


Descriptive Epidemiology of the Principal Asbestos-Related Diseases in Québec, 1981-2004

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Descriptive Epidemiology of the Principal Asbestos-Related Diseases in Québec, 1981-2004

Direction des risques biologiques,
environnementaux et occupationnels

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ABSTRACT

While awaiting the introduction of the future surveillance system for asbestos exposures and their related diseases, we created the descriptive epidemiological portrait of two of these health problems, malignant mesothelioma and asbestosis. It was constructed using the data from statutory databases available at the *ministère de la Santé et des Services sociaux*: the *Fichier des tumeurs du Québec* (tumour registry) for cancer incidence, the *Fichier des décès* (death registry) for mortality and the Med-Echo registry for asbestosis hospitalizations. Finally, the international comparisons of malignant mesothelioma incidence rates were made using the electronic database of the International Agency for Research on Cancer.

The study area is the Province of Québec. The incidence rates, mortality and hospitalization at the regional level (health region) were compared. The time trends of incidence rates, mortality and hospitalization were analyzed. Standardized rates using the direct method are used for the interregional comparisons, while indirect standardization is used for the international comparisons.

Between 1982 and 2002, 1,530 new cases of malignant mesothelioma of the pleura and 170 new cases of malignant mesothelioma of the peritoneum were diagnosed in Québec. Like many cancers, these diseases are more frequent among people aged 50 and over and among men. Furthermore, among men, the annual incidence rates of malignant mesothelioma of the pleura increased significantly between 1982 and 2002, with an average annual increase of 3.6%. No significant time trend was observed among women.

The incidence rates of cancers and malignant mesotheliomas of the pleura are significantly higher in Chaudière-Appalaches, Lanaudière and Montérégie regions among men, and in Chaudière-Appalaches among women. In Chaudière-Appalaches and Montérégie, among men, these results could be explained by prior occupational exposures in the asbestos mines of the Chaudière-Appalaches region, and in the shipyards in Montérégie and Chaudière-Appalaches. For the Lanaudière region, it is possible that the results observed are related to the presence of old shipyards in Montreal and the refineries in Montreal East. However, we cannot exclude that a higher level of clinical suspicion and the presence of specific screening programs in these same regions might explain these observations. Among men, rates lower than the provincial rate are observed in the Bas-Saint-Laurent and Outaouais regions. The lower rates observed in Outaouais might be explained by the cases treated in Ontario and not recorded in the *Fichier des tumeurs*. Furthermore, the geographical distribution of incidence is not adjusted for residential mobility.

From 1993 to 1997, the Province of Québec showed the highest standardized incidence ratio (SIR) of malignant mesothelioma in Canada, among men and among women. Among women during the same period, only Western Australia and Scotland posted SIRs significantly higher than that of Québec, in the other available cancer registries. Among men, the SIR of malignant mesothelioma in New Zealand, the Netherlands, and in several regions of Great Britain and Australia were significantly higher compared to that of Québec. These international comparisons should be interpreted with caution due to the inherent limitations of their use, given the fact that few national cancer registries are available, that it is not possible

to distinguish malignant mesothelioma of the pleura from other mesotheliomas in the aggregated data available and that differences in diagnostic methods could bias the results. However, these results are compatible with asbestos exposure among workers in Québec through mining and industrial activities and in construction. The higher rates observed in Australia might be explained by the preponderance of crocidolite in this country, which is more associated with malignant mesothelioma than chrysotile, the predominant asbestos fibre extracted in Québec. It is also possible that historically, asbestos use was greater in Australia than in Québec.

For the period from 1981 to 2003, 1,059 deaths from cancer of the pleura were recorded in Québec. Of these, almost three times more were among men than among women, and they were more frequent among persons aged 50 and older. Analysis of the annual provincial death rates from cancer of the pleura shows no significant time trend among men or among women. The geographic distribution of death rates for cancer of the pleura indicates that the Chaudière-Appalaches region presented significant excesses among men and women alike. Statistically significant excesses were also observed among men in the Lanaudière and Montérégie regions. These observations are consistent with the situation observed for the incidence of malignant mesothelioma of the pleura.

We also estimated asbestosis incidence using the Med-Echo registry, by taking into consideration the hospitalizations with first mention of asbestosis during the period from 1992 to 2004. In Québec, during this period, 2,072 hospitalizations with first mention of asbestosis were recorded. It was mainly men hospitalized for this disease (25 men for 1 woman). Similarly, the hospitalizations with first mention of asbestosis were mainly observed among people over 60 years of age, and the mean age of these people increased significantly during the period studied. No significant time trend in the estimated rate of hospitalization with first mention of asbestosis was observed among men or women. The geographic distribution of hospitalizations with first mention of asbestosis indicates significant excesses in the Chaudière-Appalaches region among men and women, and excesses for the Estrie and Lanaudière regions among men. These data are consistent with those for the incidence of malignant mesothelioma of the pleura.

In conclusion, the analysis of the data from Quebec health databases enables us to create a valuable epidemiological portrait of asbestos-related diseases. One of the most important data sources is the *Fichier des tumeurs du Québec*. However, the delays to obtain data are significant and we recommend continuing the current steps to reduce these delays. Second, we recommend carrying out periodic analysis of the trends for malignant mesothelioma of the pleura and cancer of the pleura using the *Fichier des tumeurs du Québec*, until the future surveillance system for asbestos-related diseases is operational. Finally, despite the limitations of the Med-Echo registry, analysis of hospitalizations with first mention of asbestosis could be continued while awaiting the results of a study to describe the diagnostic criteria for the asbestosis cases in this database.

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LIST OF SYMBOLS AND ABBREVIATIONS

SYMBOL	DEFINITION
CI	Confidence interval
FiTQ	*Fichier des tumeurs du Québec*
HIN	Health insurance number
HR	Health region
IARC	International Agency for Research on Cancer
ICD	International Classification of Diseases
Med-Echo	*Maintenance et exploitation des données pour l'étude de la clientèle hospitalière* (Maintenance and use of data for the study of hospital clientele)
MSSS	Ministère de la Santé et des Services sociaux (Department of health and social services)
ND	Notifiable Disease
SIR	Standardized incidence ratio
SMR	Standardized mortality ratio
SR	Standardized rate
SRR	Standardized rate ratio

INTRODUCTION

This project continues the work done for the *Programme de développement de la surveillance et des connaissances* in connection with the Policy concerning the increased and safe use of chrysotile asbestos in Québec. One of the aims of this program was to document asbestos exposure in Québec and the health problems associated with this exposure. The principal diseases associated with asbestos exposure are: malignant mesothelioma of the pleura, malignant mesothelioma of the peritoneum, asbestosis and lung cancer. Other diseases are also associated with asbestos exposure but either they are less serious (ex.: pachypleuritis and pleurisies) or the link is not as well established (ex.: other cancers) (Institut national de la santé et de la recherche médicale (INSERM), 1997; Health Effects Institute - Asbestos Research (HEI-AR), 1991*)*. In this study, we analyzed mainly the malignant mesotheliomas and asbestosis. Lung cancer was not chosen owing to the difficulty of isolating, among all cases, those that are associated with asbestos exposure.

The epidemiological profile of these health problems was created using data from the statutory databases available at the *Ministère de la Santé et des Services sociaux* (MSSS), these being: the *Fichier des tumeurs du Québec* (FiTQ) for cancer incidence, the *Fichier des décès* for mortality and the registry *Maintenance et exploitation des données pour l'étude de la clientèle hospitalière* (Med-Echo) for hospitalizations with first mention of asbestosis. Since cancer incidence in the FiTQ is established notably from the Med-Echo registry, we chose not to analyze hospitalizations by cancer. Furthermore, we wanted to compare the mortality and the incidence of the cancers. However, for the period studied, it is not possible to identify malignant mesotheliomas in the *Fichier des décès*. For this reason, cancers of the pleura and the peritoneum were also used as indicators. It is also for this reason, and only for comparison, that the analysis of data on the incidence of cancers of the pleura and the peritoneum was carried out.

This study is intended to update data from a previous study (Lebel et al., 2001), while awaiting the introduction of the surveillance system for asbestos-related diseases that is currently in development.

1 OBJECTIVES

The main objective of this project is to measure the frequency of the principal asbestos-related diseases in Québec, these being malignant mesothelioma and asbestosis.

The secondary objectives of this project are related to the incidence, mortality and hospitalization relative to two principal asbestos-related diseases. Thus, the secondary objectives are:

- For the incidence of cancer of the pleura, malignant mesothelioma of the pleura[1] and malignant mesothelioma of the peritoneum, from 1982 to 2002:
  - Estimate the incidence by health region (HR) and by sex;
  - Estimate the annual provincial incidence trends, by sex;
  - Compare the incidence of malignant mesotheliomas in Québec to the incidence measured elsewhere in Canada and in other countries, by sex.
- For mortality from cancer of the pleura, cancer of the peritoneum and asbestosis, from 1981 to 2003:
  - Estimate mortality by health region and by sex;
  - Estimate annual provincial mortality trends, by sex.
- For hospitalizations with first mention of asbestosis from 1992 to 2004:
  - Estimate rates of hospitalization with first mention of asbestosis, by health region and by sex;
  - Estimate annual provincial trends of hospitalizations with first mention of asbestosis, by sex.

[1] Note that malignant mesothelioma of the pleura is a sub-set of cancers of the pleura.

2 METHODOLOGY

This section presents first, for the study of incidence, mortality and hospitalizations, the study population and the data sources. The principal statistical methods used to calculate standardized rates (SD), standardized rate ratios (SRR), standardized mortality ratios (SMR*)* standardized incidence ratios *(*SIR*)*, and time trends are presented and followed by the general approach to the statistical analysis. All calculations were performed using the SAS software package.

The study territory is defined as all of Québec. The smallest geographic unit of analysis used to describe incidence and mortality for cancer and hospitalizations with first mention of asbestosis is the health region (Figure 1).

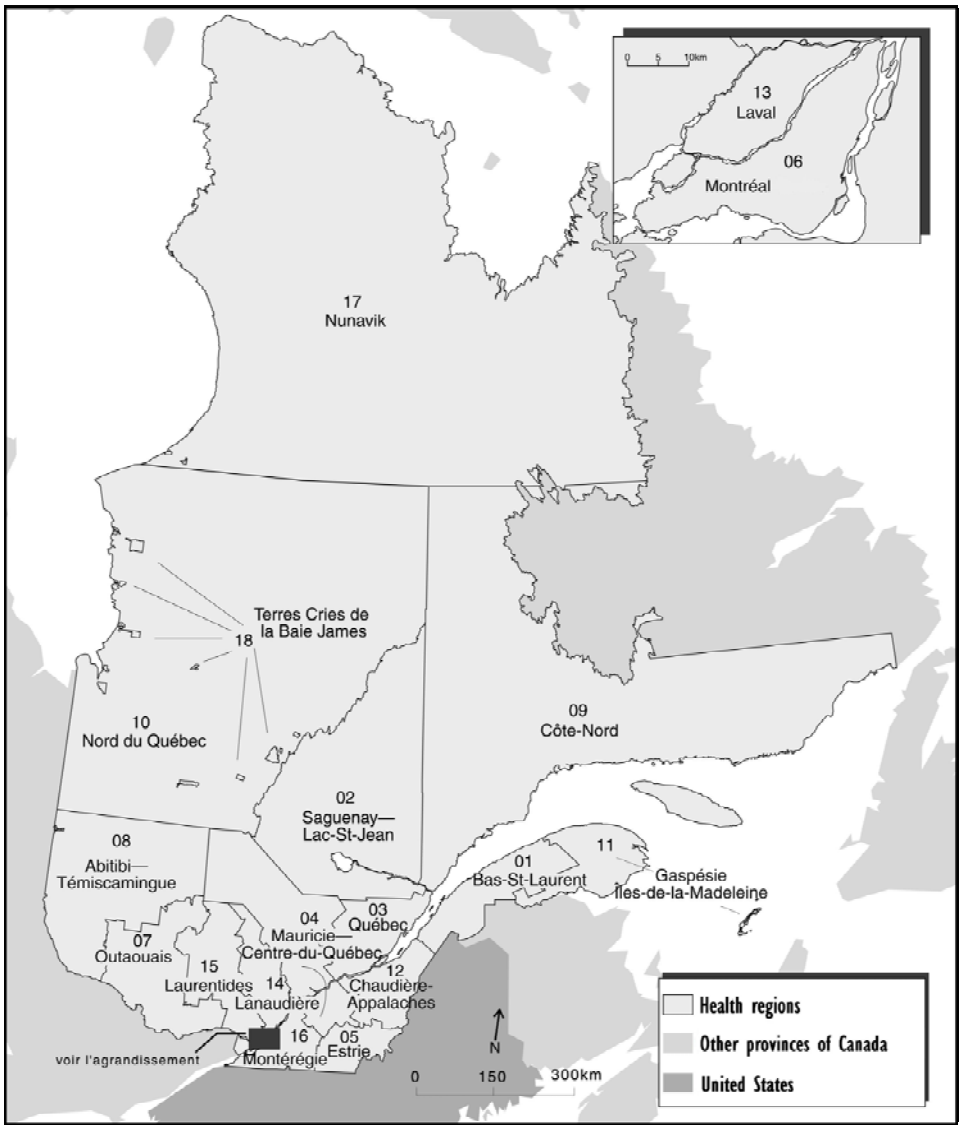

Figure 1 Map of health region locations

2.1 STUDY POPULATION

This section presents the population used for each of the health problems studied, and all the data processed. In general, population counts by year, by sex and by five year age group, for each health region, come from the MSSS (Pelletier, 2005).

2.1.1 Incidence of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum

For the incidence of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum the study period is from January 1982 to December 2002 inclusively[2]. The new cases of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum come from the FiTQ. Among the new cases of cancer of the pleura (ICD-9: 163) and the peritoneum (ICD-9: 158), mesotheliomas were identified using tumour morphology (ICD-O2: M905). For each new cancer case, the information gathered at the time of diagnosis is: topography code (based on ICD-9), tumour morphology (based on ICD-O2), sex, age, date of diagnosis and code for health region of residence at time of diagnosis.

2.1.2 Mortality from cancer of the pleura, cancer of the peritoneum and asbestosis

For mortality from cancer of the pleura, cancer of the peritoneum and asbestosis, the study period is January 1981 to December 2003 inclusively. Mortality data for asbestosis (ICD-9: 501), cancer of the pleura (ICD-9: 163) and cancer of the peritoneum (ICD-9: 158) come from the *Fichier des décès* for the period from 1981 to 1999. For those years, among cancers of the pleura and the peritoneum it was not possible to distinguish mesotheliomas from other morphologies. Therefore, only the mortality for all cancers of the pleura and the peritoneum were studied. Starting in 2000, the ICD-10 classification was used in the *Fichier des décès* and this classification distinguishes mesotheliomas from other morphologies. However, since this distinction was not made for previous years, the data were grouped to consider mortality for all cancers of the pleura and all cancers of the peritoneum. Hence, for the years 2000 to 2003, the data on mortality from asbestosis (ICD-10: J61 [asbestosis] and J92.0 [pleural plaques with asbestosis]), from cancer of the pleura (ICD-10: C38.4 and C45.0 [mesothelioma of the pleura]) and from cancer of the peritoneum (ICD-10: C48 [cancer of the peritoneum and retroperitoneum] and C45.1 [mesothelioma of the peritoneum]) come from the *Fichier des décès*. For each death, the information gathered is: cause of death, sex, age, date of death and code for health region of residence at time of death.

2.1.3 Hospitalizations with first mention of asbestosis

For hospitalizations with first mention of asbestosis, the study period is January 1992 to December 2004 inclusively. The hospitalizations with first mention of asbestosis (ICD-9: 501) come from the Med-Echo registry for the years 1992 to 2004 (financial years 1991-1992 to 2004-2005). This registry contains the health care data relative to hospitalizations in Québec

[2] We want to mention here that the results obtained using the data from the 1984 to 2002 period were verified and that no inconsistency was observed in the conclusions. We chose to use data from over the longest possible period.

institutions that dispense general and specialized care. The hospitalizations chosen are those in which the final primary diagnosis or one of the 15 secondary diagnoses is asbestosis (ICD-9: 501). It is important to specify that in the Med-Echo registry, the diagnosis of asbestosis can be present in the record, even if it is just part of the medical history. The information gathered for each hospitalization is: encrypted health insurance number (HIN), final primary diagnosis, 15 secondary diagnoses, sex, age, date of hospitalization and health region of residence at time of hospitalization. To estimate asbestosis incidence from hospitalizations, we used a patient's first hospitalization with mention of asbestosis in the period from 1992 to 2004 and identified it from the encrypted HIN.

