienist B	+	0	0	0	0	1	1	0	1	1	0	1	0	5	1
	-	13	290	1	302	17	284	20	282	2	300	13	289	8	289
Overall		0.96		1.00		0.94		0.93		0.99		0.96		0.97	
K		...		...		0.09	(<0, .265)	-0.01	(<0, .01)	0.50	(.19, .81)	0.13	(<0, .36)	0.51	(.24, .79)
α		0.75	(.18, 1.0)	0.93	(.74, 1.0)	0.71	(.41, 1.0)	0.37	(<0, 1.6)	0.95	(.86, 1.04)	0.86	(.66, 1.07)	0.89	(.79, .98)

F- Miscellaneous exposures

n=303		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
Hygienist A		+	-	+	-	+	-	+	-
Hygienist B	+	12	2	4	1	0	7	15	2
	-	33	256	40	258	18	278	38	248
Overall		0.88		0.86		0.92		0.87	
K		0.36	(.21, .52)	0.14	(0, .28)	-0.03	(<0, <0)	0.38	(.24, .51)
α		0.75	(.63, .86)	0.68	(.48, .88)	-0.35	(<0, 1.0)	0.74	(.62, .85)

12.5 Inter-rater agreement for coding at least one exposure in the latest job

Concordance was analyzed in a similar way to that described in section 12.3 by combining all the results obtained in latest job for each product of the different categories (A,B,C,D and E) into one column. For instance, whenever an hygienist coded a participant as being exposed either to paint **and/or** varnish **and/or** thinners **and/or** hardeners **and/or** glues **and/or** to any substances included into the "A" category, this participant was assigned as an exposed person to category A. Results showed fairly good agreement for all categories (K >0.40) except for inorganic dusts (K=0.23) (see table 12.5).

12.6 Analysis of inter-rater differences in coding exposures in 927 jobs (men and women combined)

This analysis were conducted to investigate why hygienist A coded more jobs at risk for exposure than hygienist B (number in cell c always higher than in cell b in table 12.6). One explanation might lie in differences in the confidance (certainty) between hygienists in coding exposure. Recall that the hygienists were asked to assign a probability of a subject having had exposure to the contaminants included in the list as follows: 1= possible: some persons in that particular workplace might have been exposed; 2= definite exposure, over 50% probability that this person in that particular workplace would have been exposed. One explanation between hygienists differences could be that hygienist A

Table 12.5 **Concordance between 2 hygienists in coding at least one exposure in the latest job**

n=303

A- Solvents

Hygienist B \ Hygienist A	+	-
+	42	4
-	59	198

Overall	0.79	
K	0.46	(.36, .56)
Aickin's alpha: α	0.65	(.56, .75)

B- Other chemicals

Hygienist B \ Hygienist A	+	-
+	59	14
-	62	168

Overall	0.75	
K	0.44	(.34, .54)
Aickin's alpha: α	0.53	(.42, .62)

C- Organic dusts

Hygienist B \ Hygienist A	+	-
+	58	1
-	46	198

Overall	0.84	
K	0.62	(.52, .71)
Aickin's alpha: α	no convergence	

D- Inorganic dusts

Hygienist B \ Hygienist A	+	-
+	14	0
-	68	221

Overall	0.78	
K	0.23	(.13, .33)
Aickin's alpha: α	no convergence	

E- Metals (vapour or dusts)

Hygienist B \ Hygienist A	+	-
+	8	0
-	18	277

Overall	0.94	
K	0.45	(.23, .66)
Aickin's alpha: α	0.90	(.80, .99)

more often coded exposures " possible " than hygienist B. This was investigated by examining the results according to level of certainty of coding by the hygienist.

For example, for the presence of vapors, hygienist A and B were concordant in 108 jobs out of 927, ie " a " cell of the two by two table (see table 12.6). These concordances were analysed first: they distributed according to the level of certainty of coding as follows; in 9 out of 108 concordances, both hygienists coded the exposure as being possible (level 1), and in 26 out of 108 concordances, hygienist's coded the exposure to vapors as being definite (level 2). However in 59 out of 108 concordances they differed, with hygienist A coding the exposure as definite compared to hygienist B who coded that exposure as possible. Next the discordances were examined (cell c), hygienist A coded the presence of vapors for 121 jobs, as opposed to hygienist B who for the same jobs didn't code any exposure to vapors. These 121 discordances were distributed according to level of certainty as follows: 36 were coded by hygienist A as possible and 85 were coded as definite. Furthermore from table 12.6 it can be seen that hygienist A coded as <u>definite exposure</u> to vapors, glue and plastic in category A; formaldehyde and insecticides in category B; wood and coffee in category C; fiberglass, silica, concrete and other dusts in category D, platinum and iron in category E; and cold and heat in category F, more often than <u>possible exposure</u>.

Table 12.6 Interrater differences in coding exposures for 927 jobs (men and women)

A- Solvents

VAPO	+ 1	+ 2	−
+ 1	9	59	18
+ 2	14	26	2
	$\boxed{108}$		$\boxed{20}$
−	36	85	$\boxed{678}$
	$\boxed{121}$		

HARD	+ 1	+ 2	−
+ 1	5	6	14
+ 2	0	2	8
	$\boxed{13}$		$\boxed{22}$
−	63	16	$\boxed{813}$
	$\boxed{79}$		

GLUE	+ 1	+ 2	−
+ 1	1	16	6
+ 2	1	10	0
	$\boxed{28}$		$\boxed{6}$
−	29	31	$\boxed{833}$
	$\boxed{60}$		

RESN	+ 1	+ 2	−
+ 1	15	12	16
+ 2	1	0	3
	$\boxed{28}$		$\boxed{19}$
−	49	20	$\boxed{811}$
	$\boxed{69}$		

PLAS	+ 1	+ 2	−
+ 1	15	11	15
+ 2	2	4	1
	$\boxed{32}$		$\boxed{16}$
−	28	101	$\boxed{750}$
	$\boxed{129}$		

TARS	+ 1	+ 2	−
+ 1	34	57	6
+ 2	1	8	9
	$\boxed{100}$		$\boxed{15}$
−	85	35	$\boxed{692}$
	$\boxed{120}$		

BENZ	+ 1	+ 2	−
+ 1	9	0	48
+ 2	2	0	3
	$\boxed{11}$		$\boxed{51}$
−	66	0	$\boxed{799}$
	$\boxed{66}$		

B- Other chemicals not in group A
(gases, vapours, mists or dusts)

ACID	+ 1	+ 2	−
+ 1	9	7	33
+ 2	3	6	2
	$\boxed{25}$		$\boxed{35}$
−	67	55	$\boxed{745}$
	$\boxed{122}$		

BASE	+ 1	+ 2	−
+ 1	1	2	15
+ 2	0	5	3
	$\boxed{8}$		$\boxed{18}$
−	89	64	$\boxed{748}$
	$\boxed{153}$		

AMMO	+ 1	+ 2	−
+ 1	9	1	21
+ 2	0	13	3
	$\boxed{23}$		$\boxed{24}$
−	89	20	$\boxed{771}$
	$\boxed{109}$		

FORM	+ 1	+ 2	−
+ 1	34	2	76
+ 2	0	0	3
	$\boxed{36}$		$\boxed{79}$
−	87	124	$\boxed{598}$
	$\boxed{211}$		

DYES	+ 1	+ 2	−
+ 1	15	5	6
+ 2	3	19	4
	$\boxed{42}$		$\boxed{10}$
−	33	20	$\boxed{822}$
	$\boxed{53}$		

INSE	+ 1	+ 2	−
+ 1	0	6	2
+ 2	0	0	0
	$\boxed{6}$		$\boxed{2}$
−	37	49	$\boxed{833}$
	$\boxed{86}$		

PHAR	+ 1	+ 2	−
+ 1	0	12	0
+ 2	0	49	0
	$\boxed{61}$		$\boxed{0}$
−	14	1	$\boxed{851}$
	$\boxed{15}$		

C- Organic dusts

FLOU	+ 1	+ 2	−
+ 1	0	24	1
+ 2	0	3	0
	$\boxed{27}$		$\boxed{1}$
−	12	10	$\boxed{877}$
	$\boxed{22}$		

WOOD	+ 1	+ 2	−
+ 1	2	2	4
+ 2	0	10	1
	$\boxed{14}$		$\boxed{5}$
−	8	15	$\boxed{885}$
	$\boxed{23}$		

COSO	+ 1	+ 2	−
+ 1	0	7	1
+ 2	0	0	0
	$\boxed{7}$		$\boxed{1}$
−	4	23	$\boxed{892}$
	$\boxed{27}$		

FEED	+ 1	+ 2	−
+ 1	0	0	1
+ 2	0	2	0
	$\boxed{2}$		$\boxed{1}$
−	0	0	$\boxed{924}$
	$\boxed{0}$		

ODUS	+ 1	+ 2	−
+ 1	5	64	4
+ 2	3	70	2
	$\boxed{142}$		$\boxed{6}$
−	9	132	$\boxed{638}$
	$\boxed{141}$		

EXAMPLE

VAPOURS

Hygienist A (columns); Hygienist B (rows)

VAPOURS	+ 1	+ 2	−
+ 1	9	59	18
+ 2	14	26	2
	$\boxed{108}$		$\boxed{20}$
−	36	85	$\boxed{678}$
	$\boxed{121}$		

1= possible
2= definite

Table 12.6 Interrater differences in coding exposures for 927 jobs (men and women) (continued...)

D- Inorganic dusts

ASBE

	+	-
+	6, 3, 0, 0 [9]	2, 0 [2]
-	44, 41 [85]	[831]

FIBR

	+	-
+	8, 5, 1, 3 [17]	5, 1 [6]
-	60, 104 [164]	[740]

SILI

	+	-
+	10, 9, 3, 7 [29]	6, 2 [8]
-	23, 72 [95]	[795]

CONC

	+	-
+	1, 5, 0, 3 [9]	2, 0 [2]
-	5, 63 [68]	[848]

CHAR

	+	-
+	0, 0, 0, 0 [0]	1, 0 [1]
-	18, 2 [20]	[906]

IDUS

	+	-
+	3, 10, 5, 6 [24]	16, 3 [19]
-	30, 53 [83]	[801]

E- Metals as vapours or dusts

ALUM

	+	-
+	1, 0, 0, 0 [1]	3, 0 [3]
-	61, 1 [62]	[861]

PLAT

	+	-
+	0, 0, 0, 0 [0]	0, 0 [0]
-	0, 1 [1]	[926]

NICK

	+	-
+	2, 0, 0, 1 [3]	1, 0 [1]
-	59, 6 [65]	[858]

CHRO

	+	-
+	4, 0, 0, 0 [4]	1, 0 [1]
-	75, 11 [86]	[836]

COBA

	+	-
+	2, 0, 0, 0 [2]	0, 0 [0]
-	4, 3 [7]	[918]

CADM

	+	-
+	1, 1, 0, 0 [2]	1, 0 [1]
-	36, 11 [47]	[877]

IRON

	+	-
+	6, 6, 3, 6 [21]	4, 0 [4]
-	19, 28 [47]	[855]

F- Miscellaneous exposures

PYRO

	+	-
+	6, 39, 1, 1 [47]	5, 1 [6]
-	60, 44 [104]	[770]

CIGA

	+	-
+	0, 22, 0, 1 [23]	1, 0 [1]
-	106, 42 [148]	[755]

COLD

	+	-
+	0, 5, 0, 1 [6]	26, 0 [26]
-	3, 44 [47]	[848]

HEAT

	+	-
+	2, 28, 1, 5 [36]	12, 2 [14]
-	39, 57 [96]	[781]

12.7 Analysis of inter-rater differences in coding exposures in latest job (men and women combined)

The same analysis (levels of certainty) was conducted on the latest job reported by subjects. Results presented in table 12.7 show that hygienist A coded as definite the following: exposure to vapors and plastics in category A; to acid and formaldehyde in category B; to wood, coffee and other dusts in category C; to asbestos, fiberglass, silica, concrete and other dusts in category D, to platinum and iron in category E; and to pyrolisis products as well as cold and heat in category F.

12.8 Synthesis

Concordance between 2 industrial hygienists in coding occupational exposures in 927 jobs was investigated in terms of exposure to potential asthmagens. Agreement varied according to different exposures, but was not influenced by gender or whether the coding referred to the latest job only, or all jobs (see table 12.8). Agreement reflected in Aickin's alpha was consistently better than reflected in the Kappa statistic.

Table 12.7 **Interrater differences in coding exposures in the latest job (men and women)**

A- Solvents

VAPO	+	-
+	2, 12, 5, 8 [27]	8, 0 [8]
-	10, 26 [36]	[232]

HARD	+	-
+	1, 1, 0, 1 [3]	7, 2 [9]
-	13, 3 [16]	[275]

GLUE	+	-
+	0, 5, 0, 3 [8]	2, 0 [2]
-	10, 5 [15]	[278]

RESN	+	-
+	4, 5, 0, 0 [9]	5, 1 [6]
-	10, 5 [15]	[273]

PLAS	+	-
+	4, 5, 1, 0 [10]	7, 0 [7]
-	8, 34 [42]	[244]

TARS	+	-
+	9, 17, 1, 2 [29]	2, 3 [5]
-	23, 10 [33]	[236]

BENZ	+	-
+	2, 0, 1, 0 [3]	20, 0 [20]
-	15, 0 [15]	[265]

B- Other chemicals not in group A

(gases, vapours, mists or dusts)

ACID	+	-
+	2, 1, 1, 2 [6]	9, 0 [9]
-	16, 21 [37]	[251]

BASE	+	-
+	1, 1, 0, 2 [4]	6, 0 [6]
-	23, 22 [45]	[248]

AMMO	+	-
+	2, 0, 0, 6 [8]	7, 3 [10]
-	30, 4 [34]	[251]

FORM	+	-
+	8, 0, 0, 0 [8]	30, 1 [31]
-	21, 46 [67]	[198]

DYES	+	-
+	3, 0, 1, 4 [8]	4, 2 [6]
-	11, 6 [17]	[272]

INSE	+	-
+	0, 1, 0, 0 [1]	1, 0 [1]
-	17, 17 [34]	[267]

PHAR	+	-
+	0, 3, 0, 15 [18]	0, 0 [0]
-	4, 1 [5]	[280]

C- Organic dusts

FLOU	+	-
+	0, 13, 0, 2 [15]	0, 0 [0]
-	4, 3 [7]	[281]

WOOD	+	-
+	0, 0, 0, 3 [3]	1, 0 [1]
-	0, 5 [5]	[294]

COSO	+	-
+	0, 3, 0, 0 [3]	0, 0 [0]
-	0, 12 [12]	[288]

FEED	+	-
+	0, 0, 0, 0 [0]	0, 0 [0]
-	0, 0 [0]	[303]

ODUS	+	-
+	1, 26, 0, 27 [54]	1, 0 [1]
-	3, 40 [43]	[205]

EXAMPLE

VAPOURS

Hygienist B \ Hygienist A	+	-
+	2, 12, 5, 8 [27]	8, 0 [8]
-	10, 26 [36]	[232]

1 = possible
2 = definite

Table 12.7 **Interrater differences in coding exposures in the latest job (men and women)**
(continued...)

D- Inorganic dusts

ASBE

	+	-
+	2 0 [2] 0 0	0 [0] 0
-	11 [25] 14	[276]

FIBR

	+	-
+	4 2 [6] 0 0	1 [1] 0
-	15 [56] 41	[240]

SILI

	+	-
+	5 3 [10] 2 0	0 [0] 0
-	4 [27] 23	[266]

CONC

	+	-
+	0 1 [1] 0 0	0 [0] 0
-	1 [22] 21	[280]

CHAR

	+	-
+	0 0 [0] 0 0	0 [0] 0
-	4 [4] 0	[299]

IDUS

	+	-
+	1 4 [6] 0 1	2 [4] 2
-	8 [22] 14	[271]

E- Metals as vapours or dusts

ALUM

	+	-
+	0 0 [0] 0 0	0 [0] 0
-	13 [13] 0	[290]

PLAT

	+	-
+	0 0 [0] 0 0	0 [0] 0
-	0 [1] 1	[302]

NICK

	+	-
+	1 0 [1] 0 0	1 [1] 0
-	14 [17] 3	[284]

CHRO

	+	-
+	0 0 [0] 0 0	1 [1] 0
-	18 [20] 2	[282]

COBA

	+	-
+	1 0 [1] 0 0	0 [0] 0
-	2 [2] 0	[300]

CADM

	+	-
+	0 1 [1] 0 0	0 [0] 0
-	12 [13] 1	[289]

IRON

	+	-
+	1 3 [5] 0 1	1 [1] 0
-	3 [8] 5	[289]

F- Miscelleneous exposures

PYRO

	+	-
+	0 10 [12] 1 1	2 [2] 0
-	14 [33] 19	[256]

CIGA

	+	-
+	0 4 [4] 0 0	1 [1] 0
-	30 [40] 10	[258]

COLD

	+	-
+	0 0 [0] 0 0	7 [7] 0
-	1 [18] 17	[278]

HEAT

	+	-
+	1 13 [15] 0 1	2 [2] 0
-	16 [38] 22	[248]

Lexique for Tables 12.6 and 12.7

A- Solvents

VAPO	Vapours, paints
HARD	Hardener
GLUE	Glue
RESN	Resins
PLAS	Plastics
TARS	Tars
BENZ	Benzene

B- Other chemicals

ACID	Acid
BASE	Base
AMMO	Ammoniac
FORM	Formaldehyde
DYES	Dyes
INSE	Insecticides
PHAR	Pharmaceutical

C- Organic dusts

FLOU	Flour
WOOD	Wood
COSO	Coffee
FEED	Feed
ODUS	Other dusts

D-Inorganic dusts

ASBE	Asbestos
FIBR	Fiberglass
SILI	Silica
CONC	Plaster Concrete cement
CHAR	Carbon, Coal, Charcoal
IDUS	Other inorganic dusts

E- Metals

ALUM	Aluminium
PLAT	Platinium
NICK	Nickel
CHRO	Chrome
COBA	Cobalt
CADM	Cadmium
IRON	Iron

F- Miscelleneous exposures

PYRO	Pyrolysis products
CIGA	Cigarette smoke
COLD	Excessive cold
HEAT	Excessive heat

Table 12.8 **Concordance between 2 hygienists in coding occupationnal exposures Summary Table**

A- Solvents

		Paint	Hardener	Glue	Resin	Plastics	Tars	Benzene	At least one exposure
All jobs	K	0.52	0.16	0.43	0.35	0.25	0.52	0.09	0.65
Men's job	K	0.41	0.21	0.47	0.33	0.24	0.58	0.08	
Women's job	K	0.67	0.05	0.37	0.29	0.23	0.32	-0.03	
Latest job	K	0.47	0.15	0.46	0.43	0.51	0.54	0.09	0.46
All jobs	α	0.69	0.53	0.81	0.69	0.60	0.72	0.34	0.75
Men's job	α	0.52	0.55	0.84	0.59	0.53	0.69	0.20	
Women's job	α	0.82	0.37	0.78	0.76	0.64	0.69	-0.24	
Latest job	α	0.67	0.54	0.83	0.75	0.54	0.73	0.35	0.65

B- Other chemicals

		Acid	Base	Ammoniac	Formal-dehyde	Dyes	Insecticides	Pharma-ceutical	At least one exposure
All jobs	K	0.17	0.04	0.20	0.04	0.54	0.11	0.88	0.43
Men's job	K	0.24	0.05	0.18	0.02	0.38	0.12	0.88	
Women's job	K	0.05	0.03	0.22	0.07	0.65	0.09	0.88	
Latest job	K	0.14	0.09	0.20	-0.04	0.37	0.04	0.87	0.44
All jobs	α	0.43	0.28	0.54	0.09	0.82	0.73	no convergence	0.57
Men's job	α	0.54	0.28	0.46	0.06	0.75	0.70	0.97	
Women's job	α	0.22	0.24	0.61	0.16	0.86	0.73	0.97	
Latest job	α	0.45	0.40	0.44	-0.10	0.72	0.57	0.97	0.53

Table 12.8 **Concordance between 2 hygienists in coding occupationnal exposures**
Summary Table
(continued...)

C- Organic dusts

		Flour	wood	coffee	Feed	Other	At least one exposure
All jobs	K	0.69	0.49	0.32	0.80	0.57	0.69
Men's job	K	0.66	0.52	0.15	0.67	0.40	
Women's job	K	0.71	0.49	0.40	1.00	0.67	
Latest job	K	0.78	0.49	0.32	-	0.62	0.62
All jobs	α	0.95	0.87	0.90	0.99	0.76	0.76
Men's job	α	0.92	0.82	0.82	0.97	0.68	
Women's job	α	0.95	0.94	0.93	0.97	no convergence	
Latest job	α	0.96	0.80	0.90	0.97	no convergence	no convergence

D- Inorganic dusts

		Asbestos	Fiberglass	Silica	Cement	Charcoal	Other	At least one exposure
All jobs	K	0.16	0.13	0.32	0.19	0.00	0.27	0.28
Men's job	K	0.15	0.18	0.30	0.21	0.00	0.26	
Women's job	K	...	0.02	0.18	...	...	-0.01	
Latest job	K	0.13	0.14	0.39	0.08	...	0.28	0.23
All jobs	α	0.76	0.59	0.73	0.80	0.65	0.64	0.67
Men's job	α	-0.11	0.51	0.59	0.70	0.53	0.49	
Women's job	α	0.86	0.70	0.64	0.66	0.90	0.37	
Latest job	α	0.82	0.64	0.86	0.81	0.87	0.70	no convergence

Table 12.8 **Concordance between 2 hygienists in coding occupationnal exposures**
Summary Table
(continued...)

E- Metals

		Aluminium	Platinium	Nickel	Chrome	Cobalt	Cadmium	Iron	Other	At least one exposure
All jobs	K	0.02	...	0.08	0.08	0.36	0.07	0.43	0.49	0.52
Men's job	K	0.03	...	0.08	.101	0.44	0.07	0.41	0.45	
Women's job	K	-0.06	...	...	...	...	...	0.28	0.37	
Latest job	K	...	...	0.09	-0.01	-0.50	0.03	0.51	...	0.45
All jobs	α	0.53	0.96	0.77	0.75	0.96	0.78	0.85	0.71	0.52
Men's job	α	0.52	0.94	0.66	0.51	0.95	0.66	0.75	0.58	
Women's job	α	0.65	0.98	0.83	0.71	0.93	0.91	0.94	0.83	
Latest job	α	0.75	0.93	0.71	0.37	0.95	0.86	0.89		0.90

F- Miscellaneous

		Pyrolisis product	Cigarette smoke	Excessive cold	Excessive heat
All jobs	K	0.41	0.20	0.10	0.34
Men's job	K	0.42	...	0.11	0.33
Women's job	K	0.07	0.22	0.00	0.36
Latest job	K	0.36	0.14	-0.03	0.38
All jobs	α	0.77	0.75	0.48	0.69
Men's job	α	0.65	0.65	0.36	0.62
Women's job	α	0.85	0.67	0.56	0.77
Latest job	α	0.75	0.68	-0.35	0.74

Chapter 13 Comparison of self-reported exposure information with exposure information derived from hygienists evaluation of job history

13.1 Comparison of self-reported exposure with exposure coded by hygienist A

13.1.1 Exposures to individual product: 922 jobs

Validity analysis, using as the criterion the coding by hygienist A, lead to fairly poor performances regarding sensitivity (see table 13.1.1). The highest values of sensitivity was found for cigarette smoke exposure in the workplace (Sn=0.39) followed with wood dusts (Sn=0.35). A sensitivity of 0.39 means that 39% of those in whom hygienist judged them to be exposed to cigarette smoke also reported it themselves. Specificity however was high for all products (Sp>0.9) except for cigarette smoke in the workplace (Sp=0.58). A specificity of 0.9 means that in 90% of those whom hygienist judged not to be exposed, also reported no exposure. Phi coefficients were for most product lower than 0.35 except for pharmaceutical products and wood dust.

Table 13.1.1 **Concordance between self-reported exposures and exposures coded by hygienist A for 922 jobs (men and women)**

A- Solvents

		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
n=922		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	31	23	4	4	20	25	7	5	8	7	15	4	3	14
	-	196	672	87	827	68	809	88	822	150	757	202	701	73	832
Sensitivity		0.14		0.04		0.23		0.07		0.05		0.07		0.04	
Specificity		0.97		1.00		0.97		0.99		0.99		0.99		0.98	
$\boxed{\phi}$		0.19		0.13		0.27		0.18		0.12		0.19		0.05	

B- Other chemicals not in group A (gases, vapours, mists or dusts)

		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical	
n=922		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	22	25	7	8	15	18	9	2	10	8	2	3	16	1
	-	124	751	154	753	116	773	239	672	81	823	87	830	60	845
Sensitivity		0.15		0.04		0.11		0.04		0.11		0.02		0.21	
Specificity		0.97		0.99		0.98		1.00		0.99		1.00		1.00	
$\boxed{\phi}$		0.20		0.10		0.17		0.14		0.22		0.08		0.43	

Table 13.1.1 **Concordance between self-reported exposures and exposures coded by hygienist A for 922 jobs (men and women)** **(continued...)**

C- Organic dusts

n=922; columns: Hygienist A (+ / -); rows: Self-reported (+ / -)

		Flour +	Flour -	Wood +	Wood -	Coffee +	Coffee -	Feed +	Feed -	Other dusts +	Other dusts -
Self-reported	+	10	6	13	15	1	2	0	2	3	0
	-	38	868	24	870	32	887	2	918	278	641
Sensitivity		0.21		0.35		0.03		0.00		0.01	
Specificity		0.99		0.98		1.00		1.00		1.00	
$\boxed{\phi}$		0.34		0.38		0.09		0.00		0.09	

D- Inorganic dusts

n=922; columns: Hygienist A (+ / -); rows: Self-reported (+ / -)

		Asbestos +	Asbestos -	Fiberglass +	Fiberglass -	Silica +	Silica -	Plaster Concrete cement +	Plaster Concrete cement -	Carbon Coal Charcoal +	Carbon Coal Charcoal -	Other inorganic dusts +	Other inorganic dusts -
Self-reported	+	1	2	4	4	4	5	16	10	0	1	8	43
	-	92	827	175	739	119	794	61	835	20	901	98	773
Sensitivity		0.01		0.02		0.03		0.21		0.00		0.08	
Specificity		1.00		0.99		0.99		0.99		1.00		0.95	
$\boxed{\phi}$		0.04		0.07		0.09		0.33		0.00		0.03	

Table 13.1.1 **Concordance between self-reported exposures and exposures coded by hygienist A for 922 jobs (men and women)**
(continued...)

E- Metals as vapours or dusts

n=922		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron	
		Hygienist A													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	7	2	0	2	3	3	3	3	0	2	1	2	11	8
	-	54	859	1	919	86	830	86	830	9	911	47	872	55	848
Sensitivity		0.11		0.00		0.03		0.03		0.00		0.02		0.17	
Specificity		1.00		1.00		1.00		1.00		1.00		1.00		0.99	
$\boxed{\phi}$		0.28		0.00		0.11		0.11		0.00		0.07		0.29	

F- Miscellaneous exposures

n=922		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
		Hygienist A							
		+	-	+	-	+	-	+	-
Hygienist B	+	26	20	66	315	8	26	21	43
	-	124	752	105	436	44	844	110	748
Sensitivity		0.17		0.39		0.15		0.16	
Specificity		0.97		0.58		0.97		0.95	
$\boxed{\phi}$		0.25		-0.03		0.15		0.15	

13.1.2 Exposure to at least one product: 922 jobs

For this analysis the results obtained for all products in each exposure category (A,B,C,D and E) were combined into a categorical variable: exposed or not to category A, exposed or not to category B, etc.

Sensitivity ranged from 0.11 to 0.22 with the highest value for inorganic dusts. By contrast, specificity was satisfactory with all values higher than 0.95 (see table 13.1.2). Phi-coefficient were low (Phi <0.35) for all categories of agents.

13.1.3 Exposures in latest job

Analysis of results for the latest job showed a slight improvement in sensitivities (see table 13.1.3). Sensitivity for wood dusts increased to 0.5, while values of sensitivity for glue, pharmaceutical products, aluminium, iron, pyrolysis products and cigarette smoke were greater than 0.30. Phi coefficients were higher than 0.35 for resins (category A: 1 agent/7), pharmaceutical (category B: 1 agent/7), flour and wood, (category C: 2 agents/5), aluminium, nickel, chrome, iron (category E: 4 agents/7), pyrolysis product (category F: 1 agent/4).

13.1.4 At least one exposure in the latest job

For this analysis, the results obtained for all products in each exposure category (A,B,C,D and E) were combined into a categorical variable: exposed or not to category A, exposed or not to category B, etc.

Table 13.1.2 **Concordance between self report of at least one exposure and at least one exposure coded by hygienist A**

n=922

A- Solvents

Hygienist B \ Hygienist A	+	-
+	63	32
-	244	583

Sensitivity	0.21
Specificity	0.95
$\boxed{\phi}$	0.24

B- Other chemicals

Hygienist B \ Hygienist A	+	-
+	73	17
-	299	533

Sensitivity	0.20
Specificity	0.97
$\boxed{\phi}$	0.27

C- Organic dusts

Hygienist B \ Hygienist A	+	-
+	33	15
-	270	604

Sensitivity	0.11
Specificity	0.98
$\boxed{\phi}$	0.18

D- Inorganic dusts

Hygienist B \ Hygienist A	+	-
+	56	29
-	194	643

Sensitivity	0.22
Specificity	0.96
$\boxed{\phi}$	0.28

E- Metals (vapour or dusts)

Hygienist B \ Hygienist A	+	-
+	18	11
-	94	799

Sensitivity	0.16
Specificity	0.99
$\boxed{\phi}$	0.28

Table 13.1.3 **Concordance between self reported exposure for latest job and exposure coded for latest job by hygienist A**

A- Solvents

n=303		Paint +	Paint -	Hardener +	Hardener -	Glue +	Glue -	Resins +	Resins -	Plastics +	Plastics -	Tars +	Tars -	Benzene +	Benzene -
		Hygienist A													
Self	+	18	11	3	3	9	16	5	2	4	2	7	2	2	9
	-	45	229	16	281	14	264	19	277	48	249	55	239	16	276
Sensitivity		0.29		0.16		0.39		0.21		0.08		0.11		0.11	
Specificity		0.95		0.99		0.94		0.99		0.99		0.99		0.97	
$\boxed{\phi}$		0.33		0.26		0.32		0.36		0.19		0.25		0.10	

B- Other chemicals not in group A (gases, vapours, mists or dusts)

n=303		Acid +	Acid -	Base +	Base -	Ammoniac +	Ammoniac -	Formaldehyde +	Formaldehyde -	Dyes +	Dyes -	Insecticides +	Insecticides -	Pharma-ceutical +	Pharma-ceutical -
		Hygienist A													
Self	+	10	10	4	4	6	10	4	0	1	5	1	2	8	0
	-	33	250	45	250	36	251	72	227	24	273	34	266	15	280
Sensitivity		0.23		0.08		0.14		0.05		0.04		0.03		0.35	
Specificity		0.96		0.98		0.96		1.00		0.98		0.99		1.00	
$\boxed{\phi}$		0.27		0.15		0.16		0.20		0.04		0.07		0.57	

Table 13.1.3 **Concordance between self reported exposure for latest job and exposure coded for latest job by hygienist A (continued...)**

C- Organic dusts

n=303		Flour		Wood		Coffee		Feed		Other dusts	
		Hygienist A									
		+	-	+	-	+	-	+	-	+	-
Self	+	5	3	4	8	1	1	0	1	1	0
	-	17	278	4	287	14	287	0	302	96	206
Sensitivity		0.23		0.50		0.07		...		0.01	
Specificity		0.99		0.97		1.00		1.00		1.00	
$\boxed{\phi}$		0.35		0.39		0.17		...		0.08	

D- Inorganic dusts

n=303		Asbestos		Fiberglass		Silica		Plaster Concrete cement		Carbon Coal Charcoal		Other inorganic dusts	
		Hygienist A											
		+	-	+	-	+	-	+	-	+	-		
Self	+	1	0	2	3	2	2	5	5	0	0	3	26
	-	26	276	60	238	35	264	18	275	4	299	25	249
Sensitivity		0.04		0.03		0.05		0.22		0.00		0.11	
Specificity		1.00		0.99		0.99		0.98		1.00		0.91	
$\boxed{\phi}$		0.18		0.06		0.13		0.30		...		0.01	

Table 13.1.3 **Concordance between self reported exposure for latest job and exposure coded for latest job by hygienist A**
(continued...)

E- Metals as vapours or dusts

n=303; columns: Hygienist A (+ / -); rows: Self (+ / -)

		Aluminium +	Aluminium -	Platinium +	Platinium -	Nickel +	Nickel -	Chrome +	Chrome -	Cobalt +	Cobalt -	Cadmium +	Cadmium -	Iron +	Iron -
Self	+	5	2	0	2	3	0	3	0	0	2	1	1	4	3
	-	8	288	1	300	15	285	17	283	3	298	13	288	9	287

	Aluminium	Platinium	Nickel	Chrome	Cobalt	Cadmium	Iron
Sensitivity	0.38	0.00	0.17	0.15	0.00	0.07	0.31
Specificity	0.99	0.99	1.00	1.00	0.99	1.00	0.99
ϕ	0.51	0.00	0.40	0.38	-0.01	0.18	0.40

F- Miscellaneous exposures

n=303; columns: Hygienist A (+ / -); rows: Self (+ / -)

		Pyrolysis products +	Pyrolysis products -	Cigarette smoke +	Cigarette smoke -	Excessive cold +	Excessive cold -	Excessive heat +	Excessive heat -
Self	+	14	10	16	127	2	10	9	17
	-	31	248	28	132	16	275	44	233

	Pyrolysis products	Cigarette smoke	Excessive cold	Excessive heat
Sensitivity	0.31	0.36	0.11	0.17
Specificity	0.96	0.51	0.96	0.93
ϕ	0.36	-0.09	0.09	0.14

Sensitivity ranged from 0.13 to 0.32 with the highest value for inorganic dusts. Specificity were also satisfactory with all values higher than 0.90 (see table 13.1.4). Phi-coefficient for metals was 0.44, others ranged from 0.18 to 0.30.

13.2 Comparison of self-reported exposure with exposure coded by hygienist B

13.2.1 All exposures in 922 jobs

Validity analysis, using as the criterion the coding by hygienist B, lead to somewhat different results from those coded by hygienist A (see table 13.2.1). Values of sensitivity were increased with the highest values for concrete cement (Sn=0.55), followed by wood dusts (Sn=0.53), glue (Sn=0.42), formaldehyde (Sn=0.42) and cigarette smoke (Sn=0.42). Values of specificity were also all higher than 0.95, except for exposure to cigarette smoke in the worplace. Phi-coefficients were higher than 0.35 for formaldehyde (0.59), dyes (0.35) and pharmaceutical (0.48) in category B; flour (0.37), wood (0.42) in category C.

13.2.2 At least one exposure in 922 jobs

For this analysis results obtained for all products in each exposure category (A,B,C,D and E) were combined into a categorical variable. Sensitivities ranged from 0.10 to 0.30 with highest value for

Table 13.1.4 **Concordance between self-report of at least one exposure in latest job versus those coded by hygienist A in latest job**

n=303

A- Solvents

Hygienist A

Hygienist B	+	-
+	30	14
-	72	187

Sensitivity	0.29
Specificity	0.93
$\boxed{\phi}$	0.30

B- Other chemicals

Hygienist A

Hygienist B	+	-
+	35	8
-	86	174

Sensitivity	0.29
Specificity	0.96
$\boxed{\phi}$	0.34

C- Organic dusts

Hygienist A

Hygienist B	+	-
+	14	7
-	91	191

Sensitivity	0.13
Specificity	0.96
$\boxed{\phi}$	0.18

D- Inorganic dusts

Hygienist A

Hygienist B	+	-
+	26	17
-	56	204

Sensitivity	0.32
Specificity	0.92
$\boxed{\phi}$	0.31

E- Metals (vapour or dusts)

Hygienist A

Hygienist B	+	-
+	8	3
-	18	274

Sensitivity	0.31
Specificity	0.99
$\boxed{\phi}$	0.44

Table 13.2.1 **Concordance between self-reported exposures and exposures coded by hygienist B for 922 jobs (men and women)**

A- Solvents

n=922		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
		Hygienist B													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	21	33	3	5	14	31	3	9	4	11	11	8	1	16
	-	104	764	31	883	19	858	43	867	41	866	102	801	60	845
Sensitivity		0.17		0.09		0.42		0.07		0.09		0.10		0.02	
Specificity		0.96		0.99		0.97		0.99		0.99		0.99		0.98	
$\boxed{\phi}$		0.18		0.17		0.34		0.11		0.13		0.20		0.00	

B- Other chemicals not in group A (gases, vapours, mists or dusts)

n=922		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical	
		Hygienist B													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	18	29	4	11	7	26	78	4	11	7	0	5	16	1
	-	42	833	22	885	39	850	107	804	38	866	8	909	45	860
Sensitivity		0.30		0.15		0.15		0.42		0.22		0.00		0.26	
Specificity		0.97		0.99		0.97		1.00		0.99		0.99		1.00	
$\boxed{\phi}$		0.30		0.19		0.14		0.59		0.35		-0.01		0.48	

Table 13.2.1 Concordance between self-reported exposures and exposures coded by hygienist B for 922 jobs (men and women) (continued...)