2.2 STATISTICAL METHODS

2.2.1 Standardized rates

Standardized rates were calculated by the direct method. The equation used to calculate the age-standardized rate, for a territory (health region or province) or a year, is the following:

$$SR_j = \sum_i w_i \frac{d_{ij}}{n_{ij}}$$

where: SR_j = Age-standardized rate for territory j or year j

i = Age group i

w_i = Weight for age group i

d_{ij} = Number of new cases in age group i of the territory j or for the year j

n_{ij} = Person-years of observation for age group i and territory j or year j (sum of the population counts for age group i and territory j in the study period or sum of the population counts for age group i and year j in the study territory).

Five-year age groups were used: 0-4 years, 5-9 years, ..., 85 years and over. The weights used for the standardization of rates were calculated from population counts in the 1996 census (men and women together) for the province of Québec as a whole. These weights are presented in Table 1.

Table 1 Weights used for rate standardization

Age group (years)	Population 1996	Weight w	Weight, based on world population[1]
0 to 4	459 132	0.0634	0.120
5 to 9	461 103	0.0636	0.100
10 to 14	460 627	0.0636	0.090
15 to 19	498 849	0.0688	0.090
20 to 24	470 693	0.0650	0.080
25 to 29	498 847	0.0688	0.080
30 to 34	623 812	0,0861	0.060
35 to 39	659 227	0.0910	0.060
40 to 44	600 165	0.0828	0.060
45 to 49	540 089	0.0745	0.060
50 to 54	447 404	0.0617	0.050
55 to 59	346 315	0.0478	0.040
60 to 64	311 671	0.0430	0.040
65 to 69	287 002	0.0396	0.030
70 to 74	236 954	0.0327	0,020
75 to 79	162 748	0.0225	0.010
80 to 84	104 929	0.0145	0.005
≥ 85	77 329	0.0107	0.005
Total	**7 246 896**	**1.0000**	**1.000**

[1] (Parkin, D. M. *et al*., 2002).

2.2.2 Annual trends

The provincial annual trends were established using direct standardization. To determine the presence of a time trend (increase or decrease) in the provincial annual rates during the study period, we used the likelihood ratio test, obtained using the SAS GENMOD procedure under the Poisson model. For significant time trends, the average annual rate of increase or decrease was determined by using the expected values of the rate, obtained from the Poisson model. The average annual rate of change was calculated with the following equation:

$$Average\ annual\ rate\ of\ change = \frac{\sum_{i=year\ start}^{year\ end-1}\left(\frac{Rate_{i+1} - Rate_i}{Rate_i}\right)}{year\ end - year\ start} * 100$$

where: $Rate_i$ = Expected rate for year i.

2.2.3 Standardized rate ratio

The age-standardized rate ratio (SRR) was defined as being the standardized rate of a health region territory (SR_j) divided by the standardized rate of the province ($SR_{Québec}$):

$$SRR_j = \frac{SR_j}{SR_{Québec}}$$

To ensure the stability of the rates used in each comparison, the SRRs established using an unstable rate (meaning the coefficient of variation of one of the two rates is greater than 33.3%[3]) are presented for information only. The coefficient of variation of a standardized rate is defined as being the ratio of the standard deviation of the standardized rate, divided by the standardized rate. The equation used is therefore:

$$Coefficient\ of\ variation\ SR_j = \frac{\sqrt{\sum_i w_i^2 \frac{d_{ij}}{n_{ij}^2}}}{SR_j}$$

To determine the statistical significance of the SRRs, the z-statistic was used. Thus, for a territory HR_j, under the null hypothesis ($H_0 : SRR_j = 1$), the following statistic:

$$z = \frac{(\ln SR_j - \ln SR_{Québec})}{\sqrt{\text{Variance}\,(\ln SRR_j)}}$$

follows a standard normal distribution (that is, the mean is equal to zero [0] and the standard deviation is equal to one [1]). The p-value, for a two-tailed test ($H_1 : SRR_j \neq 1$), is therefore obtained using the value calculated for z.

The variance of the logarithm of the SRR_j, necessary for the calculation of z, was calculated using the following equation:

$$Variance\,(\ln SRR_j) = \frac{Variance\ SR_j}{SR_j^2} + \frac{Variance\ SR_{Québec}}{SR_{Québec}^2}$$

where :

$$Variance\ SR = \sum w_i^2 \frac{d_i}{n_i^2}$$

2.2.4 SMR and SIR

The SMR and the SIR calculated by health region are the ratio of the number of cases observed, respectively of death or incident cases, divided by the number of expected cases in a population. The specific rates by age group for the population of Québec were calculated. The number of expected cases in a region was obtained by multiplying the provincial specific rates by the population counts (by age group) of this region. The age groups used are the same as those used to calculate age-standardized rates (Table 1).

[3] Based on the agreements in force at Statistics Canada and Health Canada (Federal, Provincial and Territorial Advisory Committee on Population Health, 1999).

The 99% confidence intervals (CI) of the SMRs and SIRs were calculated using the exact method (Breslow and Day, 1987). Thus, if the exact CI does not include the value 1, we consider that the difference between the number of expected cases and the number of observed cases is statistically significant (SMR $\neq$ 1 or SIR $\neq$ 1). On the contrary, if the exact CI includes the value 1, we conclude the absence of significant difference between the number of observed cases and the number of expected cases.

2.2.5 Canadian and international comparisons

The comparisons of incidence in Québec with incidences in Canadian provinces and in other countries were made using the electronic databases of the International Agency for Research on Cancer (IARC) and the International Association of Cancer Registries (Parkin, D. M., Whelan, S. L., Ferlay, J., Teppo, L., and Thomas, D. B., 2002). It should be noted that the data on malignant mesothelioma incidence are aggregated for the pleura, the peritoneum and the pericardium. Therefore, it is not possible to distinguish mesothelioma incidence by topography codes in this database. Furthermore, according to the data available in the IARC database, not all countries have a national cancer registry and the geographic coverage of the registries in some countries is incomplete.

The 2002 IARC publication includes the electronic databases for two distinct periods: from 1988 to 1992 (volume VII) and from 1993 to 1997 (volume VIII). The software provided with this publication to calculate SIRs does not permit data analysis for the overall period from 1988 to 1997. For Canada, the data on malignant mesothelioma incidence by province and territory are available for these two periods and the Canadian comparisons for the period from 1988 to 1992 are presented in the appendix.

For the cancer registries that we selected, we present the data for the period from 1993 to 1997, while the data relative to these same registries for the period from 1988 to 1992 are presented in the appendix. To make the international comparisons, we chose to use the registries that meet the following criteria:

- The data are available for the entire period from 1993 to 1997
- The cancer registry covers the whole country or a region of the country (on the basis of map documents available within the software)
- The number of malignant mesothelioma cases observed among men and among women is greater than 10 for the period from 1993 to 1997

The incidence, by sex, of malignant mesotheliomas in each of the geographic areas considered (countries, provinces and territories) was compared to that of cancers in Québec using the SIR. Thus, for each of the geographic areas, the total number of observed cases was compared to the number of expected cases, obtained by considering the specific rates (by sex) in Québec, applied to their age structure. For the Canadian and international comparisons, the results are presented even when there are fewer than five cases, since these data are already published.

The IARC databases produce SIR CIs at a 95% confidence level. They are either exact or approximate calculations, depending on the total number of observed cases (O). As the number of observed cases follows a Poisson distribution, we first obtained the CI limits for the Poisson variable O, that is, μ_i and μ_s. For the different O values of 50 and under, tables containing the exact confidence limits for this Poisson variable are used. When the total number of observed cases is greater than 50, an approximate CI is calculated. The following approximations for μ_i and μ_s are used:

$$\mu_i = \left(\frac{Z_{\alpha/2}}{2} - \sqrt{o}\right)^2$$

and

$$\mu_s = \left(\frac{Z_{\alpha/2}}{2} + \sqrt{o+1}\right)^2$$

The CI of SIR is obtained by dividing the μ_i and μ_s limits by the number of expected cases (E). Specifically: CI of SIR = (μ_i/E; μ_s/E).

For information purposes only, we also included the age-standardized rate of the different countries in the tables. These rates were calculated using the electronic database and we chose to retain the standardized rates on the basis of the age structure of the standard world population (Parkin, D. M., Whelan, S. L., Ferlay, J., Teppo, L., and Thomas, D. B., 2002). For this reason, the rates of the Canadian and international comparisons section cannot be compared to the rates established for the province as a whole in section 4.1 (use of two weighting systems).

2.3 ANALYSIS

In general, the same analytic procedure was used for the study of incidence, mortality and hospitalizations. First, the specific rates by sex and five-year age group are presented. For all of Québec among men and among women, the age-standardized annual rates were calculated and the time trend of these annual rates was evaluated using a linear trend test.

The mean age of incident cases, the mean age at death and the mean age at the end of a hospitalization with first mention of asbestosis were also calculated by five-year period. Variance analysis was used to compare age averages by 5-year period. In the presence of a statistically significant difference in the mean age between the different periods, a Bonferroni multiple comparisons test was performed, in order to identify the source of the difference.

For the entire study period, the age-standardized rates, by sex, were also calculated by health region. The SRRs were used to compare the rate of each health region with the provincial rate. To maintain confidentiality, the results of the regions with fewer than five cases are not presented. Finally, unless otherwise stated, the statistically significant level used is 1%.

3 RESULTS

3.1 INCIDENCE OF CANCER OF THE PLEURA, MALIGNANT MESOTHELIOMA OF THE PLEURA AND MALIGNANT MESOTHELIOMA OF THE PERITONEUM

3.1.1 Incidence by age and sex

In the whole of Québec, from 1982 to 2002, 1,832 new cases of cancer of the pleura, of which 1,530 are malignant mesotheliomas of the pleura, and 170 new cases of malignant mesothelioma of the peritoneum were recorded in the FiTQ. The cases of malignant mesothelioma of the pleura made up 74% of cancers of the pleura among women and 86% among men. For cancer of the pleura, malignant mesothelioma of the pleura[4] and malignant mesothelioma of the peritoneum, the ratios of the number of new cases among men compared to the number of new cases among women were respectively 3.25, 3.78 and 1.36. Hence, the number of new cases of cancer of the pleura and malignant mesothelioma of the pleura was more than three times higher among men than among women.

The analysis of the specific rates, by age group, of the incidence of cancer of the pleura (Figure 2) and malignant mesothelioma of the pleura (Figure 3) reveal that these diseases were more frequent among persons aged 50 and over. In general, specific rates among men were higher than among women. The mean age of new cases of cancer of the pleura was 66.2 years among women and 66.3 years among men, while the median age was 68.0 years among women and 67.0 years among men. The mean age of new cases of malignant mesothelioma of the pleura was 64.5 years among women (median age of 65.5 years) and 65.9 years among men (median age of 66.0 years).

For the incidence of malignant mesothelioma of the peritoneum, we observe that the specific rates were lower than those of malignant mesothelioma of the pleura and that the differences between men and women were smaller (Figure 4). The mean age of new cases of malignant mesothelioma of the peritoneum was 64.6 years among women and 61.9 years among men, and the median age was 67.0 years and 63.0 years respectively among women and among men.

[4] Mesotheliomas of the pleura are a sub-set of cancers of the pleura.

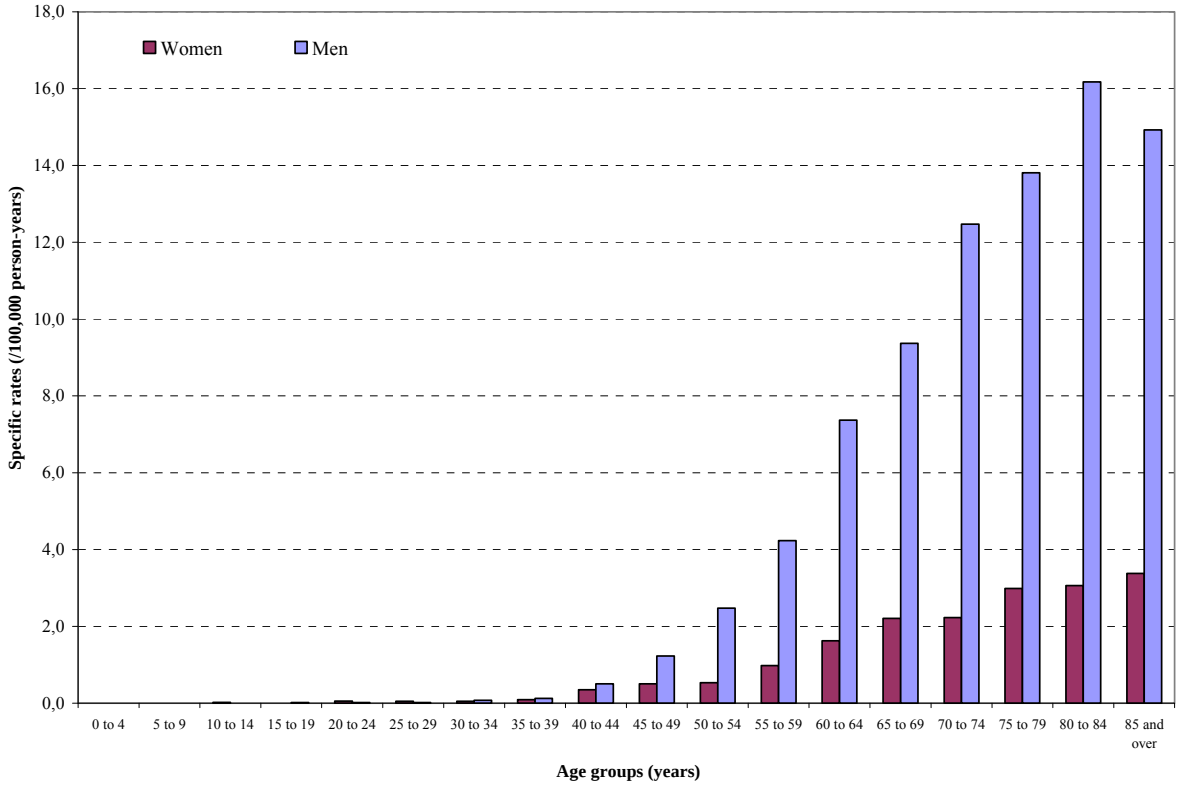

Figure 2 Specific incidence rates (/100,000 person-years) of cancer of the pleura by sex and five-year age group, Québec, 1982-2002

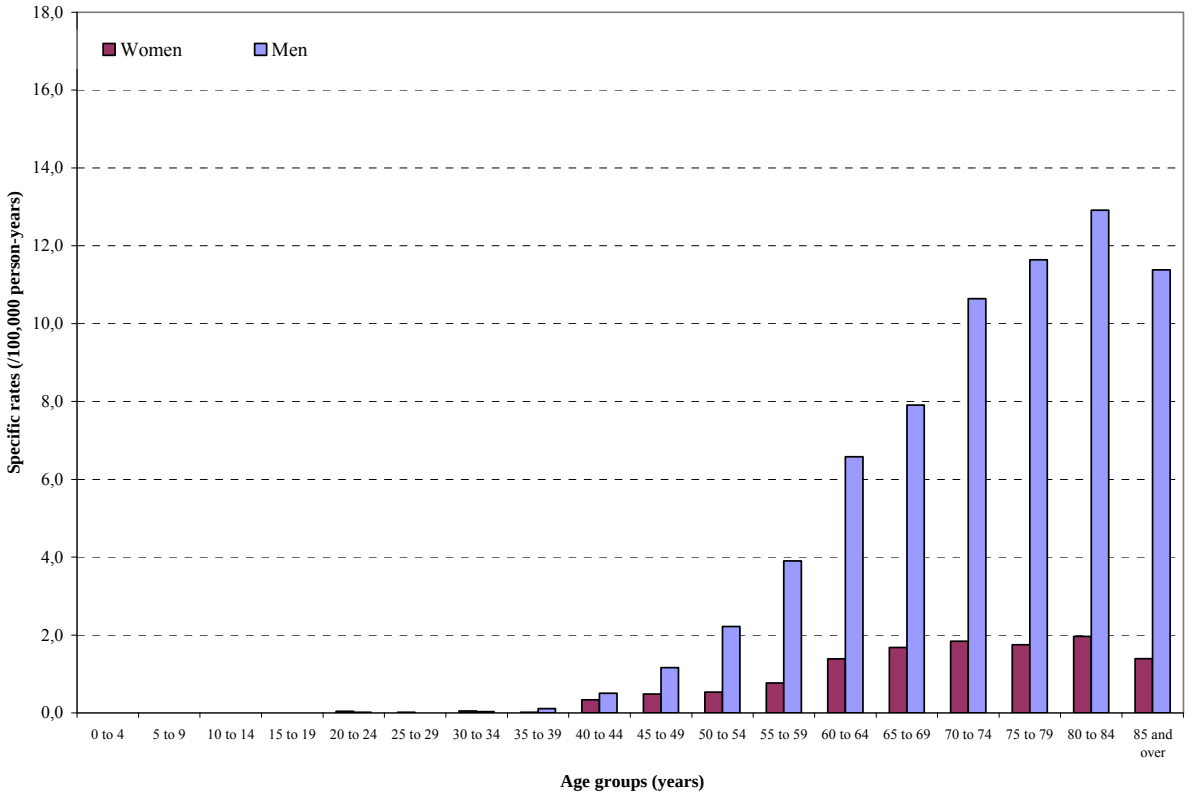

Figure 3 Specific incidence rates (/100,000 person-years) of malignant mesothelioma of the pleura by sex and five-year age group, Québec, 1982-2002

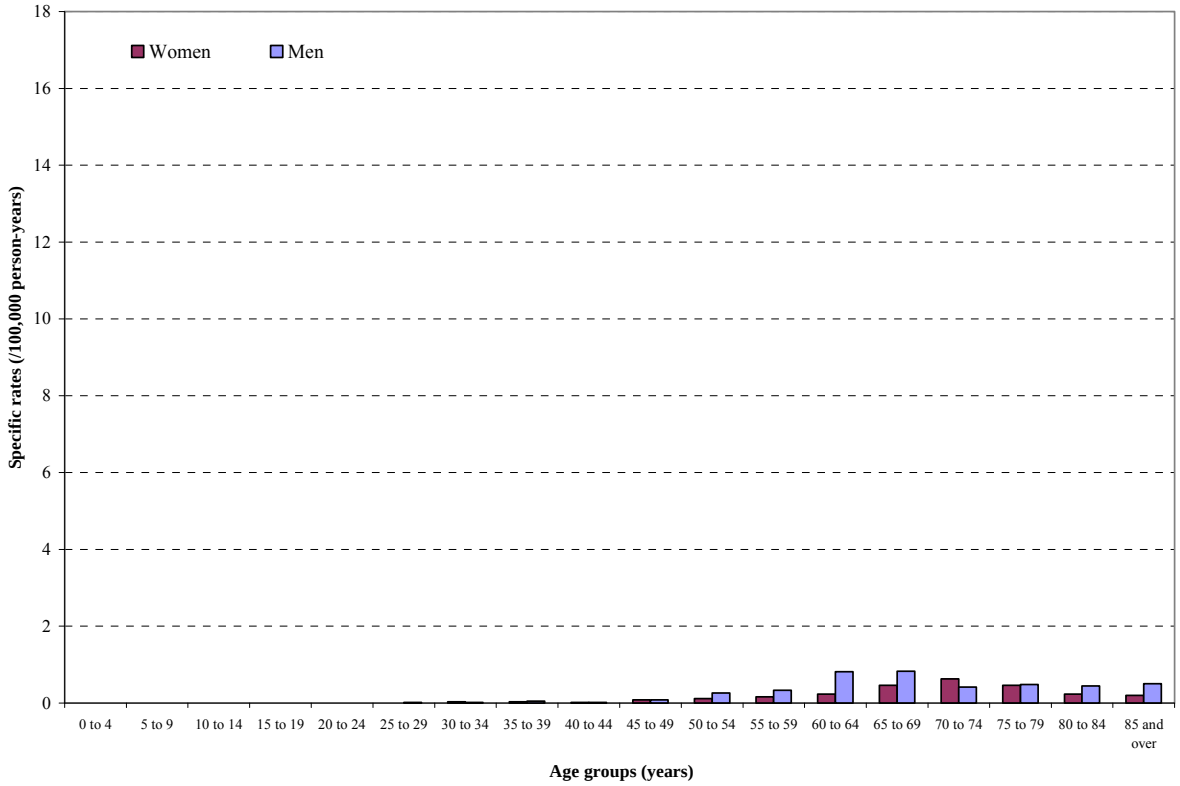

Figure 4 Specific incidence rates (/100,000 person-years) of malignant mesothelioma of the peritoneum by sex and five-year age group, Québec, 1982-2002

3.1.2 Annual trends

For all of Québec, the number of new cases and the age-standardized annual incidence rates of cancer of the pleura, malignant mesothelioma of the pleura[5] and malignant mesothelioma of the peritoneum are presented in Table 2. We observe that, among men, the incidence rates of cancer of the pleura and malignant mesothelioma of the pleura (Figure 5) showed a statistically significant increase between the years 1982 and 2002, with an average annual rate of increase of 2.0% for cancer of the pleura and 3.6% for malignant mesothelioma of the pleura. For malignant mesothelioma of the peritoneum, the annual incidence rates were stable for this same period. Finally, among women, no statistically significant linear time trend is observed for the annual incidence rates of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum.

[5] Mesotheliomas of the pleura are a sub-set of cancers of the pleura.

Table 2 Number of new cases and age-standardized incidence rates (/100,000 person-years) of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum by sex and year, Québec, 1982-2002

Year	Cancer of the pleura				Malignant mesothelioma of the pleura				Malignant mesothelioma of the peritoneum			
	Women		Men		Women		Men		Women		Men	
	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate	Number of cases	Rate
1982	22	0.786	38	1.587	12	0.447	27	1.088	1	0.037	3	0.140
1983	23	0774	43	1.840	15	0.507	31	1.308	2	0.061	6	0.233
1984	14	0.449	47	1.835	10	0.329	38	1.441	4	0.123	1	0.041
1985	15	0.466	43	1.814	9	0.281	31	1.284	7	0.227	7	0.269
1986	18	0.559	49	1.972	14	0.439	41	1.665	2	0.067	6	0.228
1987	20	0.580	50	1.845	12	0.351	40	1.469	3	0.094	7	0.240
1988	27	0.792	63	2.458	16	0.474	44	1.666	6	0.181	2	0.068
1989	19	0.534	60	2.220	14	0.405	52	1.921	7	0.187	4	0.142
1990	17	0.476	69	2.541	8	0.242	54	1.955	1	0.027	9	0.324
1991	18	0.458	74	2.650	8	0.205	52	1.859	0	0.000	3	0.085
1992	17	0.445	59	2.050	15	0.398	58	1.993	4	0.104	6	0.184
1993	15	0.383	61	2.105	14	0.361	57	1.957	1	0.030	5	0.156
1994	25	0.635	82	2.784	22	0.567	73	2.452	5	0.126	6	0.177
1995	11	0.282	72	2.298	9	0.237	69	2.194	1	0.026	4	0.116
1996	24	0.579	68	2.192	20	0.495	62	1.991	3	0.079	5	0.176
1997	32	0.782	87	2.677	26	0.645	79	2.394	4	0.102	4	0.117
1998	22	0.499	93	2.800	17	0.401	80	2.404	4	0.098	4	0.116
1999	22	0.520	83	2.489	21	0.495	75	2.225	4	0.095	6	0.164
2000	26	0.559	96	2.887	22	0.489	93	2.805	3	0.069	2	0.057
2001	18	0.407	74	2.122	16	0.373	71	2.039	6	0.130	6	0.168
2002	26	0.566	90	2.467	20	0.461	83	2.235	4	0.091	2	0.056
Total	431		1 401		320		1 210		72		98	
p-value[1]		0.178		< 0.001		0.258		< 0.001		0.665		0.066

[1] p-value of the linear trend test.

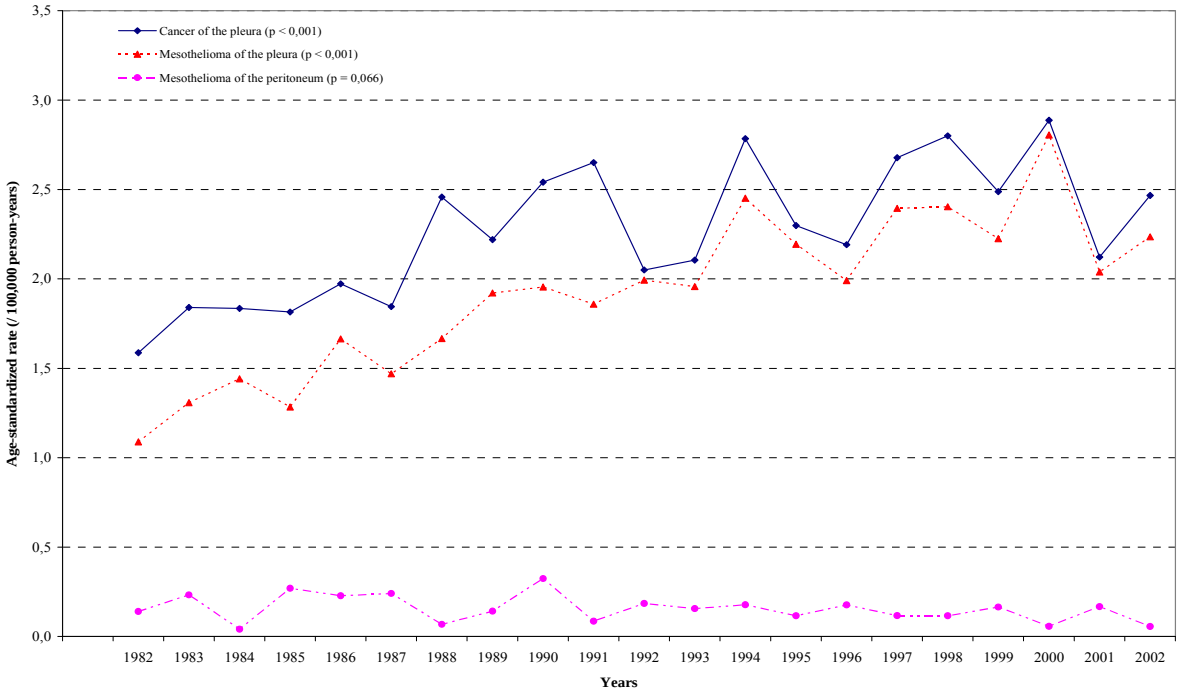

Figure 5 Age-standardized annual incidence rates (/100,000 person-years) of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum among men, Québec, 1982-2002

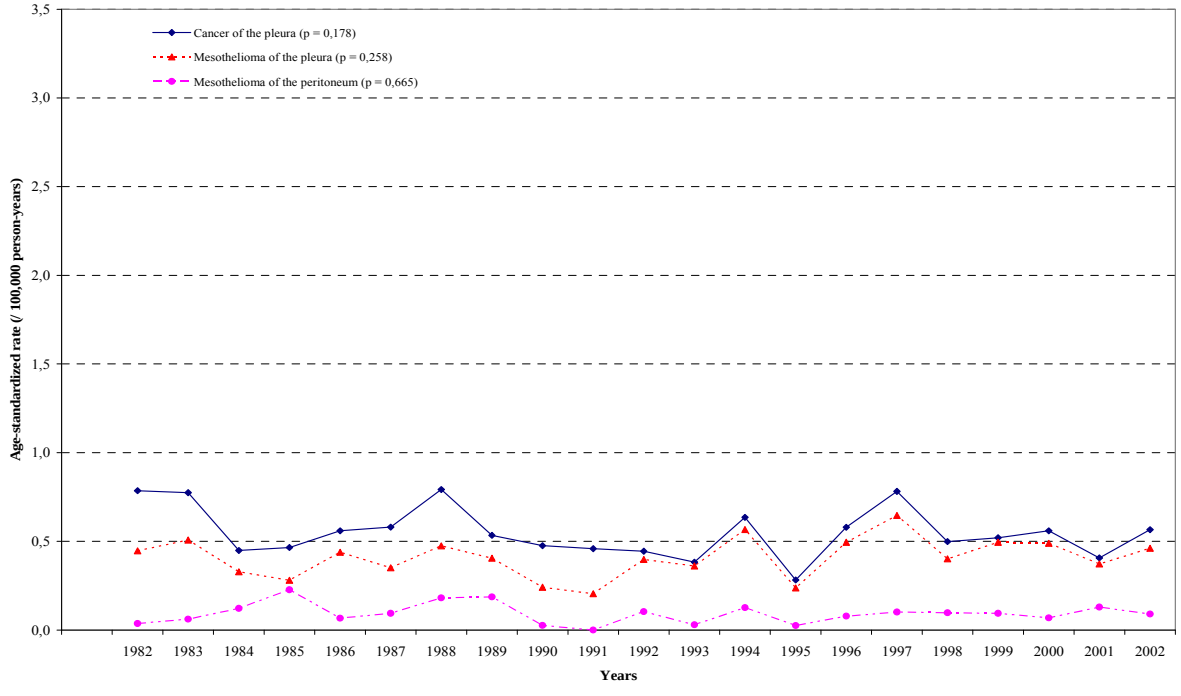

Figure 6 Age-standardized annual incidence rates (/100,000 person-years) of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum among women, Québec, 1982-2002

Analysis of the mean age of new cases of cancer was performed by aggregating the data by five-year period. The results of these analyses for new cases of malignant mesothelioma of the pleura and the peritoneum, and for new cases of cancer of the pleura are presented in Table 3. Among women, the mean age of new cases of malignant mesothelioma of the pleura, malignant mesothelioma of the peritoneum and cancer of the pleura does not vary significantly over time. Among men, the mean age of new cases of cancer and malignant mesothelioma of the pleura varies over the four study periods. More precisely, for cancer of the pleura, the mean age of new cases diagnosed over the 1992-1996 and 1997-2002 periods is significantly higher than that of cases diagnosed during the 1982-1986 period. Furthermore, the mean age for the 1997-2002 period is significantly higher than that for the 1987-1991 period. For malignant mesothelioma of the pleura, the mean age of new cases diagnosed over the 1992-1996 and 1997-2002 periods is significantly higher than that of cases diagnosed during the two previous periods.

Table 3 Mean age of new cases of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum by sex and five-year period, Québec, 1982-2002

	Women		Men	
	Mean[1]	99% CI	Mean[1]	99% CI
Cancer of the pleura				
1982-1986	64.5 [a]	(60.3-68.7)	63.5 [a]	(61.4-65.6)
1987-1991	66.4 [a]	(62.9-69.9)	64.5 [a,b]	(62.8-66.3)
1992-1996	67.0 [a]	(63.2-70.7)	67.2 [b, c]	(65.6-68.7)
1997-2002[2]	66.6 [a]	(63.5-69.8)	68.1 [c]	(66.9-69.2)
p-value[3]	0.641		< 0.001	
Malignant mesothelioma of the pleura				
1982-1986	64.7 [a]	(59.8-69.5)	62.9 [a]	(60.7-65.1)
1987-1991	64.0 [a]	(59.6-68.3)	63.2 [a]	(61.1-65.2)
1992-1996	64.8 [a]	(61.0-68.6)	66.9 [b]	(65.4-68.5)
1997-2002[2]	64.5 [a]	(61.4-67.7)	67.8 [b]	(66.5-69.0)
p-value[3]	0.985		< 0.001	
Malignant mesothelioma of the peritoneum				
1982-1986	65.6 [a]	(58.4-72.9)	62.5 [a]	(56.1-68.9)
1987-1991	59.8 [a]	(50.4-69.2)	59.4 [a]	(51.9-67.0)
1992-1996	66.4 [a]	(57.3-75.5)	62.7 [a]	(57.4-68.0)
1997-2002[2]	66.2 [a]	(58.4-74.0)	63.1 [a]	(57.5-68.7)
p-value[3]	0.360		0.640	

[1] The means are statistically the same, at the 1% level, when the letters are identical, results obtained with the Bonferroni multiple comparisons test.