C- Organic dusts

n=922; columns: Hygienist B (+ / -); rows: Self-reported (+ / -)

		Flour +	Flour -	Wood +	Wood -	Coffee +	Coffee -	Feed +	Feed -	Other dusts +	Other dusts -
Self-reported	+	8	8	10	18	0	3	0	2	2	1
	-	20	886	9	885	8	911	3	917	144	775

	Flour	Wood	Coffee	Feed	Other dusts
Sensitivity	0.29	0.53	0.00	0.00	0.01
Specificity	0.99	0.98	1.00	1.00	1.00
ϕ	0.36	0.42	-0.01	0.00	0.08

D- Inorganic dusts

n=922; columns: Hygienist B (+ / -); rows: Self-reported (+ / -)

		Asbestos +	Asbestos -	Fiberglass +	Fiberglass -	Silica +	Silica -	Plaster Concrete cement +	Plaster Concrete cement -	Carbon Coal Charcoal +	Carbon Coal Charcoal -	Other inorganic dusts +	Other inorganic dusts -
Self-reported	+	1	2	1	7	4	5	6	20	0	1	3	48
	-	10	909	22	892	33	880	5	891	1	920	40	831

	Asbestos	Fiberglass	Silica	Plaster Concrete cement	Carbon Coal Charcoal	Other inorganic dusts
Sensitivity	0.09	0.04	0.11	0.55	0.00	0.07
Specificity	1.00	0.99	0.99	0.98	1.00	0.95
ϕ	0.17	0.06	0.20	0.34	0.00	0.01

Table 13.2.1 Concordance between self-reported exposures and exposures coded by hygienist B for 922 jobs (men and women)
(continued...)

E- Metals as vapours or dusts

n=922		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron	
		Hygienist B													
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self-reported	+	0	9	0	2	0	6	0	6	0	2	0	3	3	16
	-	4	909	0	920	4	912	5	911	2	918	3	916	22	881
Sensitivity		0.00		-		0.00		0.00		0.00		0.00		0.12	
Specificity		0.99		1.00		0.99		0.99		1.00		1.00		0.98	
ϕ		-0.01		-		-0.01		-0.01		0.00		0.00		0.12	

F- Miscellaneous exposures

n=922		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
		Hygienist B							
		+	-	+	-	+	-	+	-
Hygienist B	+	14	32	10	371	8	26	8	56
	-	39	837	14	527	24	864	42	816
Sensitivity		0.26		0.42		0.25		0.16	
Specificity		0.96		0.59		0.97		0.94	
ϕ		0.24		0.00		0.21		0.09	

inorganic dusts; specificities were all over 0.90 (see table 13.2.2). All Phi-coefficients were inferior to 0.35 (ranged from 0.13 to 0.25).

13.2.3 All exposures in latest job

Analysis of results for latest job showed an improvement in values for sensitivity (see table 13.2.3). The highest value for sensitivity was found for wood dusts (Sn=0.75) followed by glue (Sn=0.60), pyrolysis products (Sn=0.50), pharmaceutical products (Sn=0.44) and cigarette smoke (Sn=0.40). Specificities were all over 0.90, except for exposure to cigarette smoke in the workplace. Phi-coefficients ranged -0.06 to 0.66 for pharmaceutical. Glue, in category A (0.35) and two types of organic dusts in category C, flour (0.44) and wood (0.42) had values higher than 0.35.

13.2.4 At least one exposure in latest job

For this analysis the results obtained for all product in each exposure category (A,B,C,D and E) were combined into a categorical variable: exposed or not to category A, exposed or not to category B, etc. Values of sensitivity ranged from 0.15 to 0.62 with highest value for inorganic dusts. Specificities were all over 0.85, and phi-coefficients were all below 0.35 (see table 13.2.4).

Table 13.2.2 **Concordance between self report of at least one exposure and at least one exposure coded by hygienist B**

n=922

A- Solvents

Hygienist A

Hygienist B	+	-
+	48	45
-	156	673

Sensitivity	0.24
Specificity	0.94
$\boxed{\phi}$	0.24

B- Other chemicals

Hygienist A

Hygienist B	+	-
+	53	40
-	173	656

Sensitivity	0.23
Specificity	0.94
$\boxed{\phi}$	0.25

C- Organic dusts

Hygienist A

Hygienist B	+	-
+	23	25
-	198	676

Sensitivity	0.10
Specificity	0.96
$\boxed{\phi}$	0.13

D- Inorganic dusts

Hygienist A

Hygienist B	+	-
+	19	61
-	44	798

Sensitivity	0.30
Specificity	0.93
$\boxed{\phi}$	0.21

E- Metals (vapour or dusts)

Hygienist A

Hygienist B	+	-
+	14	14
-	84	810

Sensitivity	0.14
Specificity	0.98
$\boxed{\phi}$	0.23

Table 13.2.3 **Concordance between self reported exposure for latest job and exposures coded for latest job by hygienist B**

A- Solvents

n=303; Hygienist B

		Paint		Hardener		Glue		Resins		Plastics		Tars		Benzene	
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self	+	11	18	3	3	6	19	3	4	2	4	6	3	0	11
	-	24	250	9	288	4	274	12	284	15	282	28	266	23	269

	Paint	Hardener	Glue	Resins	Plastics	Tars	Benzene
Sensitivity	0.31	0.25	0.60	0.20	0.12	0.18	0.00
Specificity	0.93	0.99	0.94	0.99	0.99	0.99	0.96
$\boxed{\phi}$	0.27	0.34	0.35	0.27	0.17	0.31	-0.06

B- Other chemicals not in group A (gases, vapours, mists or dusts)

n=303; Hygienist B

		Acid		Base		Ammoniac		Formaldehyde		Dyes		Insecticides		Pharmaceutical	
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self	+	5	15	2	6	4	12	2	2	3	3	0	3	8	0
	-	10	273	8	287	14	273	37	262	11	286	2	298	10	285

	Acid	Base	Ammoniac	Formaldehyde	Dyes	Insecticides	Pharmaceutical
Sensitivity	0.33	0.20	0.22	0.05	0.21	0.00	0.44
Specificity	0.95	0.98	0.96	0.99	0.99	0.99	1.00
$\boxed{\phi}$	0.25	0.20	0.19	0.13	0.31	-0.01	0.66

Table 13.2.3 **Concordance between self reported exposure for latest job and exposures coded for latest job by hygienist B**
(continued...)

C- Organic dusts

n=303 (Hygienist B: columns; Self: rows)

		Flour		Wood		Coffee		Feed		Other dusts	
		+	-	+	-	+	-	+	-	+	-
Self	+	5	3	3	9	0	2	0	1	0	1
	-	10	285	1	290	3	298	0	302	55	247
Sensitivity		0.33		0.75		0.00		...		0.00	
Specificity		0.99		0.97		0.99		1.00		1.00	
$\boxed{\phi}$		0.44		0.42		-0.01		...		-0.03	

D- Inorganic dusts

n=303 (Hygienist B: columns; Self: rows)

		Asbestos		Fiberglass		Silica		Plaster Concrete cement		Coal Charcoal		Other Inorganic dusts	
		+	-	+	-	+	-	+	-	+	-		
Self	+	0	1	1	4	2	2	1	9	0	0	1	28
	-	2	300	6	292	8	291	0	293	0	303	9	265
Sensitivity		0.00		0.14		0.20		1.00		...		0.10	
Specificity		1.00		0.99		0.99		0.97		1.00		0.90	
$\boxed{\phi}$		0.00		0.15		0.30		0.31		...		0.00	

Table 13.2.3 Concordance between self reported exposure for latest job and exposures coded for latest job by hygienist B
(continued...)

E- Metals as vapours or dusts

n=303; Hygienist B (columns) by Self (rows)

		Aluminium		Platinium		Nickel		Chrome		Cobalt		Cadmium		Iron	
		+	-	+	-	+	-	+	-	+	-	+	-	+	-
Self	+	0	7	0	2	0	3	0	3	0	2	0	2	1	6
	-	0	296	0	301	1	299	1	299	1	300	1	300	5	291
Sensitivity		...		...		0.00		0.00		0.00		0.00		0.17	
Specificity		0.98		0.99		0.99		0.99		0.99		0.99		0.98	
$\boxed{\phi}$		...		...		-0.01		-0.01		0.00		0.00		0.14	

F- Miscellaneous exposures

n=303; Hygienist B (columns) by Self (rows)

		Pyrolysis products		Cigarette smoke		Excessive cold		Excessive heat	
		+	-	+	-	+	-	+	-
Self	+	7	17	2	141	1	11	3	23
	-	7	272	3	157	6	285	14	263
Sensitivity		0.50		0.40		0.14		0.18	
Specificity		0.94		0.53		0.96		0.92	
$\boxed{\phi}$		0.34		-0.02		0.08		0.08	

Table 13.2.4 **Concordance between self-report of at least one exposure in latest job versus those coded by hygienist B in latest job**

A- Solvents

		Hygienist A +	Hygienist A -
Hygienist B	+	19	25
	-	43	216

Sensitivity 0.31
Specificity 0.90
$\boxed{\phi}$ 0.23

B- Other chemicals

		Hygienist A +	Hygienist A -
Hygienist B	+	23	20
	-	50	210

Sensitivity 0.32
Specificity 0.91
$\boxed{\phi}$ 0.28

C- Organic dusts

		Hygienist A +	Hygienist A -
Hygienist B	+	9	12
	-	50	232

Sensitivity 0.15
Specificity 0.95
$\boxed{\phi}$ 0.16

D- Inorganic dusts

		Hygienist A +	Hygienist A -
Hygienist B	+	8	35
	-	5	255

Sensitivity 0.62
Specificity 0.88
$\boxed{\phi}$ 0.29

E- Metals (vapour or dusts)

		Hygienist A +	Hygienist A -
Hygienist B	+	3	8
	-	5	287

Sensitivity 0.38
Specificity 0.97
$\boxed{\phi}$ 0.30

13.3 Analysis of categories of exposures on which there was disagreement.

Amongst the 303 subjects reporting a work history, hygienist A assigned 194 persons into the ever-exposed category compared with 175 for hygienist B and 148 according to self-reported exposures. The major difference lies into the complexity of exposures reported. Complex refers to exposures to substances included in three categories or more. Hygienist A reports more often complex exposures (162/194). The corresponding findings for hygienist B (81/175) and self-report (35/148) (see table 13.3).

13.4 Synthesis

Concordance between industrial hygienists in coding occupational exposures and self-reporting exposures was investigated. A total of 922 jobs reported by the subjects were analysed, each of which were assessed by 2 industrial hygienists working independently, for exposure to potential asthmagens. The actual or latest job held was investigated (n=303) to verify if concordances in coding contaminants was similar compared to those found in coding all jobs (n=922). Results of all analysis performed are summarized in tables 13.5 a and b. Values of sensitivity, specificity and phi-coefficients are presented.

Table 13.3 Number of persons reporting or being coded as ever exposed to different types of exposures

Types of exposures	Self-reporting	Hygienist B	Hygienist A
A	18	12	
B	25	11	
C	9	16	
D	22	4	
E	4	3	
AB	6	4	4
AC	4	3	1
AD	11		
AE	3	4	
BC	5	34	17
BD	4		1
BE	1	1	
CD	1	1	9
CE		1	
ABC	4	32	16
ABD	6	1	9
ABE		2	3
ACD	7	3	3
ACE	1	1	
ADE	1		2
BCD	1	1	7
BDE	3	3	
ABCD	2	4	58
ABCE	3	8	7
ABDE	5	7	17
ACDE		6	
BCDE	1	2	1
ABCDE	1	11	39
Total	148	175	194

A= Vapours - fumes
B= Others chemicals
C= Organic dusts
D= Inorganic dusts
E= Metals

Table 13.5 a **Concordance between hygienist A and self-reported exposure**
Summary table

A- Solvents

All jobs (n=922)	Paint	Hardener	Glue	Resin	Plastics	Tars	Benzene	At least one exposure
Sensitivity	0.14	0.04	0.23	0.07	0.05	0.07	0.04	0.21
Specificity	0.97	1.00	0.97	0.99	0.99	0.99	0.98	0.95
$\boxed{\phi}$	0.19	0.13	0.27	0.18	0.12	0.19	0.05	0.24
Latest job (n=303)								
Sensitivity	0.29	0.16	0.39	0.21	0.08	0.11	0.11	0.29
Specificity	0.95	0.99	0.94	0.99	0.99	0.99	0.97	0.93
$\boxed{\phi}$	0.33	0.26	0.32	0.36	0.19	0.25	0.10	0.30

B- Other chemicals

All jobs (n=922)	Acid	Base	Ammoniac	Formal-dehide	Dyes	Insecticides	Pharma-ceutical	At least one exposure
Sensitivity	0.15	0.04	0.11	0.04	0.11	0.02	0.21	0.20
Specificity	0.97	0.99	0.98	1.00	0.99	1.00	1.00	0.97
$\boxed{\phi}$	0.20	0.10	0.17	0.14	0.22	0.08	0.43	0.27
Latest job (n=303)								
Sensitivity	0.23	0.08	0.14	0.05	0.04	0.03	0.35	0.29
Specificity	0.96	0.98	0.96	1.00	0.98	0.99	1.00	0.96
$\boxed{\phi}$	0.27	0.15	0.16	0.20	0.04	0.07	0.57	0.34

Table 13.5 a **Concordance between hygienist A and self-reported exposure**
Summary table
(continued...)

C- Organic dusts

All jobs (n=922)	Flour	wood	coffee	Feed	Other	At least one exposure
Sensitivity	0.21	0.35	0.03	0.00	0.01	0.11
Specificity	0.99	0.98	1.00	1.00	1.00	0.98
$\lvert\phi\rvert$	0.34	0.38	0.09	0.00	0.09	0.18
Latest job (n=303)						
Sensitivity	0.23	0.50	0.07	...	0.01	0.13
Specificity	0.99	0.97	1.00	1.00	1.00	0.96
$\lvert\phi\rvert$	0.35	0.39	0.17	...	0.08	0.18

D- Inorganic dusts

All jobs (n=922)	Asbestos	Fiberglass	Silica	Cement	Charcoal	Other	At least one exposure
Sensitivity	0.01	0.02	0.03	0.21	0.00	0.08	0.22
Specificity	1.00	0.99	0.99	0.99	1.00	0.95	0.96
$\lvert\phi\rvert$	0.04	0.07	0.09	0.33	0.00	0.03	0.28
Latest job (n=303)							
Sensitivity	0.04	0.03	0.05	0.22	0.00	0.11	0.32
Specificity	1.00	0.99	0.99	0.98	1.00	0.91	0.92
$\lvert\phi\rvert$	0.18	0.06	0.13	0.30	...	0.01	0.31

Table 13.5 a Concordance between hygienist A and self-reported exposure
Summary table
(continued...)

E- Metals

All jobs (n=922)	Aluminium	Platinium	Nickel	Chrome	Cobalt	Cadmium	Iron	At least one exposure
Sensitivity	0.11	0.00	0.03	0.03	0.00	0.02	0.17	0.16
Specificity	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
$\boxed{\phi}$	0.28	0.00	0.11	0.11	0.00	0.07	0.29	0.28
Latest job (n=303)								
Sensitivity	0.38	0.00	0.17	0.15	0.00	0.07	0.31	0.31
Specificity	0.99	0.99	1.00	1.00	0.99	1.00	0.99	0.99
$\boxed{\phi}$	0.51	0.00	0.40	0.38	-0.01	0.18	0.40	0.44

F- Miscelleneous

All jobs (n=922)	Pyrolysis	Cigarette smoke	Excessive cold	Excessive heat
Sensitivity	0.17	0.39	0.15	0.16
Specificity	0.97	0.58	0.97	0.95
$\boxed{\phi}$	0.25	-0.03	0.15	0.15
Latest job (n=303)				
Sensitivity	0.31	0.36	0.11	0.17
Specificity	0.96	0.51	0.96	0.93
$\boxed{\phi}$	0.36	-0.09	0.09	0.14

Table13.5 b **Concordance between hygienist B and self-reported exposure Summary table**

A- Solvents

All jobs (n=922)	Paint	Hardener	Glue	Resin	Plastics	Tars	Benzene	At least one exposure
Sensitivity	0.17	0.09	0.42	0.07	0.09	0.10	0.02	0.24
Specificity	0.96	0.99	0.97	0.99	0.99	0.99	0.98	0.94
$\boxed{\phi}$	0.18	0.17	0.34	0.11	0.13	0.20	0.00	0.24
Latest job (n=303)								
Sensitivity	0.31	0.25	0.60	0.20	0.12	0.18	0.00	0.31
Specificity	0.93	0.99	0.94	0.99	0.99	0.99	0.96	0.90
$\boxed{\phi}$	0.27	0.34	0.35	0.27	0.17	0.31	-0.06	0.23

B- Other chemicals

All jobs (n=922)	Acid	Base	Ammoniac	Formal-dehyde	Dyes	Insecticides	Pharma-ceutical	At least one exposure
Sensitivity	0.30	0.15	0.15	0.42	0.22	0.00	0.26	0.23
Specificity	0.97	0.99	0.97	1.00	0.99	0.99	1.00	0.94
$\boxed{\phi}$	0.30	0.19	0.14	0.59	0.35	-0.01	0.48	0.25
Latest job (n=303)								
Sensitivity	0.33	0.20	0.22	0.05	0.21	0.00	0.44	0.32
Specificity	0.95	0.98	0.96	0.99	0.99	0.99	1.00	0.91
$\boxed{\phi}$	0.25	0.20	0.19	0.13	0.31	-0.01	0.66	0.28

Table13.5 b **Concordance between hygienist B and self-reported exposure**
Summary table
(continued...)

C- Organic dusts

All jobs (n=922)	Flour	wood	coffee	Feed	Other		At least one exposure
Sensitivity	0.29	0.53	0.00	0.00	0.01		0.10
Specificity	0.99	0.98	1.00	1.00	1.00		0.96
$\|\phi\|$	0.36	0.42	-0.01	0.00	0.08		0.13
Latest job (n=303)							
Sensitivity	0.33	0.75	0.00	...	0.00		0.15
Specificity	0.99	0.97	0.99	1.00	1.00		0.95
$\|\phi\|$	0.44	0.42	-0.01	...	-0.03		0.16

D- Inorganic dusts

All jobs (n=922)	Asbestos	Fiberglass	Silica	Cement	Charcoal	Other	At least one exposure
Sensitivity	0.09	0.04	0.11	0.55	0.00	0.07	0.30
Specificity	1.00	0.99	0.99	0.98	1.00	0.95	0.93
$\|\phi\|$	0.17	0.06	0.20	0.34	0.00	0.01	0.21
Latest job (n=303)							
Sensitivity	0.00	0.14	0.20	1.00	-	0.10	0.62
Specificity	1.00	0.99	0.99	0.97	1.00	0.90	0.88
$\|\phi\|$	0.00	0.15	0.30	0.31	-	0.00	0.29

Table13.5 b **Concordance between hygienist B and self-reported exposure**
Summary table
(continued...)

E- Metals

All jobs (n=922)	Aluminium	Platinium	Nickel	Chrome	Cobalt	Cadmium	Iron	At least one exposure
Sensitivity	0.00	...	0.00	0.00	0.00	0.00	0.12	0.14
Specificity	0.99	1.00	0.99	0.99	1.00	1.00	0.98	0.98
ϕ	-0.01	...	-0.01	-0.01	0.00	0.00	0.12	0.23
Latest job (n=303)								
Sensitivity	...	...	0.00	0.00	0.00	0.00	0.17	0.38
Specificity	0.98	0.99	0.99	0.99	0.99	0.99	0.98	0.97
ϕ	...	...	-0.01	-0.01	0.00	0.00	0.14	0.30

F- Miscelleneous

All jobs (n=922)	Pyrolysis	Cigarette smoke	Excessive cold	Excessive heat
Sensitivity	0.26	0.42	0.25	0.16
Specificity	0.96	0.59	0.97	0.94
ϕ	0.24	0.00	0.21	0.09
Latest job (n=303)				
Sensitivity	0.50	0.40	0.14	0.18
Specificity	0.94	0.53	0.96	0.92
ϕ	0.34	-0.02	0.08	0.08

Chapter 14 Comparison of the relationship for asthma with exposure assessed in 2 ways: i) by self-report and ii) by hygienist

For these analyses, asthma was defined in two ways, current asthma, and ever asthma. These two definitions were used because recall is usually thought to be better for recent than remote events, whether symptoms (outcome) or exposure. The analyses were carried out using the logistic regression procedure. Personal characteristics (gender, family history of allergies and atopy and smoking) were first entered into the model on a priori grounds, followed by occupational exposure. Different models are presented, all of which represent self-reported or exposures according to hygienist A or B, for each outcome (current or ever), and each definition of exposure (current or ever). The results for current asthma are presented in section 14.1 and for ever asthma in section 14.2.

14.1 Current asthma

The definition of asthma was based on answers to 7 questions (see section 2.3). A total of 69 subjects with current asthma were found in the sample, giving a prevalence of 20.4% of current asthma(69/338).

14.1.1 Characteristics of subjects with and without current asthma

Women were predominantly represented in the group of current asthmatics (73.9%) compared to men (26.1%) and comparatively to the group without current asthma (59.9% for women, 40.1%) for men). A higher percentage of current asthmatics were current smokers (52.2%) compared to non-asthmatics (37.5%). Amongst the asthmatic group, 63.8% had family history of allergies, compared to 39.4% in the other group. The asthmatic group also reported more often, although we are dealing with very small numbers, having experienced chest tightness or wheezing at work and had to change job because it affected their breathing (see table 14.1.1).

14.1.2 Distribution of exposures in cases of current asthma according to self-report and according to hygienist A and hygienist B

Amongst the subjects reporting a work history, hygienist A assigned 36 persons into the ever-exposed category compared with 29 for hygienist B and 30 according to self-reported exposures. The major difference lies into the complexity of exposures reported. Complex refers to exposures to substances included in three categories or more. Hygienist A reports more often complex exposures (31/36). The corresponding findings for hygienist B (10/29) and self-report (6/30) (see table 14.1.2).

Table 14.1.1 Characteristics of subjects with and without current asthma

	current asthma n= 69		without current asthma n= 269	
	Nb	% of 69	Nb	% of 269
Men	18	26.1%	108	40.1%
Women	51	73.9%	161	59.9%
Current smokers	36	52.2%	101	37.5%
Family history of allergies	44	63.8%	106	39.4%
Age: mean (SD)	36,3 (5,6)		37,1 (5,8)	
Number reporting being exposed in their current or most recent job	22	31.9%	82	30.5%
Number reporting being *ever* exposed	31	44.9%	7	2.6%
Ever experienced chest tightness or wheezing at work	17	24.6%	14	5.2%
Had to change job because their job affected their breathing	4	5.8%	8	3.0%

Table 14.1.2 **Distribution of exposures (ever by category) according to self-report and according to coding by hygienist A and B of cases of current asthma**

Types of exposures	Self-reporting	Hygienist B	Hygienist A
A	3	3	
B	8		
C		4	
D	4		
E			
AB	2	1	1
AC	1	1	
AD	2		
AE		2	
BC	2	7	4
BD	1		
BE			
CD	1	1	
CE			
ABC		6	3
ABD	2		2
ABE			
ACD	2		
ACE			
ADE			
BCD		1	1
BDE	1		
ABCD		1	13
ABCE	1	1	2
ABDE			2
ACDE			
BCDE			
ABCDE		1	8
Total	30	29	36

A= Vapours - fumes
B= Others chemicals
C= Organic dusts
D= Inorganic dusts
E= Metals

14.1.3 Relationship of current asthma and ever exposed to fumes or chemicals or dusts or metals at work (self-reported and hygienist evaluation)

In the first series of models, exposure was categorised into ever or never exposed to any agent in any of the 5 categories examined (see chapter 13). OR's show that current smoking, family history of allergies and atopy were significant determinants in all 3 models (first model, self-reported exposures; second model, hygienist A coding exposures; third model, hygienist B coding exposures). Exposure ever to fumes or chemicals or dusts or metals was not significantly related to current asthma whatever evaluation of exposures was incorporated into the models (self-reporting vs hygienists evaluation). (see table 14.1.3.a). Interaction terms for all these personal variables and exposure were introduced into all 3 models (self-reported exposures, hygienist A, hygienist B), and was significant only in the self-reported exposure model suggesting a modifying effect of exposure amongst the atopic subjects (see table 14.1.3 a). The interaction term was not significant in the other models. Similar results, except for interaction term, that was not significant under the self-reported current exposures were found for current exposures (self-reported, and hygienists evaluations) into the models. (see table 14.1.3 b).

14.1.4 Relationship of current asthma and different types of exposures

Current exposures, as well as ever exposures, were analysed by categories (A,B,C.D and E) giving the opportunity to investigate the different measures of the exposure-disease association. Important

Table 14.1.3 a **Relationship of current asthma and ever exposed to fumes or chemicals or dusts or metals at work**

Exposure	Variables	Values of the OR and 95% CI under					
		Self-reporting		Hygienist A evaluation		Hygienist B evaluation	
		OR	CI	OR	CI	OR	CI
Model without interaction							
Ever exposed	gender	1.5	(0.8 , 2.9)	1.4	(0.8 , 2.8)	1.4	(0.7 , 2.7)
	current smoker	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.6)*	2.1	(1.2 , 3.6)*
	family history	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.8)*	2.2	(1.2 , 3.9)*
	atopy	3.3	(1.8 , 6.0)*	3.3	(1.8 , 6.0)*	3.3	(1.8 , 6.0)*
	exposed	1.1	(0.6 , 2.0)	0.9	(0.5 , 1.6)	0.8	(0.4 , 1.4)
Model with interaction							
Ever exposed	gender	1.5	(0.8 , 2.9)	1.4	(0.7 , 2.6)	1.3	(0.7 , 2.6)
	current smoker	2.2	(1.2 , 4.0)*	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.7)*
	family history	2.0	(1.1 , 3.7)*	2.1	(1.2 , 3.8)*	2.2	(1.2 , 3.9)*
	atopy	1.9	(0.9 , 4.0)	2.1	(0.9 , 4.7)	2.2	(1.0 , 4.7)
	exposed	0.5	(0.2 , 1.3)	0.5	(0.2 , 1.2)	0.4	(0.2 , 1.1)
	atopy*exposed	1.9	(1.2 ,14.4)*	1.3	(0.8 , 8.8)	1.1	(0.8 , 8.4)

* significant at 0.5% level

Table 14.1.3 b **Relationship of current asthma and current exposure to fumes or chemicals or dusts or metals at work**

Exposure	Variables	Values of the OR and 95% CI under					
		Self-reporting		Hygienist A evaluation		Hygienist B evaluation	
		OR	CI	OR	CI	OR	CI
Model without interaction							
Current exposure	gender	1.5	(0.8 , 2.8)	1.4	(0.8 , 2.7)	1.5	(0.8 , 2.8)
	current smoker	2.1	(1.2 , 3.6)*	2.1	(1.2 , 3.7)*	2.2	(1.2 , 3.0)*
	family history	2.1	(1.2 , 3.8)*	2.2	(1.2 , 3.9)*	2.2	(1.2 , 3.9)*
	atopy	3.3	(1.8 , 6.0)*	3.3	(1.8 , 6.0)*	3.3	(1.8 , 5.9)*
	exposed	1.0	(0.5 , 3.8)	0.6	(0.3 , 1.1)	0.5	(0.3 , 1.0)
Model with interaction							
Current exposure	gender	1.5	(0.8 , 2.8)	1.4	(0.7 , 2.8)	1.4	(0.7 , 2.7)
	current smoker	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.8)*
	family history	2.1	(1.2 , 3.8)*	2.2	(1.2 , 3.9)*	2.2	(1.2 , 4.0)*
	atopy	2.8	(1.4 , 5.6)*	2.6	(1.3 , 5.3)*	2.7	(1.4 , 5.3)*
	exposed	0.7	(0.2 , 2.0)	0.4	(0.1 , 1.1)	0.3	(0.1 , 1.0)
	atopy*exposed	1.25	(0.3 , 4.6)	0.8	(0.2 , 3.0)	0.7	(0.2 , 2.8)

* significant at 0.5% level

covariates, such as gender, current smoking family history of allergies and atopy were again incorporated into the logistic model on a priori grounds.

Current smoking, family history of allergies and atopy were all significant covariables. However, there was no statistically significant relationship between current asthma and self-reported/current exposure, nor with either hygienist's coding of current exposure (see table 14.1.4). Values of the OR's and 95% confidence interval for self-reported exposures were comparable to those generated by the hygienist A's coding of exposure, all the coefficients being in the same direction (OR< or > 1) and with similar confidence interval. However, OR's and confidence intervals generated by the hygienist B's coding of exposures were different in direction for other chemicals and for inorganic dusts (see table 14.1.4).

Similar results were obtained when exposure was defined in terms of " ever exposed " to category A, B,C, D and E. Thus there was no statistically significant relationship between current asthma and ever exposure, whether self-reported or with either hygienist's coding of ever exposed. In this analysis also, all values of the coefficients and 95% confidence interval for self-reported exposures were comparable in direction and confidence intervals to those generated by hygienist A's coding of ever exposures, but not for those generated by hygienist B's coding of exposures. For instance, for current category D exposures (inorganic dusts), an OR under the self-reporting model was 0.9, under

Table 14.1.4 Relationship of current asthma and different kind of exposures

Current asthma: n=338 (69 "cases", 269 "non cases")

Exposure	Variables	Values of the OR's and 95% CI under					
		Self-reporting		Hygienist A evaluation		Hygienist B evaluation	
		OR	CI	OR	CI	OR	CI
Current exposure	Gender	1.4	(0.7 , 2.8)	1.5	(0.8 , 2.9)	1.6	(0.8 , 3.1)
	Current smoker	2.1	(1.2 , 3.7)*	2.2	(1.2 , 3.8)*	2.1	(1.2 , 3.7)*
	Family history	2.1	(1.2 , 3.7)*	2.2	(1.2 , 4.0)*	2.1	(1.2 , 3.8)*
	Atopy	3.3	(1.8 , 6.0)*	3.3	(1.7 , 5.6)*	3.2	(1.7 , 5.8)*
	A: Solvents	0.7	(0.2 , 2.1)	0.7	(0.2 , 2.1)	0.7	(0.2 , 2.0)
	B: Other chemicals	1.3	(0.6 , 3.0)	1.8	(0.5 , 6.3)	0.7	(0.3 , 1.7)
	C: Organic dusts	0.9	(0.3 , 3.1)	0.5	(0.2 , 1.6)	0.6	(0.2 , 1.5)
	D: Inorganic dusts	0.9	(0.3 , 2.5)	0.9	(0.3 , 2.5)	2.9	(0.4 , 21.9)
	E: Metals	1.1	(0.2 , 6.7)	0.5	(0.1 , 2.6)	0.0	(0 + $\boxed{\infty}$)
Ever exposed	Gender	1.5	(0.7 , 2.9)	1.5	(0.7 , 3.0)	1.4	(0.7 , 2.9)
	Current smoker	2.1	(1.2 , 3.8)*	2.0	(1.2 , 3.6)*	2.1	(1.2 , 3.6)*
	Family history	2.1	(1.2 , 3.7)*	2.1	(1.2 , 3.8)*	2.2	(1.2 , 3.9)*
	Atopy	3.3	(1.8 , 5.9)*	3.3	(1.8 , 6.0)*	3.4	(1.8 , 6.2)*
	A: Solvents	1.0	(0.5 , 2.3)	1.2	(0.4 , 3.8)	1.2	(0.5 , 2.7)
	B: Other chemicals	1.6	(0.8 , 3.3)	1.3	(0.4 , 4.6)	0.7	(0.3 , 1.7)
	C: Organic dusts	1.0	(0.4 , 2.5)	0.8	(0.3 , 2.1)	1.1	(0.5 , 2.3)
	D: Inorganic dusts	1.0	(0.4 , 2.1)	0.8	(0.3 , 1.9)	2.5	(0.7 , 9.2)
	E: Metals	0.6	(0.1 , 2.4)	0.9	(0.4 , 2.1)	0.3	(0.1 , 1.2)

* significant at 0.5% level

the hygienist "A" 0.91 and under hygienist "B", 2.9. Nevertheless, none of those OR's were significant (see table 14.1.4 b).

14.2 Ever asthma

A total of 31 cases of confirmed diagnosed asthma was found in the sample, 5 men and 26 women.

14.2.1 Characteristics of cases of ever asthma

Mean age of the 31 cases was 33.9 years (4.4), with men older in average than women (37.4 vs 33.3). Almost 50% of cases were current smokers and more than 70% had a family history of allergies (22/31) and atopy (25/31) (see table 14.2.1 a). Almost 70% of the cases reported being exposed in their actual or latest job to fumes or chemicals or dusts or metals at work. More than 50% (17/31) of the cases was diagnosed as chilhood asthma, while others were diagnosed during their working life (see table 14.2.1.b). The exposure pattern at time of onset of asthma for those who were diagnosed during their working life is presented in table 14.2.1.b. A majority of them reported exposures, or were identified as being exposed by hygienists.

Table 14.2.1 a **Characteristics of cases of everasthma**

	ever asthma n= 31		without ever asthma according to MD diagnosis n= 307	
Men	5	16%	121	39.4%
Women	26	84%	186	60.6%
Current smokers	15	48%	122	39.7%
Family history	22	71%	128	41.7%
Atopy	25	81%	118	38.4%
Mean age (SD)	33,4 (4,5)		37,3 (5,8)	
Number reporting being exposed in their current or most recent job	21	68%	83	27.0%
Number reporting being ever exposed	22	71%	120	39.1%
Ever experienced chest tightness	10	32%	21	6.8%
Had to change job because their job affected their breathing	3	10%	9	2.9%

Table 14.2.1 b **Exposure pattern of 14 cases of diagnosed asthma (adulthood asthma)**

Case #	Age at time of study	Age at onset	Working when onset?	Exposed at age of onset? According to: Hygienist A	Hygienist B	Self report
1	34.0	23	Y	B-C	B-C	B-F
2	34.6	28	Y	A-B-C-D-E-F	A-B-C-E	A-F
3	35.2	35	Y	-	-	D-F
4	36.2	29	N			
5	31.6	22	Y	F	-	F
6	31.1	25	N			
7	28.1	26	Y	A-B-C-D-F	A-B-C	-
8	35.1	21	Y	A-B-C-F	A-B-C	A
9	40.0	20	Y	-	-	D
10	39.7	24	Y	B-C	B	B
11	32.2	18	Y	F	-	D
12	34.6	29	Y	B-C	B	C
13	39.5	34	Y	A-B-C-D-F	B-C	D-F
14	37.2	22	N			

A= Vapours - fumes
B= Others chemicals
C= Organic dusts
D= Inorganic dusts
E= Metals
F= Miscellaneous

14.2.2 Relationship of ever asthma and ever exposed to fumes or chemicals or dusts or metals at work (self-reported and hygienist evaluation)

As was done for current asthma, in the first series of models, exposure was categorised into ever or never exposed with each agent in any of the 5 categories examined (see sections 7.2 and 14.1.3). OR's show that atopy was a significant determinant in all 3 models (first model, self-reported exposures; second model, hygienist A coding exposures; third model, hygienist B coding exposures) as in all 3 models of curreent asthma. Exposure was categorised as ever to fumes **or** chemicals **or** dusts or metals, and again ever asthma was significantly related to ever exposed but only in the self-reported exposure model. Ever asthma was not significantly related to either hygienists evaluation of exposures (see table 14.2.2).

14.2.3 Relationship of ever asthma and ever exposed to different types of substances

Ever exposures was analysed by categories (A,B,C.D and E) giving the opportunity to investigate the different measures of the exposure-disease association. Important covariates, such as gender, age, family history of allergies and atopy were incorporated into the logistic model (see table 14.2.3). The values of coefficients for age and atopy were all in the same ranges for each model (self-reporting exposures, hygienist A evaluation, hygienist B evaluation). Family

Table 14.2.2 **Relationship of ever asthma and ever exposed to fumes or chemicals or dusts or metals at work**

Ever asthma: n= 31

Exposure	Variables	Values of the OR and 95% CI under					
		Self-reporting		Hygienist A evaluation		Hygienist B evaluation	
		OR	CI	OR	CI	OR	CI
Model without interaction							
Ever exposed	gender	3.4	(1.2 , 9.8)*	2.4	(0.9 , 6.7)	2.4	(0.9 , 6.7)
	current smoker	2.1	(0.9 , 4.7)	1.7	(0.8 , 3.5)	1.7	(0.8 , 3.5)
	family history	2.0	(0.8 , 4.9)	2.3	(1.0 , 5.4)*	2.3	(1.0 , 5.4)*
	atopy	5.5	(2.1 , 14.4)*	5.1	(2.0 , 13.1)*	5.1	(2.0 , 13.0)*
	exposed	4.8	(2.0 , 11.6)*	1.0	(0.4 , 2.1)	1.0	(0.4 , 2.1)

* significant at 0.5% level

history of allergies was not significant in one model (self-reporting) but was significant in the 2 others models. Self-reported exposure to inorganic dusts (E) yielded a significant odds-ratio of 6.71. This result must be interpretated with caution given the small number of cases.

Table 14.2.3 **Relationship of ever asthma and ever exposed to different types of substances**

Ever asthma: n= 31

Exposure	Variables	Values of the estimated OR's and 95% CI under					
		Self-reporting		Hygienist A evaluation		Hygienist B evaluation	
		OR	CI	OR	CI	OR	CI
Ever exposed	Gender	2.0	(0.6 , 6.9)	1.8	(0.6 , 5.8)	1.6	(0.5 , 5.1)
	Current smoker	0.9	(0.8 , 1.0)	0.9	(0.8 , 1.0)	0.9	(0.8 , 1.9)
	Family history	2.3	(0.9 , 5.6)	2.5	(1.1 , 6.1)*	2.5	(1.1 , 5.9)*
	Atopy	5.6	(2.0 , 15.5)*	5.6	(2.1 , 14.5)*	5.3	(2.0 , 13.7)*
	A: Solvents	0.5	(0.2 , 1.8)	0.6	(0.1 , 2.9)	0.9	(0.4 , 2.1)
	B: Other chemicals	1.6	(0.6 , 4.2)	1.2	(0.2 , 6.6)	1.3	(0.4 , 4.1)
	C: Organic dusts	1.0	(0.3 , 4.0)	0.5	(0.1 , 1.9)	0.6	(0.2 , 1.8)
	D: Inorganic dusts	6.7	(2.5 , 18.2)*	2.9	(0.8 , 11.1)	0.3	(0.0 , 3.8)
	E: Metals	0.3	(0.0 , 4.1)	0.7	(0.2 , 2.7)	1.5	(0.2 , 9.1)

* significant at 0.5% level

DISCUSSION

Chapter 15. Discussion of findings of this study

15.1 General comments.

Before considering the implications of the results found in this study, it is important to consider potential sources of bias, of which the most important are selection of study population, and information (differential across the comparison groups).

15.2 Potential source of bias.

15.2.1 Selection of study population

The ideal population for a study such as this would have been a randomly selected sample of a general population of Montreal, weighted towards younger adults early into their working career when jobs starts and changes are more likely to occur. The study population for the present study, essentially a convenience sample, even though population-based, cannot be considered representative of the adult population in Montreal since children (and indirectly their families) were recruited either for being a case or a non-case. Thus adults with a family or personal history of allergies as well as atopic individuals are likely to be overrepresented in the study sample. This bias should be kept in mind while interpreting the relationship of exposure to asthma-like outcomes particularly in analysing the performance of men and women separately because of the small numbers (section 15.5). However for the other parts of the study, this sample represents a reasonable one in which to assess reproducibility of questionnaire information and hygienist coding. The fact that the sample contains a greater than average proportion of asthmatics or atopic persons should not inherently affect reproducibility and inter-rater issues per se. One way in which it could conceivably affect the assessement is if atopic or asthmatic subjects knowning their own status would try to minimise or avoid exposures while carrying out their job. This might have resulted in overestimating of exposures by hygienists, who were blind to the status of the subject.

15.2.2 Methods of obtaining information

The procedure of administration of questionnaire was changed during the survey. During the first study year, the questionnaire was self-administered, while for the second study year, it was administered by an interviewer (see section 6.3). This change in procedures could have resulted in a better quality of information for the second year of the survey. However the results of the intra-subject reliability analysis, specifically the analysis of discrepancies (figures 1 to 14, see section) do not suggest that this occurred. There is no clear evidence that one type of administration (self-administered vs administered) resulted in more reliable information.

15.2.3 Potential for recall bias

In studies, such as this one, which rely on the recalling and reporting of long-past events, recall bias could operate amongst the symptomatic subjects. One could thus argue that asthmatic subjects are more likely to recall their past and present exposures because of their health problem. To address this issue, results from the reproducibility study were analysed according the health status of the parents who were stratified according to the definition in section 5.2 as current asthma or not. In this analysis, values of Kappa coefficients were comparable in the two groups (see table 15.2.3) and where there were differences, the highest values were in the nonsymptomatic and not in the symptomatic group. This analysis therefore provides no evidence that recall bias operated in this study to exagerate exposure-response relationships, indeed if anything it operated to minimise them..

15.2.4 Sample size

Sample size is usually thought in terms of maximizing precision of the effect estimate of the study in other words to obtain precise and confident generalizations about the situation in a population, or to obtain statistical significance when associations are tested. Calculations of sample size require suppositions and decisions. Firstly the incidence rate of the disease must be known or estimated. Also, a decision must be

Table 15.2.3 **Reproducibility of self reported exposures to recognized occupationnal asthmagens according to health status of subjects**

33 parents, 93 jobs

Exposure categories	Subjects without symptoms		Subjects with symptoms	
	K=	(C.I.)	K=	(C.I.)
A: Solvents	0.66	(.33 , .98)	0.48	(.05 , .91)
B: Other chemicals	0.47	(.08 , .86)	0.45	(.16 , .74)
C: Organic dusts	0.37	(< 0 , .82)	----- *	
D: Inorganic dusts	0.51	(.14 , .88)	0.51	(.24, .78)
E: Metals	0.65	(.02 , 1.27)	0.35	(<0 , .76)

* "n" to small to allow calculation

specified made on how precise the effect estimates must be and the level of confidence level required for the study in question. In other words, what "margin of error" will be accepted, and what risk is to be taken that the actual error is larger than this margin. When the incidence rate of two populations are compared, the rate in one of the population must be known or a reasonable estimate must be available, and the magnitude of the difference that the investigators wishes to detect as well as the significance level and the power of the test must be specified. Abramson (1984) underlines the importance of achieving a balance between the ideal and the practical as follows: "the objectives and design of the study must be taken into account, *and* (SdG italic) consideration must be given to time constraints and availability of resources, insofar as they may affect sample size".

Calculation of sample size in reliability studies using indices such as those used in the present study, is not straightforward and the goal as indicated above, is not to obtain statistical significance but to improve precision of the effect estimates. Nevertheless to give a sense of the effect of sample size on the precision of Kappa, different scenarios were examined. In the present research, the reproducibility study was undertaken using a sample of 33 parents generating 93 jobs for which the dichotomous status of exposed/non-exposed for each of 5 broad categories of asthmagenic agents (solvents, other chemicals, etc. see section 7.2) was examined, giving 465 answers. The overall agreement was 86% and the Kappa coefficient 0.50 (0.40, 0.60). A first scenario evaluated the impact of increasing the number of parents and jobs to 50 (giving 150 jobs and 750 answers) on the precision of the Kappa. Given the same overall agreement of 86%, but with 50 parents, the value of Kappa would be 0.49 (0.40, 0.56). In other words, the increase in precision would be very slight. In fact the optimal gain in precision seems to have been achieved in the first 30 cases and adding 20 more do not improve substantially precision. A second scenario was then examined namely that by increasing the number of parents from 30 to 50, the overall agreement would be increased from 86 to 90% under this assumption, the Kappa coefficient would be increased from 0.50 to 0.63 (0.55, 0.71). Likewise, in a third scenario, the sample was increased up to 100 subjects (giving 300 jobs and 1500 answers) and overall agreement was again set at 90%, Kappa coefficient increased up to 0.80 (0.76, 0.84). Thus, the gain in precision given by increasing only the number of subjects appears to be slight, if the overall agreement does not increase as well.

15.3 Reproducibility of questionnaire information for eliciting exposure history for community based studies: comparison with published data.

15.3.1 Work history

In the present study, the concordance analysis in 33 subjects showed good agreement for most components of work history for both men and women (% overall agreement ranged from 53.5 to 70.9% see table 11.1.1). The findings in several reports are relevant to the present study and are discussed below. The present results concord with those found by Rona and Mosbech (1989) who examined the validity and repeatability of self-reported occupational and industrial history was based on a sample of 72 cancer patients (age ranged from 25 to 65 years) in different countries who were randomly allocated to different testing procedures: self-administered versus self-administered, self-administered versus administered, or administered versus administered. They found that between 61.5% and 69.2%, depending on the type of procedures, gave the same number of occupations on both occasions. In that study, almost half of the patients were currently unemployed and only 14% of the patients recorded 3 jobs or more. This differs from the population in the present study, which was constituded not of patients, but of healthy younger adults, 64% (21/33) of whom reported 3 jobs or more. In spite of these differences, the results of Rona's and Mosbech's study agree with the present present study and support the present study hypothesis on the usefulness of self-reported exposure information.

In another study, Bourbonnais et al (1988) examined the validity of work history, by comparing the information furnished by the workers with that derived from the company's registers. They showed that the number of jobs held, the time elapsed since the beginning of the job to the time of the report, and the level of education of the subjects were all determinants of the *validity* of the occupational questionnaire regarding work history. In spite of this, they finally concluded that workers themselves can provide valid information, especially when it pertains to job titles and time events related to their main job. In the present study, no validation against company records was possible. Nevertheless, the reproducibility for current and past jobs can be considered as evidence in support of self reporting work history as a useful source of information in community-based study, as well as being obviously a necessary prerequisite for validity.

In a third report relevant to the present study Baumgarten et al (1983) showed that overall results indicated a satisfactory concordance between interview and company records, but persons reporting many jobs were more likely to err than those reporting few jobs. Their findings are not unexpected since number of jobs, as well as distance in time and level of education would also affect reproducibility.

Brisson et al (1991) in a study to validate occupational histories obtained by interview with female workers also found similar results. In this study, information obtained from interview was compared to information registered in separate public and union records. Factors likely to influence interview validity were lapse of time, number of jobs held, age, number of years worked, education and ethnicity.

The small sample size for the reproducibility study in the present study (n=33 workers reporting 92 jobs) did not allow to a formal analysis of number of the effect of the jobs held, time elapsed and level of education as potential determinants for reproducibility as was done in the studies quoted above (Bourbonnais et al (1988), Baumgarten et al (1983) and Brisson et al (1991)). Nevertheless, the results obtained in figures 1 to 14 (see section 11.1) do at least give a sense of the effect of the number of jobs held. Thus, concordance in reporting job titles were perfect in 16/33 subjects, even though 7/16 had had more than 3 jobs. Also, the 33 subjects who participated into the reproducibility study had had on average more education than the other 338 subjects in the study population.

15.3.2 Work processes

In the present study, questionnaire information was also sought on work processess and sectors of activity which could generate exposures pertinent into the genesis of asthma and asthma-like outcomes. Subject were asked to indicate whether they had worked in particular sectors of activity or work processes. Thus a subject who indicated yes to a work process, but omitted to include that job in the work history allowed the investigator to identify an inaccuracy in the work history. The list of work processes may also have been of help to subjects in their recall. Results for men and women combined showed overall fair agreement (K=0.45 for sectors of activity and 0.51 for work processes); and with little evidence for gender differences (see table 11.2). The present results show somewhat better agreement than that reported in a retrospective study of validation of work histories carried out by Bond et al (1988). 734 respondents chemical workers who had one or more years of service at a Texas production facility and who were followed from 1940 through 1980 were interviewed by telephone. The validation of the information obtained by interview was made against employee's documented work history records maintained by the company. Results indicate that respondents recalled 48.4% of all work area assignments and only 2.6% of chemical or physical agents. Respondents (the subject himself, or, if he was deceased or otherwise incapacitated, a spouse, an off-spring, a sibling, another relative, or a friend) were prompted to list chemical exposures they ever worked with. At no time did the interviewers suggest specific agents. According to the authors, the low percentage for agents encountered in the work place is surprising given that the employees in that facility were appraised repeatedly as part of their safety training, on the materials with which they worked.

15.3.3 Exposure history

In the present study, reasonably good intra-rater reliability for self-reported exposures to potential asthmagens was also found for most of the 5 exposure categories based on Kappa coefficients and Aickin's alpha index. Also results showed that overall concordance for all jobs ranged from 0.81 to 0.91 for men and women combined, compared to Kappa statistic which varied from 0.23 to 0.56. Exposures reported by men were reasonably reproducible for vapors/fumes, chemical substances, organic dusts, inorganic dusts (K ranged from 0.42 to 0.66 see table 11.3) but reproducibility was considerably lower for metals and miscellaneous exposures (K= 0.21 and 0.15 respectively). Women reported exposures to vapors/fumes, inorganic dusts and miscelleneous exposures in a much more reproducible fashion (K= 0.91 , 0.70 and .45

respectively). Comparable results, with higher values, were found for Aickin's alpha. Nevertheless, interpretation of the analysis of men's and women's performance separately must be done with caution given the small numbers of subjects reporting exposures.

Current or most recent job was investigated to evaluate if time and number of jobs held could have influenced recall. A simple comparison of K's and Aickin's alpha, obtained for the whole work history (n=92 jobs) against current or most recent job (n=33) was made. Given the small sample size for current or most recent job, it was not possible to calculate gender specific K's and Aickin's alpha. Overall concordance ranged from 0.27 to 0.62. Reported exposures were reasonably reproducible for vapors/fumes, chemical substances, inorganic dusts and metals (K ranged from 0.54 to 0.62; see table 11.3.1) but was considerably lower for organic dusts and miscellaneous exposures (K= 0.35 and 0.27 respectively). Aickin's alpha indeces were higher than 0.40 for all categories, except for miscelleneous exposures (alpha=0.34, see table 11.3.1). Results of current or latest job must be interpretated with caution, given the small numbers involved.

In interpreting the significance of the K statistic an important issue is raised in a paper by Chinn and Burney (1987). These authors point out that K, which attempts to measure the proportion of agreement in symptom score that is "real" agreement is dependent upon the prevalence of what is measured. It is therefore important to interpret values of K in relation to standard error and CI, because K value can be low when the prevalence is low, even if absolute repeatability is extremely good. In the present study, Aickin's alpha seemed to overcome this problem. For instance when the K value was very low, eg for organic dust K=0.47, even though overall agreement was good (0.94), the agreement based on Aickin's alpha seemed to reflect more accurately the reality (alpha=0.76). No reference was found in the literature on the effect of low prevalence on Aickin's alpha.

Van Der Gulden et al (1993) also evaluated the repeatability of self-reported data on occupational exposure to 8 specific compounds, and found fairly good agreement. The sample consisted of 469 cases diagnosed with prostate cancer and 1872 referents aged 49-87 years. The questions used to elicit this information were as follows: " Have you ever worked with... or been exposed to ... in your job? " This differs from the present study where each job was evaluated separately, and reproducibility was investigated analysing information sought for each job. Van Der Gulden et al (1993) found no substantial influence of age or socio-economic status, or of case or referent status on the reproducibility of self-reported exposures. The percentages of agreement calculated in Van Der Gulden study for asbestos and dust were in the same order of magnitude as those found by Holmes and Garshick (1991) (60% concordance and 44% respectively) and are comparable to those found in the present study (K=0.48 for inorganic dusts and 0.47 for organic dusts). The authors concluded that self-reported exposure data appear to be sufficient for epidemiological studies when objective information on occupational exposure is not available. Note that exposures relevant to cancer are usually those which occurred at least 20 years ago and were sustained over time compared to those relevant to asthma and asthma-like conditions for which recent exposures are more pertinent.

15.4 Inter-rater agreement for exposures estimates based on industrial hygiene coding

15.4.1 All jobs recorded

In the present study, inter-rater agreement was calculated, product by product, first using Kappa coefficient then Aickin's index for all jobs reported. The results showed good agreement for a number of agents (see section 12.1). Aickin's index indicated stronger agreement, compared to Kappa coefficient, except for benzene, base and formaldehyde, for which there was poor agreement whatever coefficient or index used. All these products except benzene, are quite common in industry. Of interest is a study of Benke et al (1997), discussed in more detail later, which also found poor inter-rater reliability for benzene (K=0.19) and formaldehyde (K=0.16). No gender difference was observed in inter-rater agreement for coding exposure in all jobs recorded in the present study; in other words hygienists did not seem to code men's or women's jobs differently (see section 12.2), even though they were not blind to gender. Regrouping substances within categories and analysing reliability by categories, instead of by specific agent, yielded increments for all values of Kappa and Aickin's alpha, suggesting that the broader the category, the more likely are the raters to agree.

15.4.2 Current or most recent job

Analysing reliability for current or most recent job, for each agent did not lead to tangible improvement for Kappa coefficients or Aickin's alpha index for inter-rater agreement. However, analysing current or most recent job within categories of agent and analysing reliability by categories did lead to slight improvement of all Kappa coefficients, except for inorganic dusts. Similar results were found using Aickin's alpha index. Concordance between hygienists agreement in evaluating exposures in past compared with current or most recent job was not different, suggesting that time (present versus more distant job) did not affect the present results in this particular sample of Montreal adults aged 23 to 59, in which the earliest jobs reported were in the 1950's and early 1960's, compared to some of the studies cited earlier where the subjects were older presumably starting first jobs in the 1930's and 1940's.

15.4.3 Inter-rater differences

Further analysis of inter-rater differences showed that the patterns of exposure complexity reported by the two hygienists were different. Hygienist A not only assessed more jobs as involving definite exposure (over 50% probability that this person would have been exposed) to different substances in categories A,B,C,D,E and F in all jobs recorded in work history but also reported complex exposures more often. Such inter-rater differences would result in misclassification of exposure. The 2 industrial hygienists, had both had experience in the Montreal area, but hygienist B's was shorter and therefore perhaps reflected less familiarity with the additional sources usually used by industrial hygienists in the areas in which they work. Similar important inter-rater differences have been found in other studies, and these are discussed below.

In a community-based case-control study of glioma, a team of three experienced industrial hygienists and two occupational health physicians formed the expert panel which was responsible for coding the exposures of the study participants (Benke et al, 1997). Results showed low inter-rater reliability, measured with Kappa statistic, for the presence of exposure for the 199 jobs randomly selected from a glioma case-control study, in which prevalence of exposure was low, ranging from -0.001 (prevalence of aconitrile of 0.2%) to 0.64 (prevalence of cutting fluids of 8.1%). The authors also noted that the Kappa statistic tended to be lower when there were large differences between raters in reported prevalence of exposure. Intra-rater reliability was good, raging from 0.46 for physician to 0.73 for hygienist. These results are in concordance with those found in the present study, except for intra-rater reliability of " expert raters ", which was not assessed in our study. The authors argue that the use of experts for studies with low prevalence of exposure may not be a satisfactory method of retrospective assessment of exposures. The issue of unequal prevalences reported by different raters also raises the question of whether the Kappa statistic is suited to these types of binary decisions, where the main reason for the disagreement may be the different thresholds used by the different raters. It suggests that in such studies efforts should be made to record exposure, not on a binary scale, but on a four or five point probability scale. Even then Kappa might still have to be adjusted for unequal thresholds by the 2 raters.

Another example of the consequences of inter-rater variability can be found in a study conducted to evaluate radiographic changes in a group of 331 chrysotile miners and millers exposed to low asbestos dust concentration (Cordier et al, 1984) A prevalence of 2.1% for small irregular opacities of grade 1/0 or more and 2 to 7% for pleural changes was found by pooling the results of 4 readers who provided similar ratings. The corresponding prevalences were respectively 24.0% and 8.8% according to a fifth reader whose results were analysed separately. No association between exposure indices and radiological changes as ascertained by the first four readers was found whereas the analysis of the fifth reader's showed statistical association between small opacities and average level of exposure. In other words, data generated by different readers led to different conclusions. The authors did not express an opinion as to whether this fifth reader was "wrong". It seems unlikely, however that misclassification could explain totally the very different findings in particular the exposure response relationships.

An argument can be made that more than one view of a phenomenon is useful in understanding its complexity. In this example of miners and millers, the 4 readers may have viewed the study mandate from a clinical perspective with case-detection in mind, while the fifth may have viewed the study mandate in the context of prevention. Broader definitions of disease, not necessarily those which would attract a clinical diagnosis, are often used in the investigation of exposure-response relationship which are important in setting appropriate exposure standards for prevention. In other words, both types of reading could be right, but for different purposes. In the present study, not only the experience of the raters could be an important factor accounting for inter-rater differences, but also their interpretation of their mandate (why the data was being gathered and what use would be made of their exposure estimates). Hygienists may also use different thresholds ("clinical" versus "epidemiologic") in evaluating exposures from job histories, the former resulting a more conservative coding than the latter.

15.5 Hygienists job industry analysis and questionnaire reported exposure assessment: validity analysis, their relationship to asthma-like outcomes

15.5.1 Validity analysis

Validity analysis, taking as the criterion (or "gold standard") hygienist A's evaluation of past and current exposures, led to poor values of sensitivities and phi-coefficients but not for specificities which were all over 90%. Regrouping substances within categories and analysing validity of self-reported exposures for past and current jobs did not lead to any improvement. Those results agree with those reported in a study by Ahlborg et al (1990) that subjects know some of the specific agents with which they are working, but that shrinking the data into one category, tends to "dilute" the information.

Validity analysis using as the criterion (or "gold standard") hygienist B's evaluation yielded higher values of sensitivity for all jobs, also for current or most recent job, indicating that sensitivity varies with the " gold standard " or criterion used. Hygienist B coded overall fewer exposures than hygienist A, the exposures coded were more likely to concord with the subject's self-reported history of exposures. Values of sensitivity, specificity and phi-coefficient were however still very low when these analyses were conducted using categories of exposure.

Other authors have drawn attention to the extent of inter-rater differences in exposure assessments by experts. For instance, the study of Benke et al (1997), already referred to, aimed to assess the validity and repeatability of industrial hygiene panel ratings in a community-based study. The authors concluded that " clearly, the reported prevalence of exposure by the raters has a highly significant effect upon the validity of expert panels to retrospectively assess the occupational exposure to chemicals in community-based studies ".

Different results were found in other studies. Rosenstock et al (1984) found higher sensitivity (of about 75%) and specificity (of about 70%) for self completed questionnaire compared with hygienist assessment of exposures based on work history analysis. The source of their material was an occupational clinic data base. The positive predictive value was 83% for exposures in the current jobs, when using as criterion estimates made by an occupationnal hygienist. The authors concluded that despite some limitations found in their study (study population was highly selected, industrial hygienist assessment was not completely independent from health questionnaire content), " health history information can be feasibly obtained in a self-afministered format, and that such information has validity in that it correlates with a separate assessment of work exposures and correctly identifies groups of workers with known high and low hazardous exposures. However it may be less easy to assess cumulative lifetime exposure, usually the focus of interest in occupational studies particularly for chronic conditions."

15.5.2 Their relationship to asthma-like outcomes

In the present study, self-reported ever asthma was significantly related to self reported ever exposure to any of the 5 categories of asthmagens analysed and a modifying effect was shown amongst atopic subjects. where as no such relationships was shown to ever exposure assessed by either of the hygienists (see tables 14.2.2 and 14.2.3). Investigation into the relationship of other outcomes, including current asthma and ever asthma to exposure was however essentially negative for exposure defined by categories (yes/no to fumes and vapors; yes/no to other chemicals; yes/no to organic dusts, etc). Nevertheless, values of the coefficients and their confidence interval using self-reported exposures were, for most part in the same direction (and with similar confidence intervals) to those based on exposures by hygienists, concordance being better for hygienist A than for hygienist B. However, once again, caution is advised in interpreting results in the present study. First, small numbers were involved in most models so that large differences in coefficients can be seen if 1 or 2 observations were changed, and second, since this sample is biased in favor of atopy, the results of asthma-exposure relationship cannot be generalised to all Montreal adults.

The present study results concord with those found by Hsairi et al (1992). Their analysis addressed the question of whether certain personal characteristics influenced the perception by workers of their exposure to dusts or fumes in a large sample of 6803 men and 6765 women non-manual workers. Their analysis also showed that self-reported exposure was related to respiratory symptoms for both sexes after adjusment for age, smoking habits, and educational level. They also found that the strength of association between both estimates of exposure and estimates based on a job exposure matrix (JEM) did not vary according to whether the outcome was asthma (defined as a positive answer to Have you ever had attack of breathlessness with wheezing?), wheezing or dyspnoea.

The present study results also agree with several other community-based studies in different countries, in which significant associations were found between wheezing and self reported exposures to fumes and vapours, in communities exposures with exposure rates lower than in this study (Becklake, 1992).

The results of our study are therefore encouraging. They are consistent with the study hypothesis in that self reported exposures performed comparably to (and apparently better than) exposures coded by hygienist in demonstrating exposure response relationship. Indeed it could be argued that given the modest number of observations in the present study (338 subjects generating 927 jobs) the findings imply a considerably better performance by self reported exposures in detecting exposure-response relationships than exposures assessed by hygienists. Thus significant relationships might well have been present for all exposures if the number of observations had been larger, as in the study of Hsairi (1992). Given the present study and its exposure profile, the exposure information pertinent to airway disease provided directly by the subject was as accurate a reflexion of exposure as were exposures derived indirectly from other sources. In the present study, the other sources were 2 industrial hygienists both with experience in the Montreal area, but one for a shorter period than the other, and therefore perhaps less familiar with the additional sources usually used by industrial hygienists. These include health department records, company and union sources and other general industrial hygiene expertise.

basis for public health planning; all have emphasized the importance of examining the contribution of environmental exposures. The overall goal of the research reported in the thesis was to develop and validate an instrument to measure occupational exposures in epidemiologic research in general population (as opposed to workforce based) studies of airway disease. Estimates of prevalence of occupational asthma based on workplace studies are likely to lead to an underestimation of both its cumulative incidence and its prevalence because of health selection and turnover due to asthmatic symptoms. Community-based studies avoid those bias, giving the opportunity to estimate more adequately the associations between workplace exposures and asthma and asthma-like symptoms. Such an instrument was expected to be useful in community or population-based studies designed 1) to estimate the importance of occupational exposures in the genesis of airway disease (including asthma and asthma-like conditions) in populations and ii) to investigate the role of multiple exposures. To be useful, this instrument needed to adequately estimate outcome/exposure relationship to lead eventually to better control of exposure. The questionnaire, developed, pre-tested and validated in this study seems to be a promising tool to gather exposure information in a context of community-based studies of asthma and asthma-like conditions. The results found in this very specific population are consistent with the study hypothesis stating that exposure information pertinent to airway disease provided directly by the subject performed comparably to the hygienist evaluation in demonstrating exposure response relationship. Statistically significant relationship might well have been present if the study population had been larger.

15.7 Areas for further research

One important methodological issue of this study was to compare 2 measures of agreement Kappa and Aickin's alpha. Aickin's alpha seems to be an interesting index of concordance (see results in chapters 12 and 13), probably less dependent upon the prevalence of what is measured, than the Kappa statistic. More research is needed to evaluate it's performance in studies with low prevalence of the characteristic studied.

The health questionnaire used in this study was the one sponsored by the International Union Against Tuberculosis and Lund Diseases (IUATLD) as the Bronchial Symptoms Questionnaire and tested in international studies (Burney et al,1989). A French version of this questionnaire has also been developed (Perdrizet,1984; Neukirch,1990). The main disadvantage of this questionnaire is the lack of information about age of onset of asthma or asthma-like conditions, except for medical diagnosis of asthma. If links are to be made with exposures encountered in the work-place, a questionnaire should be used which will provide this.

References

- Abramson JH. Survey methods in community medicine, an introduction to epidemiological and evaluative studies, Third edition, Churchill Livingstone, 1988.
- Aickin M. Maximum Likelihood estimation of agreement in the constant predictive probability model, and its relation to Cohen's Kappa. Biometrics 1990; 46: 293-302.
- Ahlborg GA. Validity of exposure data obtained by questionnaire. Two examples from occupational reproductive studies. Scand J Wk Environ Hlth 1990; 16:284-8.
- Armstrong BK, White E, Saracci R. Principles of Exposure Measurement in Epidemiology. Oxford Medical Publications, Oxford University Press, Oxford, U.K., 1992.
- Baumgarten M, Oseasohn R. Studies on occupational health: A critique JOM 1980; 22(3):171-176.
- Baumgarten M, Siemiatycki, Gibbs G. Validity of work histories obtained by interview for epidemiologic purposes. Am J Epi 1983; 118:583-591.
- Becklake M., Chronic airflow limitations: Its relationship to work in dusty occupations. Chest 1985; 88:608-617.

- Becklake MR. Occupational pollution. Chest; 1989a, 96:373S-378S.
- Becklake MR, Occupational exposures: evidence for a causal association with chronic obstructive pulmonary disease. Am Rev Respir Dis 1989b; 140:S85-S91.
- Becklake MR, Epidemiology and surveillance. Chest 1990; 98:165S-173S.
- Becklake MR, The workrelatedness of Airways Dysfunction, Proceedings of the 9th International Symposium on Epidemiology in Occupational Health, September 23-25, 1992.
- Becklake MR, Ernst P, Chan-Yeug M, Manfreda M, Dimich-Ward H, Sears MR, Siersted H. The burden of airway disease attributable to work exposures in Canada. Am J Respir Crit Care Med 1996:153;4(p+2).
- Benke G, Sim M, Forbes A, Salzberg M., Retrospective assessment of occupational exposure to chemicals in community-based studies: validity and repeatability of industrial hygiene panel ratings. Int J Epidemiol 1997; 26:635-642.
- Bond G, Bodner KM, Sobel W, Shellengerger RJ, Flores GH. Validation of work histories obtained from interviews. Am J Epidemiol 1988; 128:343-351.
- Bourbonnais R, Meyer F, Thériault G. Validity of self-reported work history. Br J Ind Med 1988, 45:29-32.

- Brisson C, Vézina M, Bernard P-M, Gingras S. Validity of occupational histories obtained by interview with female workers. Am J Ind Med, 1991; 19:523-530.
- Burney PGJ, Laitinen LA, Perrizet S, Huckauf H, et al. Validity and repeatability of the IUATLD (1984) Bronchial Symptoms Questionnaire: an international comparison. Eur Resp J 1989; 2:940-945.
- Chan-Yeung M., Lam S. Occupational asthma. Chest 1990; 98:148S-162S.
- Chan-Yeung M., Malo J-L. Occupational asthma. NEJM 1995; 333: 107-18.
- Chinn S, Burney P. On measuring repeatability of data from self-administered questionnaires. Int J Epidemiol 1987; 16:121-127.
- Cohen J. A coefficient of agreement for nominal scales. Educ. Psychol. Meas. 1960; 20:37-46.
- Cordier S, Thériault G, Provencher S. Radiographic changes in a group of chrysotile miners and millers exposed to low asbestos dust concentrations. Br J Ind Med 1984; 41: 384-388.
- Cronbach LJ, Gleser GC, Nanda H, Rajaratnam N. The dependability of behavioral measurements: Theory of generalizability for scores and profiles. 1972, Wiley New York.

- de Haan W, Comparison of the US job exposure matrix with the Dutch field investigation findings. NIPG-TNO Leiden Wageningen 1989
- Demissie K, Ernst P, Gray-Donald K, Joseph L. Usual dietary salt intake and asthma in children: a case-control study, Thorax 1996; 51:59-63.
- Eisen EA. Healthy worker effect in morbidity studies. Med Lav 1995; 86, 2:125-138.
- Ernst P, Demissie K, Joseph L, Locher U, Becklake MR. Socioeconomic status and indicators of asthma in children. Am J Respir Crit Care Med 1995; 152:570-575.
- Fleiss JL., Statistical methods for rates and proportions, Second edition, New York: J. Wiley and Sons, 1981.
- Fletcher C, Peto R, The natural history of chronic airflow obstruction. British Med J 1977; 1:1645-1648.
- Gérin M, Siemiatycki J, Kemper, Bégin D. Obtaining occupationalexposure histories in epidemiologic case-control studies. JOM 1985; 27:420-426.
- Goldberg MS, Siemiatycki J, Gérin M. Inter-rater agreement in assessing occupational exposure in a case-control study. Br J Ind Med 1986; 43:667-76.

- Gordis L, Assuring the quality of questionnaire data in epidemiologic research. Am J Epi 1979; 109:21-24.

- Heederik D, Pouwels H, Kromhout H, Kromhout D, Chronic non-specific lung disease and occupational exposures estimated by means of a job exposure matrix - The Zutphen Study. Int J Epi 1989; 18:32-389.

- Heederick D., Epidemiological studies of the relationship between occupational exposures and chronic non-specific lung disease. 1990, PhD thesis, Wageningen University.

- Hill AB. The environment and disease: association or causation. Proc Roy Soc Med 1965; 58: 295-300.

- Hinds MW, Kolonel LN, Lec J. Application of a job exposure matrix to a case-control study of lung cancer. J Nat Cancer Inst 1985; 75:193-19.7

- Hoar SK, Morrison AS, Cole P, Silverman DT. An occupational linkage system for the study of occupational carcinogens. JOM 1980; 22:722-726.

- Hoar SK., Job exposure matrix methodology. J Clin Toxicol 1983; 21:9-26.

- Holmes E, Garschick E. The reproducibility of the self-report of occupational exposure to asbestos and dust. J Occup Med 1991; 33: 134-138.

- Hsairi M, Fauffmann F, Chavance M, Brochard P. Personal factors related to the perception of occupational exposure: an application of a Job Exposure Matrix. Int J Epidemiol 1992; 21: 972-980.
- Joffe M., Validity of exposure data derived from interviews with workers, 23rd International Congress on Occupational Health
- Kauffman F, Drouet D, Lellouch J, Brille D. Occupational exposure and 12-year spirometric changes among Paris area workers. Br J Ind Med 1982; 39: 221-232.
- Kelsey JL, Thompson WD, Evans As. Methods in observational epidemiology, New York, Oxford University Press, 1986.
- Kobayaski S. Different aspects of occupational asthma in Japan. In: Frazier CA (Ed.) Occupational asthma. New York, Van Nostrand Reinhold, 1980: 229-244.
- Korn RJ, Dockery DW, Speizer FE, Ware JH, Ferris BG. Occupational exposures and chronic respiratory symptoms - a population based study. Am Rev Respir Dis 1987; 136:296-304.
- Kromhout H, Oostendorp Y, Heederik D, Boleij JSM. Agreement between qualitative exposure estimates and quantitative exposure measurements. Am J Ind Med 1987; 12:551-562.
- Kromhout H, Heederik D. Performance of two general job-exposure matrices in a study of lung cancer morbidity in the Zutphen cohort. Am J Epidemiol 1992; 136: 698-711.

- Kromhout H. From eyeballing to statistical modelling, methods for assessment of occupational exposure. Ph D thesis, 1994. Wageningen University.

- Krzyzanowski M, Jedrychowski W, Wysocki M. Occupational exposures and changes in pulmonary function over 13 years among residents of Cracow. Br J Ind Med 1988; 45: 747-754.

- Krzyzanowski M, Kauffmann F, The relation of respiratory symptoms and ventilatory function to moderate occupational exposure in a general population. Results from the French PAARC Study among 16000 adults. Int J Epidemiol 1988; 17: 397-406.

- Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977; 33: 159-174.

- Last JM., A dictionnary of Epidemiology, Oxford University Press, 1995.