[2] Contains the data for 6 years.

[3] p-value of the global comparison of the 4 means, calculated using a variance analysis.

3.1.3 Geographic distributions

Tables 4 to 6 present respectively the incidence rates of cancer of the pleura, malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum, by health region. Among men, the incidence rates of cancer of the pleura indicate a statistically significant excess, compared to the provincial rate, in the Chaudière-Appalaches, Lanaudière and Montérégie regions and a statistically significant deficit in the Bas-Saint-Laurent and Outaouais regions (Table 4). Among women, we find a statistically significant excess in the incidence of cancer of the pleura in the Chaudière-Appalaches region. The same results are observed if SIRs are used instead of SRRs (Appendix, Table A-1).

The geographic distribution of malignant mesothelioma of the pleura (Table 5) reveals that, among men and women, significant excesses of the incidence of this disease are observed in the Chaudière-Appalaches region. Also, only among men, we observe a significant excess in the incidence of malignant mesothelioma of the pleura in the Lanaudière and Montérégie regions and a statistically significant deficit in the Bas-Saint-Laurent and Outaouais regions. The same results are observed if SIRs are used instead of SRRs (Appendix, Table A-2).

Finally, no health region presents significant excess or deficit in the incidence of malignant mesothelioma of the peritoneum, either among men or among women (Table 6). The same results are observed if SIRs are used instead of SRRs (Appendix, Table A-3).

Table 4 Incidence of cancer of the pleura by sex and health region, 1982-2002

Region	Women[1]				Men[1]			
	Number of cases	SR[2]	SRR	p-value of SRR	Number of cases	SR[2]	SRR	p-value of SRR
01 Bas-Saint-Laurent	6	0.256[3]	0.469	0.068	23	1.112	0.482	0.001
02 Saguenay–Lac-Saint-Jean	21	0.762	1.397	0.136	65	3.073	1.330	0.034
03 Capitale-Nationale	26	0.333	0.610	0.015	122	2.335	1.011	0.910
04 Mauricie and Centre-du-Québec	31	0.516	0.947	0.773	105	2.294	0.993	0.947
05 Estrie	15	0.475	0.871	0.601	62	2.386	1.033	0.802
06 Montréal	136	0.553	1.015	0.884	354	2.048	0.887	0.045
07 Outaouais	6	0.223[3]	0.408	0.030	28	1.203	0.521	0.001
08 Abitibi-Témiscamingue					14	1.208	0.523	0.019
09 Côte-Nord	5	0.707[3]	1.298	0.574	12	1.563	0.677	0.219
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine	8	0.643[3]	1.178	0.648	16	1.461	0.633	0.070
12 Chaudière-Appalaches	39	0.967	1.773	0.001	125	3.845	1.665	0.000
13 Laval	14	0.422	0.774	0.347	57	2.217	0.960	0.773
14 Lanaudière	25	0.799	1.466	0.064	91	3.318	1.437	0.001
15 Laurentides	17	0.454	0.833	0.462	53	1.716	0.743	0.040
16 Montérégie	78	0.644	1.182	0.176	272	2.862	1.239	0.002
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	431	0.545			1 401	2.310		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

Table 5 Incidence of malignant mesothelioma of the pleura by sex and health region, 1982-2002

Region	Women[1]				Men[1]			
	Number of cases	SR[2]	SRR	p-value of SRR	Number of cases	SR[2]	SRR	p-value of SRR
01 Bas-Saint-Laurent					20	0.977	0.494	0.002
02 Saguenay–Lac-Saint-Jean	13	0.472	1.147	0.628	60	2.796	1.413	0.013
03 Capitale-Nationale	22	0.287	0.698	0.105	104	1.983	1.002	0.987
04 Mauricie and Centre-du-Québec	20	0.345	0.839	0.452	93	2.025	1.023	0.835
05 Estrie	10	0.327	0.794	0.477	60	2.301	1.163	0.256
06 Montréal	94	0.394	0.958	0.719	289	1.671	0.844	0.011
07 Outaouais	5	0.184[3]	0.446	0.074	26	1.110	0.561	0.004
08 Abitibi-Témiscamingue					12	1.042	0.526	0.032
09 Côte-Nord	5	0.707[3]	1.720	0.243	11	1.425[3]	0.720	0.327
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine	7	0.558[3]	1.355	0.430	12	1.075	0.543	0.036
12 Chaudière-Appalaches	33	0.825	2.006	0.000	111	3.382	1.708	0.000
13 Laval	12	0.359	0.872	0.642	48	1.747	0.883	0.409
14 Lanaudière	19	0.600	1.459	0.111	79	2.765	1.397	0.005
15 Laurentides	15	0.398	0.969	0.904	42	1.379	0.697	0.026
16 Montérégie	59	0.489	1.190	0.221	243	2.534	1.280	0.001
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	320	0.411			1 210	1.980		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

Table 6 Incidence of malignant mesothelioma of the peritoneum by sex and health region, 1982-2002

	Women[1]				Men[1]			
Region	**Number of cases**	**SR[2]**	**SRR**	**p-value of SRR**	**Number of cases**	**SR[2]**	**SRR**	**p-value of SRR**
01 Bas-Saint-Laurent								
02 Saguenay–Lac-Saint-Jean	6	0.232[3]	2.503	0.032				
03 Capitale-Nationale	8	0.108[3]	1.166	0.681	5	0.078[3]	0.514	0.148
04 Mauricie and Centre-du-Québec								
05 Estrie								
06 Montréal	18	0.076	0.819	0.456	35	0.193	1.279	0.214
07 Outaouais								
08 Abitibi-Témiscamingue								
09 Côte-Nord								
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine								
12 Chaudière-Appalaches					6	0.164[3]	1.089	0,840
13 Laval	7	0.215[3]	2.322	0.034				
14 Lanaudière					6	0.217[3]	1.435	0.410
15 Laurentides					6	0.165[3]	1.096	0.829
16 Montérégie	15	0.125	1.348	0.293	18	0.182	1.204	0.479
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	72	0.093			98	0.151		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

3.1.4 Canadian and international comparisons

For the period 1993 to 1997, compared to the rest of Canada, Québec is the province with the highest incidence rate, and consequently the highest SIR, of malignant mesothelioma among men and among women (Table 7). However, among women the SIRs of malignant mesothelioma in Manitoba, in Alberta and in Prince Edward Island were not statistically different from 100 and therefore did not differ significantly from that of Québec (reference province SIR = 100). Among men in British Columbia, in Manitoba and in Prince Edward Island, the SIRs of malignant mesothelioma were not statistically different from that of Québec.

For the period 1988 to 1992, Québec was again the province where the incidence rate, and therefore the SIR, of malignant mesothelioma were among the highest in Canada (Appendix, Table A-4). However, among women the SIRs of Saskatchewan, Newfoundland and Nova Scotia were not significantly different from that of Québec, while among men, the SIRs of Manitoba, British Columbia, Nova Scotia and Prince Edward Island were not statistically different from that of Québec.

The international comparisons among women (Table 8), for the period 1993 to 1997 reveal that the SIRs of malignant mesothelioma for Western Australia and for the region of Scotland in the United Kingdom were significantly higher than that of Québec, and that those of most of the other regions of Australia did not differ significantly from that of Québec. However, the SIRs in the rest of Canada, in the United States, New Zealand, the Scandinavian countries, the Netherlands, Israel and several Eastern European countries were significantly lower than that of Québec. The data from 1988 to 1992 are presented in the appendix in Table A-5, in the same order of countries as in Table 7. We observe in the table that from 1988 to 1992, the SIRs of the different countries were comparable to or lower than that of Québec. However, no SIR was significantly higher.

Table 9 presents the SIRs of malignant mesotheliomas among men, for the countries that we considered, for the period from 1993 to 1997. In particular, we observe in this table that the SIRs of malignant mesotheliomas in New Zealand, the Netherlands and in several regions of the United Kingdom and of Australia are significantly higher compared to that of Québec. The SIR of malignant mesotheliomas in Denmark was not significantly different from that measured in Québec. Finally, among the countries where the SIR of malignant mesotheliomas was significantly lower than in Québec, we note Norway, Sweden, Finland, United States, Canada as a whole, Slovenia, Israel, Czech Republic, Slovakia and Estonia. We can see in Table A-6 in the appendix that the data for the period 1988 to 1992 produces the same portrait as that for the period 1993 to 1997.

Table 7 SIR and standardized rate of malignant mesothelioma (pleura, peritoneum and pericardium), by province and territory, Canada 1993-1997, in comparison with Québec

Province/Territory	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Women					
Québec	115	115.0	0.4	100	
Manitoba	13	18.1	0.3	72	(38-123)
Alberta	23	34.7	0.2	66	(42-100)
Ontario	83	169.8	0.2	49	(39-61)
Prince Edward Island	1	2.1	0.1	47	(1-264)
Saskatchewan	7	16.3	0.1	43	(17-88)
British Columbia	23	58.9	0.2	39	(25-59)
New Brunswick	4	11.7	0.1	34	(9-88)
Nova Scotia	4	14.9	0.1	27	(7-69)
Newfoundland	1	7.7	0.0	13	(0-72)
Northwest Territories[2]	0	0.9	--	--	--
Men					
Québec	378	378.0	1.6	100	
British Columbia	189	213.2	1.4	89	(76-102)
Manitoba	50	63.5	1.2	79	(58-104)
Alberta	93	125.1	1.3	74	(60-91)
Prince Edward Island	5	7.5	1.2	67	(22-156)
Ontario	387	587.4	1.1	66	(59-73)
Nova Scotia	30	51.3	0.9	59	(39-84)
New Brunswick	21	40.8	0.8	52	(32-79)
Saskatchewan	29	61.1	0.9	47	(32-68)
Northwest Territories[2]	1	3.8	0.3	26	(1-147)
Newfoundland	7	28.2	0.4	25	(10-51)

[1] Age-standardized rate (/100,000 person-years) based on the standard world population.

[2] Data for the period from 1983 to 1997.

Table 8 SIR and standardized rate of malignant mesothelioma (pleura, peritoneum and pericardium), among women, by country, 1993-1997, in comparison with Québec

Country	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Western Australia	36	23.2	0.6	155	(109-215)
United Kingdom, Scotland	120	96.3	0.5	125	(103-149)
Australia, Victoria	83	69.1	0.5	120	(96-149)
South Australia	25	24.3	0.5	103	(67-152)
Canada, Québec	**115**	**115.0**	**0.4**	**100**	**-**
Australia, New South Wales	95	94.6	0.4	100	(81-123)
United Kingdom, England[2]	846	934.2	0.4	91	(85-97)
Netherlands	222	261.1	0.3	85	(74-97)
Denmark	71	96.4	0.3	74	(58-93)
Sweden	127	173.2	0.3	73	(61-87)
United States, SEER	272	379.9	0.3	72	(63-81)
Australia, Queensland	33	47.0	0.3	70	(48-99)
Finland	62	97.0	0.2	64	(49-82)
Canada[3]	274	449.7	0.2	61	(54-69)
Czech Republic	112	189.3	0.3	59	(49-71)
Norway	45	79.2	0.2	57	(41-76)
New Zealand	29	52.7	0.2	55	(37-79)
Slovakia	45	83.6	0.2	54	(39-72)
Estonia[4]	14	29.4	0.2	48	(26-80)
Israel[4]	30	67.4	0.2	45	(30-64)
United Kingdom, Northern Ireland	12	26.6	0.2	45	(23-79)
Slovenia[4]	16	37.1	0.2	43	(25-70)

[1] Age standardized rate (/100,000 person-years) based on the standard world population.

[2] Includes the regional registries of: South and Western, South Thames, Oxford, East Anglia, Trent, West Midlands, Mersey, North Western, Yorkshire.

[3] Includes Québec.

[4] Disparities in the number of observed cases were remarked between the published tables and the results obtained from the electronic database.

Table 9 SIR and standardized rate of malignant mesothelioma (pleura, peritoneum and pericardium), among men, by country, 1993-1997, in comparison with Québec

Country	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Western Australia	274	85.1	2.6	322	(285-363)
United Kingdom, Scotland	652	315.7	3.4	207	(191-223)
Australia, New South Wales	645	341.1	3.0	189	(175-204)
Netherlands	1 451	877.8	2.8	165	(157-174)
United Kingdom, England[2]	5 041	3 154.5	2.7	160	(155-164)
South Australia	139	87.4	2.6	159	(134-188)
Australia, Victoria	378	246.7	2.5	153	(138-169)
Australia, Queensland	258	174.6	2.7	148	(130-167)
United Kingdom, Northern Ireland	112	87.6	2.1	128	(105-154)
New Zealand	217	187.8	1.9	116	(101-132)
Canada, Québec	**378**	**378.0**	**1.6**	**100**	**-**
Denmark	322	336.9	1.6	96	(85-107)
Norway	220	278.6	1.3	79	(69-90)
Sweden	497	630.5	1.3	79	(72-86)
United States, SEER	998	1 262.4	1.2	79	(74-84)
Canada[3]	1 190	1 558.7	1.3	76	(72-81)
Finland	196	293.3	1.1	67	(58-77)
Slovenia	47	105.4	0.8	45	(33-59)
Israel[4]	71	227.2	0.6	31	(24-39)
Czech Republic	150	563.4	0.5	27	(23-31)
Slovakia	64	250.1	0.4	26	(20-33)
Estonia	13	72.8	0.3	18	(10-31)

1 Age-standardized rate (/100,000 person-years) based on the standard world population.

2 Includes the regional registries of: South and Western, South Thames, Oxford, East Anglia, Trent, West Midlands, Mersey, North Western, Yorkshire.

3 Includes Québec.

4 Disparities in the number of observed cases were remarked between the published tables and the results obtained from the electronic database.

3.2 MORTALITY FROM CANCER OF THE PLEURA, CANCER OF THE PERITONEUM AND ASBESTOSIS

3.2.1 Mortality by age and sex

For the period from 1981 to 2003, the *Fichier des décès* contains 1,059 deaths from cancer of the pleura, 824 deaths from cancer of the peritoneum and 195 deaths from asbestosis. The ratios of the number of deaths among men compared to the number of deaths among women were 2.65 for cancer of the pleura, 0.87 for cancer of the peritoneum and 47.75 for asbestosis. Thus, deaths from cancer of the pleura and from asbestosis were much more frequent among men than among women, while deaths from cancer of the peritoneum were a little less frequent among men than among women.

The analysis of the specific mortality rates, by sex and by age group, from cancer of the pleura reveal that this cause of death affected mainly people aged 50 and over (Figure 7). This same observation applies to mortality from cancer of the peritoneum (Figure 8) and to mortality from asbestosis (Figure 9).