- Lebowitz MD, Occupational exposures in relation to symptomatology and lung function in a community population, Env Res, 1977;104:59-67.

- Malo J-L, Compensation for occupational asthma in Québec, Chest, 1990;98:236S-240S.

- McDonald C, Surveillance of work-related and occupational respiratory disease in the United Kingdom: the Sword project, 23e Congrès de Médecine du Travail, Montréal, 1990.

- Miettinen OS. Theoretical epidemiology, Principles of occurrence research in medicine. New York, J. Wileu and Sons, 1985.
- Neukirch F., Mise au point d'un questionnaire -version courte et version longue- sur l'asthme, 1990
- Nunally J. Psychometric theory, Second edition New York, McGraw-Hill, 1978.
- Osterman JW, Brochu Danièle, Thériault G, Reaves IA. Evaluation of the ATS Respiratory Disease Questionnaire among French-speaking Silicon Carbide Workers. Can J Public Health 1990:81; 66-72.
- Oxman AD, Muir DCF, Shannon HS, Stock SR, Lange ET. Occupational dust exposure and chronic obstructive pulmonary disease. A systematic overview of the evidence. Am Rev Respir Dis 1983; 148:38-48.
- Pannett B, Coggon D, Asheson RED. A job exposure matrix for use in population based studies in England and Wales. Br J Ind Med 1985; 42:777-783.
- Perdrizet S., Version originale française du questionnaire IUAT, 1984.
- Quanjer PhH, Helms P, Bjure J, Gaultier C. Standardization of lung function tests in paediatrics. Europ Respir J 1989; 2(Suppl 4):121S-.

- Rona RJ, Mosbech J. Validity and repeatability of self-reported occupational and industrial history from patients in EEC countries. Int J Epi 1989; 18:674-679

- Rosenstock L, Logerfo J, Heywer VJ, Carter WB. Development and validation of a self-administered occupational health history questionnaire. JOM 1984; 26:50-54

- Rothman KJ. Modern Epidemiology. Little Brown and Company, 1986.

- Salvaggio J (ed.) Occupational and environmental respiratory disease in NIAID task force report: asthma and other allergic disease. Washington DC.: USA Department of health, Education and Welfare, 1979.

- Scott WA. Reliability of content analysis: the case of nominal scale coding. Public Opinion Quartely 1955; 19: 321-325..

- Siemiatycki J, Day NE, Fabry J et al. Discovering carcinogens in the occupational environment: a novel epidemiologic approach. JNCI 1981; 66:217-225

- Siemiatycki J, Richardson L, Gérin M, Goldberg M, Dewar R, Désy M, Campbell S, Wacholder S. Associations between several sites of cancer and nine organic dusts: results from an hypothesis-generating case-control study in Montreal, 1979-1983. Am J Epidemiol 1986; 123: 235-249.

- Siemiatycki J, Dewar R, Richardson L. Costs and statisticalpower associated with five methods of collecting occupation exposure information for population based case-control studies. Am J Epi 1989; 130:1236-1246

- Soeken KL, Prescott PA. Issues in the use of Kappa to estimate reliability. Med Care 1986; 24: 733-741.

- Streiner DL, Norman GR. Health measurement scales. A practical guide to their development and use. Oxford University Press, 1989.

- Van Der Guilden JWJ, Jansen IW, Verbeek ALM, Kolk JJ. Repeatability of self-reported data on occupational exposure to particulat compounds. Int J Epidemiol 1993; 22: 284-287.

- Wigle D, Summary of LCDC National workshop on asthma, Chronic Disease in Canada, Research reports, Ottawa, 1988.

- Wilkins R, Census data on poverty in the Montréal Métropolitain area, 1981. Joint committee of the Research Group "Surfacing the poor" and the DSC Montreal General Hospital, 1985

Appendix 1

Appendix

Using $n(ij)$ for the observed frequency in the cell at the intersection of the ith row and jth column, and replacing a subscript by + to indicate summation, the log-likelihood is

$$L = \sum n(i+)\ln p_r(i) + \sum n(+j)\ln p_c(j) + \sum n(ij)\ln\left[1 - \alpha + \frac{\alpha d(ij)}{s}\right],$$

where $d(ij)$ is the Kronecker delta and p_r, p_c, and s are as defined in the body of the article. Letting $A = \sum d(i, j)n(ij)$, and $n = n(++)$ be the sample size, we have

$$\frac{dL}{d\alpha} = \frac{A - n((1 - \alpha)s + \alpha)}{(1 - \alpha)((1 - \alpha)s + \alpha)},$$

$$\frac{dL}{dp_r(m)} = \frac{n(m+)}{p_r(m)} - \frac{A\alpha p_c(m)}{s((1 - \alpha)s + \alpha)} - \left[\frac{n(0+)}{p_r(0)} - \frac{A\alpha p_c(0)}{s((1 - \alpha)s + \alpha)}\right].$$

There is, of course, a corresponding derivative with respect to $p_c(m)$ that is the symmetric version of the latter equation. Note that $p_r(0)$ is taken to be a function of the other $p_r(i)$'s.

For the second derivatives, we first have

$$\frac{d^2L}{d\alpha^2} = -\frac{n(1 - s)}{(1 - \alpha)((1 - \alpha)s + \alpha)}.$$

For subsequent computations, it is convenient to define

$$T = \frac{1 - \alpha}{\alpha}, \quad V = \frac{\alpha}{s((1 - \alpha)s + \alpha)},$$

and note that substitution of the ML estimates yields $dR/d\alpha = (n/A)^2$. We can then obtain the relatively simple expressions:

$$\frac{d^2L}{d\alpha dp_r(i)} = -A[p_c(i) - p_c(0)]\left(\frac{n}{A}\right)^2,$$

$$\frac{d^2L}{dp_r(i)^2} = -\frac{n(i+)}{p_r(i)^2} - \frac{n(0+)}{p_r(0)^2} + A(2sT + 1)V^2[p_c(i) - p_c(0)]^2,$$

$$\frac{d^2L}{dp_r(i)dp_r(j)} = -\frac{n(0+)}{p_r(0)^2} + A(2sT + 1)V^2[p_c(i) - p_c(0)][p_c(j) - p_c(0)],$$

$$\frac{d^2L}{dp_r(i)dp_c(i)} = -2AR + A(2sT + 1)V^2[p_r(i) - p_r(0)][p_c(i) - p_c(0)],$$

$$\frac{d^2L}{dp_r(i)dp_c(j)} = -AR + A(2sT + 1)V^2[p_c(i) - p_c(0)][p_r(j) - p_r(0)].$$

Letting r denote the number of rows in the table, there are altogether $2r - 1$ parameters, and thus computation of the variance estimate for the α estimator involves inverting a $(2r - 2) \times (2r - 2)$ matrix.

Appendix 2

RESPIRATORY HEALTH STUDY

QUESTIONNAIRE ID ______________________________

Interviewer ______________________

Name ______________________ Date |__|__| |__|__| |__|__|

First name ______________________ day month year

TO ANSWER THE QUESTIONS PLEASE CHOOSE THE APPROPRIATE BOX, IF YOU ARE UNSURE OF THE ANSWER PLEASE CHOOSE 'NO'

Wheeze and tightness in the chest

1. Have you had wheezing or whistling in your chest at any time in the last 12 months? NO ☐ YES ☐

   IF NO, GO TO QUESTION 2, IF 'YES':

   1.1 Have you been at all breathless when the wheezing noise was present? NO ☐ YES ☐

   1.2 Have you had this wheezing or whistling when you did not have a cold? NO ☐ YES ☐

2. Have you woken up with a feeling of tightness in your chest or difficulty in breathing at any time in the last, 12 months? NO ☐ YES ☐

   NO ☐ YES ☐

Shortness of breath

3. Have you had an attack of shortness of breath that came on during the day when you were at rest at any time in the last 12 months? NO ☐ YES ☐

4. Have you had an attack of shortness of breath that came on following strenuous activity at any time in the last 12 months? NO ☐ YES ☐

5. Have you been woken by an attack of shortness of breath at any time in the last 12 months? NO ☐ YES ☐

Cough and Phlegm from the chest

6. Have you been woken by an attack of coughing at any time in the last 12 months? NO ☐ YES ☐

7. Do you <u>usually</u> cough first thing in the morning in winter? NO ☐ YES ☐

8. Do you <u>usually</u> cough during the day, or at night, in the winter? NO ☐ YES ☐

IF NO, GO TO QUESTION 9, IF 'YES':

8.1 Do you cough like this on most days for as much as 3 months each year? NO ☐ YES ☐

9. Do you <u>usually</u> bring up any phlegm from your chest first thing in the morning in the winter? NO ☐ YES ☐

10. Do you <u>usually</u> bring up any phelgm from your chest during the day, or at night, in the winter? NO ☐ YES ☐

IF NO, GO TO QUESTION 11, IF 'YES':

10.1 Do you bring up phlegm like this on most days for as much as 3 months each year? NO ☐ YES ☐

<u>Breathing</u>

11. Do you ever have trouble with your breathing? NO ☐ YES ☐

IF NO, GO TO QUESTION 12, IF 'YES':

11.1 Do you have this trouble **TICK ONE BOX ONLY**

A) continuously, so that your breathing is never quite right? 1 ☐

B) repeatedly, but it always gets completely better? 2 ☐

C) only rarely? 3 ☐

12. Are you disabled from walking by a condition <u>other than</u> heart or lung disease? NO ☐ YES ☐

IF 'YES': 12.0 STATE CONDITION ________________ AND GO TO QUESTION 13.

IF 'NO':

12.1 Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? NO ☐ YES ☐

IF NO, GO TO QUESTION 13, IF 'YES':

12.1.1 Do you get short of breath walking with other people of your own age on level ground? NO ☐ YES ☐

IF NO, GO TO QUESTION 13. IF YES :

12.1.1.1 Do you have to stop for breath when walking at your own pace on level ground? NO ☐ YES ☐

Asthma

13. Have you ever had asthma? NO ☐ YES ☐

IF 'NO' GO TO QUESTION 14, IF 'YES':

13.1 Was this confirmed by a doctor? NO ☐ YES ☐

13.2 How old were you when you had your first attack? |__|__| years

13.3 How old were you when you had your most recent attack of asthma? |__|__| years

13.4. 1-6 Which months of the year do usually have attacks of asthma?

13.4.1 January/February? NO ☐ YES ☐

13.4.2 March/April? NO ☐ YES ☐

13.4.3 May/June? NO ☐ YES ☐

13.4.4 July/August? NO ☐ YES ☐

13.4.5 September/October? NO ☐ YES ☐

13.4.6 November/December? NO ☐ YES ☐

13.5 Have you had an attack of asthma in the last 12 months? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 13.6. IF 'YES':

13.5.1 How many attacks of asthma have you had in the last <u>12 months</u>? number

13.6 Are you currently taking any medications (including inhalers, aerosols or tablets) for asthma? NO ☐ YES ☐

Other conditions

14. Do you have any nasal allergies including 'hay fever'? NO ☐ YES ☐

15. Have you ever had eczema or any kind of skin allergy? NO ☐ YES ☐

16. Are you allergic to insect stings? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 17. IF YES:

16.1 Which insect(s)? ....

16.2. 1-3 What kind of reaction do you have?

16.2.1 breathing difficulty, feeling faint, nausea or fever? NO ☐ YES ☐

16.2.2 redness, itching or swelling at the site of the sting? NO ☐ YES ☐

16.2.3 other (please specify)......... .... NO ☐ YES ☐

17. Have you ever had any difficulty with your breathing after taking medications? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 18, IF YES:

17.1 Which medication(s)?.................. ....

Your parents' smoking

18. Did your father ever smoke regularly during your childhood? NO ☐ YES ☐ DON'T KNOW ☐

19.	Did your mother ever smoke regularly during your childhood?	NO ☐	YES ☐	DON'T KNOW ☐

IF 'NO', GO TO QUESTION 20, IF YES:

19.1 When your mother was pregnant (in particular with you), did she

TICK ONE BOX ONLY

A) stop smoking before pregnancy? 1 ☐

B) cut down or stop smoking during pregnancy? 2 ☐

C) smoke as usual during pregnancy? 3 ☐

D) don't know 4 ☐

More about yourself

20. When were you born? ⌊_|_⌋ day ⌊_|_⌋ month ⌊_|_⌋ year

21. What country were you born in?................ ⌊_|_|_⌋

22. Are you male or female? Male ☐ Female ☐

23. How many brothers do or did you have? ⌊_|_⌋ number

IF '00', GO TO QUESTION 24, OTHERWISE:

NUMBER

23.1 How many older brothers? ⌊_|_⌋

23.2 How many younger brothers? ⌊_|_⌋

23.3 How many of your brothers ever had asthma? ⌊_|_⌋

23.4 How many of your other brothers had eczema, skin or nasal allergy or 'hay fever'? ⌊_|_⌋

24. How many sisters do or did you have? ⌊_|_⌋ number

IF '00', GO TO QUESTION 25, OTHERWISE:

NUMBER

24.1 How many older sisters? |__|__|

24.2 How many younger sisters? |__|__|

24.3 How many of your sisters ever had asthma? |__|__|

24.4 How many of your other sisters had eczema, skin or nasal allergy or 'hay fever'? |__|__|

25.	Did your mother ever have asthma?	NO ☐	YES ☐	DON'T KNOW ☐
26.	Did your mother ever have eczema, skin or nasal allergy or 'hay fever'?	NO ☐	YES ☐	DON'T KNOW ☐
27.	Did your father ever have asthma?	NO ☐	YES ☐	DON'T KNOW ☐
28.	Did your father ever have eczema, skin or nasal allergy or 'hay fever'?	NO ☐	YES ☐	DON'T KNOW ☐
29.	Did you regularly share your bedroom with any older children before the age of 5 years?	NO ☐	YES ☐	DON'T KNOW ☐
30.	Did you go to a school or day care with other children before the age of 5 years?	NO ☐	YES ☐	DON'T KNOW ☐
31.	Did you have a serious respiratory infection before the age of 5 years?	NO ☐	YES ☐	DON'T KNOW ☐

32. When you were a child did you keep any of the following pets?

	NO	YES
32.1 cats	☐	☐
32.2 dogs	☐	☐
32.3 horses	☐	☐
32.4 birds	☐	☐

	NO	YES
32.5 guinea pigs	☐	☐
32.6 hamsters	☐	☐
32.7 mice	☐	☐
32.8 rats	☐	☐
32.9 rabbits	☐	☐
32.10 gerbils	☐	☐
32.11 ferrets	☐	☐
32.12 others (please specify)..................	☐	☐

33. When you are near animals (e.g. cats, dogs, horses), near feathers (including pillows, quilts or duvets) or in a dusty part of the house, do you <u>ever</u>

	NO	YES
33.1 start to cough?	☐	☐
33.2 start to wheeze?	☐	☐
33.3 get a feeling of tightness in your chest?	☐	☐
33.4 start to feel short of breath?	☐	☐
33.5 get a runny or a stuffy nose or start to sneeze?	☐	☐
33.6 get itchy or watery eyes?	☐	☐

<u>Trees, grass, shrubs, flowers or pollens</u>

34. 1-6 When you are near trees, grass or flowers, or when there is a lot of pollen about, do you <u>ever</u>

	NO	YES
34.1 start to cough?	☐	☐
34.2 start to wheeze?	☐	☐
34.3 get a feeling of tightness in your chest?	☐	☐
34.4 start to feel short of breath?	☐	☐

	NO	YES
34.5 get a runny or a stuffy nose or start to sneeze?	☐	☐
34.6 get itchy or watery eyes?	☐	☐

IF 'NO', GO TO QUESTION 35, IF 'YES' TO ANY OF THE ABOVE:

34.7 1-4 Which time of year does this happen?

	NO	YES
34.7.1 Winter	☐	☐
34.7.2 Spring	☐	☐
34.7.3 Summer	☐	☐
34.7.4 Autumn	☐	☐

<u>Smoking</u>

35. Have you ever smoked for as long as a year ? NO ☐ YES ☐

('YES' means at least 20 packs of cigarettes or 12 oz. (360 grams) of tobacco in a lifetime, or at least one cigarette per day or one cigar a week for one year)

IF 'NO', GO TO QUESTION 36, IF 'YES':

35.1 How old were you when you started smoking? |__|__| years

35.2 Do you now smoke (as of <u>one month</u> ago)? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 35.3, IF 'YES':

35.2. 1-4 How much do you <u>now</u> smoke <u>on average?</u>

	NUMBER
35.2.1 number of cigarettes per day?	|__|__|
35.2.2 number of cigarellos per day?	|__|__|
35.2.3 number of cigars per day?	|__|__|

35.2.4 pipe tobacco in :
A) ounces/week |_|_|
or
B) grams/week |_|_|_|

35.3 Have you stopped or cut down smoking? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 35.4, IF 'YES':

35.3.1 How old were you when you stopped or cut down smoking? |_|_| years

35.3.2. 1-4 <u>On average</u> of the entire time you smoked (before you stopped or cut down), how much did you smoke?

NUMBER

35.3.2.1 number of cigarettes/day |_|_|

35.3.2.2 number of cigarellos/day |_|_|

35.3.2.3 number of cigars/day |_|_|

35.3.2.4 pipe tobacco in :
A) ounces/week |_|_|
or
B) grams/week |_|_|_|

35.4 Do you or did you inhale the smoke? NO ☐ YES ☐

36. Have you been <u>regularly</u> exposed to tobacco smoke in the last <u>12 months</u>? ('Regularly' means on most days or nights) NO ☐ YES ☐

IF 'NO', GO TO QUESTION 37, IF 'YES':

36.1 Not counting yourself, how many people in your household smoke regularly?

NUMBER |_|_|

36.2 Do people regularly smoke in the room where you work? NO ☐ YES ☐

HOURS

36.3 How many hours per week are you exposed to <u>other people's</u> tobacco smoke? |_|_|

37. Are you a full-time student? NO ☐ YES ☐

IF 'YES', GO TO QUESTION 37.7, IF NO:

37.1 At what age did you complete full-time education? ⌴⌴ years

37.2 Are you currently employed or self-employed? NO ☐ YES ☐

IF 'YES', GO TO QUESTION 37.3, IF 'NO':

37.2.1 Are you currently looking for a job? NO ☐ YES ☐

37.3 What is or was your current or most recent job? (Be as precise as possible)

....

.... ⌴⌴⌴

37.4 Are you

TICK ONE BOX ONLY

A) a manager working for an employer? 1 ☐

B) a foreman or supervisor working for an employer? 2 ☐

C) working for an employer, but neither a manager, supervisor or foreman? 3 ☐

D) self-employed? 4 ☐

37.5 Does going to work ever make your chest tight or wheezy? NO ☐ YES ☐

37.6 Have you ever had to change or leave your job because it affected your breathing? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 37.7, IF 'YES':

37.6.1 What was this job? (Be as precise as possible)

....

.... ⌴⌴⌴

37.7 Have you ever worked in a job which exposed you to vapours, gas, dust or fumes? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 38, IF 'YES':

37.7.1 What was this job? (Be as precise as possible)

....

.... |_|_|_|

37.7.2 Have you ever experienced a serious exposure to vapour, gas or fumes at work that lead you to need urgent medical therapy? NO ☐ YES ☐

IF 'NO', GO TO QUESTION 38, IF 'YES':

37.7.3 What was this job?

(Mark same ☐ if this is the job reported in question 37.7.1)

Describe this job: ....

....

....

Appendix 3

38. **EMPLOYMENT HISTORY**

Job # 1

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

Job # 2

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

Job # 3

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

Job # 4

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

Job # 5

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

Job # 6

Name of company____

Type of industry____

Department____

Job title____

Short job description____

____

Year began: 19______ Year ended: 19______

39. **Have you worked at any of the following jobs?**

Please check ( ) which jobs you have done and for how long.

LIST OF JOBS	YES	NO	Job #	Less than 1 year	2-5 years	5 years or more
bakery						
food processing						
foundry						
sawmilling						
mining						
carpentry						
leather industry						
pharmaceutical industry						
detergent production						
printing industry						
laboratory work						
chemical industry						
handling laboratory animals						

40. Have you ever used the following work procedures?

Please check ( ) which procedures you have used and for how long.

LIST OF JOBS	YES	NO	Job #	Less than 1 year	2-5 years	5 years or more
auto body shop						
spray painting						
spraying of insulating material						
flour milling						
welding						
soldering						
sandpapering and varnishing of wooden floors						
electroplating						
handling and shipping						

41. OCCUPATIONAL EXPOSURES

In the next pages there are lists of agents or exposures that you may have encountered in your work. Please indicate **YES** or **NO** if you have been exposed to any of these agents or exposures, and, if so, of what intensity you think the exposure was: **low, medium** or **high** intensity. Also you are asked to specify whether these exposures occurred occasionnally or regularly (**please circle**).

Example: A worker is currently employed in construction and has occasional low exposure to asbestos. In the employment history this current job was his(her) job # 1. Previous work in a ship yard (which was his(her) job # 2) regularly exposed him to high levels of asbestos.

Exposures	Exposed		Job #	Frequency			Intensity		
Asbestos	N	Y	1	Occ	reg		L	M	H
	N	Y	2	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H

Legend:

N = no
Y = yes

Occ = occasionnally
Reg = regularly

L = low
M = medium
H = high

A. HAVE YOU EVER BEEN EXPOSED TO FUMES AT WORK?

Please check this list of exposures. If you have been exposed please circle YES and complete the relevant section; if not exposed, please circle NO and proceed to the next list.

Exposures	Exposed		Job #	Frequency			Intensity		
Paint, varnish, thinners	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Hardeners	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Glues	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Resins, epoxy accelerators	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Benzene, toluene, xylene, degreasers, turpentine	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Plastic, polyurethane, polystyrene	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Tar, rubber, gazoline, petrochemical products	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Other(specify if known)	N	Y		Occ	reg		L	M	H

Legend			
	N = no	Occ = occasionnally	L = low
	Y = yes	Reg = regularly	M = medium
			H = high

B. HAVE YOU EVER BEEN EXPOSED TO CHEMICALS AT WORK ?

Please check this list of exposures. If you have been exposed please circle **YES** and complete the relevant section; if not exposed, please circle **NO** and proceed to the next list.

Exposures	Exposed		Job #	Frequency			Intensity		
Acids	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Alkali (caustics)	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Ammonia	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Pharmaceuticals (manufactured drugs	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Formaldehyde	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Dyes	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Insecticides	N	Y	---------	Occ	reg		L	M	H
	N	Y	---------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H

Legend
N = no
Y = yes
Occ = occasionnally
Reg = regularly
L = low
M = medium
H = high

C. **HAVE YOU EVER BEEN EXPOSED TO ORGANIC DUSTS AT WORK ?**

Please check this list of exposures. If you have been exposed please circle **YES** and complete the relevant section; if not exposed, please circle **NO** and proceed to the next list.

Exposures	Exposed		Job #	Frequency			Intensity		
Grain or flour	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Wood dust: specify types	N	Y		Occ	reg		L	M	H
....	N	Y		Occ	reg		L	M	H
....	N	Y		Occ	reg		L	M	H
Fur dust	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Coffee dust	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Animal food	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H

Legend:

N = no	Occ = occasionnally	L = low
N = no	Reg = regularly	M = medium
		H = high

D. **HAVE YOU EVER BEEN EXPOSED TO INORGANIC DUSTS AT WORK ?**

Please check this list of exposures. If you have been exposed please circle **YES** and complete the relevant section; if not exposed, please circle **NO** and proceed to the next list.

Exposures	Exposed		Job #	Frequency			Intensity		
Asbestos	N	Y	----------	Occ	reg		L	M	H
	N	Y	----------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Fiberglass	N	Y	----------	Occ	reg		L	M	H
	N	Y	----------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Silica (e.g. sand, brick, sand-blasting)	N	Y	----------	Occ	reg		L	M	H
	N	Y	----------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Construction site dust (e.g. cement, concrete, plaster)	N	Y	----------	Occ	reg		L	M	H
	N	Y	----------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Coal dust	N	Y	----------	Occ	reg		L	M	H
	N	Y	----------	Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Other dust Specify:	N	Y	----------	Occ	reg		L	M	H
....	N	Y	----------	Occ	reg		L	M	H
....	N	Y		Occ	reg		L	M	H

Legend: N = no, Y = yes; Occ = occasionnally, Reg = regularly; L = low, M = medium, H = high

E. HAVE YOU EVER BEEN EXPOSED TO FUMES OR DUST FROM METALS OR METAL COMPOUNDS (SALTS) AT WORK ?

Please check this list of exposures. If you have been exposed please circle **YES** and complete the relevant section; if not exposed, please circle **NO** and proceed to the next list.

Exposures	Exposed		Job #	Frequency			Intensity		
Aluminum	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Platinum	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Nickel	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Chromium	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Cobalt	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Cadmium	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Iron	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H

Legend: N = no; Y = yes; Occ = occasionnally; Reg = regularly; L = low; M = medium; H = high

F. MISCELLEANEOUS

Please check this list of exposures. If you have been exposed please circle **YES** and complete the relevant section; if not exposed, please circle **NO**.

Exposures	Exposed		Job #	Frequency			Intensity		
Smoke from combustion: e.g. diesel engine, fire-fighters, incinerators	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Cigarette smoke in work place (passive smoking)	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Excess cold	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
Excess heat	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H
	N	Y		Occ	reg		L	M	H

Legend: N = no, Y = yes; Occ = occasionnally, Reg = regularly; L = low, M = medium, H = high

Appendix 4

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
1	aide-wagonnier	aide-wagonnier	507082001							
2	ajust_mecan	ajusteur mecanique	507171001				11	21	22	
3	archeologue	archeologie	112062001	22	12	22	12		12	12
4	ass/rech_INRS	assistante de recherche	311112000	21				11	11	11
5	assembl_battr	assembleur	309192001					11	11	
6	assembl_bross	assembleuse	308152000	21		21		21	11	
7	assembl_elect		514031000	21			12	11		
8	assembl_lunet	assembleur	114081000	22	11	12	12	21		
9	assembl_metal		104181001	11	11		11		11	11
10	assembl_serr		510212000	11	11		11		11	11
11	assembl_skido	assembleur	313041001	21	21	21	11	11	11	11
12	bardeau_asphalte		104181001			12			22	
13	bartender	bartender	511152000							
14	cables teleph		504261000	11				21	11	
15	cariste_alimt	cariste	513227001	21				11	21	
16	cariste_brass	operateur chariot elevateur	313081001	21				11	21	
17	chauffeur		304211001	21				21	21	
18	chauffeur	camionneur livreur	515221001	21				21	21	
19	chauffeur	chauffeur	304211001	21				21	21	
20	chauffeur	chauffeur	506082001	21				21	21	
21	chauffeur	chauffeur	307202001	21				21	21	
22	chauffeur	chauffeur	506071001	21				21	21	
23	chauffeur	chauffeur	304211001	21				21	21	
24	chauffeur	chauffeur	513227001	21				21	21	
25	chauffeur	chauffeur	508192001	21				21	21	
26	chauffeur	chauffeur (stationnement)	506131001	22				21	21	
27	chauffeur	chauffeur d'autobus	506071001	21				21	21	
28	chauffeur	chauffeur d'autobus	507191001	21				21	21	
29	chauffeur	chauffeur d'autobus	504252001	21				21	21	
30	chauffeur	chauffeur de camion	112091001	21				21	21	
31	chauffeur	chauffeur de camion	507041001	21				21	21	
31	chauffeur	chauffeur de camion	507041001	21				21	21	
32	chauffeur	chauffeur de camion	514031001	21				21	21	
33	chauffeur	chauffeur de camion	514031001	21				21	21	
34	chauffeur	chauffeur de camion	514031001	21				21	21	
35	chauffeur	chauffeur de camion	514031001	21				21	21	
36	chauffeur	chauffeur de camion	310011001	21				21	21	
37	chauffeur	chauffeur de camion et mecanicien	112091001	22				21	21	
38	chauffeur	chauffeur de taxi	312101001	21	21				21	
39	chauffeur	chauffeur journalier	104181001	21	21				21	
40	chauffeur	chauffeure	507041000	21	21				21	
41	chauffeur	livreur	306122001	21				21	21	
42	chauffeur	livreur	504261001	21	21				21	
43	chauffeur	livreur	504252001	21				21	21	
44	chauffeur	livreur	504261001	21				21	21	
45	chauffeur	livreur	513101001	22				21	21	
46	chauffeur	livreur	513101001	22				21	21	
47	chauffeur	livreur	513101001	22				21	21	
48	chauffeur	livreur	504261001	12						

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
49	chauffeur	transport camionneur	306071001	21				21	21	
50	cimenteuse	cimenteuse	513121000	22	11	21	11	11	11	12
51	cimenteuse	echantillonneuse	313182000	22		22				
52	coiffeuse	aide	311102000	21	11				11	
53	coiffeuse	aide-coiffeuse	313091000	21	11				11	
54	coiffeuse	assistante coiffeuse	313032000	21	11				11	
55	coiffeuse	assistante-coiffeuse	504252000	21	11				11	
56	coiffeuse	assistante-coiffeuse	504252000	21	11				11	
57	coiffeuse	coiffeuse	107212000	21	11				11	
58	coiffeuse	coiffeuse	107212000	21	11				11	
59	coiffeuse	coiffeuse	107212000	21	11				11	
60	coiffeuse	coiffeuse	107212000	21	11				11	
61	coiffeuse	coiffeuse	504252000	21	11				11	
62	coiffeuse	coiffeuse	107212000	21	11				11	
63	coiffeuse	coiffeuse	508202000	21	11				11	
64	coiffeuse	coiffeuse	313212000	21	11				11	
65	coiffeuse	coiffeuse	313212000	21	11				11	
66	coiffeuse	coiffeuse	313212000	21	11				11	
67	coiffeuse	coiffeuse	313212000	21	11				11	
68	commis_maq	commis	106072000							
69	concierge	concierge	309232001	21		21	11		11	
70	concierge	concierge	309232000	21		21	11		11	
71	concierge	entreteneur de batiment	314121001	21		21	11		11	
72	contre_met	contre-maitre	514101001	22	22		22		12	12
73	coordonn	coordonnatrice	511091000	21	21					
74	coupeur_arc	coupeur a l'arc	314251001							
75	coupeur_cuir	coupeur	509121001	21	11	21	11	11	11	12
76	couturier	couturier	115172000							
77	couturiere	couturiere	509192000							
78	couturiere	couturiere	510182000							
79	couturiere	couturiere	110132001							
80	couturiere	couturiere	109211000							
80	couturiere	couturiere	109211000							
81	couturiere	couturiere	109111000							
82	couturiere	couturiere	109111000							
83	couturiere	couturiere	514011000							
84	couturiere	couturiere	314291000							
85	couturiere	couturiere	508021000							
86	couturiere	couturiere	314291000							
87	couturiere	couturiere	115162000							
88	couturiere	couturiere	509192000							
89	couturiere	couturiere	509121000							
90	couturiere	couturiere	510111000							
91	couturiere	couturiere	509172000							
92	couturiere	operatrice de machine a coudre	508161000							
93	couturiere	operatrice de machine a coudre	508161000							
94	couturiere	operatrice de machine a coudre	313091000							
95	couturiere	operatrice de machine a coudre	114052000							
96	couturiere	operatrice de machine a coudre	508102000							
97	crustaces		104031000							

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
97	crustaces		104031001					21		
98	cuisinier		311102000					21		
99	cuisinier		112062000					21		
100	cuisinier		104121000					21		
101	cuisinier	aide feminin	306091000					21		
102	cuisinier	cuisinier	509192001					21		
103	cuisinier	cuisinier	509172001					21		
104	cuisinier	cuisinier	509192001					21		
105	cuisinier	cuisinier	514101000					21		
106	cuisinier	cuisinier	110112000					21		
107	cuisinier	cuisinier	110112000					21		
108	cuisinier	cuisinier	110112000					21		
109	cuisinier	cuisinier	514101000					21		
110	cuisinier	cuisinier	510212001					21		
111	cuisinier	cuisinier	110232000					21		
112	cuisinier	cuisinier	110132001					21		
113	cuisinier	cuisinier	509172001					21		
114	cuisinier	cuisinier	314071001					21		
115	cuisinier	cuisinier	514011000					21		
116	cuisinier	cuisinier / plongeur	509192001					21		
117	cuisinier	cuisiniere	314071000					21		
118	cuisinier	cuisiniere	514031000					21		
119	cuisiniere	aide cuisiniere	112062000					21		
120	cuisiniere	aide-alimentaire	313091000					21		
121	cuisiniere	aide-cuisinier	311102001					21		
122	cuisiniere	serveuse aide-cuisiniere	314221000					21		
123	deboss/peintre		107212001	22	22		22	21	22	12
124	deboss/peintre	gerant	313061001	22	22		22	21	22	12
125	dentiste	assistante dentaire	512211000		21	21				
126	direct_impr	directrice de finition	306091000	22		21			11	11
127	ebeniste	ebeniste	306232001	22	12	22	22		12	12
128	electricien	apprentis electricien	106152001	21			22	12	12	
129	electricien	electricien	115172001	21			22	12	12	
130	electricien	electricien	108061001	21			22	12	12	
131	electricien	electro mecanicien	513101001	21			22	12	12	
132	electroplast	electroplast	308172001							
133	emballeur	emballeur	310051000					22		
134	emballeur	empaquetteuse de egg rolls	313182000					22		
135	enseignant	enseignant	314121001	22	12	22	22		12	12
136	entre-menag	entretien menager	115101001	21		11			21	
137	entre-menag	entretien menager	112071000	21		11			21	
138	entre-menag	entretien menager quart de travail du soir	513202000	21		11			21	
139	entre-menag	prepose a l'entretien	312281001	21		11			21	
140	entre-menag	prepose a l'entretien menager	115101001	21		11			21	
141	entre-menag	prepose a l'entretien menager	313091001	21		11			21	
142	entre-menag	prepose a l'entretien menager	514172001	21		11			21	
143	entre-menag	trieuse et entretien menager	314121000	21		11			21	
144	entre_menag	entretien menager	511192000	21		11			21	
145	entre_menag	entretien menager	110132001	21		11			21	
146	entre_menag	entretien menager	109121001	21		11			21	

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
147	entre_menag	entretien menager	109121000	21		11			21	
148	entre_menag	entretien menager	513101000	21		11			21	
149	entre_menag	entretien menager	313231000	21		11			21	
150	entre_menag	entretien menager	508102000	21		11			21	
151	entre_menag	ouvrier d'entretien general	314071001	21		11			21	
152	entrepr_const		109211001	22	22	21	22	21	22	12
153	entrepr_const		113062001							
154	entrepr_const		511152001	21	11	21	11	21	21	11
155	entrepr_const		513111001	22	22	21	22	21	22	12
156	estheticienne		304211000	11		11	11		11	
157	estheticienne	estheticienne	511132000	11		11	11		11	
158	estheticienne	estheticienne	511132000	11		11	11		11	
159	estheticienne	estheticienne	511132000	11		11	11		11	
160	estheticienne	estheticienne	511132000	11		11	11		11	
161	estheticienne	estheticienne	511132000	11		11	11		11	
162	estheticienne	proprietaire estheticienne	511132000	11		11	11		11	
163	etiquetteuse	etiquetteuse	310222000					21		
164	graveur		309232001	21			11	11		
165	imprimeur		313041000	21		21			11	11
166	imprimeur	apprenti-pressier	312042001	22		11			12	12
167	imprimeur	imprimeur	511152001	22		11			12	12
168	imprimeur	imprimeur	109191000	22		21	21	21		12
169	imprimeur	relieur	105202001	21		21			11	11
170	infirmiere		112022001							
171	infirmiere	aide-infirmiere	307071000							
172	infirmiere	infirmiere	312082000							
173	infirmiere	infirmiere	107011000							
174	infirmiere	infirmiere	312082000							
175	infirmiere	infirmiere	312082000							
176	infirmiere	infirmiere	312082000							
177	infirmiere	infirmiere	307192000							
178	infirmiere	infirmiere	512112000							
179	infirmiere	infirmiere	314021000							
180	infirmiere	infirmiere	314021000							
181	infirmiere	infirmiere	312151000							
182	infirmiere	infirmiere	312151000							
183	infirmiere	infirmiere	312151000							
184	infirmiere	infirmiere	312102000							
185	infirmiere	infirmiere auxiliaire	307041000							
186	infirmiere	infirmiere auxiliaire	307041000							
187	infirmiere	infirmiere auxiliaire	307041000							
188	infirmiere	infirmiere auxiliaire	114081000							
189	infirmiere	infirmiere auxiliaire	107022000							
190	infirmiere	infirmiere auxiliaire	309222000							
191	infirmiere	infirmiere auxiliaire	505071000							
192	infirmiere	infirmiere auxiliaire	505071000							
193	infirmiere	infirmiere auxilliare	307041000							
194	infirmiere	infirmiere en medecine et chirurgie	312151000							
195	infirmiere	infirmiere en milieu scolaire	312151000							
196	infirmiere	infirmiere etudiante	512112000							

Standardized job title / Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
197	ingenieur	ingenieur	507151001						11	
198	inspect_alimt	cadre inspecteur des viandes	504211001							
199	inspect_metal	inspecteur contre-maitre	514101001	21	11	21	11	21	11	11
200	inspect_metal	inspecteur controle de qualite	509152001	21	21		21	21	21	11
201	inspect_plast/met	inspecteur controle de qualite	514101001	21	11	21	11	21	11	11
202	instruct_arts	instructeur de metiers	114151000	22		22			22	12
203	journl_aero		510212001	21	21		21	21	21	11
204	journl_agric	cueilleur	514241000							
205	journl_agric	travailleur agricole	112062001							
206	journl_alimt	journalier	104031001					21		
206	journl_alimt	journalier	104031000					21		
207	journl_alimt	journalier	114122001					21		
208	journl_alimt	journaliere	504211000					21		
209	journl_alimt	journaliere	313051000					21		
210	journl_alimt	ouvrage general	113101000					21		
211	journl_alimt	ouvrier	507221001					21		
212	journl_auton	journalier	313041001	11	11		11		21	
213	journl_brass	journalier conducteur de chariot elevateur	113062001	21				21		
214	journl_buand		113101000					21		
215	journl_buand	journaliere	106152000					21		
216	journl_buand	ouvrier	507221001					21		
217	journl_cartn	journalier	114052001	11		21			11	
218	journl_chaus		514031000	22	22	22		11	12	12
219	journl_chaus		109211001	22	22	22		11	12	12
220	journl_chaus	journaliere	114052000	22	22	22		11	12	12
221	journl_const		305012001	21	11	21	11	21	21	11
222	journl_const	journalier	306071001	21	11	21	11	21	21	11
223	journl_const	journalier	511091001	21	11	21	11	21	21	11
224	journl_const	ouvrier	110112000	21	11	21	11	21	21	11
225	journl_const	ouvrier specialise en excavation	313041001							
226	journl_disqu	prepose	505061001	22				22		
227	journl_disqu	prepose	505061001	22				22		
228	journl_encre		115162001	11					21	
229	journl_entre	journalier	307192001	22	12	22	12	21	22	
230	journl_entrp		309232001							
231	journl_fourn	journalier	113062001	22	12	22	12	21	22	
232	journl_metal		307121000	11	11		11		11	11
233	journl_metal		514172001	11	11		11		11	11
234	journl_metal	journalier	114122001	22					12	
235	journl_metal	journaliere	314071000	11	11		11		11	11
236	journl_metal	manoeuvre	505061001	11	11		11		11	11
237	journl_meubl	journalier	508192001	21	11	21	21		11	11
238	journl_meubl	ouvrier general	115101001	21	11	21	21		11	11
239	journl_netto		112071001	22					22	
240	journl_netto		506131000	22					22	
241	journl_papir		510212001			21				
242	journl_pharm		514031000							
243	journl_pharm	journalier	307121000							
244	journl_placq	ouvrier	314121001	22					12	
245	journl_plast		514172001	21			11	21		

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
246	journl_pompe	journalier	314071001	11	11		11		11	11
247	journl_tabac	journalier	313041001							
248	journl_textl		514031000							
249	journl_textl		511261000							
250	journl_textl		114181001							
251	journl_textl	general	508232000							
252	journl_textl	ouvrier	309212000							
253	journl_textl	ouvrier a tout faire	513031000							
254	journl_textl	separateur	109131000							
255	journl_textl	travailleuse generale	514211000							
256	journl_tr.pub	journalier	113091001	11						
257	journl_tr.pub	journalier	314251001	11					22	
258	journl_tr.pub	journalier	507041001	11						
259	journl_tr.pub	journalier	511132001	11						
260	journl_verre	ouvrier travail a la chaine	314261001					11		
261	journl_vitrx	journalier	114052001	21			11		11	
262	machiniste	machiniste	314291001				11	21	22	
263	machiniste	machiniste	314291001				11	21	22	
264	machiniste	machiniste	510192001				11	21	22	
265	machiniste	machiniste	314291001				11	21	22	
266	mecan_aeron	mecanicien	108061001	21	21		21	21	21	11
267	mecan_aspir	mecanicien	513101001	22		21		21	11	12
268	mecan_auto		110202001	22			11	21	22	12
269	mecan_autom	mecanicien	512151001	22			11	21	22	12
270	mecan_autom	mecanicien automobile	504252001	22			11	21	22	12
271	mecan_autom	mecanicien d'auto	108061001	22			11	21	22	12
272	mecan_bicy		312281001	22	12	21	21	21	22	12
273	mecan_char-elev		304102001	21					21	11
274	mecan_chauf	mecanicien	106011001	22					21	
275	mecan_equip		508192001	22						
276	mecan_equip	mecanicien chariot elevateur	304102001	21					21	11
277	mecan_equip	mecanicien d'entretien	506131001	22				11	22	
278	mecan_equip	reparateur appareils Gestetner	510192001	22					22	12
279	mecan_fixes		507041001	22	12	22	12	21	22	
280	mecan_fixes	mecanicien	314251001	22	12	22	12	21	22	
281	mecan_metal	mecanicien	304102001	11	11		11		11	11
282	mecan_plaqu	mecanicien plaqueur	308172001	22					12	
283	medecin		112022001							
284	medecin	medecin	112022000							
285	medecin	medecin	112022001							
286	medecin	medecin	112022000							
287	medecin	medecin	112022000							
288	medecin	medecin	112022000							
289	medecin	medecin	315261000							
290	medecin	medecin	315261000							
291	medecin	medecin	315061000							
292	medecin	medecin	112022000							
293	medecin	medecin	315261001							
294	medecin	medecin	112022001							
295	medecin	medecin	112022001							

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
296	medecin	medecin	315261001							
297	medecin	medecin	112022001							
298	medecin	medecin	112022001							
299	medecin	medecin	112022001							
300	medecin	medecin	315261001							
301	medecin	medecin	112022001							
302	medecin	medecin a temps partiel	315261001							
303	medecin	medecin generaliste	315261000							
304	medecin	pediatre	315061000							
305	medecin	pediatre	315061001							
306	medecin	pediatre	315061000							
307	medecin	pediatre	315061001							
308	medecin	resident	315061001							
308	medecin	resident	315061001							
309	medecin	resident	315061001							
310	medecin	resident	315061001							
311	menuisier_const	aide-menuisier	511091001	22		22	21		12	
312	menuisier_constr	menuisier	314121001	22		22	21		12	
313	menuisier_meubl		508192001	22	12	22	22		12	12
314	menuisier_meubl	fabricant de cadre	109231001	22	12	22	22		12	
315	menuisier_meubl	sableur et confection	109121001	22	12	22	22		12	12
316	menuisier_verre		114052001	12		12	21			
317	mouleur		513111001	22	12		22	11	12	12
318	mouleur	mouleur	313041001	22	12		22	11	12	12
319	operat_alimt	operateur de machine	514011000					21		
320	operat_alimt	operateur de machine	110061000					21		
321	operat_brass	operateur	507221001					21		
322	operat_chimq	operateur et ajusteur de ligne	313091001							
323	operat_cuir	operateur	309041000	21	11	21	11	11	11	12
324	operat_cuir	operateur	513111001	22	22	22		11	12	
325	operat_fondr	operateur	313041001	22	12	22		11	12	12
326	operat_fourr	operateur	508202000	21	11	21	11	11	11	12
327	operat_imprim	operatrice de camera electronique	306091000	21		11			11	11
328	operat_mach	operatrice de machine	311102000	21		21		21	11	
329	operat_metal	operateur	513111001	21	21	21	11	11	22	11
330	operat_metal	operateur	507111001	11	11		11		11	11
331	operat_meubles	operatrice de machine	508192000	21	11	21	21		11	11
332	operat_meubles	operatrice de machine	508192000	21	11	21	21		11	11
333	operat_plast	operateur de machine	309192001	21	11	21	11	21	11	11
334	operat_pompe	operateur de pompes	507041001							
335	operat_soul	operatrice de machine	313172000	22	22	22		11	12	12
336	operat_tabac	operatrice	313191000			11		11		
337	operat_text	fileuse	113132000						11	
338	operat_textl	operateur	309041000						11	
339	operat_textl	operateur	508202000						11	
340	operat_textl	operateur	309041000						11	
341	operat_textl	operateur	313091001						11	
342	operat_textl	operateur	310051000						11	
343	operat_textl	operateur	309041000						11	
344	operat_textl	operateur de machine	509152000						11	

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
345	operat_textl	operateur de machine	309192000						11	
346	operat_textl	operateur de machine	508092001						11	
347	operat_textl	operateur de machine	110232000						11	
348	operat_textl	operateur de machine	510111000						11	
349	operat_textl	operateur de machine	510111000						11	
350	operat_textl	operateur de machine	110071001						11	
351	operat_textl	operateur de machine	510111001						11	
352	operat_textl	operateur de machine	509121000						11	
353	operat_textl	operatrice	514241000						11	
354	operat_textl	operatrice	514241000						11	
355	operat_textl	operatrice	108021000						11	
356	operat_textl	operatrice	108021000						11	
357	operat_textl	operatrice de machine	108061000						11	
358	operat_textl	operatrice de machines	306122000						11	
359	operat_textl	tisseusse	314291000							
360	patissier	patissier	509121001							
361	patissier	patissier	509121001							
362	patissier	patissiere	313032000							
363	peintre	artiste peintre	511511000	22			22	11	12	
364	peintre	peintre	509172001	22	22	21	22	21	22	12
365	peintre	peintre	114122001	22	22		21		22	12
366	peintre	peintre	504221001	22	22	21	22	21	22	12
367	plieuse_buand	plieuse de vetement	313182000	11				11		
368	plombier	plombier	114122001	22		22	12	22		
369	plongeur	operateur de lave-vaisselle	313041001					11		
370	polycopiste	polycopiste	313081001	22						
371	prepose_autom		510212001	21				21	21	
372	prepose_autom	prepose aux pieces et comptoir	513101001	11	11		11		21	
373	prepose_statn	prepose au stationnement	515221001	21				21	21	
374	prepose_textl	preposee aux commandes	513022000	11				11		
375	presseur_textl		511261001	11				11		
376	presseur_textl	presseur	109211001	11				11		
377	presseur_textl	presseur	109211001	11				11		
378	presseur_textl	presseur	109131001	11				11		
379	presseur_textl	presseur	109131001	11				11		
380	presseur_textl	presseur	109131001	11				11		
381	presseur_textl	presseur	109131001	11				11		
382	presseur_textl	presseur	511261001	11				11		
383	presseur_textl	presseur	511261001	11				11		
384	presseur_textl	presseur	511261001	11				11		
385	presseur_textl	presseuse	508161000	11				11		
386	secretaire	secretaire de direction	511152000	21						
387	secretaire	secretaire et teneur de livre	509051000	21						
388	soudeur		510212001	11	11		11		11	11
389	soudeur		510212001	11	11		11		11	11
390	soudeur	aide-soudeur	114052001							
391	soudeur	assemblage d'equipement forestier	511132001	11	11		11		11	11
392	soudeur	soudeur	511132001	11	11		11		11	11
393	soudeur	soudeur	511132001	11	11		11		11	11
394	soudeur	soudeur	306071001	11	11		11		11	11

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	VAPO A1	HARD A2	GLUE A3	RESN A4	PLAS A5	TARS A6	BENZ A8
395	soudeur	soudeur	511132001	11	11	11	11	11	11	11
396	soudeur	soudeur	510212001	11	11		11		11	11
397	soudeur	soudeur	510212001	11	11		11		11	11
398	soutireur_brass	soutireur	313081001							
399	spinner_metal	tourneur de metal "spinneur"	506082001	11	11		11		11	
400	superv_textl	superviseur	309212000					21		
401	technic	agent technique	314192000	21						
402	technic	aviseur technique Bi-energie	512191001	21						
403	technic_elect	technicien en electro-ceramique	307071001	11						
404	technic_equip	technicien	306241001						22	
405	technic_equip	technicien	306241001						22	
406	technic_equip	technicien	306241001						22	
407	technic_equip	technicien	306241001						22	
408	technic_gen.civ	technicien de laboratoire	507271001	12					12	
409	tech_labo	aide laboratoire	106032000	11						
410	technic_lentl	technicien	114151000	11				12		
411	technic_pharm	technicienne en laboratoire	513101000							
412	technic_photo	technicien	507281001	11						
413	technic_photo	technicien	507281001	11						
414	technic_photo	technicien	507281001	12						
415	technic_photo	technicienne en impression	507281000	11						
416	technic_photo	technicienne en impression	507281000	11						
417	tisseur_textl	tisseur	314261001							
418	valet	valet	309021001					11		
419	vendeuse_textl	vendeuse	504221000							
420	vendeuse_textl	vendeuse	507221000							

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ACID B1	BASE B2	AMMO B3	FORM B4	DYES B5	INSE B6	PHAR B7	CHEM Bx	CHEM Bx-name
1	aide-wagonnier	aide-wagonnier	507082001				21					
2	ajust_mecan	ajusteur mecanique	507171001						21		11	machine oil additives
3	archeologue	archeologie	112062001									
4	ass/rech_INRS	assistante de recherche	311112000	11	11	11	11			11		
5	assembl_battr	assembleur	309192001	11							11	lime dust
6	assembl_bross	assembleuse	308152000									
7	assembl_elect		514031000	11							22	cyan.salts(1/1),ZnCl(2/2)
8	assembl_lunet	assembleur	114081000								11	plastic additives
9	assembl_metal		104181001	11	11	11	11				11	see Un.Op:metal products
10	assembl_serr		510212000	11	11	11	11				11	see Un.Op:metal products
11	assembl_skido	assembleur	313041001	11	11	11	11				11	see Un.Op:metal products
12	bardeau asphalte		104181001									
13	bartender	bartender	511152000		11						11	DETERGENT
14	cables teleph		504261000					21				
15	cariste_alimt	cariste	513227001			11			21			
16	cariste_brass	operateur chariot elevateur	313081001						21			
17	chauffeur		304211001				21					
18	chauffeur	camionneur livreur	515221001				21		21			
19	chauffeur	chauffeur	304211001				21					
20	chauffeur	chauffeur	506082001				21					
21	chauffeur	chauffeur	307202001				21					
22	chauffeur	chauffeur	506071001				21					
23	chauffeur	chauffeur	304211001				21					
24	chauffeur	chauffeur	513227001				21					
25	chauffeur	chauffeur	508192001				21					
26	chauffeur	chauffeur (stationnement)	506131001				21					
27	chauffeur	chauffeur d'autobus	506071001				21					
28	chauffeur	chauffeur d'autobus	507191001				21					
29	chauffeur	chauffeur d'autobus	504252001				21					
30	chauffeur	chauffeur de camion	112091001				21					
31	chauffeur	chauffeur de camion	507041001				21					
31	chauffeur	chauffeur de camion	507041001				21					
32	chauffeur	chauffeur de camion	514031001				21					
33	chauffeur	chauffeur de camion	514031001				21					
34	chauffeur	chauffeur de camion	514031001				21					
35	chauffeur	chauffeur de camion	514031001				21					
36	chauffeur	chauffeur de camion	310011001				21					
37	chauffeur	chauffeur de camion et mecanicien	112091001				21					
38	chauffeur	chauffeur de taxi	312101001				21					
39	chauffeur	chauffeur journalier	104181001				21					
40	chauffeur	chauffeure	507041000				21					
41	chauffeur	livreur	306122001				21					
42	chauffeur	livreur	504261001				21					
43	chauffeur	livreur	504252001				21					
44	chauffeur	livreur	504261001				21					
45	chauffeur	livreur	513101001				21				21	fluorides,O3,NO2,CO,phosg
46	chauffeur	livreur	513101001				21				21	fluorides,O3,NO2,CO,phosg
47	chauffeur	livreur	513101001				21				21	fluorides,O3,NO2,CO,phosg
48	chauffeur	livreur	504261001	11	11		21			11		

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ACID B1	BASE B2	AMMO B3	FORM B4	DYES B5	INSE B6	PHAR B7	CHEM Bx	CHEM Bx-name
49	chauffeur	transport camionneur	306071001				21					
50	cimenteuse	cimenteuse	513121000			12		11			11	Tetrahydrofuran, waxes
51	cimenteuse	echantillonneuse	313182000									
52	coiffeuse	aide	311102000		11	21	11	21			21	perfumes,detergents
53	coiffeuse	aide-coiffeuse	313091000		11	21	11	21			21	perfumes,detergents
54	coiffeuse	assistante coiffeuse	313032000		11	21	11	21			21	perfumes,detergents
55	coiffeuse	assistante-coiffeuse	504252000		11	21	11	21			21	perfumes,detergents
56	coiffeuse	assistante-coiffeuse	504252000		11	21	11	21			21	perfumes,detergents
57	coiffeuse	coiffeuse	107212000		11	21	11	21			21	perfumes,detergents
58	coiffeuse	coiffeuse	107212000		11	21	11	21			21	perfumes,detergents
59	coiffeuse	coiffeuse	107212000		11	21	11	21			21	perfumes,detergents
60	coiffeuse	coiffeuse	107212000		11	21	11	21			21	perfumes,detergents
61	coiffeuse	coiffeuse	504252000		11	21	11	21			21	perfumes,detergents
62	coiffeuse	coiffeuse	107212000		11	21	11	21			21	perfumes,detergents
63	coiffeuse	coiffeuse	508202000		11	21	11	21			21	perfumes,detergents
64	coiffeuse	coiffeuse	313212000		11	21	11	21			21	perfumes,detergents
65	coiffeuse	coiffeuse	313212000		11	21	11	21			21	perfumes,detergents
66	coiffeuse	coiffeuse	313212000		11	21	11	21			21	perfumes,detergents
67	coiffeuse	coiffeuse	313212000		11	21	11	21			21	perfumes,detergents
68	commis_mag	commis	106072000			11			21			
69	concierge	concierge	309232001		11	21			21		21	detergents
70	concierge	concierge	309232000		11			21	21		21	detergents
71	concierge	entreteneur de batiment	314121001		11			21	21		21	detergents
72	contre_met	contre-maitre	514101001	22	22	12	11	21			22	driers,stabilizers,organi
73	coordonn	coordonnatrice	511091000				21					
74	coupeur_arc	coupeur a l'arc	314251001									
75	coupeur_cuir	coupeur	509121001			12		22				
76	couturier	couturier	115172000									
77	couturiere	couturiere	509192000									
78	couturiere	couturiere	510182000									
79	couturiere	couturiere	110132001									
80	couturiere	couturiere	109211000									
80	couturiere	couturiere	109211000									
81	couturiere	couturiere	109111000									
82	couturiere	couturiere	109111000									
83	couturiere	couturiere	514011000									
84	couturiere	couturiere	314291000									
85	couturiere	couturiere	508021000									
86	couturiere	couturiere	314291000									
87	couturiere	couturiere	115162000									
88	couturiere	couturiere	509192000									
89	couturiere	couturiere	509121000									
90	couturiere	couturiere	510111000									
91	couturiere	couturiere	509172000									
92	couturiere	operatrice de machine a coudre	508161000									
93	couturiere	operatrice de machine a coudre	508161000									
94	couturiere	operatrice de machine a coudre	313091000									
95	couturiere	operatrice de machine a coudre	114052000									
96	couturiere	operatrice de machine a coudre	508102000									
97	crustaces		104031000									

[E_code]	Standardized job title [Job_rev]	Original job title given by subject [Job title]	[ID]	ACID B1	BASE B2	AMMO B3	FORM B4	DYES B5	INSE B6	PHAR B7	CHEM Bx	CHEM Bx-name
97	crustaces		104031001				21					
98	cuisinier		311102000			11	22				21	perfumes, detergents
99	cuisinier		112062000			11	22				21	perfumes, detergents
100	cuisinier		104121000			11	22				21	perfumes, detergents
101	cuisinier	aide feminin	306091000			11	22				21	perfumes, detergents
102	cuisinier	cuisinier	509192001			11	22				21	perfumes, detergents
103	cuisinier	cuisinier	509172001			11	22				21	perfumes, detergents
104	cuisinier	cuisinier	509192001			11	22				21	perfumes, detergents
105	cuisinier	cuisinier	514101000			11	22				21	perfumes, detergents
106	cuisinier	cuisinier	110112000			11	22				21	perfumes, detergents
107	cuisinier	cuisinier	110112000			11	22				21	perfumes, detergents
108	cuisinier	cuisinier	110112000			11	22				21	perfumes, detergents
109	cuisinier	cuisinier	514101000			11	22				21	perfumes, detergents
110	cuisinier	cuisinier	510212001			11	22				21	perfumes, detergents
111	cuisinier	cuisinier	110232000			11	22				21	perfumes, detergents
112	cuisinier	cuisinier	110132001			11	22				21	perfumes, detergents
113	cuisinier	cuisinier	509172001			11	22				21	perfumes, detergents
114	cuisinier	cuisinier	314071001			11	22				21	perfumes, detergents
115	cuisinier	cuisinier	514011000			11	22				21	perfumes, detergents
116	cuisinier	cuisinier / plongeur	509192001			11	22				21	perfumes, detergents
117	cuisinier	cuisiniere	314071000			11	22				21	perfumes, detergents
118	cuisinier	cuisiniere	514031000			11	22				21	perfumes, detergents
119	cuisiniere	aide cuisiniere	112062000			11	22				21	perfumes, detergents
120	cuisiniere	aide-alimentaire	313091000			11	22				21	perfumes, detergents
121	cuisiniere	aide-cuisinier	311102001			11	22				21	perfumes, detergents
122	cuisiniere	serveuse aide-cuisiniere	314221000			11	22				21	perfumes, detergents
123	deboss/peintre		107212001	21			11	21			21	additives:driers,stabiliz
124	deboss/peintre	gerant	313061001	21			11	21			21	additives:driers,stabiliz
125	dentiste	assistante dentaire	512211000		21	21				21	21	methylmethacrylate,H2O2
126	direct_impr	directrice de finition	306091000	11			11	11			21	ozone
127	ebeniste	ebeniste	306232001				21		21			
128	electricien	apprentis electricien	106152001	22							22	fluxes
129	electricien	electricien	115172001	22							22	fluxes
130	electricien	electricien	108061001	22							22	fluxes
131	electricien	electro mecanicien	513101001	22							22	fluxes
132	electroplast	electroplast	308172001	22	22	12	12				12	cyanide,fluoborates,Ni,Sn
133	emballeur	emballeur	310051000				21				21	detergents
134	emballeur	empaquetteuse de egg rolls	313182000				21				21	detergents
135	enseignant	enseignant	314121001				21		21			
136	entre-menag	entretien menager	115101001		21	21			21		11	detergents
137	entre-menag	entretien menager	112071000		21	21			21		11	detergents
138	entre-menag	entretien menager quart de travail du	513202000		21	21			21		11	detergents
139	entre-menag	prepose a l'entretien	312281001		21	21			21		11	detergents
140	entre-menag	prepose a l'entretien menager	115101001		21	21			21		11	detergents
141	entre-menag	prepose a l'entretien menager	313091001		21	21			21		11	detergents
142	entre-menag	prepose a l'entretien menager	514172001		21	21			21		11	detergents
143	entre-menag	trieuse et entretien menager	314121000		21	21			21		11	detergents
144	entre_menag	entretien menager	511192000		21	21			21		11	detergents
145	entre_menag	entretien menager	110132001		21	21			21		11	detergents
146	entre_menag	entretien menager	109121001		21	21			21		11	detergents

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ACID B1	BASE B2	AMMO B3	FORM B4	DYES B5	INSE B6	PHAR B7	CHEM Bx	CHEM Bx-name
147	entre_menag	entretien menager	109121000		21	21			21		11	detergents
148	entre_menag	entretien menager	513101000		21	21			21		11	detergents
149	entre_menag	entretien menager	313231000		21	21			21		11	detergents
150	entre_menag	entretien menager	508102000		21	21			21		11	detergents
151	entre_menag	ouvrier d'entretien general	314071001		21	21			21		11	detergents
152	entrepr_const		109211001	11			21				21	additives:driers,stabiliz
153	entrepr_const		113062001					21				
154	entrepr_const		511152001	11			21				21	misc. chemicals
155	entrepr_const		513111001	11			2				21	additives:driers,stabiliz
156	estheticienne		304211000			11		11		11	11	perfumes,detergents
157	estheticienne	estheticienne	511132000			11		11		11	11	perfumes,detergents
158	estheticienne	estheticienne	511132000			11		11		11	11	perfumes,detergents
159	estheticienne	estheticienne	511132000			11		11		11	11	perfumes,detergents
160	estheticienne	estheticienne	511132000			11		11		11	11	perfumes,detergents
161	estheticienne	estheticienne	511132000			11		11		11	11	perfumes,detergents
162	estheticienne	proprietaire estheticienne	511132000			11		11		11	11	perfumes,detergents
163	etiquetteuse	etiquetteuse	310222000					21				
164	graveur		309232001	22							22	cyan.salts(1/1),ZnCl(2/2)
165	imprimeur		313041000	11			11	11			21	additives:driers,stabiliz
166	imprimeur	apprenti-pressier	312042001	12			12	21			21	ozone,photo chemical
167	imprimeur	imprimeur	511152001	12			12	21			21	ozone,photo chemical
168	imprimeur	imprimeur	109191000		21					11		
169	imprimeur	relieur	105202001	11			11	11			21	additives:driers,stabiliz
170	infirmiere		112022001	21	21		21			22	21	acetone,isopropyl alcohol
171	infirmiere	aide-infirmiere	307071000	21	21		21			22	21	acetone,isopropyl alcohol
172	infirmiere	infirmiere	312082000	21	21		21			22	21	acetone,isopropyl alcohol
173	infirmiere	infirmiere	107011000	21	21		21			22	21	acetone,isopropyl alcohol
174	infirmiere	infirmiere	312082000	21	21		21			22	21	acetone,isopropyl alcohol
175	infirmiere	infirmiere	312082000	21	21		21			22	21	acetone,isopropyl alcohol
176	infirmiere	infirmiere	312082000	21	21		21			22	21	acetone,isopropyl alcohol
177	infirmiere	infirmiere	307192000	21	21		21			22	21	acetone,isopropyl alcohol
178	infirmiere	infirmiere	512112000	21	21		21			22	21	acetone,isopropyl alcohol
179	infirmiere	infirmiere	314021000	21	21		21			22	21	acetone,isopropyl alcohol
180	infirmiere	infirmiere	314021000	21	21		21			22	21	acetone,isopropyl alcohol
181	infirmiere	infirmiere	312151000	21	21		21			22	21	acetone,isopropyl alcohol
182	infirmiere	infirmiere	312151000	21	21		21			22	21	acetone,isopropyl alcohol
183	infirmiere	infirmiere	312151000	21	21		21			22	21	acetone,isopropyl alcohol
184	infirmiere	infirmiere	312102000	21	21		21			22	21	acetone,isopropyl alcohol
185	infirmiere	infirmiere auxiliaire	307041000	21	21		21			22	21	acetone,isopropyl alcohol
186	infirmiere	infirmiere auxiliaire	307041000	21	21		21			22	21	acetone,isopropyl alcohol
187	infirmiere	infirmiere auxiliaire	307041000	21	21		21			22	21	acetone,isopropyl alcohol
188	infirmiere	infirmiere auxiliaire	114081000	21	21		21			22	21	acetone,isopropyl alcohol
189	infirmiere	infirmiere auxiliaire	107022000	21	21		21			22	21	acetone,isopropyl alcohol
190	infirmiere	infirmiere auxiliaire	309222000	21	21		21			22	21	acetone,isopropyl alcohol
191	infirmiere	infirmiere auxiliaire	505071000	21	21		21			22	21	acetone,isopropyl alcohol
192	infirmiere	infirmiere auxiliaire	505071000	21	21		21			22	21	acetone,isopropyl alcohol
193	infirmiere	infirmiere auxilliare	307041000	21	21		21			22	21	acetone,isopropyl alcohol
194	infirmiere	infirmiere en medecine et chirurgie	312151000	21	21		21			22	21	acetone,isopropyl alcohol
195	infirmiere	infirmiere en milieu scolaire	312151000	21	21		21			22	21	acetone,isopropyl alcohol
196	infirmiere	infirmiere etudiante	512112000	21	21		21			22	21	acetone,isopropyl alcohol

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197	ingenieur	ingenieur	507151001								11	Co,NOx,SOx
198	inspect_alimt	cadre inspecteur des viandes	504211001						21			
199	inspect_metal	inspecteur contre-maitre	514101001	11	11	11	11	11				
200	inspect_metal	inspecteur controle de qualite	509152001	21	21	11	11	11	11		21	fluorides,ozone,NO2,Co
201	inspect_plast/met	inspecteur controle de qualite	514101001	11	11		11	11			21	stabilizers,foaming agent
202	instruct_arts	instructeur de metiers	114151000	11				21				
203	journl_aero		510212001	21	21	11	11	11	11		21	antioxidants,plasticizers
204	journl_agric	cueilleur	514241000						22			
205	journl_agric	travailleur agricole	112062001						22			
206	journl_alimt	journalier	104031001				21	21			21	chemical preservatives
206	journl_alimt	journalier	104031000				21	21			21	chemical preservatives
207	journl_alimt	journalier	114122001					21	21		21	chemical preservatives
208	journl_alimt	journaliere	504211000					21	21		21	chemical preservatives
209	journl_alimt	journaliere	313051000					21	21		21	chemical preservatives
210	journl_alimt	ouvrage general	113101000								21	chemical preservatives
211	journl_alimt	ouvrier	507221001					21	21		21	chemical preservatives
212	journl_autom	journalier	313041001	11								
213	journl_brass	journalier conducteur de chariot elev	113062001		21		21				21	fermentation:CO2,methane
214	journl_buand		113101000		21						21	detergents,perfumes
215	journl_buand	journaliere	106152000		21						21	detergents,perfumes
216	journl_buand	ouvrier	507221001		21						21	detergents,perfumes
217	journl_cartn	journalier	114052001				12	21				
218	journl_chaus		514031000			12	12	12			12	silicones
219	journl_chaus		109211001			12	12	12			12	silicones
220	journl_chaus	journaliere	114052000			12	12	12			12	silicones
221	journl_const		305012001	11			21				21	misc. chemicals
222	journl_const	journalier	306071001	11			21				21	misc. chemicals
223	journl_const	journalier	511091001	11			21				21	misc. chemicals
224	journl_const	ouvrier	110112000	11			21				21	misc. chemicals
225	journl_const	ouvrier specialise en excavation	313041001								22	explosives fumes,CO
226	journl_disqu	prepose	505061001	12				11			21	antioxidants,plasticizers
227	journl_disqu	prepose	505061001	12				11			21	antioxidants,plasticizers
228	journl_encre		115162001					21			21	waxes,greases,antioxidant
229	journl_entre	journalier	307192001		22		21				11	O3,CO,cleaning agents
230	journl_entrp		309232001									
231	journl_fourn	journalier	113062001		22		21				11	O3,CO,cleaning agents
232	journl_metal		307121000	11	11	11	11				11	NOx,Cyanide,sodium nitrat
233	journl_metal		514172001	11	11	11	11				11	NOx,cyanide,sodium nitrat
234	journl_metal	journalier	114122001	22	22	12		22				
235	journl_metal	journaliere	314071000	11	11	11	11				11	NOx,cyanide,sodium nitrat
236	journl_metal	manoeuvre	505061001	11	11	11	11				11	NOx,cyanide, sodium nitra
237	journl_meubl	journalier	508192001				21		21			
238	journl_meubl	ouvrier general	115101001				21		21			
239	journl_netto		112071001		21		12				21	detergents
240	journl_netto		506131000		21		12				21	detergents
241	journl_papir		510212001					21				
242	journl_pharm		514031000					11		22	11	parfumes,colorants
243	journl_pharm	journalier	307121000					11		22	11	perfumes,colorant
244	journl_placq	ouvrier	314121001	22	22	12	12				22	NOx,cyanide,sodium nitrat
245	journl_plast		514172001			11	11	11			21	antioxidants,lubricants

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246	journl_pompe	journalier	314071001	11	11	11	11				11	fluorides,O3,NO2,CO,phosq
247	journl_tabac	journalier	313041001			11			11			
248	journl_textl		514031000			11		11				
249	journl_textl		511261000			11		11				
250	journl_textl		114181001			11		11				
251	journl_textl	general	508232000			11		11				
252	journl_textl	ouvrier	309212000			11		11				
253	journl_textl	ouvrier a tout faire	513031000					11				
254	journl_textl	separateur	109131000					11				
255	journl_textl	travailleuse generale	514211000					11				
256	journl_tr.pub	journalier	113091001		11				21	11		
257	journl_tr.pub	journalier	314251001		11				21	11		
258	journl_tr.pub	journalier	507041001		11				21	11		
259	journl_tr.pub	journalier	511132001		11				21	11		
260	journl_verre	ouvrier travail a la chaine	314261001	11							21	SO2,sodium,potas.carbonat
261	journl_vitrx	journalier	114052001	11							11	silver nitrate,zinc chlor
262	machiniste	machiniste	314291001						21		11	additives:petroleum sulfo
263	machiniste	machiniste	314291001						21		11	additives:petroleum sulfo
264	machiniste	machiniste	510192001						21		11	different additives
265	machiniste	machiniste	314291001						21		11	fumigants
266	mecan_aeron	mecanicien	108061001	21	21	11	11	11	11			
267	mecan_aspir	mecanicien	513101001	22							22	fluxes
268	mecan_auto		110202001	22	11		11	11			22	driers,flatting agents
269	mecan_autom	mecanicien	512151001	22	11		11	11			22	driers,flatting agents
270	mecan_autom	mecanicien automobile	504252001	22	11		11	11			22	driers,flatting agents
271	mecan_autom	mecanicien d'auto	108061001	22	11		11	11			22	driers,flatting agents
272	mecan_bicy		312281001	22			11	21	11		22	driers,flatting agents
273	mecan_char-elev		304102001	21			11	11				
274	mecan_chauf	mecanicien	106011001	12	12						22	miscellaneous:cleaners,et
275	mecan_equip		508192001	11	11		11				22	driers,flatting agents
276	mecan_equip	mecanicien chariot elevateur	304102001	21			11	11				
277	mecan_equip	mecanicien d'entretien	506131001	22			11				22	O3,fluorides,NO2,CO,phosq
278	mecan_equip	reparateur appareils Gestetner	510192001				21					
279	mecan_fixes		507041001		22		21				11	O3,CO,cleaning agents
280	mecan_fixes	mecanicien	314251001		22		21				11	O3,CO,cleaning agents
281	mecan_metal	mecanicien	304102001	11	11	11	11					
282	mecan_plaqu	mecanicien plaqueur	308172001	22	22	12	12				22	cyanide,fluoroborates,Ni
283	medecin		112022001	11	11		11			22	11	alcohol,trichlorethane
284	medecin	medecin	112022000	11	11		11			22	11	alcohol,trichlorethane
285	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
286	medecin	medecin	112022000	11	11		11			22	11	alcohol,trichlorethane
287	medecin	medecin	112022000	11	11		11			22	11	alcohol,trichlorethane
288	medecin	medecin	112022000	11	11		11			22	11	alcohol,trichlorethane
289	medecin	medecin	315261000	11	11		11			22	11	alcohol,trichlorethane
290	medecin	medecin	315261000	11	11		11			22	11	alcohol,trichlorethane
291	medecin	medecin	315061000	11	11		11			22	11	alcohol,trichlorethane
292	medecin	medecin	112022000	11	11		11			22	11	alcohol,trichlorethane
293	medecin	medecin	315261001	11	11		11			22	11	alcohol,trichlorethane
294	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
295	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane