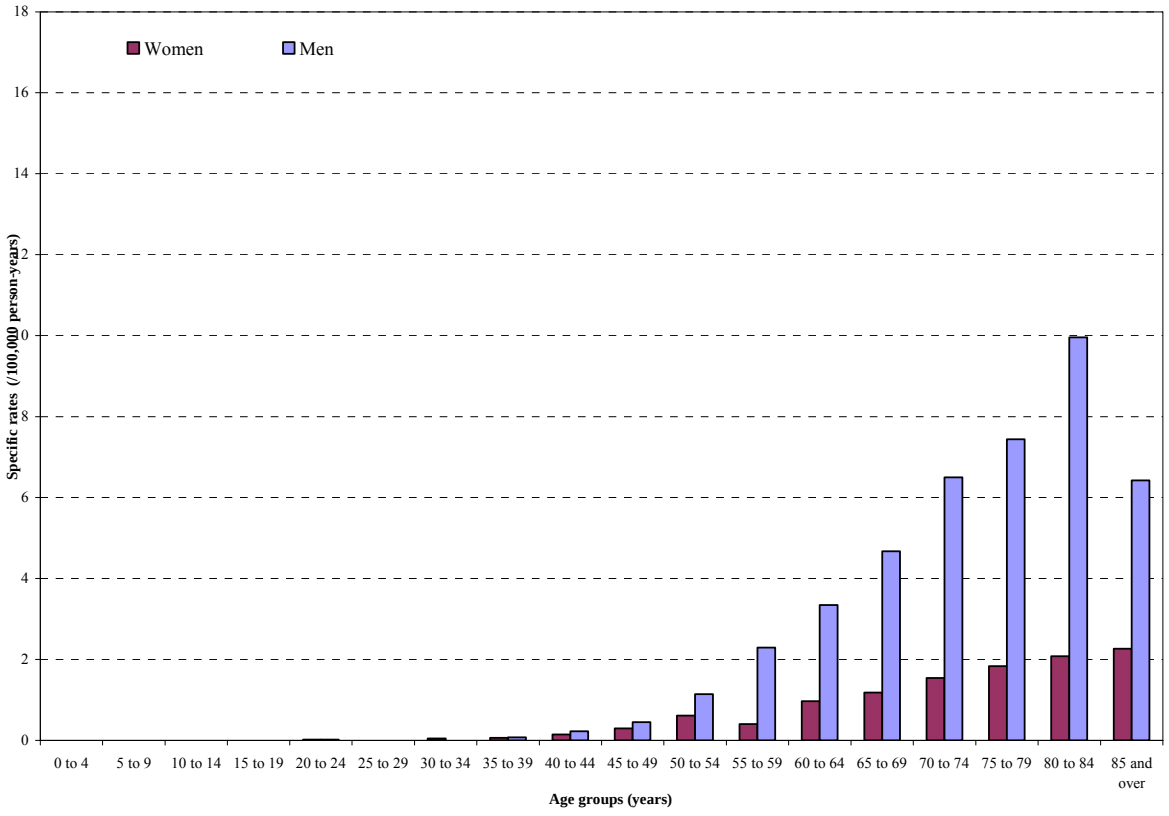

Figure 7 Specific mortality rates (/100,000 person-years) for cancer of the pleura by sex and five-year age group, Québec, 1981-2003

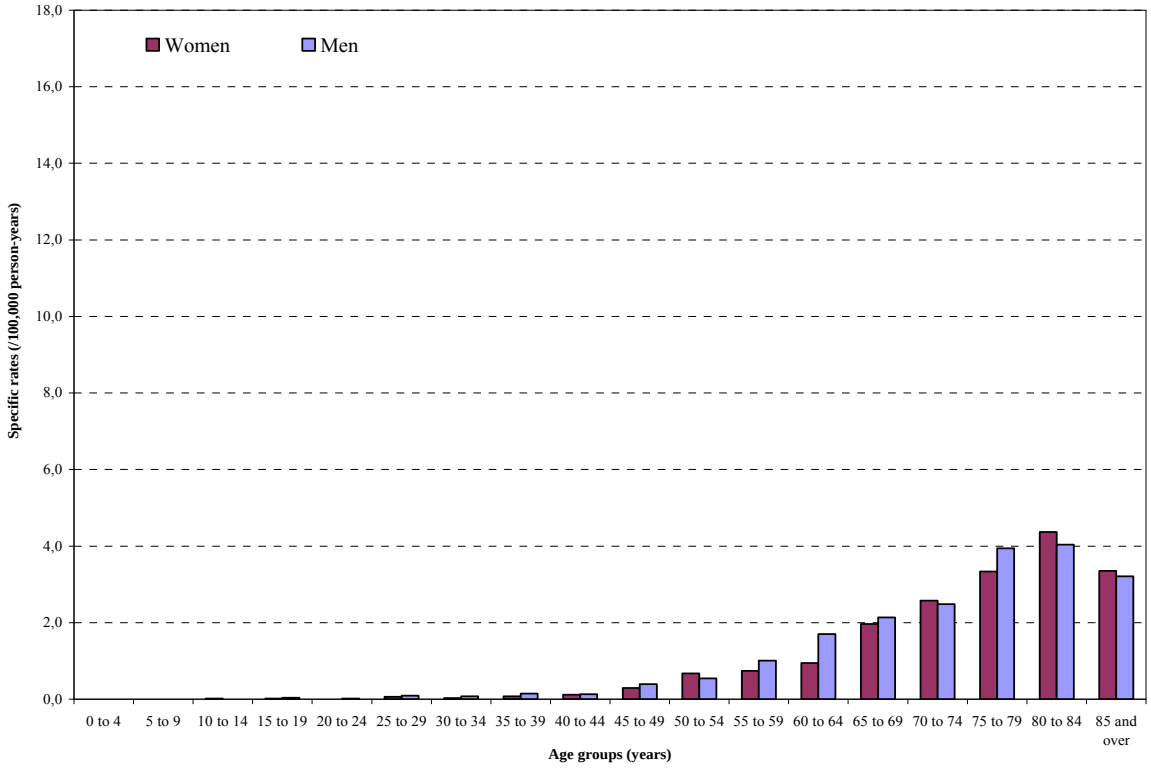

Figure 8 Specific mortality rates (/100,000 person-years) for cancer of the peritoneum by sex and five-year age group, Québec, 1981-2003

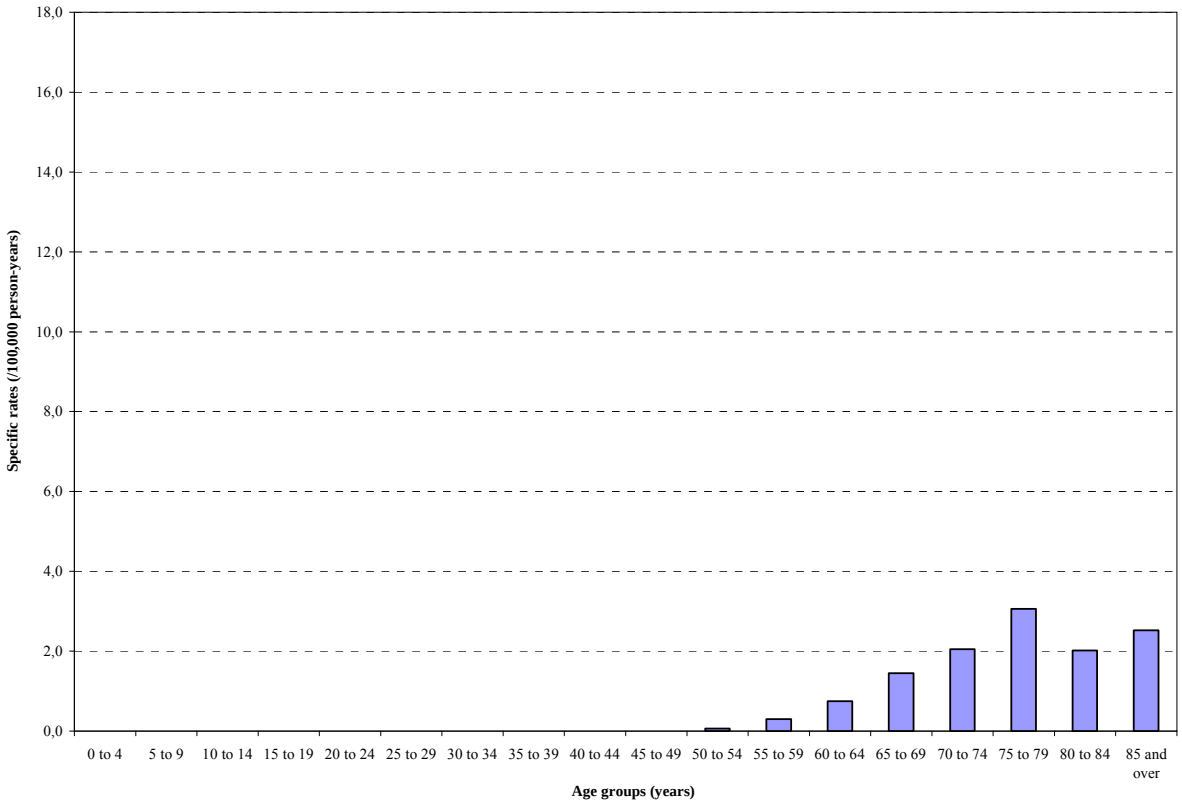

Figure 9 Specific mortality rates (/100,000 person-years) for asbestosis among men by five-year age group, Québec, 1981-2003

3.2.2 Annual trends

For all of Québec, the number of deaths and the age-standardized mortality ratios, by year, for cancer of the pleura, cancer of the peritoneum and asbestosis are presented in Table 10. For the entire period from 1981 to 2003, among men, although mortality varies from year to year, there is no significant increase or decrease in mortality from cancer of the pleura, cancer of the peritoneum and asbestosis (Figure 10). For the same period, among women, there is no significant time trend in the mortality rate from cancer of the peritoneum, or from cancer of the pleura (Figure 11). Note that, for reasons of confidentiality, the four cases of death from asbestosis among women are not presented by year.

Table 10 Number of deaths and age-standardized mortality rates (/100,000 person-years) for cancer of the pleura, cancer of the peritoneum and asbestosis by sex and year, Québec, 1981-2003

	Cancer of the pleura				Cancer of the peritoneum				Asbestosis	
	Women		Men		Women		Men		Men	
Year	Number of deaths	Rate	Number of deaths	Rate	Number of deaths	Rate	Number of deaths	Rate	Number of deaths	Rate
1981	3	0.099	14	0.636	17	0.548	19	0.783	5	0.216
1982	13	0.465	24	0.990	9	0.315	18	0.785	4	0.206
1983	9	0.311	18	0.754	18	0.578	20	0.824	10	0.387
1984	16	0.544	19	0.768	15	0.481	17	0.697	11	0.407
1985	13	0.406	42	1.714	14	0.461	11	0.440	5	0.203
1986	7	0.214	24	0.992	12	0.385	12	0.473	11	0.438
1987	12	0.361	32	1.310	16	0.474	23	0.892	7	0.263
1988	16	0.472	30	1.070	17	0.515	20	0.750	11	0.391
1989	10	0.293	33	1.260	16	0.446	10	0.396	4	0.156
1990	7	0.213	36	1.320	15	0.415	17	0.616	6	0.270
1991	12	0.319	50	1.824	13	0.337	19	0.628	7	0.243
1992	14	0.384	45	1.511	18	0.453	8	0.264	4	0.142
1993	14	0.372	40	1.386	17	0.430	17	0.557	7	0.253
1994	20	0.492	34	1.181	24	0.596	16	0.511	11	0.390
1995	21	0.524	31	0.979	18	0.445	20	0.649	4	0.129
1996	8	0.199	34	1.176	17	0.416	18	0.563	7	0.248
1997	18	0.433	51	1.552	25	0.589	17	0.558	7	0.236
1998	14	0.301	51	1.568	20	0.458	10	0.322	12	0.402
1999	18	0.434	46	1.402	21	0.469	15	0.435	11	0.346
2000	12	0.249	35	1.054	23	0.531	10	0.332	12	0.372
2001	11	0.227	35	0.947	29	0.599	21	0.582	8	0.241
2002	9	0.196	20	0.585	33	0.669	23	0.653	8	0.239
2003	13	0.245	25	0.674	33	0.664	23	0.627	19	0.549
Total	290		769		440		384		191	
p-value[1]		0.291		0.947		0.081		0.013		0.335

[1] p-value of the linear trend test.

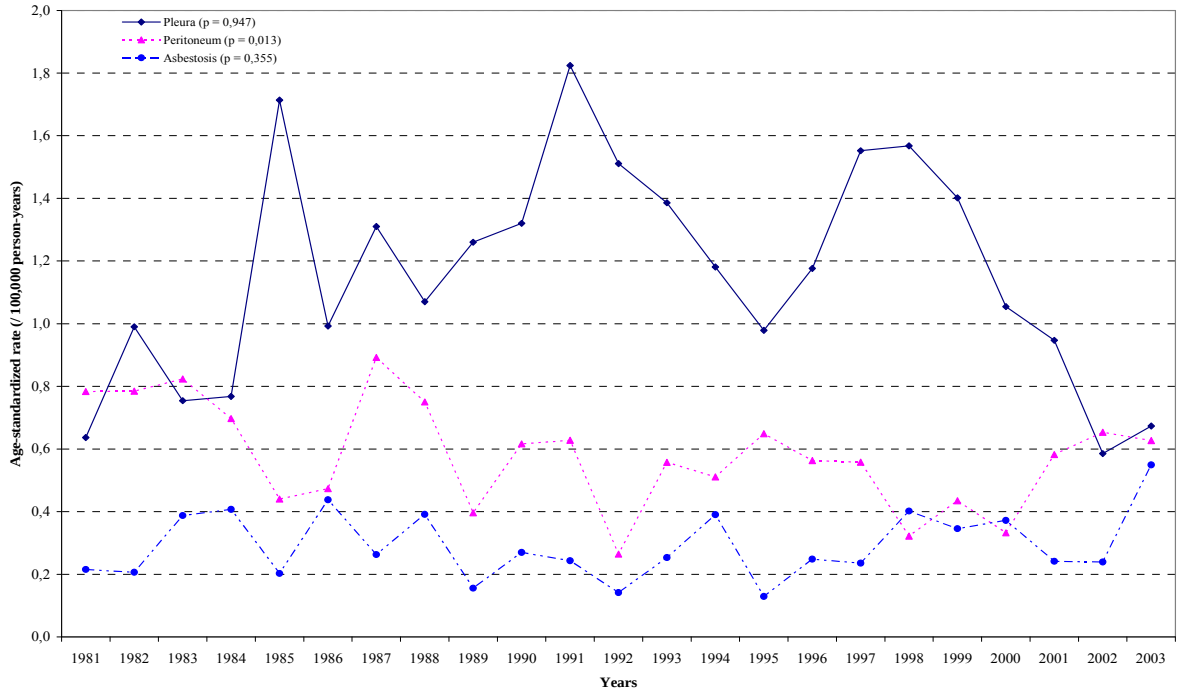

Figure 10 Age-standardized annual mortality rates (/100,000 person-years) for cancer of the pleura, cancer of the peritoneum and asbestosis among men, Québec, 1981-2003

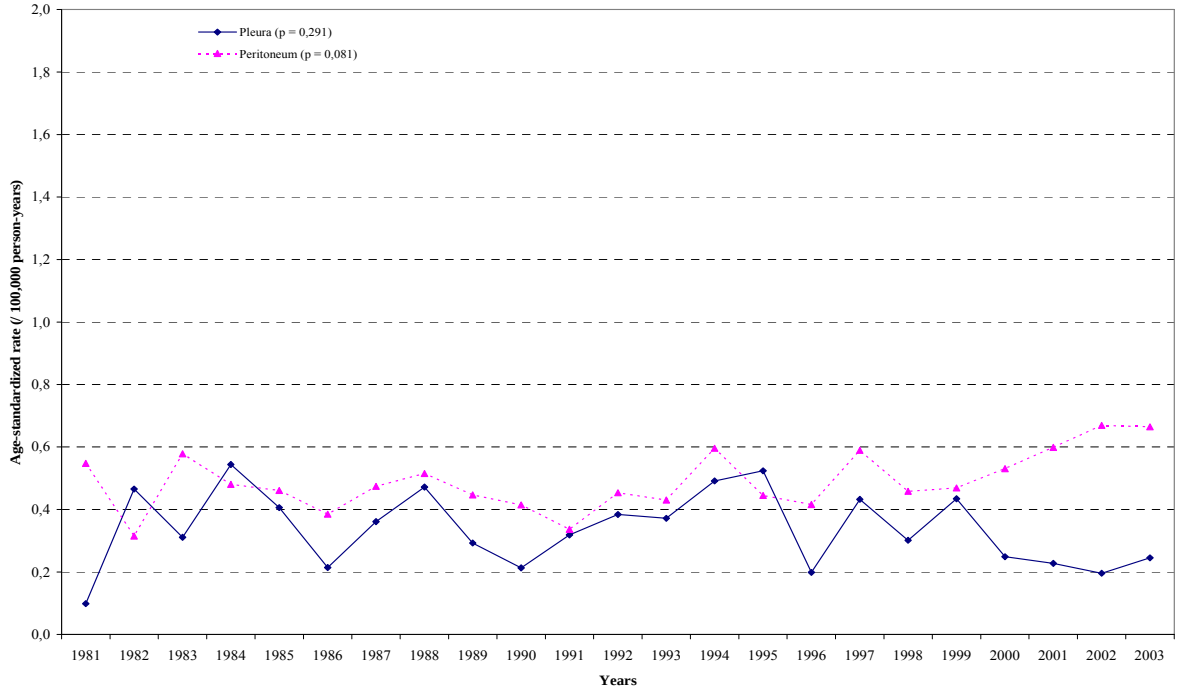

Figure 11 Age-standardized annual mortality rates (/100,000 person-years) for cancer of the pleura and cancer of the peritoneum among women, Québec, 1981-2003

For cancer of the pleura and asbestosis, among men, the mean age at death is statistically different by five-year periods studied (Table 11). More precisely, for asbestosis, the mean age of men who died between 1996 and 2000, and between 2001 and 2003 is higher compared to men who died during the period from 1981 to 1985. For cancer of the peritoneum among men, and for cancers of the peritoneum and the pleura among women, no statistically significant difference in mean age at time of death by five-year period is observed.