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296	medecin	medecin	315261001	11	11		11			22	11	alcohol,trichlorethane
297	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
298	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
299	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
300	medecin	medecin	315261001	11	11		11			22	11	alcohol,trichlorethane
301	medecin	medecin	112022001	11	11		11			22	11	alcohol,trichlorethane
302	medecin	medecin a temps partiel	315261001	11	11		11			22	11	alcohol,trichlorethane
303	medecin	medecin generaliste	315261000	11	11		11			22	11	alcohol,trichlorethane
304	medecin	pediatre	315061000	11	11		11			22	11	alcohol,trichlorethane
305	medecin	pediatre	315061001	11	11		11			22	11	alcohol,trichlorethane
306	medecin	pediatre	315061000	11	11		11			22	11	alcohol,trichlorethane
307	medecin	pediatre	315061001	11	11		11			22	11	alcohol,trichlorethane
308	medecin	resident	315061001	11	11		11			22	11	alcohol,trichlorethane
308	medecin	resident	315061001	11	11		11			22	11	alcohol,trichlorethane
309	medecin	resident	315061001	11	11		11			22	11	alcohol,trichlorethane
310	medecin	resident	315061001	11	11		11			22	11	alcohol,trichlorethane
311	menuisier_const	aide-menuisier	511091001				21		21			
312	menuisier_constr	menuisier	314121001				21		21			
313	menuisier_meubl		508192001				21		21			
314	menuisier_meubl	fabricant de cadre	109231001				21		21			
315	menuisier_meubl	sableur et confection	109121001				21		21			
316	menuisier_verre		114052001				11					
317	mouleur		513111001	11		12	11				22	NOx,SOx,CO,hydrogen sulfi
318	mouleur	mouleur	313041001	11		12	11				22	NOx,SOx,CO,hydrogen sulfi
319	operat_alint	operateur de machine	514011000								11	detergents
320	operat_alint	operateur de machine	110061000						11			
321	operat_brass	operateur	507221001		11		11		11		11	CO2,methane
322	operat_chimq	operateur et ajusteur de ligne	313091001		21			21			21	soaps,phosphates,silicate
323	operat_cuir	operateur	309041000			12		22			11	tetrahydrofuran,waxes
324	operat_cuir	operateur	513111001			12	12	12			12	silicones
325	operat_fondr	operateur	313041001	11		12	12				22	NOx,SOx,CO,hydrogen sulfi
326	operat_fourr	operateur	508202000			12		22			11	tetrahydrofuran,waxes
327	operat_imprim	operatrice de camera electronique	306091000	21	21	12	12	11			11	potassium aluminum sulfat
328	operat_mach	operatrice de machine	311102000									
329	operat_metal	operateur	513111001			11		11			11	sodium silicate,magnesite
330	operat_metal	operateur	507111001	11	11	11	11					
331	operat_meubles	operatrice de machine	508192000				21		21			
332	operat_meubles	operatrice de machine	508192000				21		21			
333	operat_plast	operateur de machine	309192001	11	11	11	11	11				
334	operat_pompe	operateur de pompes	507041001	12	12	12			21		12	Cl compounds
335	operat_soul	operatrice de machine	313172000			12	12	12			12	silicones
336	operat_tabac	operatrice	313191000			11	11		11			
337	operat_text	fileuse	113132000						11		11	soluble and oil additives
338	operat_textl	operateur	309041000						11		11	soluble and oil additives
339	operat_textl	operateur	508202000						11		11	soluble and oil additives
340	operat_textl	operateur	309041000						11		11	soluble and oil additives
341	operat_textl	operateur	313091001						11		11	soluble and oil additives
342	operat_textl	operateur	310051000						11		11	soluble and oil additives
343	operat_textl	operateur	309041000						11		11	soluble and oil additives
344	operat_textl	operateur de machine	509152000						11		11	soluble and oil additives

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345	operat_textl	operateur de machine	309192000						11		11	soluble and oil additives
346	operat_textl	operateur de machine	508092001					11	11		11	soluble and oil additives
347	operat_textl	operateur de machine	110232000						11		11	soluble and oil additives
348	operat_textl	operateur de machine	510111000						11		11	soluble and oil additives
349	operat_textl	operateur de machine	510111000						11		11	soluble and oil additives
350	operat_textl	operateur de machine	110071001						11		11	soluble and oil additives
351	operat_textl	operateur de machine	510111001						11		11	soluble and oil additives
352	operat_textl	operateur de machine	509121000						11		11	soluble and oil additives
353	operat_textl	operatrice	514241000						11		11	soluble and oil additives
354	operat_textl	operatrice	514241000						11		11	soluble and oil additives
355	operat_textl	operatrice	108021000						11		11	soluble and oil additives
356	operat_textl	operatrice	108021000						11		11	soluble and oil additives
357	operat_textl	operatrice de machine	108061000						11		11	soluble and oil additives
358	operat_textl	operatrice de machines	306122000						11		11	soluble and oil additives
359	operat_textl	tisseusse	314291000						11		11	soluble and oil additives
360	patissier	patissier	509121001				11		11			
361	patissier	patissier	509121001				11		11			
362	patissier	patissiere	313032000				11		11			
363	peintre	artiste peintre	511511000			11	11	21	11		11	glycols and derivates
364	peintre	peintre	509172001	11			21				21	additives:driers,stabiliz
365	peintre	peintre	114122001				11	21			21	additives:driers,stabiliz
366	peintre	peintre	504221001	11			21				21	additives:driers,stabiliz
367	plieuse_buand	plieuse de vetement	313182000									
368	plombier	plombier	114122001	22			11				22	NOx
369	plongeur	operateur de lave-vaisselle	313041001			11	11				11	detergents
370	polycopiste	polycopiste	313081001				21				21	O3,CO,cleaning agents
371	prepose_autom		510212001				21					
372	prepose_autom	prepose aux pieces et comptoir	513101001	11								
373	prepose_statn	prepose au stationnement	515221001				21					
374	prepose_textl	preposee aux commandes	513022000				D					
375	presseur_textl		511261001									
376	presseur_textl	presseur	109211001									
377	presseur_textl	presseur	109211001									
378	presseur_textl	presseur	109131001									
379	presseur_textl	presseur	109131001									
380	presseur_textl	presseur	109131001									
381	presseur_textl	presseur	109131001									
382	presseur_textl	presseur	511261001									
383	presseur_textl	presseur	511261001									
384	presseur_textl	presseur	511261001									
385	presseur_textl	presseuse	508161000									
386	secretaire	secretaire de direction	511152000				21				11	O3,CO,cleaning agents
387	secretaire	secretaire et teneur de livre	509051000				21				11	O3,CO,cleaning agents
388	soudeur		510212001	22	11	11	11				22	Fluorides,O3,NO2,CO,phosg
389	soudeur		510212001	22	11	11	11				22	Fluorides,O3,NO2,CO,phosg
390	soudeur	aide-soudeur	114052001	21			11				21	Fluorides,O3,NO2,CO,phosg
391	soudeur	assemblage d'equipement forestier	511132001	22	11	11	11				22	Fluorides,O3,NO2,CO,phosg
392	soudeur	soudeur	511132001	22	11	11	12				22	Fluorides,O3,NO2,CO,phosg
393	soudeur	soudeur	511132001	22	11	11	11				22	Fluorides,O3,NO2,CO,phosg
394	soudeur	soudeur	306071001	22	11	11	11				22	Fluorides,O3,NO2,CO,phosg

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395	soudeur	soudeur	511132001	22	11	11	11				22	03,NO2,Co,phosgene
396	soudeur	soudeur	510212001	22	11	11	11				22	Fluorides,03,NO2,CO,phosg
397	soudeur	soudeur	510212001	22	11	11	12				22	Fluorides,03,NO2,CO,phosg
398	soutireur_brass	soutireur	313081001						11		22	CO2 from fermentation
399	spinner_metal	tourneur de metal "spinneur"	506082001	11	11	11	11					
400	superv_textl	superviseur	309212000				D					
401	technic	agent technique	314192000				21				11	03,CO,cleaning agent
402	technic	aviseur technique Bi-energie	512191001				21				11	03,CO,cleaning agents
403	technic_elect	technicien en electro-ceramique	307071001	11	11			11				
404	technic_equip	technicien	306241001						21		11	additives
405	technic_equip	technicien	306241001						21		11	additives
406	technic_equip	technicien	306241001						21		11	additives
407	technic_equip	technicien	306241001						21		11	additives
408	technic_gen.civ	technicien de laboratoire	507271001	12								
409	tech_labo	aide laboratoire	106032000	11	11	11				22		
410	technic_lentl	technicien	114151000	11	11	11				21		
411	technic_pharm	technicienne en laboratoire	513101000	11	11	11				22		
412	technic_photo	technicien	507281001	21	21	12	12	11			21	see Job sheet 412 - 416
413	technic_photo	technicien	507281001	21	21	12	12	11			21	see Job sheet 412 - 416
414	technic_photo	technicien	507281001	21	21	12	12	11			11	see Job sheet 412 - 416
415	technic_photo	technicienne en impression	507281000	21	21	12	12	11			21	see Job sheet 412 - 416
416	technic_photo	technicienne en impression	507281000	21	21	12	12	11			21	see Job sheet 412 - 416
417	tisseur_textl	tisseur	314261001					11	11			
418	valet	valet	309021001		22						11	detergents
419	vendeuse_textl	vendeuse	504221000									
420	vendeuse_textl	vendeuse	507221000				P					

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	OCUS Cx	OCUS Cx-name
1	aide-wagonnier	aide-wagonnier	507082001						
2	ajust_mecan	ajusteur mecanique	507171001						
3	archeologue	archeologie	112062001		21			21	soil dust
4	ass/rech_INRS	assistante de recherche	311112000						
5	assembl_battr	assembleur	309192001						
6	assembl_bross	assembleuse	308152000					21	natural hairs, fibres
7	assembl_elect		514031000						
8	assembl_lunet	assembleur	114081000						
9	assembl_metal		104181001						
10	assembl_serr		510212000						
11	assembl_skido	assembleur	313041001						
12	bardeau_asphalte		104181001					21	paper, textile dust
13	bartender	bartender	511152000			21			
14	cables_teleph		504261000						
15	cariste_alimt	cariste	513227001					11	dust/spore(fresh & decay.food)
16	cariste_brass	operateur chariot elevateur	313081001					12	dust from hops, yeast, malt
17	chauffeur		304211001						
18	chauffeur	camionneur livreur	515221001					21	plant dust
19	chauffeur	chauffeur	304211001						
20	chauffeur	chauffeur	506082001						
21	chauffeur	chauffeur	307202001						
22	chauffeur	chauffeur	506071001						
23	chauffeur	chauffeur	304211001						
24	chauffeur	chauffeur	513227001						
25	chauffeur	chauffeur	508192001						
26	chauffeur	chauffeur (stationnement)	506131001						
27	chauffeur	chauffeur d'autobus	506071001						
28	chauffeur	chauffeur d'autobus	507191001						
29	chauffeur	chauffeur d'autobus	504252001						
30	chauffeur	chauffeur de camion	112091001						
31	chauffeur	chauffeur de camion	507041001						
31	chauffeur	chauffeur de camion	507041001					21	plant dust
32	chauffeur	chauffeur de camion	514031001					21	dust/spore(fresh & decay.food)
33	chauffeur	chauffeur de camion	514031001						
34	chauffeur	chauffeur de camion	514031001					21	textile dust
35	chauffeur	chauffeur de camion	514031001						
36	chauffeur	chauffeur de camion	310011001					21	textile dust
37	chauffeur	chauffeur de camion et mecanicien	112091001					21	plant dust
38	chauffeur	chauffeur de taxi	312101001						
39	chauffeur	chauffeur journalier	104181001						
40	chauffeur	chauffeure	507041000						
41	chauffeur	livreur	306122001						
42	chauffeur	livreur	504261001						
43	chauffeur	livreur	504252001						
44	chauffeur	livreur	504261001						
45	chauffeur	livreur	513101001						
46	chauffeur	livreur	513101001						
47	chauffeur	livreur	513101001						
48	chauffeur	livreur	504261001						

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOO C1	WOOD C2	COSO C3	FEED C4	ODUS Cx	ODUS Cx-name
49	chauffeur	transport camionneur	306071001						
50	cimenteuse	cimenteuse	513121000	11		11		22	leather dust
51	cimenteuse	echantillonneuse	313182000						
52	coiffeuse	aide	311102000					21	hair,skin,dandruff
53	coiffeuse	aide-coiffeuse	313091000					21	hair,skin,dandruff
54	coiffeuse	assistante coiffeuse	313032000					21	hair,skin,dandruff
55	coiffeuse	assistante-coiffeuse	504252000					21	hair,skin,dandruff
56	coiffeuse	assistante-coiffeuse	504252000					21	hair,skin,dandruff
57	coiffeuse	coiffeuse	107212000					21	hair,skin,dandruff
58	coiffeuse	coiffeuse	107212000					21	hair,skin,dandruff
59	coiffeuse	coiffeuse	107212000					21	hair,skin,dandruff
60	coiffeuse	coiffeuse	107212000					21	skin cells, biologic material
61	coiffeuse	coiffeuse	504252000					21	skin cells, biologic material
62	coiffeuse	coiffeuse	107212000					21	skin cells, biologic material
63	coiffeuse	coiffeuse	508202000					21	skin cells, biologic material
64	coiffeuse	coiffeuse	313212000					21	skin cells, biologic material
65	coiffeuse	coiffeuse	313212000					21	skin cells, biologic material
66	coiffeuse	coiffeuse	313212000					21	skin cells, biologic material
67	coiffeuse	coiffeuse	313212000					21	skin cells, biologic material
68	commis_mag	commis	106072000				21	21	hair,fur,dust mites,skin
69	concierge	concierge	309232001					21	household/building dust
70	concierge	concierge	309232000					21	household/building dust
71	concierge	entreteneur de batiment	314121001					21	household/building dust
72	contre_met	contre-maitre	514101001						
73	coordonn	coordonnatrice	511091000					21	organic dusts, microorganisms
74	coupeur_arc	coupeur a l'arc	314251001						
75	coupeur_cuir	coupeur	509121001	11		11		22	leather dust
76	couturier	couturier	115172000					21	cotton, jute, wool, linen dust
77	couturiere	couturiere	509192000					21	cotton, jute, wool, linen dust
78	couturiere	couturiere	510182000					21	cotton, jute, wool, linen dust
79	couturiere	couturiere	110132001					21	cotton, jute, wool, linen dust
80	couturiere	couturiere	109211000					21	cotton, jute, wool, linen dust
80	couturiere	couturiere	109211000					21	cotton, jute, wool, linen dust
81	couturiere	couturiere	109111000					21	cotton, jute, wool, linen dust
82	couturiere	couturiere	109111000					21	cotton, jute, wool, linen dust
83	couturiere	couturiere	514011000					21	cotton, jute, wool, linen dust
84	couturiere	couturiere	314291000					21	cotton, jute, wool, linen dust
85	couturiere	couturiere	508021000					21	cotton, jute, wool, linen dust
86	couturiere	couturiere	314291000					21	cotton, jute, wool, linen dust
87	couturiere	couturiere	115162000					21	cotton, jute, wool, linen dust
88	couturiere	couturiere	509192000					21	cotton, jute, wool, linen dust
89	couturiere	couturiere	509121000					21	cotton, jute, wool, linen dust
90	couturiere	couturiere	510111000					21	cotton, jute, wool, linen dust
91	couturiere	couturiere	509172000					21	cotton, jute, wool, linen dust
92	couturiere	operatrice de machine a coudre	508161000					21	cotton, jute, wool, linen dust
93	couturiere	operatrice de machine a coudre	508161000					21	cotton, jute, wool, linen dust
94	couturiere	operatrice de machine a coudre	313091000					21	cotton, jute, wool, linen dust
95	couturiere	operatrice de machine a coudre	114052000					21	cotton, jute, wool, linen dust
96	couturiere	operatrice de machine a coudre	508102000					21	cotton, jute, wool, linen dust
97	crustaces		104031000					21	aerosol from crustaceans

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	OCUS Cx	OCUS Cx-name
97	crustaces		104031001					21	aerosol from crustaceans
98	cuisinier		311102000	21		21		21	dust/spore(fresh & decay.food)
99	cuisinier		112062000	21		21		21	dust/spore(fresh & decay.food)
100	cuisinier		104121000	21		21		21	dust/spore(fresh & decay.food)
101	cuisinier	aide feminin	306091000	21		21		21	dust/spore(fresh & decay.food)
102	cuisinier	cuisinier	509192001	21		21		21	dust/spore(fresh & decay.food)
103	cuisinier	cuisinier	509172001	21		21		21	dust/spore(fresh & decay.food)
104	cuisinier	cuisinier	509192001	21		21		21	dust/spore(fresh & decay.food)
105	cuisinier	cuisinier	514101000	21		21		21	dust/spore(fresh & decay.food)
106	cuisinier	cuisinier	110112000	21		21		21	dust/spore(fresh & decay.food)
107	cuisinier	cuisinier	110112000	21		21		21	dust/spore(fresh & decay.food)
108	cuisinier	cuisinier	110112000	21		21		21	dust/spore(fresh & decay.food)
109	cuisinier	cuisinier	514101000	21		21		21	dust/spore(fresh & decay.food)
110	cuisinier	cuisinier	510212001	21		21		21	dust/spore(fresh & decay.food)
111	cuisinier	cuisinier	110232000	21		21		21	dust/spore(fresh & decay.food)
112	cuisinier	cuisinier	110132001	21		21		21	dust/spore(fresh & decay.food)
113	cuisinier	cuisinier	509172001	21		21		21	dust/spore(fresh & decay.food)
114	cuisinier	cuisinier	314071001	21		21		21	dust/spore(fresh & decay.food)
115	cuisinier	cuisinier	514011000	21		21		21	dust/spore(fresh & decay.food)
116	cuisinier	cuisinier / plongeur	509192001	21		21		21	dust/spore(fresh & decay.food)
117	cuisinier	cuisiniere	314071000	21		21		21	dust/spore(fresh & decay.food)
118	cuisinier	cuisiniere	514031000	21		21		21	dust/spore(fresh & decay.food)
119	cuisiniere	aide cuisiniere	112062000	21		21		21	dust/spore(fresh & decay.food)
120	cuisiniere	aide-alimentaire	313091000	21		21		21	dust/spore(fresh & decay.food)
121	cuisiniere	aide-cuisinier	311102001	21		21		21	dust/spore(fresh & decay.food)
122	cuisiniere	serveuse aide-cuisiniere	314221000	21		21		21	dust/spore(fresh & decay.food)
123	deboss/peintre		107212001						
124	deboss/peintre	gerant	313061001						
125	dentiste	assistante dentaire	512211000					21	dust from dental enamel
126	direct_impr	directrice de finition	306091000					21	paper dust,leather,fabric
127	ebeniste	ebeniste	306232001		22				
128	electricien	apprentis electricien	106152001						
129	electricien	electricien	115172001						
130	electricien	electricien	108061001						
131	electricien	electro mecanicien	513101001						
132	electroplast	electroplast	308172001						
133	emballeur	emballeur	310051000	21				21	dust from food material
134	emballeur	empaquetteuse de egg rolls	313182000	21				21	dust from food material
135	enseignant	enseignant	314121001		22				
136	entre-menag	entretien menager	115101001					21	household/building dust
137	entre-menag	entretien menager	112071000					21	household/building dust
138	entre-menag	entretien menager quart de travail	513202000					21	household/building dust
139	entre-menag	prepose a l'entretien	312281001					21	household/building dust
140	entre-menag	prepose a l'entretien menager	115101001					21	household/building dust
141	entre-menag	prepose a l'entretien menager	313091001					21	household/building dust
142	entre-menag	prepose a l'entretien menager	514172001					21	household/building dust
143	entre-menag	triense et entretien menager	314121000					21	household/building dust
144	entre_menag	entretien menager	511192000					21	household/building dust
145	entre_menag	entretien menager	110132001					21	household/building dust
146	entre_menag	entretien menager	109121001					21	household/building dust

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	ODUS Cx	ODUS Cx-name
147	entre_menag	entretien menager	109121000					21	household/building dust
148	entre_menag	entretien menager	513101000					21	household/building dust
149	entre_menag	entretien menager	313231000					21	household/building dust
150	entre_menag	entretien menager	508102000					21	household/building dust
151	entre_menag	ouvrier d'entretien general	314071001					21	household/building dust
152	entrepr_const		109211001		21			11	household/building dust
153	entrepr_const		113062001		22			22	household/building dust
154	entrepr_const		511152001		21			11	household/building dust
155	entrepr_const		513111001		21			11	household/building dust
156	estheticienne		304211000					21	hair, skin, dandruff
157	estheticienne	estheticienne	511132000					21	hair, skin, dandruff
158	estheticienne	estheticienne	511132000					21	hair, skin, dandruff
159	estheticienne	estheticienne	511132000					21	hair, skin, dandruff
160	estheticienne	estheticienne	511132000					21	hair, skin, dandruff
161	estheticienne	estheticienne	511132000					21	hair, skin, dandruff
162	estheticienne	proprietaire estheticienne	511132000					21	hair, skin, dandruff
163	etiquetteuse	etiquetteuse	310222000					21	cotton, jute, wool, linen dust
164	graveur		309232001						
165	imprimeur		313041000					21	paper,leather,fabric dust
166	imprimeur	apprenti-pressier	312042001					21	paper dust
167	imprimeur	imprimeur	511152001					21	paper dust
168	imprimeur	imprimeur	109191000					21	cotton dust
169	imprimeur	relieur	105202001					21	paper,leather,fabric dust
170	infirmiere		112022001					21	biologic mat.,microorganisms..
171	infirmiere	aide-infirmiere	307071000					21	biologic mat.,microorganisms..
172	infirmiere	infirmiere	312082000					21	biologic mat.,microorganisms..
173	infirmiere	infirmiere	107011000					21	biologic mat.,microorganisms..
174	infirmiere	infirmiere	312082000					21	biologic mat.,microorganisms..
175	infirmiere	infirmiere	312082000					21	biologic mat.,microorganisms..
176	infirmiere	infirmiere	312082000					21	biologic mat.,microorganisms..
177	infirmiere	infirmiere	107192000					21	biologic mat.,microorganisms..
178	infirmiere	infirmiere	512112000					21	biologic mat.,microorganisms..
179	infirmiere	infirmiere	314021000					21	biologic mat.,microorganisms..
180	infirmiere	infirmiere	314021000					21	biologic mat.,microorganisms..
181	infirmiere	infirmiere	312151000					21	biologic mat.,microorganisms..
182	infirmiere	infirmiere	312151000					21	biologic mat.,microorganisms..
183	infirmiere	infirmiere	312151000					21	biologic mat.,microorganisms..
184	infirmiere	infirmiere	312102000					21	biologic mat.,microorganisms..
185	infirmiere	infirmiere auxiliaire	307041000					21	biologic mat.,microorganisms..
186	infirmiere	infirmiere auxiliaire	307041000					21	biologic mat.,microorganisms..
187	infirmiere	infirmiere auxiliaire	307041000					21	biologic mat.,microorganisms..
188	infirmiere	infirmiere auxiliaire	114081000					21	biologic mat.,microorganisms..
189	infirmiere	infirmiere auxiliaire	107022000					21	biologic mat.,microorganisms..
190	infirmiere	infirmiere auxiliaire	309222000					21	biologic mat.,microorganisms..
191	infirmiere	infirmiere auxiliaire	505071000					21	biologic mat.,microorganisms..
192	infirmiere	infirmiere auxiliaire	505071000					21	biologic mat.,microorganisms..
193	infirmiere	infirmiere auxilliare	307041000					21	biologic mat.,microorganisms..
194	infirmiere	infirmiere en medecine et chirurgie	312151000					21	biologic mat.,microorganisms..
195	infirmiere	infirmiere en milieu scolaire	312151000					21	biologic mat.,microorganisms..
196	infirmiere	infirmiere etudiante	512112000					21	biologic mat.,microorganisms..

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197	ingenieur	ingenieur	507151001						
198	inspect_alimt	cadre inspecteur des viandes	504211001					21	biologic material:spores,fungi
199	inspect_metal	inspecteur contre-maitre	514101001						
200	inspect_metal	inspecteur controle de qualite	509152001						
201	inspect_plast/met	inspecteur controle de qualite	514101001					11	organic fillers
202	instruct_arts	instructeur de metiers	114151000		21				
203	journl_aero		510212001						
204	journl_agric	cueilleur	514241000		21			21	biologic material,pollen,jute
205	journl_agric	travailleur agricole	112062001		21			21	biologic material,pollen,jute
206	journl_alimt	journalier	104031001					21	dust/spore(fresh & decay.food)
206	journl_alimt	journalier	104031000					21	dust/spore(fresh & decay.food)
207	journl_alimt	journalier	114122001	21			22		
208	journl_alimt	journaliere	504211000	21		21		21	dust from food material
209	journl_alimt	journaliere	313051000	21		21		21	aerosol from crustaceans
210	journl_alimt	ouvrage general	113101000	21		21		21	aerosols from crustaceans
211	journl_alimt	ouvrier	507221001	21		21		21	aerosols from crustaceans
212	journl_autom	journalier	313041001						
213	journl_brass	journalier conducteur de chariot el	113062001	21				21	dust from hops, yeast, malt
214	journl_buand		113101000					21	cotton,linen,wool,biologic mat
215	journl_buand	journaliere	106152000					21	cotton,linen,wool,biologic mat
216	journl_buand	ouvrier	507221001					21	cotton,linen,wool,biologic mat
217	journl_cartn	journalier	114052001					21	paper dust
218	journl_chaus		514031000		11			22	leather,cellulose,textile dust
219	journl_chaus		109211001		11			22	leather,cellulose,textile dust
220	journl_chaus	journaliere	114052000	11				22	leather,cellulose,textile dust
221	journl_const		305012001		21			11	household/building dust
222	journl_const	journalier	306071001		21			11	household/building dust
223	journl_const	journalier	511091001		21			11	dust from plant material
224	journl_const	ouvrier	110112000		21			11	household/building dust
225	journl_const	ouvrier specialise en excavation	313041001						
226	journl_disqu	prepose	505061001						
227	journl_disqu	prepose	505061001						
228	journl_encre		115162001					11	cornstarch
229	journl_entre	journalier	307192001		11			21	organic dust,microorganism
230	journl_entrp		309232001						
231	journl_fourn	journalier	113062001		11			21	organic dust,microorganism
232	journl_metal		307121000						
233	journl_metal		514172001						
234	journl_metal	journalier	114122001						
235	journl_metal	journaliere	314071000						
236	journl_metal	manoeuvre	505061001						
237	journl_meubl	journalier	508192001		21				
238	journl_meubl	ouvrier general	115101001		21				
239	journl_netto		112071001					22	biologic material,natural fibr
240	journl_netto		506131000					22	biologic material,natural fibr
241	journl_papir		510212001					21	paper dust
242	journl_pharm		514031000	11					
243	journl_pharm	journalier	307121000	11					
244	journl_placq	ouvrier	314121001						
245	journl_plast		514172001						

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	ODUS Cx	ODUS Cx-name
246	journl_pompe	journalier	314071001						
247	journl_tabac	journalier	313041001					12	tobacco, paper dust
248	journl_textl		514031000					22	cotton,wool,flax,sisal,jute
249	journl_textl		511261000					22	cotton,wool,flax,jute sisal
250	journl_textl		114181001					22	cotton,wool,flax,jute
251	journl_textl	general	508232000					22	cotton, jute, wool, linen dust
252	journl_textl	ouvrier	309212000					22	cotton, jute, wool, linen dust
253	journl_textl	ouvrier a tout faire	513031000					22	cotton, jute, wool, linen dust
254	journl_textl	separateur	109131000					22	cotton, jute, wool, linen dust
255	journl_textl	travailleuse generale	514211000					22	cotton, jute, wool, linen dust
256	journl_tr.pub	journalier	113091001					22	outdoor dust,biologic material
257	journl_tr.pub	journalier	314251001					22	outdoor dust,biologic material
258	journl_tr.pub	journalier	507041001					22	outdoor dust,biologic material
259	journl_tr.pub	journalier	511132001					22	outdoor dust,biologic material
260	journl_verre	ouvrier travail a la chaine	314261001						
261	journl_vitrx	journalier	114052001						
262	machiniste	machiniste	314291001						
263	machiniste	machiniste	314291001						
264	machiniste	machiniste	510192001						
265	machiniste	machiniste	314291001	22				21	grain dust, mites, spores
266	mecan_aeron	mecanicien	108061001						
267	mecan_aspir	mecanicien	513101001						
268	mecan_auto		110202001						
269	mecan_autom	mecanicien	512151001						
270	mecan_autom	mecanicien automobile	504252001						
271	mecan_autom	mecanicien d'auto	108061001						
272	mecan_bicy		312281001						
273	mecan_char-elev		304102001						
274	mecan_chauf	mecanicien	106011001					22	household/building dust
275	mecan_equip		508192001						
276	mecan_equip	mecanicien chariot elevateur	304102001						
277	mecan_equip	mecanicien d'entretien	506131001						
278	mecan_equip	reparateur appareils Gestetner	510192001					21	organic dust,microorganism
279	mecan_fixes		507041001		11			21	organic dust,microorganism
280	mecan_fixes	mecanicien	314251001		11			21	organic dust,microorganism
281	mecan_metal	mecanicien	304102001						
282	mecan_plaqu	mecanicien plaqueur	308172001						
283	medecin		112022001					22	biologic mat.,microorganisms..
284	medecin	medecin	112022000					22	biologic mat.,microorganisms..
285	medecin	medecin	112022001					22	biologic mat.,microorganisms..
286	medecin	medecin	112022000					22	biologic mat.,microorganisms..
287	medecin	medecin	112022000					22	biologic mat.,microorganisms..
288	medecin	medecin	112022000					22	biologic mat.,microorganisms..
289	medecin	medecin	315261000					22	biologic mat.,microorganisms..
290	medecin	medecin	315261000					22	biologic mat.,microorganisms..
291	medecin	medecin	315061000					22	biologic mat.,microorganisms..
292	medecin	medecin	112022000					22	biologic mat.,microorganisms..
293	medecin	medecin	315261001					22	biologic mat.,microorganisms..
294	medecin	medecin	112022001					22	biologic mat.,microorganisms..
295	medecin	medecin	112022001					22	biologic mat.,microorganisms..

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	ODUS Cx	ODUS Cx-name
296	medecin	medecin	315261001					22	biologic mat.,microorganisms..
297	medecin	medecin	112022001					22	biologic mat.,microorganisms..
298	medecin	medecin	112022001					22	biologic mat.,microorganisms..
299	medecin	medecin	112022001					22	biologic mat.,microorganisms..
300	medecin	medecin	315261001					22	biologic mat.,microorganisms..
301	medecin	medecin	112022001					22	biologic mat.,microorganisms..
302	medecin	medecin a temps partiel	315261001					22	biologic mat.,microorganisms..
303	medecin	medecin generaliste	315261000					22	biologic mat.,microorganisms..
304	medecin	pediatre	315061000					22	biologic mat.,microorganisms..
305	medecin	pediatre	315061001					22	biologic mat.,microorganisms..
306	medecin	pediatre	315061000					22	biologic mat.,microorganisms..
307	medecin	pediatre	315061001					22	biologic mat.,microorganisms..
308	medecin	resident	315061001					22	biologic mat.,microorganisms..
308	medecin	resident	315061001					22	biologic mat.,microorganisms..
309	medecin	resident	315061001					22	biologic mat.,microorganisms..
310	medecin	resident	315061001					22	biologic mat.,microorganisms..
311	menuisier_const	aide-menuisier	511091001		22				
312	menuisier_constr	menuisier	314121001		22				
313	menuisier_meubl		508192001		22				
314	menuisier_meubl	fabricant de cadre	109231001		22				
315	menuisier_meubl	sableur et confection	109121001		22				
316	menuisier_verre		114052001		21				
317	mouleur		513111001						
318	mouleur	mouleur	313041001						
319	operat_alimt	operateur de machine	514011000						
320	operat_alimt	operateur de machine	110061000					21	dust from nuts and raisins
321	operat_brass	operateur	507221001	11				11	dust from hops, yeast, malt
322	operat_chimq	operateur et ajusteur de ligne	313091001					22	enzymes
323	operat_cuir	operateur	309041000	11		11		22	stiffeners,cork,felt,hemp
324	operat_cuir	operateur	513111001		11			22	leather dust,cellulose,textile
325	operat_fondr	operateur	313041001						leather,cellulose,textile dust
326	operat_fourr	operateur	508202000	11		11		22	leather dust,cork,felt,hemp
327	operat_imprim	operatrice de camera electronique	306091000						
328	operat_mach	operatrice de machine	311102000					21	natural fibre dust
329	operat_metal	operateur	513111001						
330	operat_metal	operateur	507111001						
331	operat_meubles	operatrice de machine	508192000		21				
332	operat_meubles	operatrice de machine	508192000		21				
333	operat_plast	operateur de machine	309192001					11	organic fillers
334	operat_pompe	operateur de pompes	507041001						
335	operat_soul	operatrice de machine	313172000					22	leather dust,cellulose,textile
336	operat_tabac	operatrice	313191000					22	tobacco, paper dust
337	operat_text	fileuse	111132000					21	cotton, jute, wool, linen dust
338	operat_textl	operateur	309041000					21	cotton, jute, wool, linen dust
339	operat_textl	operateur	508202000					21	cotton, jute, wool, linen dust
340	operat_textl	operateur	309041000					21	cotton, jute, wool, linen dust
341	operat_textl	operateur	313091001					21	cotton, jute, wool, linen dust
342	operat_textl	operateur	310051000					21	cotton, jute, wool, linen dust
343	operat_textl	operateur	309041000					21	cotton, jute, wool, linen dust
344	operat_textl	operateur de machine	509152000					21	cotton, jute, wool, linen dust

Standardized job title [E_code]	[Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	ODUS Cx	ODUS Cx-name
345	operat_textl	operateur de machine	309192000					21	cotton, jute, wool, linen dust
346	operat_textl	operateur de machine	508092001					21	cotton, jute, wool, linen dust
347	operat_textl	operateur de machine	110232000					21	cotton, jute, wool, linen dust
348	operat_textl	operateur de machine	510111000					21	cotton, jute, wool, linen dust
349	operat_textl	operateur de machine	510111000					21	cotton, jute, wool, linen dust
350	operat_textl	operateur de machine	110071001					21	cotton, jute, wool, linen dust
351	operat_textl	operateur de machine	510111001					21	cotton, jute, wool, linen dust
352	operat_textl	operateur de machine	509121000					21	cotton, jute, wool, linen dust
353	operat_textl	operatrice	514241000					21	cotton, jute, wool, linen dust
354	operat_textl	operatrice	514241000					21	cotton, jute, wool, linen dust
355	operat_textl	operatrice	108021000					21	cotton, jute, wool, linen dust
356	operat_textl	operatrice	108021000					21	cotton, jute, wool, linen dust
357	operat_textl	operatrice de machine	108061000					21	cotton, jute, wool, linen dust
358	operat_textl	operatrice de machines	306122000					21	cotton, jute, wool, linen dust
359	operat_textl	tisseusse	314291000					21	cotton, jute, wool, linen dust
360	patissier	patissier	509121001	21				21	spice,ingredient(nuts..)dust
361	patissier	patissier	509121001	21				21	spice,ingredient(nuts..)dust
362	patissier	patissiere	313032000	21				21	spice,ingredient(nuts..)dust
363	peintre	artiste peintre	511511000						
364	peintre	peintre	509172001		21				
365	peintre	peintre	114122001						
366	peintre	peintre	504221001		21				
367	plieuse_brand	plieuse de vetement	313182000					22	textile dust,biologic material
368	plombier	plombier	114122001		11				
369	plongeur	operateur de lave-vaisselle	313041001	11					
370	polycopiste	polycopiste	313081001					21	organic dust,microorganism
371	prepose_autom		510212001						
372	prepose_autom	prepose aux pieces et comptoir	513101001						
373	prepose_statn	prepose au stationnement	515221001						
374	prepose_textl	preposee aux commandes	513022000					21	cotton, jute, wool, linen dust
375	presseur_textl		511261001					21	cotton, jute, wool, linen dust
376	presseur_textl	presseur	109211001					21	cotton, jute, wool, linen dust
377	presseur_textl	presseur	109211001					21	cotton, jute, wool, linen dust
378	presseur_textl	presseur	109131001					21	cotton, jute, wool, linen dust
379	presseur_textl	presseur	109131001					21	cotton, jute, wool, linen dust
380	presseur_textl	presseur	109131001					21	cotton, jute, wool, linen dust
381	presseur_textl	presseur	109131001					21	cotton, jute, wool, linen dust
382	presseur_textl	presseur	511261001					21	cotton, jute, wool, linen dust
383	presseur_textl	presseur	511261001					21	cotton, jute, wool, linen dust
384	presseur_textl	presseur	511261001					21	cotton, jute, wool, linen dust
385	presseur_textl	presseuse	508161000					21	cotton, jute, wool, linen dust
386	secretaire	secretaire de direction	511152000					22	organic dust,microorganism
387	secretaire	secretaire et teneur de livre	509051000					22	organic dust,microorganism
388	soudeur		510212001						
389	soudeur		510212001						
390	soudeur	aide-soudeur	114052001						
391	soudeur	assemblage d'equipement forestier	511132001						
392	soudeur	soudeur	511132001						
393	soudeur	soudeur	511132001						
394	soudeur	soudeur	306071001						