Table 11 Mean age at death in cases of cancer of the pleura and the peritoneum and asbestosis by sex and five-year period, Québec, 1981-2003

	Women		Men	
	Mean[1]	99% CI	Mean[1]	99% CI
Cancer of the pleura				
1981-1985	64.6[a]	(60.5-68.7)	64.5[a]	(62.4-66.5)
1986-1990	62.5[a]	(58.7-66.4)	65.1[a]	(63.2-67.0)
1991-1995	67.9[a]	(65.3-70.4)	67.6[a,b]	(66.1-69.0)
1996-2000	68.8[a]	(65.6-72.1)	69.0[b]	(67.7-70.3)
2001-2003[2]	71.7 [a]	(66.9-76.4)	69.6[a,b]	(67.2-72.0)
p-value[3]	0.012		< 0.001	
Cancer of the peritoneum				
1981-1985	65.4[a]	(61.9-68.8)	62.8[a]	(59.8-65.7)
1986-1990	68.6[a]	(65.9-71.3)	64.7[a]	(62.0-67.4)
1991-1995	70.2[a]	(67.5-72.9)	61.5[a]	(58.2-64.8)
1996-2000	69.0[a]	(66.4-71.6)	67.8[a]	(65.0-70.5)
2001-2003[2]	71.2[a]	(68.3-74.1)	66.2[a]	(62.7-69.8)
p-value[3]	0.076		0.034	
Asbestosis				
1981-1985			66.1[a]	(63.3-68.9)
1986-1990			68.7[a,b]	(66.1-71.3)
1991-1995			71.0[a,b,c]	(68.6-73.4)
1996-2000			73.5[b,c]	(71.1-75.8)
2001-2003[2]			75.0[c]	(72.2-77.7)
p-value[3]			< 0.001	

[1] The means are statistically the same, at a 1% level, when the letters are identical, results obtained with the Bonferroni multiple comparisons test.

[2] Contains the data for 3 years.

[3] p-value of the global comparison of the 4 means, calculated using a variance analysis.

3.2.3 Geographic distributions

Tables 12 to 14 present respectively the mortality rates for cancer of the pleura, cancer of the peritoneum and asbestosis, by health region of residence at time of death. For cancer of the pleura (Table 12), the results indicate significant excesses of mortality (compared to the provincial mortality rate), among men and women, in the Chaudière-Appalaches region and among men only in the Lanaudière and Montérégie regions. For mortality from cancer of the peritoneum, no health region differs significantly from the rate for the province as a whole (Table 13). Finally, for mortality from asbestosis among men, significant excesses are observed in the Estrie and Chaudière-Appalaches health regions (Table 14). We observe the same results when the SMRs are considered (Appendix, Tables A-7, A-8 and A-9).

Table 12 Mortality from cancer of the pleura by sex and health region, 1981-2003

	Women[1]				Men[1]			
Region	**Number of deaths**	**SR[2]**	**SRR**	**p-value of SRR**	**Number of deaths**	**SR[2]**	**SRR**	**p-value of SRR**
01 Bas-Saint-Laurent					14	0.624	0.537	0.022
02 Saguenay–Lac-Saint-Jean	14	0.472	1.409	0.211	30	1.186	1.022	0.909
03 Capitale-Nationale	21	0.253	0.753	0.212	80	1.414	1.218	0.100
04 Mauricie and Centre-du-Québec	18	0.280	0.835	0.462	50	0.995	0.858	0.296
05 Estrie	10	0.285	0.850	0.616	36	1.288	1.110	0.542
06 Montréal	88	0.327	0.975	0.837	194	1.031	0.889	0.146
07 Outaouais					7	0.299[3]	0.258	0.001
08 Abitibi-Témiscamingue								
09 Côte-Nord								
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine					5	0.387[3]	0.334	0.015
12 Chaudière-Appalaches	34	0.780	2.327	0.000	82	2.251	1.940	0.000
13 Laval	16	0.452	1.349	0.245	33	1.179	1.016	0.931
14 Lanaudière	11	0.321	0.958	0.888	51	1.708	1.472	0.010
15 Laurentides	12	0.286	0.852	0.587	28	0.784	0.676	0.049
16 Montérégie	52	0.387	1.154	0.342	153	1.471	1.267	0.009
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	290	0.335			769	1.160		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

Table 13 Mortality from cancer of the peritoneum by sex and health region, 1981-2003

Region	Women[1]				Men[1]			
	Number of deaths	SR[2]	SRR	p-value of SRR	Number of deaths	SR[2]	SRR	p-value of SSR
01 Bas-Saint-Laurent	13	0.465	0.929	0.795	18	0.824	1.444	0.130
02 Saguenay–Lac-Saint-Jean	9	0.311[3]	0.621	0.159	10	0.424[3]	0.743	0.390
03 Capitale-Nationale	40	0.473	0.945	0.733	22	0.347	0.608	0.024
04 Mauricie and Centre-du-Québec	26	0.400	0.799	0.271	27	0.539	0.945	0.778
05 Estrie	26	0.690	1.378	0.116	17	0.617	1.081	0.754
06 Montréal	139	0.495	0.988	0.900	134	0.704	1.234	0.038
07 Outaouais	15	0.521	1.041	0.880	11	0.421	0.739	0.359
08 Abitibi-Témiscamingue	8	0.552[3]	1.103	0.784	5	0.373[3]	0.655	0.352
09 Côte-Nord	5	0.742[3]	1.482	0.387				
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine	12	0.900	1.797	0.047				
12 Chaudière-Appalaches	26	0.569	1.136	0.531	21	0.572	1.003	0.989
13 Laval	21	0.583	1.165	0.496	20	0.742	1.300	0.272
14 Lanaudière	21	0.623	1.244	0.329	14	0.484	0.849	0.563
15 Laurentides	16	0.381	0.762	0.286	20	0.532	0.934	0.771
16 Montérégie	61	0.460	0.919	0.537	58	0.533	0.935	0.640
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	440	0.501			384	0.570		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

Table 14 Mortality from asbestosis among men by health region, 1981-2003

Region	Number of deaths[1]	SR[2]	SRR	p-value of SRR
01 Bas-Saint-Laurent				
02 Saguenay–Lac-Saint-Jean				
03 Capitale-Nationale	7	0.135[3]	0.450	0.043
04 Mauricie and Centre-du-Québec				
05 Estrie	30	1.116	3.720	0.000
06 Montréal	49	0.261	0.870	0.390
07 Outaouais				
08 Abitibi-Témiscamingue				
09 Côte-Nord				
10 Nord-du-Québec				
11 Gaspésie–Îles-de-la-Madeleine				
12 Chaudière-Appalaches	56	1.560	5.199	0.000
13 Laval	6	0.237[3]	0.791	0.585
14 Lanaudière				
15 Laurentides	7	0.240[3]	0.799	0.575
16 Montérégie	22	0.225	0.751	0.216
17 Nunavik				
18 Terres-Cries-de-la-Baie-James				
Province	191	0.300		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

3.3 HOSPITALIZATIONS WITH FIRST MENTION OF ASBESTOSIS

3.3.1 Hospitalization by age and sex

The estimation of asbestosis incidence is based on the first hospitalization in which we find a mention of asbestosis during the period from 1992 to 2004. In Québec over this period, 2,072 new hospitalizations with first mention of asbestosis were recorded in the Med-Echo registry, either as primary or secondary diagnosis. This disease mainly affects men, with 1,993 incident cases (ratio men/women = 25.2). The specific rates by sex and age group (Figure 12) indicate that the rate of hospitalization with first mention of asbestosis was higher from age 50. The mean age of the 2,072 hospitalizations with first mention of asbestosis is 71.7 years among women and 71.3 years among men.

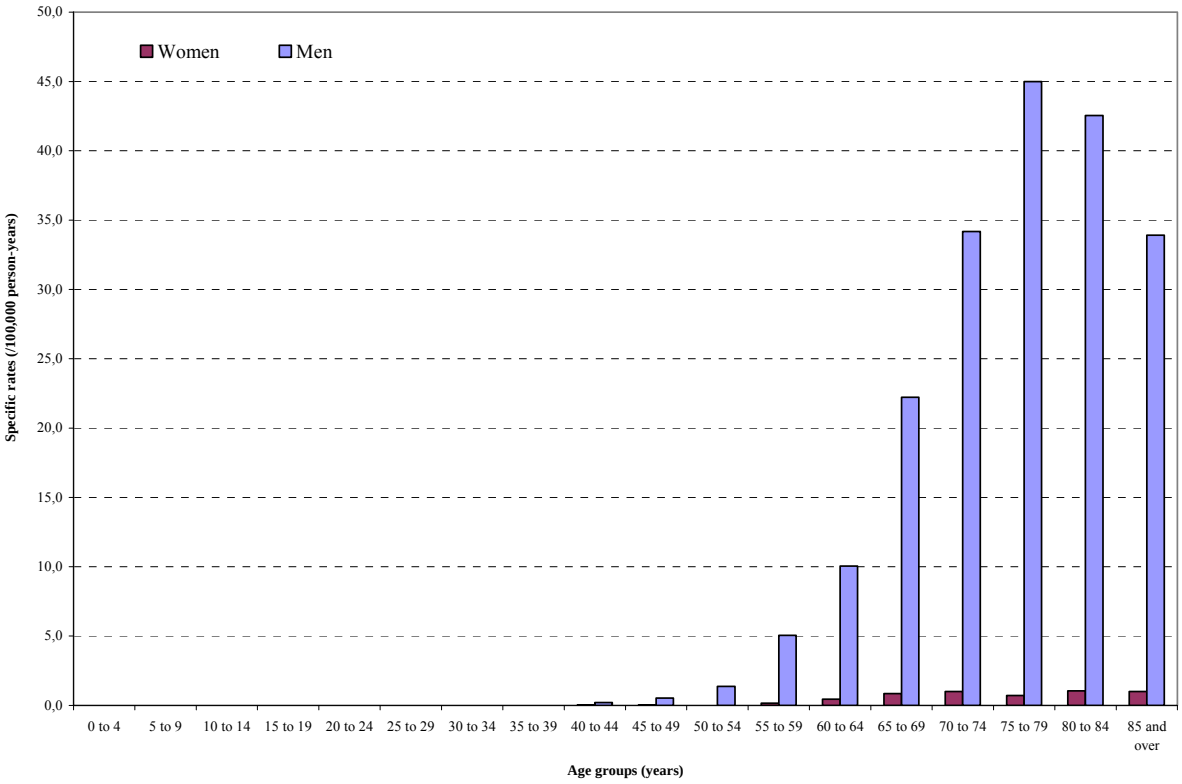

Figure 12 Specific rates (/100,000 person-years) of hospitalization with first mention of asbestosis by sex and five-year age group, Québec, 1992-2004

3.3.2 Annual trends

The number and the age-standardized annual rate of hospitalizations with first mention of asbestosis are presented by year, for the period from 1992 to 2004, in Table 15. The analysis of these results indicates that there is no significant linear time trend, between 1992 and 2004, in the rates of hospitalization with first mention of asbestosis among men or among women (Figure 13).

Table 15 Number and annual age-standardized rates (/100,000 person-years) of hospitalizations with first mention of asbestosis by sex and year, Québec, 1992-2004

	Women		Men	
Year	Number of first hospitalizations	SR[1]	Number of first hospitalizations	SR[1]
1992	1	0.023	144	4.979
1993	7	0.180	137	4.679
1994	6	0.148	109	3.633
1995	8	0.211	150	5.076
1996	5	0.111	134	4.351
1997	3	0.069	135	4.397
1998	6	0.140	133	4.364
1999	7	0.148	148	4.651
2000	5	0.116	171	5.147
2001	8	0.167	167	4.915
2002	9	0.185	172	4.812
2003	9	0.186	187	5.187
2004	5	0.102	206	5.581
Total	79		1 993	
p-value[2]		0.469		0.013

[1] Age-standardized rate (/100,000 person-years).

[2] p-value of the linear trend test.

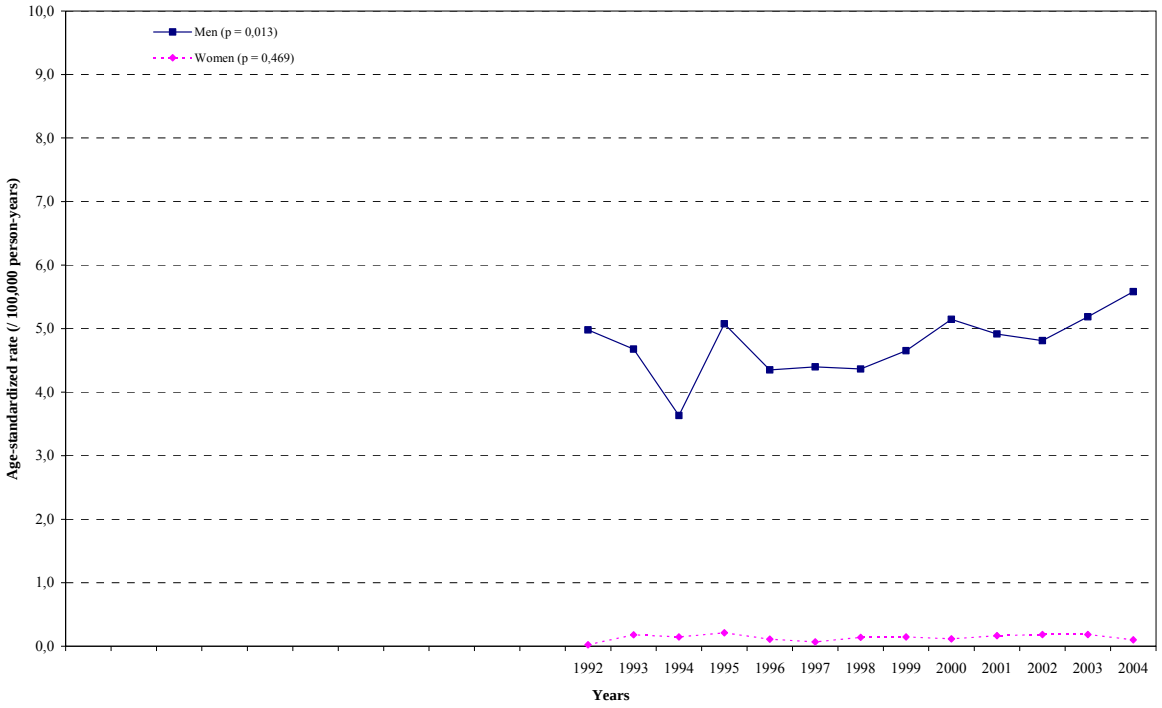

Figure 13 Age-standardized annual rates (/100 000 person-years) of hospitalization with first mention of asbestosis, Québec, 1992-2004

The mean age of women with a hospitalization with first mention of asbestosis did not vary in a statistically significant way (p-value = 0.0103) during the 3 periods (Table 16). Among men, the mean age during the first hospitalization with mention of asbestosis was significantly lower for the period 1992-1995 compared to the two other periods.

Table 16 Mean age of patients with a hospitalization with first mention of asbestosis by sex and period, Québec, 1992-2004

	Women		Men	
	Mean[1]	99% CI	Mean[1]	99% CI
1992-1995	67.0[a]	(61.6-72.3)	69.0[a]	(68.0-70.0)
1996-1999	74.9[a]	(69.1-80.7)	71.6[b]	(70.7-72.5)
2000-2004[2]	72.8[a]	(69.0-76.7)	72.4[b]	(71.7-73.1)
p-value[3]	0.010		< 0.001	

1 The means are statistically the same, at a 1% level, when the letters are identical, results obtained with the Bonferroni multiple comparisons test.

2 Includes 5 years.

3 p-value of the global comparison of the 4 means, calculated using a variance analysis.

3.3.3 Geographic distributions

Table 17 presents the incidence rates of hospitalization with first mention of asbestosis, for the period from 1992 to 2004, by sex and health region of residence. During this period, we observe among men an excess of hospitalization with first mention of asbestosis in the Chaudière-Appalaches, Estrie and Lanaudière regions and among women an excess in the Chaudière-Appalaches region. Using the SIR, we observe essentially the same results (Appendix, Table A-10).

Table 17 Rate of hospitalization with first mention of asbestosis by sex and health region, 1992-2004

Region	Women[1]				Men[1]			
	Number	SR[2]	SRR	p-value of SRR	Number	SR[2]	SRR	p-value of SRR
01 Bas-Saint-Laurent					5	0.343[3]	0.071	0.000
02 Saguenay–Lac-Saint-Jean					21	1.235	0.257	0.000
03 Capitale-Nationale					104	2.837	0.591	0.000
04 Mauricie and Centre-du-Québec					48	1.552	0.323	0.000
05 Estrie	8	0.338[3]	2.429	0.018	193	11.096	2.312	0.000
06 Montréal	28	0.171	1.228	0.359	584	5.136	1.070	0.152
07 Outaouais					27	1.716	0.357	0.000
08 Abitibi-Témiscamingue					9	1.056[3]	0.220	0.000
09 Côte-Nord					9	1.582[3]	0.330	0.001
10 Nord-du-Québec								
11 Gaspésie–Îles-de-la-Madeleine					15	2.071	0.432	0.001
12 Chaudière-Appalaches	12	0.381	2.744	0.001	367	16.476	3.433	0.000
13 Laval					64	3.144	0.655	0.001
14 Lanaudière	6	0.256[3]	1.843	0.149	131	6.216	1.295	0.005
15 Laurentides					86	3.536	0.737	0.007
16 Montérégie	16	0.184	1.326	0.304	329	4.977	1.037	0.549
17 Nunavik								
18 Terres-Cries-de-la-Baie-James								
Province	79	0.139			1 1993	4.800		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

[2] Age-standardized rate (/100,000 person-years).

[3] The coefficient of variation of the standardized rate is greater than or equal to 33.3%, the information is presented for information only.

4 DISCUSSION

4.1 INCIDENCE OF CANCERS AND MALIGNANT MESOTHELIOMAS OF THE PLEURA

To estimate the incidence of malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum from 1982 to 2002, we examined the data from the FiTQ. We selected only the neoplasias of the pleura and the peritoneum for which the tumour morphology code is a mesothelioma.

For the period from 1982 to 2002, mesotheliomas of the pleura represent 74% of the cancers of the pleura among women and 86% among men. For the period from 1982 to 1991, these proportions are respectively 61% and 76%, while for the period from 1992 to 2002, they are respectively 85% and 92%. The number of new cases of mesothelioma of the pleura therefore explains the largest portion of new cases of cancer of the pleura for the period from 1992 to 2002. Two factors that could explain this situation are the improvements made to the FiTQ after 1992 (personal communication from Michel Beaupré, MSSS) and the improvement in diagnostic techniques for malignant mesotheliomas of the pleura, notably with the development of histoimmunochemistry tests (Carella *et al*., 2001). In addition, in an asbestos-producing province like Québec, the new cohorts of physicians are possibly more aware of the existence of malignant mesothelioma of the pleura than physicians trained in the past. To better interpret the time trends, it is therefore useful to monitor the two indicators of the incidence of cancer of the pleura and malignant mesothelioma of the pleura.

The incidence of malignant mesothelioma of the pleura and cancer of the pleura presents a preponderance among men and among the older population. We also observe an increase over time in the incidence of malignant mesothelioma of the pleura and cancer of the pleura among men. The scientific literature on malignant mesothelioma of the pleura shows that among 70% to 90% of people suffering from this cancer, we are able to document a prior exposure to asbestos (Institut national de la santé et de la recherche Médicale (INSERM), 1997). The most plausible explanation for this preponderance of cases among men is their prior occupational exposure to asbestos.

Scientific knowledge shows that the time elapsed between the start of asbestos exposure and the diagnosis of malignant mesothelioma, that is, the latency, is on the order of 20 to 40 years (Health Effects Institute - Asbestos Research (HEI-AR), 1991). Hence, the observation of cases mainly from age 50 and up explains in part the latency time. So, if we subtract a 40-year latency from the date of diagnosis of malignant mesotheliomas of the pleura, Quebec men and women suffering from this cancer between 1982 and 2002 would have been first exposed between 1942 and 1962. By decreasing the latency to 20 years, the start of exposure could date to the period from 1962 to 1982. The period from 1942 to 1982 includes the height of mining operations in Québec and of asbestos use in construction, either asbestos originating in Quebec or imported from other producing countries. Between 1942 and 1982, working conditions varied greatly and occupational exposures likely diminished in several activity sectors, in particular in the mines. Asbestos exposure standards were also reduced, but it was not until 1990 that the current standard was adopted. We can therefore

hypothesize that the increase in the number of new cases of malignant mesothelioma observed up to 2002 could continue in the coming years.

The increasing trend in the incidence rates of malignant mesothelioma of the pleura, which we believe to be linked to occupational exposure to asbestos among men, has been documented in several industrialized countries (Health Effects Institute - Asbestos Research (HEI-AR), 1991). In particular, we observe similar situations in the United States (Price, 1997), in Great Britain (Peto *et al*., 1999; Peto *et al*., 1995) and in several countries in Western Europe (Peto *et al.*, 1999) with variations in the size of the increase and the presumed time of incidence peaks. In fact, the increase could continue for another 20 years in Europe (Peto *et al.*, 1999), while the maximum rates in the United States would have already been reached at the beginning of the year 2000 (Price, 1997). In Québec, the annual incidence rates of malignant mesothelioma should reach a maximum around 2010 (De Guire *et al*., 2003).

Concerning the incidence of malignant mesothelioma of the peritoneum, the rates are much lower than those of malignant mesothelioma of the pleura, particularly among men, and the annual time trends are not significant. However, as with malignant mesotheliomas of the pleura, we also observe a higher incidence in the older age strata. The long latency could explain this phenomenon.

In several countries, malignant mesotheliomas of the pleura are also more frequent than malignant mesotheliomas of the peritoneum (Institut national de la santé et de la recherche médicale (INSERM), 1997; Health Effects Institute - Asbestos Research (HEI-AR), 1991). Most authors are of the opinion that malignant mesotheliomas (of the pleura and of the peritoneum) are more linked to exposure to amphiboles (Hodgson and Darnton, 2000). However, occupational exposure to chrysotile asbestos also increases the risk of malignant mesothelioma of the pleura (World Health Organization (WHO), 1998; Health Effects Institute - Asbestos Research (HEI-AR), 1991). According to scientific publications, malignant mesothelioma of the peritoneum is mainly associated with exposure to amosite (Health Effects Institute - Asbestos Research (HEI-AR), 1991). Since we do not know the type of asbestos to which Québec men suffering from malignant mesothelioma were exposed, it is not possible to identify the type of asbestos responsible for the cancers observed. We found only one Québec study characterizing asbestos-containing materials. It was conducted in Québec schools and shows a preponderance of the use of chrysotile asbestos compared to amosite (Dion and Perreault, 2000). Two other studies are currently being conducted to better define the type of asbestos installed in public buildings in Québec.

It is sometimes postulated that malignant mesothelioma rates among women enable us to estimate the incidence of the disease in connection with background concentration, if they have not been exposed to asbestos (Price, 1997). The time trends that show a stable incidence rate among women, and an increase among men, corroborate this hypothesis. Among women suffering from malignant mesothelioma between 1982 and 2002, and recognizing a 40-year latency, asbestos exposure would have started between 1942 and 1962, which corresponds to a period preceding the massive arrival of women on the Québec job market (except for the war period from 1939 to 1945).

4.1.1 Comparison of malignant mesotheliomas with the rest of Canada and with other countries

Compared to Canada, Québec presents the highest standardized incidence ratio (SIR) of malignant mesothelioma of the pleura, the peritoneum and the pericardium combined, both among men and among women. In the male population, the SIR is significantly higher in Québec than that in other provinces, although we note that the differences between the SIRs of Québec and those of Manitoba, British Columbia and Prince Edward Island are not statistically significant. Among women, the SIR is significantly higher in Québec than in the other Canadian provinces, except for Manitoba, Alberta and Prince Edward Island where the differences are not statistically significant. We can assume that this situation is attributable to a greater exposure to asbestos in the Québec population from mining, industrial and construction activities.

We also note that the SIR of malignant mesothelioma in Québec among men seems somewhat lower than in certain regions of Australia. Australia is a country that produces crocidolite, a fibre possibly more associated with malignant mesothelioma than chrysotile (Hodgson and Darnton, 2000). This is also the case of several parts of the United Kingdom where asbestos was used in abundance between 1950 and 1980 (Peto *et al.*, 1995) and in the Netherlands where it was used mainly in shipyards and in the heavy industry of the North Sea coastal region (Health Effects Institute - Asbestos Research (HEI-AR), 1991). It is possible that asbestos use was also greater in Australia than in Québec. Incidentally, among men and women, malignant mesothelioma incidence in Québec is higher than in the United States and in several countries in Western and Eastern Europe. Once again, this situation may be plausibly explained by greater asbestos exposure in the Québec population.

The Canadian and international comparisons were carried out for malignant mesothelioma incidence by using the electronic databases of the IARC and the International Association of Cancer Registries (Parkin, D. M., Whelan, S. L., Ferlay, J., Teppo, L., and Thomas, D. B., 2002). Since it is not possible from this database to distinguish cancer sites in which the morphology is mesothelioma, the comparisons were made by taking into consideration malignant mesotheliomas of the pleura, the peritoneum and the pericardium combined. Not all countries have cancer registries and the data used sometimes provide a piecemeal image of a country. In addition, confirmation of the diagnosis of malignant mesothelioma requires a histopathology examination of tissues and the proportion of cases confirmed by a histopathology exam is not known by country. These different limitations mean that the results obtained using the IARC database must be interpreted with caution.

4.2 MORTALITY FROM CANCERS OF THE PLEURA AND THE PERITONEUM

To evaluate mortality from cancer of the pleura and from cancer of the peritoneum, the period from 1981 to 2003 was studied. The causes of death were codified up to 1999 using the ICD-9, which does not allow us to distinguish malignant mesotheliomas from cancers of the pleura or the peritoneum. However, since 2000, death certificates are codified using the ICD-10 that includes morphology. So, for 2000 to 2003 deaths from malignant mesothelioma of the pleura represent only 53.1% of deaths from cancer of the pleura, and deaths from malignant mesothelioma of the peritoneum represent only 5.6% of deaths from cancer of the

peritoneum. The small percentage of deaths from malignant mesothelioma of the pleura is surprising because the median survival for this cancer is from 9 to 13 months following diagnosis (Holland *et al*., 2003). It is therefore difficult to find an explanation for this observation because malignant mesothelioma of the pleura explains a very large proportion of the incident cases of cancers of the pleura. This small percentage may increase as we become more familiar with the ICD-10 in the next few years. In the meantime, the obligation to consider cancers of the pleura and cancers of the peritoneum globally risks giving an inaccurate idea of mortality from malignant mesothelioma, particularly of the peritoneum.

As with the data on the incidence of malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum, the analysis of mortality from cancers of the pleura and the peritoneum from 1981 to 2003 shows higher rates among men and among the older population. The mortality statistics are also relatively concordant with those for the incidence for cancer of the pleura, including the annual time trends.

4.3 ASBESTOSIS

To describe the frequency of asbestosis, we focused on the hospitalizations and deaths for this cause. The hospitalizations with first mention of asbestosis from 1992 to 2004 were studied first. It is important to specify that in the Med-Echo registry, the diagnosis of asbestosis may be present in the file, even if it is just in the past medical history. Thus, the date of the first diagnosis of asbestosis may be prior to 1992, which could result in an overestimation of the incidence for the study period. In total, 2,072 persons were hospitalized, during this period, with a primary or secondary diagnosis of asbestosis. These hospitalizations involved mainly men, in the oldest age strata. No time trend of the annual rate of hospitalization with first mention of asbestosis was observed. It is interesting to note that the temporal increase in malignant mesothelioma incidence is not observed in the annual rates of hospitalization with first mention of asbestosis. This could be explained by the fact that the development of asbestosis depends on a significant cumulative dose (Becklake and Case, 1994; Becklake, 1991), while the incidence of malignant mesothelioma is proportional to the third power of the time since first exposure to asbestos (Health Effects Institute - Asbestos Research (HEI-AR), 1991). Moreover, malignant mesothelioma cases are reported following low levels of past exposure to asbestos (Hansen *et al*., 1998; Institut national de la santé et de la recherche médicale (INSERM), 1997). The absence of time trend for asbestosis could reflect a decreasing exposure over the years, although we have only incomplete data on this subject. Other explanations can be considered, such as classification errors.

The estimation of asbestosis incidence from hospitalization data must be interpreted with caution. Indeed, this estimation can be influenced not only by the evolution of the incidence of the disease, but also by other factors such as: hospitalization patterns (which can vary by region or even within a single health institution), the administrative organization or the policies related to care and services (ex.: the shift to ambulatory care), the diagnostic tools available and used in different regions and earlier screening activities.

To evaluate mortality from asbestosis, the period from 1981 to 2003 was used. In total, 195 deaths from asbestosis are recorded in the Fichier des décès for these years. With the exception of four people, these deaths occurred among men. This is not surprising since asbestosis is a pulmonary fibrosis that occurs among individuals with a substantial exposure to asbestos. There is scientific consensus in the literature on a threshold of 25 fibres-years/ml under which the probability of developing an asbestosis would be low (National Industrial Chemicals Notification and Assessment Scheme (NICNAS), 1999; Meldrum, 1996; Dupré et al., 1984). Asbestosis is therefore associated with substantial exposures in the workplace and as such, the higher number of cases among men over 50 is explained. Incidentally, the annual rates of mortality from asbestosis are stable from 1981 to 2003. These deaths are attributable to past exposures, but it is important to note that we observe no decrease in the rate of death from asbestosis over the years.

4.4 COMPARISON OF THE REGIONAL FREQUENCY OF THE INCIDENCE OF MALIGNANT MESOTHELIOMA, OF DEATHS FROM CANCER OF THE PLEURA AND OF HOSPITALIZATIONS WITH FIRST MENTION OF ASBESTOSIS IN QUÉBEC

The incidence rates of cancers and malignant mesotheliomas of the pleura are significantly higher in the Chaudière-Appalaches, Lanaudière and Montérégie regions among men, and in Chaudière-Appalaches among women. For mortality, the rates of cancer of the pleura are higher in the Chaudière-Appalaches region, among men and among women. No region stands out from the provincial rate with regard to mortality from cancer of the peritoneum, either among men or among women. Incidentally, we note among men excesses of hospitalization with first mention of asbestosis in the Estrie, Chaudière-Appalaches and Lanaudière regions. In addition, in the Chaudière-Appalaches region we observe excesses in the rate of hospitalization with first mention of asbestosis among women. Finally, there is an excess of mortality from asbestosis among men in Estrie and Chaudière-Appalaches.

These results can be explained, among men, by an occupational exposure in the mines of the asbestos region (Chaudière-Appalaches), as well as in the shipyards of Lévis-Lauzon and Sorel (located respectively in the Chaudière-Appalaches and Montérégie regions). In comparison with our previous study, an excess is observed this time among men in the Lanaudière region. These men could have been exposed in Montreal's shipyards, now closed, and in the refineries in Montreal East. They could also have been exposed in jobs in the construction industry. The excesses observed in the mining regions can also be linked to a greater degree of clinical suspicion on the part of health professionals in these regions, and to the presence of medical surveillance programs introduced in the mining industry in the 1980s. Moreover, a Québec regulation requires all mine workers to undergo periodic pulmonary health examinations (Regulation respecting pulmonary health examinations for mine workers R.Q. c. S-2.1, r.10.01, 1995).

Among women, we can consider occupational exposure in some cases, but also greater household exposures (for example: spouse of an asbestos worker) and environmental exposures (Camus *et al*., 1998).

The explanations reported in the preceding paragraphs are plausible if the patients remained in the same region either between the asbestos exposure and diagnosis of the disease

during hospitalization, or between the asbestos exposure and death. Few data exist to quantify the impact of interregional residential mobility on the regional rates of mortality, hospitalization or incidence.