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	FLOU C1	WOOD C2	COSO C3	FEED C4	OCUS Cx	OCUS Cx-name
395	soudeur	soudeur	511132001						
396	soudeur	soudeur	510212001						
397	soudeur	soudeur	510212001						
398	soutireur_brass	soutireur	313081001	12				11	dust from hops, yeast, barley
399	spinner_metal	tourneur de metal "spinneur"	506082001						
400	superv_textl	superviseur	309212000					12	textile dust
401	technic	agent technique	314192000		22			21	organic dust (misc)
402	technic	aviseur technique Bi-energie	512191001		11			21	organic dust (misc)
403	technic_elect	technicien en electro-ceramique	307071001						
404	technic_equip	technicien	306241001						
405	technic_equip	technicien	306241001						
406	technic_equip	technicien	306241001						
407	technic_equip	technicien	306241001						
408	technic_gen.civ	technicien de laboratoire	507271001		11			11	soil dust
409	tech_labo	aide laboratoire	106032000	11					
410	technic_lentl	technicien	114151000						
411	technic_pharm	technicienne en laboratoire	513101000	11					
412	technic_photo	technicien	507281001						
413	technic_photo	technicien	507281001						
414	technic_photo	technicien	507281001						
415	technic_photo	technicienne en impression	507281000						
416	technic_photo	technicienne en impression	507281000						
417	tisseur_textl	tisseur	314261001					22	cotton, jute, wool, linen dust
418	valet	valet	309021001					21	textile dust,biologic material
419	vendeuse_textl	vendeuse	504221000					21	textile dust
420	vendeuse_textl	vendeuse	507221000					21	textile dust

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CEAR D5	IDUS Dx	IDUS Dx-name
1	aide-wagonnier	aide-wagonnier	507082001			21				
2	ajust_mecan	ajusteur mecanique	507171001			12				
3	archeologue	archeologie	112062001			22	11		21	excavation dust
4	ass/rech_INRS	assistante de recherche	311112000	11	11	11		11	11	misc. inorganic dusts
5	assembl_battr	assembleur	309192001	11	11			11	11	misc. inorganic dusts
6	assembl_bross	assembleuse	308152000							
7	assembl_elect		514031000		11					
8	assembl_lunet	assembleur	114081000		11				11	misc. inorganic dusts
9	assembl_metal		104181001						11	misc. inorganic dusts
10	assembl_serr		510212000						11	misc. inorganic dusts
11	assembl_skido	assembleur	313041001			11		11		
12	bardeau_asphalte		104181001	12	12	12			12	inorganic pigments
13	bartender	bartender	511152000							
14	cables teleph		504261000						11	misc. inorganic dusts
15	cariste_alimt	cariste	513227001							
16	cariste_brass	operateur chariot elevateur	313081001							
17	chauffeur		304211001	21	11	21	21		21	outdoor dust
18	chauffeur	camionneur livreur	515221001	21	11	21	21		21	outdoor dust
19	chauffeur	chauffeur	304211001	21	11	21	21		21	outdoor dust
20	chauffeur	chauffeur	506082001	21	11	21	21		21	outdoor dust
21	chauffeur	chauffeur	307202001	21	11	21	21		21	outdoor dust
22	chauffeur	chauffeur	506071001	21	11	21	21		21	outdoor dust
23	chauffeur	chauffeur	304211001	21	11	21	21		21	outdoor dust
24	chauffeur	chauffeur	513227001	21	11	21	21		21	outdoor dust
25	chauffeur	chauffeur	508192001	21	11	21	21		21	outdoor dust
26	chauffeur	chauffeur (stationnement)	506131001	21	11	21	21		21	outdoor dust
27	chauffeur	chauffeur d'autobus	506071001	21	11	21	21		21	outdoor dust
28	chauffeur	chauffeur d'autobus	507191001	21	11	21	21		21	outdoor dust
29	chauffeur	chauffeur d'autobus	504252001	21	11	21	21		21	outdoor dust
30	chauffeur	chauffeur de camion	112091001	21	11	22	21		21	outdoor dust
31	chauffeur	chauffeur de camion	507041001	21	11	21	21		21	outdoor dust
31	chauffeur	chauffeur de camion	507041001	21	11	21	21		21	outdoor dust
32	chauffeur	chauffeur de camion	514031001	21	11	21	21		21	outdoor dust
33	chauffeur	chauffeur de camion	514031001	21	11	21	21		21	outdoor dust
34	chauffeur	chauffeur de camion	514031001	21	11	21	21		21	outdoor dust
35	chauffeur	chauffeur de camion	514031001	21	11	21	21		21	outdoor dust
36	chauffeur	chauffeur de camion	310011001	21	11	21	21		21	outdoor dust
37	chauffeur	chauffeur de camion et mecanicien	112091001	21	11	21	21		21	outdoor dust
38	chauffeur	chauffeur de taxi	312101001	21	11	21	21		21	outdoor dust
39	chauffeur	chauffeur journalier	104181001	21	11	22	21		21	outdoor dust
40	chauffeur	chauffeure	507041000	21	11	21	21		21	outdoor dust
41	chauffeur	livreur	306122001	21	11	21	21		21	outdoor dust
42	chauffeur	livreur	504261001	21	11	21	21		21	outdoor dust
43	chauffeur	livreur	504252001	21	11	21	21		21	outdoor dust
44	chauffeur	livreur	504261001	21	11	21	21		21	outdoor dust
45	chauffeur	livreur	513101001	21	11	21	21		21	outdoor dust
46	chauffeur	livreur	513101001	21	11	21	21		21	outdoor dust
47	chauffeur	livreur	513101001	21	11	21	21		21	outdoor dust
48	chauffeur	livreur	504261001	21	11	21	21		21	outdoor dust

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
49	chauffeur	transport camionneur	306071001	21	11	21	21		21	outdoor dust
50	cimenteuse	cimenteuse	513121000							
51	cimenteuse	echantillonneuse	313182000			11	21			
52	coiffeuse	aide	311102000							
53	coiffeuse	aide-coiffeuse	313091000							
54	coiffeuse	assistante coiffeuse	313032000							
55	coiffeuse	assistante-coiffeuse	504252000							
56	coiffeuse	assistante-coiffeuse	504252000							
57	coiffeuse	coiffeuse	107212000							
58	coiffeuse	coiffeuse	107212000							
59	coiffeuse	coiffeuse	107212000							
60	coiffeuse	coiffeuse	107212000							
61	coiffeuse	coiffeuse	504252000							
62	coiffeuse	coiffeuse	107212000							
63	coiffeuse	coiffeuse	508202000							
64	coiffeuse	coiffeuse	313212000							
65	coiffeuse	coiffeuse	313212000							
66	coiffeuse	coiffeuse	313212000							
67	coiffeuse	coiffeuse	313212000							
68	commis_mag	commis	106072000							
69	concierge	concierge	309232001				21			
70	concierge	concierge	309232000				21			
71	concierge	entreteneur de batiment	314121001				21			
72	contre_met	contre-maitre	514101001						11	misc. inorganic dusts
73	coordonn	coordonnatrice	511091000	11	21					
74	coupeur_arc	coupeur a l'arc	314251001			11				
75	coupeur_cuir	coupeur	509121001							
76	couturier	couturier	115172000		21					
77	couturiere	couturiere	509192000		21					
78	couturiere	couturiere	510182000		21					
79	couturiere	couturiere	110132001		21					
80	couturiere	couturiere	109211000		21					
80	couturiere	couturiere	109211000		21					
81	couturiere	couturiere	109111000		21					
82	couturiere	couturiere	109111000		21					
83	couturiere	couturiere	514011000		21					
84	couturiere	couturiere	314291000		21					
85	couturiere	couturiere	508021000		21					
86	couturiere	couturiere	314291000		21					
87	couturiere	couturiere	115162000		21					
88	couturiere	couturiere	509192000		21					
89	couturiere	couturiere	509121000		21					
90	couturiere	couturiere	510111000		21					
91	couturiere	couturiere	509172000		21					
92	couturiere	operatrice de machine a coudre	508161000		21					
93	couturiere	operatrice de machine a coudre	508161000		21					
94	couturiere	operatrice de machine a coudre	313091000		21					
95	couturiere	operatrice de machine a coudre	114052000		21					
96	couturiere	operatrice de machine a coudre	508102000		21					
97	crustaces		104031000							

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDCS Dx-name
97	crustaces		104031001							
98	cuisinier		311102000							
99	cuisinier		112062000							
100	cuisinier		104121000							
101	cuisinier	aide feminin	306091000							
102	cuisinier	cuisinier	509192001							
103	cuisinier	cuisinier	509172001							
104	cuisinier	cuisinier	509192001							
105	cuisinier	cuisinier	514101000							
106	cuisinier	cuisinier	110112000							
107	cuisinier	cuisinier	110112000							
108	cuisinier	cuisinier	110112000							
109	cuisinier	cuisinier	514101000							
110	cuisinier	cuisinier	510212001							
111	cuisinier	cuisinier	110232000							
112	cuisinier	cuisinier	110132001							
113	cuisinier	cuisinier	509172001							
114	cuisinier	cuisinier	314071001							
115	cuisinier	cuisinier	514011000							
116	cuisinier	cuisinier / plongeur	509192001							
117	cuisinier	cuisiniere	314071000							
118	cuisinier	cuisiniere	514031000							
119	cuisiniere	aide cuisiniere	112062000							
120	cuisiniere	aide-alimentaire	313091000							
121	cuisiniere	aide-cuisinier	311102001							
122	cuisiniere	serveuse aide-cuisiniere	314221000							
123	deboss/peintre		107212001	11	11	11			21	talc,calcium carbonate,clays
124	deboss/peintre	gerant	313061001	11	11	11			21	talc,calcium carbonate,clays
125	dentiste	assistante dentaire	512211000			21				
126	direct_impr	directrice de finition	306091000					11		
127	ebeniste	ebeniste	306232001			21				
128	electricien	apprentis electricien	106152001							
129	electricien	electricien	115172001							
130	electricien	electricien	108061001							
131	electricien	electro mecanicien	513101001							
132	electroplast	electroplast	308172001							
133	emballeur	emballeur	310051000							
134	emballeur	empaquetteuse de egg rolls	313182000							
135	enseignant	enseignant	314121001			21				
136	entre-menag	entretien menager	115101001		21	21	21			
137	entre-menag	entretien menager	112071000		21	21	21			
138	entre-menag	entretien menager quart de travail du so	513202000		21	21	21			
139	entre-menag	prepose a l'entretien	312281001		21	21	21			
140	entre-menag	prepose a l'entretien menager	115101001		21	21	21			
141	entre-menag	prepose a l'entretien menager	313091001		21	21	21			
142	entre-menag	prepose a l'entretien menager	514172001		21	21	21			
143	entre-menag	trieuse et entretien menager	314121000		21	21	21			
144	entre_menag	entretien menager	511192000		21	21	21			
145	entre_menag	entretien menager	110132001		21	21	21			
146	entre_menag	entretien menager	109121001		21	21	21			

Standardized job title   Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
147	entre_menag	entretien menager	109121000		21	21	21			
148	entre_menag	entretien menager	513101000		21	21	21			
149	entre_menag	entretien menager	313231000		21	21	21			
150	entre_menag	entretien menager	508102000		21	21	21			
151	entre_menag	ouvrier d'entretien general	314071001		21	21	21			
152	entrepr_const		109211001	11	21	21	21		21	construction dust
153	entrepr_const		113062001	22	22	22	22		22	construction dust
154	entrepr_const		511152001	11	21	21	21		21	construction dust
155	entrepr_const		513111001	11	21	21	21		21	construction dust
156	estheticienne		304211000							
157	estheticienne	estheticienne	511132000							
158	estheticienne	estheticienne	511132000							
159	estheticienne	estheticienne	511132000							
160	estheticienne	estheticienne	511132000							
161	estheticienne	estheticienne	511132000							
162	estheticienne	proprietaire estheticienne	511132000							
163	etiquetteuse	etiquetteuse	310222000		21					
164	graveur		309232001	11						
165	imprimeur		313041000					11		
166	imprimeur	apprenti-pressier	312042001							
167	imprimeur	imprimeur	511152001							
168	imprimeur	imprimeur	109191000					11		
169	imprimeur	relieur	105202001					11		
170	infirmiere		112022001							
171	infirmiere	aide-infirmiere	307071000							
172	infirmiere	infirmiere	312082000							
173	infirmiere	infirmiere	107011000							
174	infirmiere	infirmiere	312082000							
175	infirmiere	infirmiere	312082000							
176	infirmiere	infirmiere	312082000							
177	infirmiere	infirmiere	307192000							
178	infirmiere	infirmiere	512112000							
179	infirmiere	infirmiere	314021000							
180	infirmiere	infirmiere	314021000							
181	infirmiere	infirmiere	312151000							
182	infirmiere	infirmiere	312151000							
183	infirmiere	infirmiere	312151000							
184	infirmiere	infirmiere	312102000							
185	infirmiere	infirmiere auxiliaire	307041000							
186	infirmiere	infirmiere auxiliaire	307041000							
187	infirmiere	infirmiere auxiliaire	307041000							
188	infirmiere	infirmiere auxiliaire	114081000							
189	infirmiere	infirmiere auxiliaire	107022000							
190	infirmiere	infirmiere auxiliaire	309222000							
191	infirmiere	infirmiere auxiliaire	505071000							
192	infirmiere	infirmiere auxiliaire	505071000							
193	infirmiere	infirmiere auxilliare	307041000							
194	infirmiere	infirmiere en medecine et chirurgie	312151000							
195	infirmiere	infirmiere en milieu scolaire	312151000							
196	infirmiere	infirmiere etudiante	512112000							

Standardized job title Original job title given by subject

[Z_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
197	ingenieur	ingenieur	507151001			22			22	mine, excavation dust
198	inspect_alimt	cadre inspecteur des viandes	504211001							
199	inspect_metal	inspecteur contre-maitre	514101001		11			11	11	misc. inorganic dusts
200	inspect_metal	inspecteur controle de qualite	509152001	11	11				11	misc. inorganic dusts
201	inspect_plast/met	inspecteur controle de qualite	514101001		11			11	11	misc. inorganic dusts
202	instruct_arts	instructeur de metiers	114151000	12		12	21		21	inorganic pigments
203	journl_aero		510212001	11	11				11	misc. inorganic dusts
204	journl_agric	cueilleur	514241000			21				
205	journl_agric	travailleur agricole	112062001			21				
206	journl_alimt	journalier	104031001							
206	journl_alimt	journalier	104031000							
207	journl_alimt	journalier	114122001							
208	journl_alimt	journaliere	504211000							
209	journl_alimt	journaliere	313051000							
210	journl_alimt	ouvrage general	113101000							
211	journl_alimt	ouvrier	507221001							
212	journl_autom	journalier	313041001	11						
213	journl_brass	journalier conducteur de chariot elevate	113062001							
214	journl_buand		113101000		21					
215	journl_buand	journaliere	106152000		21					
216	journl_buand	ouvrier	507221001		21					
217	journl_cartn	journalier	114052001							
218	journl_chaus		514031000							
219	journl_chaus		109211001							
220	journl_chaus	journaliere	114052000							
221	journl_const		305012001	11	21	21	21		21	construction dust
222	journl_const	journalier	306071001	11	21	21	21		21	construction dust
223	journl_const	journalier	511091001	11	21	21	21		21	construction dust
224	journl_const	ouvrier	110112000	11	21	21	21		21	construction dust
225	journl_const	ouvrier specialise en excavation	313041001			22	22		22	construction dust
226	journl_disqu	prepose	505061001					11	11	misc. inorganic dusts
227	journl_disqu	prepose	505061001					11	11	misc. inorganic dusts
228	journl_encre		115162001					11		
229	journl_entre	journalier	307192001	12	22		12		21	construction dust
230	journl_entrp		309232001							
231	journl_fourn	journalier	113062001	12	22		12		21	refractory brick dust
232	journl_metal		307121000						11	misc. inorganic dusts
233	journl_metal		514172001						11	misc. inorganic dusts
234	journl_metal	journalier	114122001							
235	journl_metal	journaliere	314071000						11	misc. inorganic dusts
236	journl_metal	manoeuvre	505061001						11	misc. inorganic dusts
237	journl_meubl	journalier	508192001			21				
238	journl_meubl	ouvrier general	115101001			21				
239	journl_netto		112071001		11					
240	journl_netto		506131000		11					
241	journl_papir		510212001							
242	journl_pharm		514031000						11	misc. inorganic dusts
243	journl_pharm	journalier	307121000						11	misc. inorganic dusts
244	journl_placq	ouvrier	314121001							
245	journl_plast		514172001					11		

Standardized job title Original job title given by subject

[Z_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
246	journl_pompe	journalier	314071001						11	misc. inorganic dusts
247	journl_tabac	journalier	313041001							
248	journl_textl		514031000		21					
249	journl_textl		511261000		21					
250	journl_textl		114181001		21					
251	journl_textl	general	508232000		21					
252	journl_textl	ouvrier	309212000		21					
253	journl_textl	ouvrier a tout faire	513031000		21					
254	journl_textl	separateur	109131000		21					
255	journl_textl	travailleuse generale	514211000		21					
256	journl_tr.pub	journalier	113091001	11		11				
257	journl_tr.pub	journalier	314251001	11		11				
258	journl_tr.pub	journalier	507041001	11		11				
259	journl_tr.pub	journalier	511132001	11		11				
260	journl_verre	ouvrier travail a la chaine	314261001			21			21	glass dust
261	journl_vitrx	journalier	114052001						22	glass dust
262	machiniste	machiniste	314291001			12			21	abrasives dust
263	machiniste	machiniste	314291001			12			21	abrasives dust
264	machiniste	machiniste	510192001			12			21	abrasives dust
265	machiniste	machiniste	314291001			12			21	abrasives dust
266	mecan_aeron	mecanicien	108061001	11	11				11	abrasives dust
267	mecan_aspir	mecanicien	513101001							
268	mecan_auto		110202001	21	11	11			21	abrasives dust
269	mecan_autom	mecanicien	512151001	21	11	11			21	abrasives dust
270	mecan_autom	mecanicien automobile	504252001	21	11	11			21	abrasives dust
271	mecan_autom	mecanicien d'auto	108061601	21	11	11			21	abrasives dust
272	mecan_bicy		312281001						11	abrasives dust
273	mecan_char-elev		304102001			11			11	abrasives dust
274	mecan_chauf	mecanicien	106011001	22	21	11			21	refractory brick dust
275	mecan_equip		508192001			11			11	abrasives dust
276	mecan_equip	mecanicien chariot elevateur	304102001			11			11	abrasives dust
277	mecan_equip	mecanicien d'entretien	506131001	11	11	21			21	glass dust
278	mecan_equip	reparateur appareils Gestetner	510192001	11	21			21		
279	mecan_fixes		507041001	12	22		12		21	refractory brick dust
280	mecan_fixes	mecanicien	314251001	12	22		12		21	refractory brick dust
281	mecan_metal	mecanicien	304102001						11	abrasives dust
282	mecan_plaqu	mecanicien plaqueur	308172001							
283	medecin		112022001							
284	medecin	medecin	112022000							
285	medecin	medecin	112022001							
286	medecin	medecin	112022000							
287	medecin	medecin	112022000							
288	medecin	medecin	112022000							
289	medecin	medecin	315261000							
290	medecin	medecin	315261000							
291	medecin	medecin	315061000							
292	medecin	medecin	112022000							
293	medecin	medecin	315261001							
294	medecin	medecin	112022001							
295	medecin	medecin	112022001							

Standardized job title Original job title given by subject

[Z_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
296	medecin	medecin	315261001							
297	medecin	medecin	112022001							
298	medecin	medecin	112022001							
299	medecin	medecin	112022001							
300	medecin	medecin	315261001							
301	medecin	medecin	112022001							
302	medecin	medecin a temps partiel	315261001							
303	medecin	medecin generaliste	315261000							
304	medecin	pediatre	315061000							
305	medecin	pediatre	315061001							
306	medecin	pediatre	315061000							
307	medecin	pediatre	315061001							
308	medecin	resident	315061001							
308	medecin	resident	315061001							
309	medecin	resident	315061001							
310	medecin	resident	315061001							
311	menuisier_const	aide-menuisier	511091001	12	11	21	21			
312	menuisier_constr	menuisier	314121001	12	11	21	21			
313	menuisier_meubl		508192001			21				
314	menuisier_meubl	fabricant de cadre	109231001			21				
315	menuisier_meubl	sableur et confection	109121001			21				
316	menuisier_verre		114052001							
317	mouleur		513111001			22		11	11	abrasives dust
318	mouleur	mouleur	313041001			22		11	11	abrasives dust
319	operat_alimt	operateur de machine	514011000							
320	operat_alimt	operateur de machine	110061000							
321	operat_brass	operateur	507221001							
322	operat_chimq	operateur et ajusteur de ligne	313091001							
323	operat_cuir	operateur	309041000							
324	operat_cuir	operateur	513111001							
325	operat_fondr	operateur	313041001			22		11	11	abrasives dust
326	operat_fourr	operateur	508202000							
327	operat_imprim	operatrice de camera electronique	306091000							
328	operat_mach	operatrice de machine	311102000							
329	operat_metal	operateur	513111001							
330	operat_metal	operateur	507111001						11	abrasives dust
331	operat_meubles	operatrice de machine	508192000			21				
332	operat_meubles	operatrice de machine	508192000			21				
333	operat_plast	operateur de machine	309192001		11			11	11	misc. inorganic dusts
334	operat_pompe	operateur de pompes	507041001							
335	operat_soul	operatrice de machine	313172000							
336	operat_tabac	operatrice	313191000							
337	operat_text	fileuse	113132000		21					
338	operat_textl	operateur	309041000		21					
339	operat_textl	operateur	508202000		21					
340	operat_textl	operateur	309041000		21					
341	operat_textl	operateur	313091001		21					
342	operat_textl	operateur	310051000		21					
343	operat_textl	operateur	309041000		21					
344	operat_textl	operateur de machine	509152000		21					

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
345	operat_textl	operateur de machine	309192000		21					
346	operat_textl	operateur de machine	508092001		21					
347	operat_textl	operateur de machine	110232000		21					
348	operat_textl	operateur de machine	510111000		21					
349	operat_textl	operateur de machine	510111000		21					
350	operat_textl	operateur de machine	110071001		21					
351	operat_textl	operateur de machine	510111001		21					
352	operat_textl	operateur de machine	509121000		21					
353	operat_textl	operatrice	514241000		21					
354	operat_textl	operatrice	514241000		21					
355	operat_textl	operatrice	108021000		21					
356	operat_textl	operatrice	108021000		21					
357	operat_textl	operatrice de machine	108061000		21					
358	operat_textl	operatrice de machines	306122000		21					
359	operat_textl	tisseusse	314291000		21					
360	patissier	patissier	509121001							
361	patissier	patissier	509121001							
362	patissier	patissiere	313032000							
363	peintre	artiste peintre	511511000							
364	peintre	peintre	509172001	11	21	21	21		21	inorganic pigments, abrasives
365	peintre	peintre	114122001	11		11			11	inorganic pigments, abrasives
366	peintre	peintre	504221001	11	21	21	21		21	inorganic pigments, abrasives
367	plieuse_buand	plieuse de vetement	313182000		11					
368	plombier	plombier	114122001	11	22	11	21			
369	plongeur	operateur de lave-vaisselle	313041001							
370	polycopiste	polycopiste	313081001	11	21			21		
371	prepose_autom		510212001	21		21	21		21	outdoor dust
372	prepose_autom	prepose aux pieces et comptoir	513101001	11						
373	prepose_statn	prepose au stationnement	515221001	21		21	21		21	outdoor dust
374	prepose_textl	preposee aux commandes	513022000		21					
375	presseur_textl		511261001		21					
376	presseur_textl	presseur	109211001		21					
377	presseur_textl	presseur	109211001		21					
378	presseur_textl	presseur	109131001		21					
379	presseur_textl	presseur	109131001		21					
380	presseur_textl	presseur	109131001		21					
381	presseur_textl	presseur	109131001		21					
382	presseur_textl	presseur	511261001		21					
383	presseur_textl	presseur	511261001		21					
384	presseur_textl	presseur	511261001		21					
385	presseur_textl	presseuse	508161000		21					
386	secretaire	secretaire de direction	511152000	11	21					
387	secretaire	secretaire et teneur de livre	509051000	11	21					
388	soudeur		510212001	11	11	11				
389	soudeur		510212001	11	11	11				
390	soudeur	aide-soudeur	114052001	11	11	11				
391	soudeur	assemblage d'equipement forestier	511132001	11	11	11				
392	soudeur	soudeur	511132001	22	22	21				
393	soudeur	soudeur	511132001	11	11	11				
394	soudeur	soudeur	306071001	11	11	11				

Standardized job title   Original job title given by subject

[Z_code]	[Job_new]	[Job title]	[ID]	ASBE D1	FIBR D2	SILI D3	CONC D4	CHAR D5	IDUS Dx	IDUS Dx-name
395	soudeur	soudeur	511132001	11	11	21			21	abrasives dust
396	soudeur	soudeur	510212001	11	11	11				
397	soudeur	soudeur	510212001	22	22	21				
398	soutireur_brass	soutireur	313081001		11					
399	spinner_metal	tourneur de metal "spinneur"	506082001							
400	superv_textl	superviseur	309212000		12					
401	technic	agent technique	314192000	11	21					
402	technic	aviseur technique Bi-energie	512191001	11	21					
403	technic_elect	technicien en electro-ceramique	307071001	11		11		11	11	misc. inorganic dusts
404	technic_equip	technicien	306241001							
405	technic_equip	technicien	306241001							
406	technic_equip	technicien	306241001							
407	technic_equip	technicien	306241001							
408	technic_gen.civ	technicien de laboratoire	507271001				11		11	misc. inorganic dusts
409	tech_labo	aide laboratoire	106032000						11	misc. inorganic dusts
410	technic_lentl	technicien	114151000		11	11			11	misc. inorganic dusts
411	technic_pharm	technicienne en laboratoire	513101000						11	misc. inorganic dusts
412	technic_photo	technicien	507281001							
413	technic_photo	technicien	507281001							
414	technic_photo	technicien	507281001							
415	technic_photo	technicienne en impression	507281000							
416	technic_photo	technicienne en impression	507281000							
417	tisseur_textl	tisseur	314261001		11					
418	valet	valet	309021001		21					
419	vendeuse_textl	vendeuse	504221000		21					
420	vendeuse_textl	vendeuse	507221000							

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
1	aide-wagonnier	aide-wagonnier	507082001									
2	ajust_mecan	ajusteur mecanique	507171001	12		12	12			12	12	various metals from alloys
3	archeologue	archeologie	112062001									
4	ass/rech_INRS	assistante de recherche	311112000								11	various metals from alloys
5	assembl_battr	assembleur	309192001						22		22	Pb,Sb,As,Sn
6	assembl_bross	assembleuse	308152000									
7	assembl_elect		514031000			11			22		22	Pb,Sb,As,Sn
8	assembl_lunet	assembleur	114081000						11			
9	assembl_metal		104181001	11		11	11			11	11	various metals from alloys
10	assembl_serr		510212000	11		11	11			11	21	various metals from alloys
11	assembl_skido	assembleur	313041001	11		11	11			11	21	various metals from alloys
12	bardeau asphalte		104181001									
13	bartender	bartender	511152000									
14	cables teleph		504261000									
15	cariste_alimt	cariste	513227001									
16	cariste_brass	operateur chariot elevateur	313081001									
17	chauffeur		304211001									
18	chauffeur	camionneur livreur	515221001									
19	chauffeur	chauffeur	304211001									
20	chauffeur	chauffeur	506062001									
21	chauffeur	chauffeur	307202001									
22	chauffeur	chauffeur	506071001									
23	chauffeur	chauffeur	304211001									
24	chauffeur	chauffeur	513227001									
25	chauffeur	chauffeur	508192001									
26	chauffeur	chauffeur (stationnement)	506131001							21		
27	chauffeur	chauffeur d'autobus	506071001									
28	chauffeur	chauffeur d'autobus	507191001							21		
29	chauffeur	chauffeur d'autobus	504252001									
30	chauffeur	chauffeur de camion	112091001									
31	chauffeur	chauffeur de camion	507041001									
31	chauffeur	chauffeur de camion	507041001									
32	chauffeur	chauffeur de camion	514031001									
33	chauffeur	chauffeur de camion	514031001									
34	chauffeur	chauffeur de camion	514031001									
35	chauffeur	chauffeur de camion	514031001									
36	chauffeur	chauffeur de camion	310011001									
37	chauffeur	chauffeur de camion et mecanicien	112091001									
38	chauffeur	chauffeur de taxi	312101001									
39	chauffeur	chauffeur journalier	104181001									
40	chauffeur	chauffeure	507041000									
41	chauffeur	livreur	306122001									
42	chauffeur	livreur	504261001									
43	chauffeur	livreur	504252001									
44	chauffeur	livreur	504261001									
45	chauffeur	livreur	513101001							21		
46	chauffeur	livreur	513101001							21		
47	chauffeur	livreur	513101001							21		
48	chauffeur	livreur	504261001									

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
49	chauffeur	transport camionneur	306071001									
50	cimenteuse	cimenteuse	513121000				11				11	metals-tanned,plated leather
51	cimenteuse	echantillonneuse	313182000			11	11	11			11	Ba,Be,Pb,U,Vd,Zr,Mg,Mo
52	coiffeuse	aide	311102000				11					
53	coiffeuse	aide-coiffeuse	313091000				11					
54	coiffeuse	assistante coiffeuse	313032000				11					
55	coiffeuse	assistante-coiffeuse	504252000				11					
56	coiffeuse	assistante-coiffeuse	504252000				11					
57	coiffeuse	coiffeuse	107212000				11					
58	coiffeuse	coiffeuse	107212000				11					
59	coiffeuse	coiffeuse	107212000				11					
60	coiffeuse	coiffeuse	107212000				11					
61	coiffeuse	coiffeuse	504252000				11					
62	coiffeuse	coiffeuse	107212000				11					
63	coiffeuse	coiffeuse	508202000				11					
64	coiffeuse	coiffeuse	313212000				11					
65	coiffeuse	coiffeuse	313212000				11					
66	coiffeuse	coiffeuse	313212000				11					
67	coiffeuse	coiffeuse	313212000				11					
68	commis_mag	commis	106072000									
69	concierge	concierge	309232001									
70	concierge	concierge	309232000									
71	concierge	entreteneur de batiment	314121001									
72	contre_met	contre-maitre	514101001				22				22	Pb,Cd,Fe,Zn,Md,Co
73	coordonn	coordonnatrice	511091000									
74	coupeur_arc	coupeur a l'arc	314251001	22		22	22		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
75	coupeur_cuir	coupeur	509121001				11				11	Cr
76	couturier	couturier	115172000									
77	couturiere	couturiere	509192000									
78	couturiere	couturiere	510182000									
79	couturiere	couturiere	110132001									
80	couturiere	couturiere	109211000									
80	couturiere	couturiere	109211000									
81	couturiere	couturiere	109111000									
82	couturiere	couturiere	109111000									
83	couturiere	couturiere	514011000									
84	couturiere	couturiere	314291000									
85	couturiere	couturiere	508021000									
86	couturiere	couturiere	314291000									
87	couturiere	couturiere	115162000									
88	couturiere	couturiere	509192000									
89	couturiere	couturiere	509121000									
90	couturiere	couturiere	510111000									
91	couturiere	couturiere	509172000									
92	couturiere	operatrice de machine a coudre	508161000									
93	couturiere	operatrice de machine a coudre	508161000									
94	couturiere	operatrice de machine a coudre	313091000									
95	couturiere	operatrice de machine a coudre	114052000									
96	couturiere	operatrice de machine a coudre	508102000									
97	crustaces		104031000									

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
97	crustaces		104031001									
98	cuisinier		311102000									
99	cuisinier		112062000									
100	cuisinier		104121000									
101	cuisinier	aide feminin	306091000									
102	cuisinier	cuisinier	509192001									
103	cuisinier	cuisinier	509172001									
104	cuisinier	cuisinier	509192001									
105	cuisinier	cuisinier	514101000									
106	cuisinier	cuisinier	110112000									
107	cuisinier	cuisinier	110112000									
108	cuisinier	cuisinier	110112000									
109	cuisinier	cuisinier	514101000									
110	cuisinier	cuisinier	510212001									
111	cuisinier	cuisinier	110232000									
112	cuisinier	cuisinier	110132001									
113	cuisinier	cuisinier	509172001									
114	cuisinier	cuisinier	314071001									
115	cuisinier	cuisinier	514011000									
116	cuisinier	cuisinier / plongeur	509192001									
117	cuisinier	cuisiniere	314071000									
118	cuisinier	cuisiniere	514031000									
119	cuisiniere	aide cuisiniere	112062000									
120	cuisiniere	aide-alimentaire	313091000									
121	cuisiniere	aide-cuisinier	311102001									
122	cuisiniere	serveuse aide-cuisiniere	314221000									
123	deboss/peintre		107212001	12		21	21		11	22	12	Pb,Hg,Mn,Ti,Zn,Vd,Sn
124	deboss/peintre	gerant	313061001	12		12	12		11	22	12	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mo,Sn
125	dentiste	assistante dentaire	512211000								21	mercury
126	direct_impr	directrice de finition	306091000			11	11				11	Cu,Pb,Sb
127	ebeniste	ebeniste	306232001									
128	electricien	apprentis electricien	106152001	11					11		22	Pb,Sn,Ag,Cu
129	electricien	electricien	115172001	11					11		22	Pb,Sn,Ag,Cu
130	electricien	electricien	108061001	11					11		22	Pb,Sn,Ag,Cu
131	electricien	electro mecanicien	513101001	11					11		22	Pb,Sn,Ag,Cu
132	electroplast	electroplast	308172001		21	22					12	Cu,Ni,Pt,Ag,Au
133	emballeur	emballeur	310051000									
134	emballeur	empaquetteuse de egg rolls	313182000									
135	enseignant	enseignant	314121001									
136	entre-menag	entretien menager	115101001									
137	entre-menag	entretien menager	112071000									
138	entre-menag	entretien menager quart de travail	513202000									
139	entre-menag	prepose a l'entretien	312281001									
140	entre-menag	prepose a l'entretien menager	115101001									
141	entre-menag	prepose a l'entretien menager	313091001									
142	entre-menag	prepose a l'entretien menager	514172001									
143	entre-menag	trieuse et entretien menager	314121000									
144	entre_menag	entretien menager	511192000									
145	entre_menag	entretien menager	110132001									
146	entre_menag	entretien menager	109121001									

[E_code]	Standardized job title [Job_rev]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
147	entre_menag	entretien menager	109121000									
148	entre_menag	entretien menager	513101000									
149	entre_menag	entretien menager	313231000									
150	entre_menag	entretien menager	508102000									
151	entre_menag	ouvrier d'entretien general	314071001									
152	entrepr_const		109211001	11		11	11		11	21	22	Pb,Zn,Nd,Co,
153	entrepr_const		113062001	12		12	12			22	22	cutting torch,paints,Pb
154	entrepr_const		511152001	11		11	11			21	11	Pb
155	entrepr_const		513111001	11		11	11		11	21	22	Pb,Zn,Nd,Co,
156	estheticienne		304211000									
157	estheticienne	estheticienne	511132000									
158	estheticienne	estheticienne	511132000									
159	estheticienne	estheticienne	511132000									
160	estheticienne	estheticienne	511132000									
161	estheticienne	estheticienne	511132000									
162	estheticienne	proprietaire estheticienne	511132000									
163	etiquetteuse	etiquetteuse	310222000									
164	graveur		309232001			22			11		11	Pb,Zn,Ag,Be,Cu,Sb
165	imprimeur		313041000			11	11				11	Cu,Pb,Sb
166	imprimeur	apprenti-pressier	312042001									
167	imprimeur	imprimeur	511152001									
168	imprimeur	imprimeur	109191000			11	11					
169	imprimeur	relieur	105202001			11	11				11	Cu,Pb,Sb
170	infirmiere		112022001									
171	infirmiere	aide-infirmiere	307071000									
172	infirmiere	infirmiere	312082000									
173	infirmiere	infirmiere	107011000									
174	infirmiere	infirmiere	312082000									
175	infirmiere	infirmiere	312082000									
176	infirmiere	infirmiere	312082000									
177	infirmiere	infirmiere	307192000									
178	infirmiere	infirmiere	512112000									
179	infirmiere	infirmiere	314021000									
180	infirmiere	infirmiere	314021000									
181	infirmiere	infirmiere	312151000									
182	infirmiere	infirmiere	312151000									
183	infirmiere	infirmiere	312151000									
184	infirmiere	infirmiere	312102000									
185	infirmiere	infirmiere auxiliaire	307041000									
186	infirmiere	infirmiere auxiliaire	307041000									
187	infirmiere	infirmiere auxiliaire	307041000									
188	infirmiere	infirmiere auxiliaire	114081000									
189	infirmiere	infirmiere auxiliaire	107022000									
190	infirmiere	infirmiere auxiliaire	309222000									
191	infirmiere	infirmiere auxiliaire	505071000									
192	infirmiere	infirmiere auxiliaire	505071000									
193	infirmiere	infirmiere auxilliare	307041000									
194	infirmiere	infirmiere en medecine et chirurgie	312151000									
195	infirmiere	infirmiere en milieu scolaire	312151000									
196	infirmiere	infirmiere etudiante	512112000									

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	FLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
197	ingenieur	ingenieur	507151001							22	21	others metals in ore
198	inspect_alim	cadre inspecteur des viandes	504211001									
199	inspect_metal	inspecteur contre-maitre	514101001	11		11	11			11	11	Pb,Sb,Sn,Ag,Bi,Cu,Zn,As,Mg
200	inspect_metal	inspecteur controle de qualite	509152001	11		11	11		11	11	11	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mo,Sn
201	inspect_plast/met	inspecteur controle de qualite	514101001	11		11	11			11	11	Pb,Zn,Ba
202	instruct_arts	instructeur de metiers	114151000			11	11	11	11			
203	journl_aero		510212001	11		11	11			11	11	Mg,Mn,Cu,Zn,Be,Ti,Hg
204	journl_agric	cueilleur	514241000									
205	journl_agric	travailleur agricole	112062001									
206	journl_alim	journalier	104031001									
206	journl_alim	journalier	104031000									
207	journl_alim	journalier	114122001									
208	journl_alim	journaliere	504211000									
209	journl_alim	journaliere	313051000									
210	journl_alim	ouvrage general	113101000									
211	journl_alim	ouvrier	507221001									
212	journl_autom	journalier	313041001									
213	journl_brass	journalier conducteur de chariot el	113062001									
214	journl_buand		113101000									
215	journl_buand	journaliere	106152000									
216	journl_buand	ouvrier	507221001									
217	journl_cartn	journalier	114052001									
218	journl_chaus		514031000									
219	journl_chaus		109211001									
220	journl_chaus	journaliere	114052000									
221	journl_const		305012001	11		11	11			21	11	Pb
222	journl_const	journalier	306071001	11		11	11			21	11	Pb
223	journl_const	journalier	511091001	11		11	11			21	11	Pb
224	journl_const	ouvrier	110112000	11		11	11			21	11	Pb
225	journl_const	ouvrier specialise en excavation	313041001									
226	journl_disqu	prepose	505061001						11		11	Pb,Zn,Ba
227	journl_disqu	prepose	505061001						11		11	Pb,Zn,Ba
228	journl_encre		115162001				11	11	11	11	21	Pb,Ti,Hg,Cu,Zn,Zr compounds
229	journl_entre	journalier	307192001									
230	journl_entrp		309232001									
231	journl_fourn	journalier	113062001									
232	journl_metal		307121000	11		11	11			11		
233	journl_metal		514172001	11		11	11			11		
234	journl_metal	journalier	114122001								12	Pb
235	journl_metal	journaliere	314071000	11		11	11			11		
236	journl_metal	manoeuvre	505061001	11		11	11			11		
237	journl_meubl	journalier	508192001									
238	journl_meubl	ouvrier general	115101001									
239	journl_netto		112071001									
240	journl_netto		506131000									
241	journl_papir		510212001									
242	journl_pharm		514031000									
243	journl_pharm	journalier	307121000									
244	journl_placq	ouvrier	314121001								12	Pb
245	journl_plast		514172001						11			

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	FLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
246	journl_pompe	journalier	314071001	11		11	11		11	11	11	Pb,Hg,Mn,Ti,Cu,Zn,Vd
247	journl_tabac	journalier	313041001									
248	journl_textl		514031000									
249	journl_textl		511261000									
250	journl_textl		114181001									
251	journl_textl	general	508232000									
252	journl_textl	ouvrier	309212000									
253	journl_textl	ouvrier a tout faire	513031000									
254	journl_textl	separateur	109131000									
255	journl_textl	travailleuse generale	514211000									
256	journl_tr.pub	journalier	113091001									
257	journl_tr.pub	journalier	314251001									
258	journl_tr.pub	journalier	507041001									
259	journl_tr.pub	journalier	511132001									
260	journl_verre	ouvrier travail a la chaine	314261001			11	11	11	11		11	Mn,Se,As,Sb,Pb,Zr,Mo,Ba
261	journl_vitrx	journalier	114052001								22	Pb,Cu,Sn
262	machiniste	machiniste	314291001	12		12	12			12	12	Co,Vd,Mn,
263	machiniste	machiniste	314291001	12		12	12			12	12	Co,Vd,Mn,
264	machiniste	machiniste	510192001	12		12	12			12	12	various alloys:Co,Vd,Mn,W
265	machiniste	machiniste	314291001	12		12	12			12	12	various alloys,tools:Co,Vd,Mn
266	mecan_aeron	mecanicien	108061001	11		11	11			11	11	various metals
267	mecan_aspir	mecanicien	513101001	11		11	21		22	11	21	Pb,Sn,Sb,
268	mecan_auto		110202001	12		12	12		22	22	21	Pb,
269	mecan_autom	mecanicien	512151001	12		12	12		22	22	21	metal oxides:Pb,Cd,Fe
270	mecan_autom	mecanicien automobile	504252001	12		12	12		22	22	21	metal oxides:Pb,Cd,Fe
271	mecan_autom	mecanicien d'auto	108061001	12		12	12		12	22	21	metal oxides:Pb,Cd,Fe
272	mecan_bicy		312281001	11		11	21		22	11	21	metal oxides:Pb,Zn,Nd
273	mecan_char-elev		304102001			21	21			21	21	metal oxides:Pb,Zn,Nd
274	mecan_chauf	mecanicien	106011001	11		11			22		12	metal in soot/ash:As,Vd
275	mecan_equip		508192001			21	21		21	21	12	metal oxides:Pb,Zn,Nd
276	mecan_equip	mecanicien chariot elevateur	304102001			21	21			21	21	metal oxides:Pb,Zn,Nd
277	mecan_equip	mecanicien d'entretien	506131001	12		12	12		22	22		
278	mecan_equip	reparateur appareils Gestetner	510192001									
279	mecan_fixes		507041001									
280	mecan_fixes	mecanicien	314251001									
281	mecan_metal	mecanicien	304102001	11		11	11			11		
282	mecan_plaqu	mecanicien plaqueur	308172001								12	Pb
283	medecin		112022001									
284	medecin	medecin	112022000									
285	medecin	medecin	112022001									
286	medecin	medecin	112022000									
287	medecin	medecin	112022000									
288	medecin	medecin	112022000									
289	medecin	medecin	315261000									
290	medecin	medecin	315261000									
291	medecin	medecin	315061000									
292	medecin	medecin	112022000									
293	medecin	medecin	315261001									
294	medecin	medecin	112022001									
295	medecin	medecin	112022001									

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
296	medecin	medecin	315261001									
297	medecin	medecin	112022001									
298	medecin	medecin	112022001									
299	medecin	medecin	112022001									
300	medecin	medecin	315261001									
301	medecin	medecin	112022001									
302	medecin	medecin a temps partiel	315261001									
303	medecin	medecin generaliste	315261000									
304	medecin	pediatre	315061000									
305	medecin	pediatre	315061001									
306	medecin	pediatre	315061000									
307	medecin	pediatre	315061001									
308	medecin	resident	315061001									
308	medecin	resident	315061001									
309	medecin	resident	315061001									
310	medecin	resident	315061001									
311	menuisier_const	aide-menuisier	511091001				21	21	21		21	Pb,Cu,As,Hg
312	menuisier_constr	menuisier	314121001				21	21	21		21	Pb,Cu,As,Hg
313	menuisier_meubl		508192001									
314	menuisier_meubl	fabricant de cadre	109231001									
315	menuisier_meubl	sableur et confection	109121001									
316	menuisier_verre		114052001									
317	mouleur		513111001	12					11	22	22	Pb,Zn,Cu,Sb,Be
318	mouleur	mouleur	313041001	12					11	22	22	Pb,Zn,Cu,Sb,Be
319	operat_alimt	operateur de machine	514011000									
320	operat_alimt	operateur de machine	110061000									
321	operat_brass	operateur	507221001									
322	operat_chimq	operateur et ajusteur de ligne	313091001									
323	operat_cuir	operateur	309041000				11					
324	operat_cuir	operateur	513111001									
325	operat_fondr	operateur	313041001	12					11	22	22	Pb,Zn,Cu,Sb,Be
326	operat_fourr	operateur	508202000				11					
327	operat_imprim	operatrice de camera electronique	306091000									
328	operat_mech	operatrice de machine	311102000	11		11	11			21	11	Co,Vd,Mn,W
329	operat_metal	operateur	513111001	11		11	11			21	11	Pb,Sb,Be,Co,W,V,Mn
330	operat_metal	operateur	507111001	11		11	11			11		
331	operat_meubles	operatrice de machine	508192000									
332	operat_meubles	operatrice de machine	508192000									
333	operat_plast	operateur de machine	309192001	11		11	11			11	11	Pb,Zn,Ba
334	operat_pompe	operateur de pompes	507041001								11	Ag compounds
335	operat_soul	operatrice de machine	313172000									
336	operat_tabac	operatrice	313191000									
337	operat_text	fileuse	113132000									
338	operat_textl	operateur	309041000									
339	operat_textl	operateur	508202000									
340	operat_textl	operateur	309041000									
341	operat_textl	operateur	313091001									
342	operat_textl	operateur	310051000									
343	operat_textl	operateur	309041000									
344	operat_textl	operateur de machine	509152000									

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OHET Ex	OHET Ex-name
345	operat_textl	operateur de machine	309192000									
346	operat_textl	operateur de machine	508092001									
347	operat_textl	operateur de machine	110232000									
348	operat_textl	operateur de machine	510111000									
349	operat_textl	operateur de machine	510111000									
350	operat_textl	operateur de machine	110071001									
351	operat_textl	operateur de machine	510111001									
352	operat_textl	operateur de machine	509121000									
353	operat_textl	operatrice	514241000									
354	operat_textl	operatrice	514241000									
355	operat_textl	operatrice	108021000									
356	operat_textl	operatrice	108021000									
357	operat_textl	operatrice de machine	108061000									
358	operat_textl	operatrice de machines	306122000									
359	operat_textl	tisseusse	314291000									
360	patissier	patissier	509121001									
361	patissier	patissier	509121001									
362	patissier	patissiere	313032000									
363	peintre	artiste peintre	511511000	11						11	11	Cu,Zn,Au,Pb,Ag
364	peintre	peintre	509172001	11		11	11		11	21	22	Pb,metal oxides:Zn,Mn
365	peintre	peintre	114122001	11			11	11	11	12	11	Pb,Zn,Mo
366	peintre	peintre	504221001	11		11	11		11	21	21	Pb,metal oxides:Cr,Zn,Md
367	plieuse_buand	plieuse de vetement	313182000									
368	plombier	plombier	114122001				22	22			22	Pb,As,Sn
369	plongeur	operateur de lave-vaisselle	313041001									
370	polycopiste	polycopiste	313081001									
371	prepose_autom		510212001									
372	prepose_autom	prepose aux pieces et comptoir	513101001									
373	prepose_statn	prepose au stationnement	515221001									
374	prepose_textl	preposee aux commandes	513022000									
375	presseur_textl		511261001									
376	presseur_textl	presseur	109211001									
377	presseur_textl	presseur	109211001									
378	presseur_textl	presseur	109131001									
379	presseur_textl	presseur	109131001									
380	presseur_textl	presseur	109131001									
381	presseur_textl	presseur	109131001									
382	presseur_textl	presseur	511261001									
383	presseur_textl	presseur	511261001									
384	presseur_textl	presseur	511261001									
385	presseur_textl	presseuse	508161000									
386	secretaire	secretaire de direction	511152000									
387	secretaire	secretaire et teneur de livre	509051000									
388	soudeur		510212001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
389	soudeur		510212001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
390	soudeur	aide-soudeur	114052001						11		12	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo
391	soudeur	assemblage d'equipement forestier	511132001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
392	soudeur	soudeur	511132001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
393	soudeur	soudeur	511132001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
394	soudeur	soudeur	306071001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.

[E_code]	Standardized job title [Job_new]	Original job title given by subject [Job title]	[ID]	ALUM E1	PLAT E2	NICK E3	CHRO E4	COBA E5	CADM E6	IRON E7	OMET Ex	OMET Ex-name
395	soudeur	soudeur	511132001	12		12	12		11	12	12	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo
396	soudeur	soudeur	510212001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
397	soudeur	soudeur	510212001	12		12	12		11	22	22	Pb,Hg,Mn,Ti,Cu,Zn,Vd,Mn,Mo.
398	soutireur_brass	soutireur	313081001									
399	spinner_metal	tourneur de metal "spinneur"	506082001	11		11	11			11		
400	superv_textl	superviseur	309212000									
401	technic	agent technique	314192000									
402	technic	aviseur technique Bi-energie	512191001									
403	technic_elect	technicien en electro-ceramique	307071001			11	11	11	11			
404	technic_equip	technicien	306241001									
405	technic_equip	technicien	306241001									
406	technic_equip	technicien	306241001									
407	technic_equip	technicien	306241001									
408	technic_gen.civ	technicien de laboratoire	507271001									
409	tech_labo	aide laboratoire	106032000									
410	technic_lentl	technicien	114151000									
411	technic_pharm	technicienne en laboratoire	513101000									
412	technic_photo	technicien	507281001									
413	technic_photo	technicien	507281001									
414	technic_photo	technicien	507281001									
415	technic_photo	technicienne en impression	507281000									
416	technic_photo	technicienne en impression	507281000									
417	tisseur_textl	tisseur	314261001									
418	valet	valet	309021001									
419	vendeuse_textl	vendeuse	504221000									
420	vendeuse_textl	vendeuse	507221000									

29-Sep-93 Group F exposures: Miscellaneous
all exposed jobs listed

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
1	aide-wagonnier	aide-wagonnier	507082001	21		22	22
2	ajust_mecan	ajusteur mecanique	507171001	11			
3	archeologue	archeologie	112062001				22
4	ass/rech_INRS	assistante de recherche	311112000	11			
5	assembl_battr	assembleur	309192001	11			
6	assembl_bross	assembleuse	308152000				
7	assembl_elect		514031000				
8	assembl_lunet	assembleur	114081000				
9	assembl_metal		104181001	11			
10	assembl_serr		510212000	11			
11	assembl_skido	assembleur	313041001	11			
12	bardeau_asphalte		104181001				
13	bartender	bartender	511152000		22		
14	cables teleph		504261000				
15	cariste_alimt	cariste	513227001			22	
16	cariste_brass	operateur chariot elevateur	313081001			12	12
17	chauffeur		304211001	21			
18	chauffeur	camionneur livreur	515221001	21	21		
19	chauffeur	chauffeur	304211001	21			
20	chauffeur	chauffeur	506082001	21			
21	chauffeur	chauffeur	307202001	21			
22	chauffeur	chauffeur	506071001	21			
23	chauffeur	chauffeur	304211001	21			
24	chauffeur	chauffeur	513227001	21			
25	chauffeur	chauffeur	508192001	21	21		
26	chauffeur	chauffeur (stationnement)	506131001	21			
27	chauffeur	chauffeur d'autobus	506071001	21			
28	chauffeur	chauffeur d'autobus	507191001	21			
29	chauffeur	chauffeur d'autobus	504252001	21			
30	chauffeur	chauffeur de camion	112091001	21			
31	chauffeur	chauffeur de camion	507041001	21			
31	chauffeur	chauffeur de camion	507041001	21			
32	chauffeur	chauffeur de camion	514031001	21			
33	chauffeur	chauffeur de camion	514031001	21			
34	chauffeur	chauffeur de camion	514031001	21			
35	chauffeur	chauffeur de camion	514031001	21			
36	chauffeur	chauffeur de camion	310011001	21			
37	chauffeur	chauffeur de camion et mecanicien	112091001	21			
38	chauffeur	chauffeur de taxi	312101001	21	21		
39	chauffeur	chauffeur journalier	104181001	21			
40	chauffeur	chauffeure	507041000	21			
41	chauffeur	livreur	306122001	21			
42	chauffeur	livreur	504261001	21			
43	chauffeur	livreur	504252001	21			
44	chauffeur	livreur	504261001	21			
45	chauffeur	livreur	513101001	21			
46	chauffeur	livreur	513101001	21			
47	chauffeur	livreur	513101001	21			
48	chauffeur	livreur	504261001	21			

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
49	chauffeur	transport camionneur	306071001	21			
50	cimenteuse	cimenteuse	513121000				
51	cimenteuse	echantillonneuse	313182000				
52	coiffeuse	aide	311102000		21		
53	coiffeuse	aide-coiffeuse	313091000		21		
54	coiffeuse	assistante coiffeuse	313032000		21		
55	coiffeuse	assistante-coiffeuse	504252000		21		
56	coiffeuse	assistante-coiffeuse	504252000		21		
57	coiffeuse	coiffeuse	107212000		21		
58	coiffeuse	coiffeuse	107212000		21		
59	coiffeuse	coiffeuse	107212000		21		
60	coiffeuse	coiffeuse	107212000		21		
61	coiffeuse	coiffeuse	504252000		21		
62	coiffeuse	coiffeuse	107212000		21		
63	coiffeuse	coiffeuse	508202000		21		
64	coiffeuse	coiffeuse	313212000		21		
65	coiffeuse	coiffeuse	313212000		21		
66	coiffeuse	coiffeuse	313212000		21		
67	coiffeuse	coiffeuse	313212000		21		
68	commis_mag	commis	106072000				
69	concierge	concierge	309232001			21	
70	concierge	concierge	309232000			21	
71	concierge	entreteneur de batiment	314121001			21	
72	contre_met	contre-maitre	514101001				
73	coordonn	coordonnatrice	511091000	11	21		
74	coupeur_arc	coupeur a l'arc	314251001	12		12	
75	coupeur_cuir	coupeur	509121001				
76	couturier	couturier	115172000				21
77	couturiere	couturiere	509192000				21
78	couturiere	couturiere	510182000				21
79	couturiere	couturiere	110132001				21
80	couturiere	couturiere	109211000				21
80	couturiere	couturiere	109211000				21
81	couturiere	couturiere	109111000				21
82	couturiere	couturiere	109111000				21
83	couturiere	couturiere	514011000				21
84	couturiere	couturiere	314291000				21
85	couturiere	couturiere	508021000				21
86	couturiere	couturiere	314291000				21
87	couturiere	couturiere	115162000				21
88	couturiere	couturiere	509192000				21
89	couturiere	couturiere	509121000				21
90	couturiere	couturiere	510111000				21
91	couturiere	couturiere	509172000				21
92	couturiere	operatrice de machine a coudre	508161000				21
93	couturiere	operatrice de machine a coudre	508161000				21
94	couturiere	operatrice de machine a coudre	313091000				21
95	couturiere	operatrice de machine a coudre	114052000				21
96	couturiere	operatrice de machine a coudre	508102000				21
97	crustaces		104031000				

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
97	crustaces		104031001			22	
98	cuisinier		311102000	21			22
99	cuisinier		112062000	21			22
100	cuisinier		104121000	21			22
101	cuisinier	aide feminin	306091000	21			22
102	cuisinier	cuisinier	509192001	21			22
103	cuisinier	cuisinier	509172001	21			22
104	cuisinier	cuisinier	509192001	21			22
105	cuisinier	cuisinier	514101000	21			22
106	cuisinier	cuisinier	110112000	21			22
107	cuisinier	cuisinier	110112000	21			22
108	cuisinier	cuisinier	110112000	21			22
109	cuisinier	cuisinier	514101000	21			22
110	cuisinier	cuisinier	510212001	21			22
111	cuisinier	cuisinier	110232000	21			22
112	cuisinier	cuisinier	110132001	21			22
113	cuisinier	cuisinier	509172001	21			22
114	cuisinier	cuisinier	314071001	21			22
115	cuisinier	cuisinier	514011000	21			22
116	cuisinier	cuisinier / plongeur	509192001	21			22
117	cuisinier	cuisiniere	314071000	21			22
118	cuisinier	cuisiniere	514031000	21			22
119	cuisiniere	aide cuisiniere	112062000	21			22
120	cuisiniere	aide-alimentaire	313091000	21			22
121	cuisiniere	aide-cuisinier	311102001	21			22
122	cuisiniere	serveuse aide-cuisiniere	314221000	21			22
123	deboss/peintre		107212001	12			
124	deboss/peintre	gerant	313061001	12			
125	dentiste	assistante dentaire	512211000				
126	direct_impr	directrice de finition	306091000				
127	ebeniste	ebeniste	306232001				
128	electricien	apprentis electricien	106152001	12			
129	electricien	electricien	115172001	12			
130	electricien	electricien	108061001	12			
131	electricien	electro mecanicien	513101001	12			
132	electroplast	electroplast	308172001				
133	emballeur	emballeur	310051000			21	
134	emballeur	empaquetteuse de egg rolls	313182000			21	
135	enseignant	enseignant	314121001				
136	entre-menag	entretien menager	115101001			21	
137	entre-menag	entretien menager	112071000			21	
138	entre-menag	entretien menager quart de travail du soir	513202000			21	
139	entre-menag	prepose a l'entretien	312281001			21	
140	entre-menag	prepose a l'entretien menager	115101001			21	
141	entre-menag	prepose a l'entretien menager	313091001			21	
142	entre-menag	prepose a l'entretien menager	514172001			21	
143	entre-menag	trieuse et entretien menager	314121000			21	
144	entre_menag	entretien menager	511192000			21	
145	entre_menag	entretien menager	110132001			21	
146	entre_menag	entretien menager	109121001			21	

Standardized job title   Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLO_F3	HEAT_F4
147	entre_menag	entretien menager	109121000			21	
148	entre_menag	entretien menager	513101000			21	
149	entre_menag	entretien menager	313231000			21	
150	entre_menag	entretien menager	508102000			21	
151	entre_menag	ouvrier d'entretien general	314071001			21	
152	entrepr_const		109211001	11			
153	entrepr_const		113062001	12		22	
154	entrepr_const		511152001	11		22	
155	entrepr_const		513111001	11			
156	estheticienne		304211000				
157	estheticienne	estheticienne	511132000		21		
158	estheticienne	estheticienne	511132000		21		
159	estheticienne	estheticienne	511132000		21		
160	estheticienne	estheticienne	511132000		21		
161	estheticienne	estheticienne	511132000		21		
162	estheticienne	proprietaire estheticienne	511132000		21		
163	etiquetteuse	etiquetteuse	310222000				
164	graveur		309232001				
165	imprimeur		313041000				
166	imprimeur	apprenti-pressier	312042001				
167	imprimeur	imprimeur	511152001				
168	imprimeur	imprimeur	109191000				
169	imprimeur	relieur	105202001				
170	infirmiere		112022001				
171	infirmiere	aide-infirmiere	307071000				
172	infirmiere	infirmiere	312082000				
173	infirmiere	infirmiere	107011000				
174	infirmiere	infirmiere	312082000				
175	infirmiere	infirmiere	312082000				
176	infirmiere	infirmiere	312082000				
177	infirmiere	infirmiere	307192000				
178	infirmiere	infirmiere	512112000				
179	infirmiere	infirmiere	314021000				
180	infirmiere	infirmiere	314021000				
181	infirmiere	infirmiere	312151000				
182	infirmiere	infirmiere	312151000				
183	infirmiere	infirmiere	312151000				
184	infirmiere	infirmiere	312102000				
185	infirmiere	infirmiere auxiliaire	307041000				
186	infirmiere	infirmiere auxiliaire	307041000				
187	infirmiere	infirmiere auxiliaire	307041000				
188	infirmiere	infirmiere auxiliaire	114081000				
189	infirmiere	infirmiere auxiliaire	107022000				
190	infirmiere	infirmiere auxiliaire	309222000				
191	infirmiere	infirmiere auxiliaire	505071000				
192	infirmiere	infirmiere auxiliaire	505071000				
193	infirmiere	infirmiere auxilliare	307041000				
194	infirmiere	infirmiere en medecine et chirurgie	312151000				
195	infirmiere	infirmiere en milieu scolaire	312151000				
196	infirmiere	infirmiere etudiante	512112000				

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
197	ingenieur	ingenieur	507151001			12	12
198	inspect_alimt	cadre inspecteur des viandes	504211001			21	
199	inspect_metal	inspecteur contre-maitre	514101001				
200	inspect_metal	inspecteur controle de qualite	509152001				
201	inspect_plast/met	inspecteur controle de qualite	514101001				12
202	instruct_arts	instructeur de metiers	114151000				12
203	journl_aero		510212001				
204	journl_agric	cueilleur	514241000			21	21
205	journl_agric	travailleur agricole	112062001			21	21
206	journl_alimt	journalier	104031001			21	21
206	journl_alimt	journalier	104031000			21	21
207	journl_alimt	journalier	114122001				21
208	journl_alimt	journaliere	504211000			21	
209	journl_alimt	journaliere	313051000			21	
210	journl_alimt	ouvrage general	113101000			22	
211	journl_alimt	ouvrier	507221001			21	
212	journl_autom	journalier	313041001	22			
213	journl_brass	journalier conducteur de chariot elevateur	113062001			21	21
214	journl_buand		113101000				21
215	journl_buand	journaliere	106152000				21
216	journl_buand	ouvrier	507221001				21
217	journl_cartn	journalier	114052001				
218	journl_chaus		514031000	12			
219	journl_chaus		109211001	12			
220	journl_chaus	journaliere	114052000	12			
221	journl_const		305012001	11		22	
222	journl_const	journalier	306071001	11		22	
223	journl_const	journalier	511091001	11		22	
224	journl_const	ouvrier	110112000	11		22	
225	journl_const	ouvrier specialise en excavation	313041001	22		22	
226	journl_disqu	prepose	505061001				22
227	journl_disqu	prepose	505061001				22
228	journl_encre		115162001				
229	journl_entre	journalier	307192001	11	21		
230	journl_entrp		309232001	21			
231	journl_fourn	journalier	113062001	11	21		
232	journl_metal		307121000	11			
233	journl_metal		514172001	11			
234	journl_metal	journalier	114122001				
235	journl_metal	journaliere	314071000	11			
236	journl_metal	manoeuvre	505061001	11			
237	journl_meubl	journalier	508192001				
238	journl_meubl	ouvrier general	115101001				
239	journl_netto		112071001				21
240	journl_netto		506131000				
241	journl_papir		510212001				
242	journl_pharm		514031000				
243	journl_pharm	journalier	307121000				
244	journl_placq	ouvrier	314121001				
245	journl_plast		514172001				

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
246	journl_pompe	journalier	314071001	11			
247	journl_tabac	journalier	313041001	12			11
248	journl_textl		514031000				
249	journl_textl		511261000				
250	journl_textl		114181001				
251	journl_textl	general	508212000				
252	journl_textl	ouvrier	309212000				
253	journl_textl	ouvrier a tout faire	513031000				
254	journl_textl	separateur	109131000				
255	journl_textl	travailleuse generale	514211000				
256	journl_tr.pub	journalier	113091001	11		22	22
257	journl_tr.pub	journalier	314251001	11		22	22
258	journl_tr.pub	journalier	507041001	11		22	22
259	journl_tr.pub	journalier	511132001	11		22	22
260	journl_verre	ouvrier travail a la chaine	314261001	21			21
261	journl_vitrx	journalier	114052001	12			
262	machiniste	machiniste	314291001	11			
263	machiniste	machiniste	314291001	11			
264	machiniste	machiniste	510192001	11			
265	machiniste	machiniste	314291001	11			
266	mecan_aeron	mecanicien	108061001	11			
267	mecan_aspir	mecanicien	513101001	11			
268	mecan_auto		110202001	22			
269	mecan_autom	mecanicien	512151001	22			
270	mecan_autom	mecanicien automobile	504252001	22			
271	mecan_autom	mecanicien d'auto	108061001	22			
272	mecan_bicy		312281001	11			
273	mecan_char-elev		304102001	12			
274	mecan_chauf	mecanicien	106011001	12			12
275	mecan_equip		508192001	12			
276	mecan_equip	mecanicien chariot elevateur	304102001	12			
277	mecan_equip	mecanicien d'entretien	506131001	22			22
278	mecan_equip	reparateur appareils Gestetner	510192001	11	21		
279	mecan_fixes		507041001	11	21		
280	mecan_fixes	mecanicien	314251001	11	21		
281	mecan_metal	mecanicien	304102001	11			
282	mecan_plaqu	mecanicien plaqueur	308172001	11			
283	medecin		112022001				
284	medecin	medecin	112022000				
285	medecin	medecin	112022001				
286	medecin	medecin	112022000				
287	medecin	medecin	112022000				
288	medecin	medecin	112022000				
289	medecin	medecin	315261000				
290	medecin	medecin	315261000				
291	medecin	medecin	315061000				
292	medecin	medecin	112022000				
293	medecin	medecin	315261001				
294	medecin	medecin	112022001				
295	medecin	medecin	112022001				

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
296	medecin	medecin	315261001				
297	medecin	medecin	112022001				
298	medecin	medecin	112022001				
299	medecin	medecin	112022001				
300	medecin	medecin	315261001				
301	medecin	medecin	112022001				
302	medecin	medecin a temps partiel	315261001				
303	medecin	medecin generaliste	315261000				
304	medecin	pediatre	315061000				
305	medecin	pediatre	315061001				
306	medecin	pediatre	315061000				
307	medecin	pediatre	315061001				
308	medecin	resident	315061001				
308	medecin	resident	315061001				
309	medecin	resident	315061001				
310	medecin	resident	315061001				
311	menuisier_const	aide-menuisier	511091001			22	22
312	menuisier_constr	menuisier	314121001			22	22
313	menuisier_meubl		508192001				
314	menuisier_meubl	fabricant de cadre	109231001				
315	menuisier_meubl	sableur et confection	109121001				
316	menuisier_verre		114052001				
317	mouleur		513111001	22			22
318	mouleur	mouleur	313041001	22			22
319	operat_alimt	operateur de machine	514011000				
320	operat_alimt	operateur de machine	110061000				
321	operat_brass	operateur	507221001			21	
322	operat_chimq	operateur et ajusteur de ligne	313091001				
323	operat_cuir	operateur	309041000				
324	operat_cuir	operateur	513111001	12			
325	operat_fondr	operateur	313041001	22			22
326	operat_fourr	operateur	508202000				
327	operat_imprim	operatrice de camera electronique	306091000				
328	operat_mach	operatrice de machine	311102000	11			
329	operat_metal	operateur	513111001	11			
330	operat_metal	operateur	507111001	11			
331	operat_meubles	operatrice de machine	508192000				
332	operat_meubles	operatrice de machine	508192000				
333	operat_plast	operateur de machine	309192001				12
334	operat_pompe	operateur de pompes	507041001				
335	operat_soul	operatrice de machine	313172000				
336	operat_tabac	operatrice	313191000				
337	operat_text	fileuse	113132000				11
338	operat_textl	operateur	309041000				11
339	operat_textl	operateur	508202000				11
340	operat_textl	operateur	309041000				11
341	operat_textl	operateur	313091001				11
342	operat_textl	operateur	310051000				11
343	operat_textl	operateur	309041000				11
344	operat_textl	operateur de machine	509152000				11

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
345	operat_textl	operateur de machine	309192000				11
346	operat_textl	operateur de machine	508092001				11
347	operat_textl	operateur de machine	110232000				11
348	operat_textl	operateur de machine	510111000				11
349	operat_textl	operateur de machine	510111000				11
350	operat_textl	operateur de machine	110071001				11
351	operat_textl	operateur de machine	510111001				11
352	operat_textl	operateur de machine	509121000				11
353	operat_textl	operatrice	514241000				11
354	operat_textl	operatrice	514241000				11
355	operat_textl	operatrice	108021000				11
356	operat_textl	operatrice	108021000				11
357	operat_textl	operatrice de machine	108061000				11
358	operat_textl	operatrice de machines	306122000				11
359	operat_textl	tisseusse	314291000				11
360	patissier	patissier	509121001	11			21
361	patissier	patissier	509121001	11			21
362	patissier	patissiere	313032000	11			21
363	peintre	artiste peintre	511511000				
364	peintre	peintre	509172001	11			
365	peintre	peintre	114122001				
366	peintre	peintre	504221001	11			
367	plieuse_buand	plieuse de vetement	313182000				21
368	plombier	plombier	114122001				
369	plongeur	operateur de lave-vaisselle	313041001	11			11
370	polycopiste	polycopiste	313081001	11	21		
371	prepose_autom		510212001	21			
372	prepose_autom	prepose aux pieces et comptoir	513101001	11			
373	prepose_statn	prepose au stationnement	515221001	21			
374	prepose_textl	preposee aux commandes	513022000				22
375	presseur_textl		511261001				22
376	presseur_textl	presseur	109211001				22
377	presseur_textl	presseur	109211001				22
378	presseur_textl	presseur	109131001				22
379	presseur_textl	presseur	109131001				22
380	presseur_textl	presseur	109131001				22
381	presseur_textl	presseur	109131001				22
382	presseur_textl	presseur	511261001				22
383	presseur_textl	presseur	511261001				22
384	presseur_textl	presseur	511261001				22
385	presseur_textl	presseuse	508161000				22
386	secretaire	secretaire de direction	511152000		21		1
387	secretaire	secretaire et teneur de livre	509051000		12		
388	soudeur		510212001	22			12
389	soudeur		510212001	22			12
390	soudeur	aide-soudeur	114052001	22			12
391	soudeur	assemblage d'equipement forestier	511132001	22			12
392	soudeur	soudeur	511132001	22		22	22
393	soudeur	soudeur	511132001	22			12
394	soudeur	soudeur	306071001	22			12

Standardized job title Original job title given by subject

[E_code]	[Job_new]	[Job title]	[ID]	PYRO_F1	CIGA_F2	COLD_F3	HEAT_F4
395	soudeur	soudeur	511132001	22			12
396	soudeur	soudeur	510212001	22			12
397	soudeur	soudeur	510212001	22		22	22
398	soutireur_brass	soutireur	313081001				
399	spinner_metal	tourneur de metal "spinneur"	506082001	11			
400	superv_textl	superviseur	309212000				
401	technic	agent technique	314192000		21		
402	technic	aviseur technique Bi-energie	512191001		21		
403	technic_elect	technicien en electro-ceramique	307071001				
404	technic_equip	technicien	306241001				
405	technic_equip	technicien	306241001				
406	technic_equip	technicien	306241001				
407	technic_equip	technicien	306241001				
408	technic_gen.civ	technicien de laboratoire	507271001				
409	tech_labo	aide laboratoire	106032000				
410	technic_lentl	technicien	114151000				
411	technic_pharm	technicienne en laboratoire	513191000				
412	technic_photo	technicien	507281001				
413	technic_photo	technicien	507281001				
414	technic_photo	technicien	507281001				
415	technic_photo	technicienne en impression	507281000				
416	technic_photo	technicienne en impression	507281000				
417	tisseur_textl	tisseur	314261001				11
418	valet	valet	309021001				11
419	vendeuse_textl	vendeuse	504221000				
420	vendeuse_textl	vendeuse	507221000				