In contrast, there is no significant difference by region with respect to malignant mesothelioma of the peritoneum, possibly owing to a smaller component linked to occupational exposure or owing to a lower statistical power, considering the small number of new cases of this cancer.

The incidence rates of malignant mesothelioma of the pleura and cancer of the pleura among men are lower in the Outaouais region compared to the province as a whole. This situation is seemingly explained by the fact the FiTQ data for the Outaouais region underestimates the actual regional situation. In fact, a significant proportion of the population of this region receives health care in Ontario. Even though mechanisms have been negotiated with Ontario to recover the information for Quebeckers who used medical and hospital services in Ontario, the recovery of the information remains incomplete and results in a systematic under-estimation of the incidence rates in this region (private communication from Michel Beaupré, MSSS).

4.5 SURVEILLANCE OF MALIGNANT MESOTHELIOMAS AND ASBESTOSIS

Overall, it should be noted that the *Fichier des décès* and the Med-Echo registry seem to be imperfect tools to monitor the evolution of asbestosis incidence in Québec. For one thing, the individuals suffering from asbestosis do not all die from their disease. For another, the people suffering from asbestosis are not necessarily hospitalized. Consequently, it is not possible to use only the Med-Echo registry to estimate asbestosis incidence. It may be that owing to the slow evolution of the pathology, many cases go unnoticed among workers exposed to asbestos who do not undergo a systematic medical surveillance. Other sources of data, such as the notifiable diseases registry, should be explored for surveillance purposes.

The FiTQ seems more pertinent for the surveillance of cancers and malignant mesothelioma of the pleura and malignant mesothelioma of the peritoneum. In fact, our results show a significant increase in these cancers, as is observed elsewhere in the world. Furthermore, the study allowed us to perform careful analyses of the cases by age and sex. The FiTQ is therefore useful to document the evolution of these diseases in Québec. The FiTQ data also allowed us to identify the regions presenting excesses of these cancers. It is interesting that these are the same regions in which we also observe excesses of deaths from asbestosis. These regions correspond to the mining operations zones and the zones with historically a more intense specific use of asbestos (shipyards, refineries).

The data on mortality from cancer of the pleura and the peritoneum should become increasingly specific in the coming years, because since the year 2000, the ICD-10 makes it possible to identify deaths from malignant mesothelioma. The mortality from asbestosis, although incomplete, is also pertinent because it teaches us that Quebeckers still die from this disease and that we find excesses of deaths in the regions where there is seemingly a greater exposure to asbestos.

The goal of this report is not to do a complete review of the strengths and weaknesses of the databases. We mentioned only the most obvious, since another working group is currently defining a proposal for a surveillance system for asbestos-related diseases and exposures based on several databases, the eventual matching of their data and the creation of new databases.

CONCLUSION

We have seen that the analysis of data from the Quebec health databases on malignant mesotheliomas, cancers of the pleura and the peritoneum and asbestosis provide much valuable information from the epidemiological point of view. Notably, we were able to document the time trends, the distributions by age and sex, and the geographic distribution of the asbestos-related diseases. However, taking into account some gaps identified, all these data do not have the same significance. Nevertheless, it was not within the jurisdiction of this work to analyze the strengths and weaknesses of each of the databases.

Recommendations

1. The long delay between the time when a diagnosis of malignant mesothelioma is made in an individual and the time the data are available in the FiTQ must be reduced. The steps currently undertaken at the MSSS to reduce this delay must be continued.

2. The analysis of the data from the *Fichier des tumeurs du Québec* on malignant mesotheliomas and on cancers of the pleura must be continued, as must analysis of mortality data, until the future surveillance system for asbestos-related diseases is operational.

3. The analysis of hospitalizations with first mention of asbestosis must be continued, despite the limitations stated, while awaiting the results of two studies, one ongoing (study to match data from the CSST and from Med-Echo) and the other in protocol preparation (exploratory study of the diagnostic criteria for asbestoses in the Med-Echo registry). Exploitation of data from the "*Système MADO-Chimique*" must be considered in the future surveillance system for asbestos-related diseases.

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APPENDIX

Table A-1 SIR of cancer of the pleura by sex and health region, 1982-2002

Region	Women[1]			Men[1]		
	Number of cases	SIR	99% CI	Number of cases	SIR	99% CI
01 Bas-Saint-Laurent	6	0.444	(0.114-1.158)	23	0.483	(0.263-0.808)
02 Saguenay–Lac-Saint-Jean	21	1.393	(0.734-2.384)	65	1.248	(0.885-1.705)
03 Capitale-Nationale	26	0.631	(0.358-1.025)	122	0.990	(0.775-1.246)
04 Mauricie and Centre-du-Québec	31	0.979	(0.585-1.529)	105	1.012	(0.776-1.295)
05 Estrie	15	0.840	(0.386-1.578)	62	1.056	(0.742-1.453)
06 Montréal	136	1.012	(0.803-1.258)	354	0.890	(0.773-1.019)
07 Outaouais	6	0.414	(0.106-1.080)	28	0.558	(0.324-0.892)
08 Abitibi-Témiscamingue				14	0.509	(0.227-0.976)
09 Côte-Nord	5	1.206	(0.260-3.413)	12	0.726	(0.299-1.461)
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine	8	1.238	(0.398-2.875)	16	0.650	(0.307-1.197)
12 Chaudière-Appalaches	39	1.781	(1.132-2.656)	125	1.643	(1.289-2.060)
13 Laval	14	0.780	(0.347-1.495)	57	0.950	(0.657-1.325)
14 Lanaudière	25	1.455	(0.814-2.386)	91	1.464	(1.099-1.907)
15 Laurentides	17	0.818	(0.397-1.482)	53	0.704	(0.480-0.994)
16 Montérégie	78	1.178	(0.863-1.568)	272	1.228	(1.044-1.433)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	431			1401		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-2 SIR of malignant mesothelioma of the pleura by sex and health region, 1982-2002

Region	Women[1]			Men[1]		
	Number of cases	SIR	99% CI	Number of cases	SIR	99% CI
01 Bas-Saint-Laurent				20	0.488	(0.253-0.847)
02 Saguenay–Lac-Saint-Jean	13	1.135	(0.487-2.226)	60	1.329	(0.929-1.838)
03 Capitale-Nationale	22	0.721	(0.387-1.221)	104	0.976	(0.747-1.251)
04 Mauricie and Centre-du-Québec	20	0.856	(0.443-1.484)	93	1.039	(0.783-1.351)
05 Estrie	10	0.763	(0.283-1.632)	60	1.187	(0.829-1.642)
06 Montréal	94	0.958	(0.722-1.243)	289	0.844	(0.722-0.981)
07 Outaouais	5	0.456	(0.098-1.291)	26	0.598	(0.339-0.972)
08 Abitibi-Témiscamingue				12	0.505	(0.208-1.016)
09 Côte-Nord	5	1.558	(0.336-4.410)	11	0.764	(0.300-1.581)
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine	7	1.467	(0.427-3.590)	12	0.567	(0.234-1.141)
12 Chaudière-Appalaches	33	2.033	(1.237-3.136)	111	1.693	(1.308-2.152)
13 Laval	12	0.884	(0.364-1.779)	48	0.921	(0.615-1.323)
14 Lanaudière	19	1.459	(0.741-2.564)	79	1.464	(1.075-1.944)
15 Laurentides	15	0.954	(0.438-1.790)	42	0.644	(0.417-0.947)
16 Montérégie	59	1.187	(0.826-1.646)	243	1.265	(1.066-1.490)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	320			1210		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-3 SIR of malignant mesothelioma of the peritoneum by sex and health region, 1982-2002

Region	Women[1]			Men[1]		
	Number of cases	SIR	99% CI	Number of cases	SIR	99% CI
01 Bas-Saint-Laurent						
02 Saguenay–Lac-Saint-Jean	6	2.328	(0.596-6.075)			
03 Capitale-Nationale	8	1.169	(0.376-2.715)	5	0.577	(0.124-1.632)
04 Mauricie and Centre-du-Québec						
05 Estrie						
06 Montréal	18	0.810	(0.402-1.444)	35	1.290	(0.798-1.966)
07 Outaouais						
08 Abitibi-Témiscamingue						
09 Côte-Nord						
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine						
12 Chaudière-Appalaches				6	1.154	(0.296-3.011)
13 Laval	7	2.316	(0.674-5.669)			
14 Lanaudière				6	1.327	(0.340-3.463)
15 Laurentides				6	1.114	(0.285-2,907)
16 Montérégie	15	1.352	(0.621-2.538)	18	1.133	(0.563-2.020)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	72			98		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-4 SIR of malignant mesothelioma (pleura, peritoneum or pericardium) by province and territory, Canada 1988-1992, in comparison with Québec

Province/Territory	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Women					
Québec	88	88.0	0.4	100	
British Columbia	26	42.7	0.2	61	(40-89)
Ontario	77	129.0	0.2	60	(47-75)
Alberta	15	25.3	0.2	59	(33-98)
Saskatchewan	7	13.2	0.2	53	(21-109)
Newfoundland	3	5.8	0.1	52	(11-151)
Manitoba	7	14.7	0.2	48	(19-98)
Nova Scotia	5	11.6	0.2	43	(14-100)
New Brunswick	2	9.1	0.1	22	(3-79)
Prince Edward Island	0	1.7	--	--	--
Northwest Territories[2]	0	0.5	--	--	--
Men					
Québec	296	296.0	1.5	100	
Manitoba	47	51.8	1.4	91	(67-121)
British Columbia	137	158.1	1.2	87	(73-102)
Nova Scotia	33	41.3	1.1	80	(55-112)
Alberta	75	95.1	1.1	79	(62-99)
Ontario	293	450.0	1.0	65	(58-73)
Newfoundland	12	22.7	0.9	53	(27-92)
New Brunswick	16	32.5	0.7	49	(28-80)
Saskatchewan	24	50.1	0.7	48	(31-71)
Prince Edward Island	2	6.1	0.5	33	(4-117)
Northwest Territories[2]	0	2.2	--	--	--

[1] Age-standardized rate (/100,000 person-years) based on the standard world population (see Table 1).

[2] Data for the period from 1983 to 1992.

Table A-5 SIR of malignant mesothelioma (pleura, peritoneum or pericardium) among women, by country, 1988-1992, in comparison with Québec

Country	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Western Australia	25	17.2	0.5	146	(94-215)
United Kingdom, Scotland	87	81.4	0.4	107	(86-132)
Australia, Victoria	40	53.7	0.3	74	(53-101)
South Australia	25	18.9	0.5	132	(86-195)
Canada, Québec	**88**	**88**	**0.4**	**100**	
Australia, New South Wales	62	73	0.3	85	(65-109)
United Kingdom, England[2]	378	491.7	0.3	77	(69-85)
Netherlands[3]	151	168	0.3	90	(76-105)
Denmark	73	80.9	0.3	90	(71-114)
Sweden	87	143.5	0.2	61	(49-75)
United States, SEER	233	278.6	0.3	84	(73-95)
Australia, Queensland[4]					
Finland[5]	107	91.6	0.4	117	(96-141)
Canada[6]	230	341.7	0.3	67	(59-77)
Czech Republic	109	152.2	0.3	72	(59-86)
Norway	43	65.6	0.2	66	(47-88)
New Zealand[4]					
Slovakia	22	65.8	0.1	33	(21-51)
Estonia	11	24.9	0.2	44	(22-79)
Israel[7]	22	45.9	0.2	48	(30-73)
United Kingdom, Northern Ireland[4]					
Slovenia[7]	16	27.3	0.3	59	(33-95)

[1] Age-standardized rate (par 100 000 person-years) based on the standard world population.

[2] Prior to 1993, new cases were recorded on a voluntary basis only. The data presented (1988 to 1990) included the regional registries of: South and Western, South Thames, Oxford, East Anglia, Trent, West Midlands, Mersey, North Western, Yorkshire and Wales.

[3] Data for the period from 1989 to 1992.

[4] Data not available for the period from 1988 to 1992.

[5] Data for the period from 1987 to 1992.

[6] Includes Québec.

[7] Disparities in the number of observed cases were remarked between the published tables and the results obtained from the electronic database.

Table A-6 SIR of malignant mesothelioma (pleura, peritoneum or pericardium) among men, by country, 1988-1992, in comparison with Québec

Country	Number of observed cases	Number of expected cases	SR[1]	SIR	95% CI of SIR
Western Australia	183	64.5	4.2	284	(244-328)
United Kingdom, Scotland	570	259.1	3.1	220	(202-239)
Australia, New South Wales	454	264.5	2.4	172	(156-188)
Netherlands[2]	1 013	566.9	2.6	179	(168-190)
United Kingdom, England[3]	2 089	1628.6	1.9	128	(123-134)
South Australia	167	68.2	3.3	245	(209-285)
Australia, Victoria	249	193.0	1.8	129	(113-146)
Australia, Queensland[4]					
United Kingdom, Northern Ireland[4]					
New Zealand[4]					
Canada, Québec	**296**	**296.0**	**1.5**	**100**	**-**
Denmark	267	281.4	1.4	95	(84-107)
Norway	198	230.4	1.2	86	(74-99)
Sweden	423	516.6	1.1	82	(74-90)
United States, SEER	915	925.2	1.3	99	(93-106)
Canada[6]	935	1205.7	1.1	78	(73-83)
Finland[5]	197	274.6	1.0	72	(62-83)
Slovenia[7]	42	81.4	0.7	52	(37-70)
Israel[7]	41	174.5	0.4	23	(17-32)
Czech Republic	126	463.8	0.4	27	(23-32)
Slovakia	46	207.2	0.3	22	(16-30)
Estonia	21	62.6	0.5	34	(21-51)

1 Age-standardized rate (/100,000 person-years) based on the standard world population.

2 Data for the period from 1989 to 1992.

3 Prior to 1993, new cases were recorded on a voluntary basis only. The data presented (1988 to 1990) included the regional registries of: South and Western, South Thames, Oxford, East Anglia, Trent, West Midlands, Mersey, North Western, Yorkshire et Wales.

4 Data not available for the period 1988 to 1992.

5 Data for the period from 1987 to 1992.

6 Includes Québec.

7 Disparities in the number of observed cases were remarked between the published tables and the results obtained from the electronic database.

Table A-7 SMR of cancer of the pleura by sex and health region, 1981-2003

Region	Women[1]			Men[1]		
	Number of deaths	SMR	99% CI	Number of deaths	SMR	99% CI
01 Bas-Saint-Laurent				14	0.532	(0.237—1.019)
02 Saguenay–Lac-Saint-Jean	14	1.390	(0.619-2.665)	30	1.054	(0.624—1.659)
03 Capitale-Nationale	21	0.755	(0.398-1.293)	80	1.183	(0.870—1.568)
04 Mauricie and Centre-du-Québec	18	0.843	(0.419-1.502)	50	0.875	(0.589—1.247)
05 Estrie	10	0.830	(0.308-1.775)	36	1.111	(0.692—1.683)
06 Montréal	88	0.972	(0.726- 1.272)	194	0.886	(0.731—1.064)
07 Outaouais				7	0.255	(0.074—0.625)
08 Abitibi-Témiscamingue						
09 Côte-Nord						
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine				5	0.368	(0.079—1.041)
12 Chaudière-Appalaches	34	2.306	(1.415-3.534)	82	1.958	(1.446—2.587)
13 Laval	16	1.329	(0.628-2.448)	33	1.010	(0.615—1.558)
14 Lanaudière	11	0.954	(0.375-1.976)	51	1.500	(1.014—2.130)
15 Laurentides	12	0.860	(0.354-1.729)	28	0.678	(0.393—1.083)
16 Montérégie	52	1.169	(0.793-1.654)	153	1.262	(1.015—1.550)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	290			769		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-8 SMR of cancer of the peritoneum by sex and health region, 1981-2003

	Women[1]			Men[1]		
Region	**Number of deaths**	**SMR**	**99% CI**	**Number of deaths**	**SMR**	**99% CI**
01 Bas-Saint-Laurent	13	0.930	(0.399-1.824)	18	1.389	(0.690-2.477)
02 Saguenay–Lac-Saint-Jean	9	0.601	(0.209-1.336)	10	0.697	(0.259-1.491)
03 Capitale-Nationale	40	0.945	(0.604-1.402)	22	0.650	(0.348-1.099)
04 Mauricie and Centre-du-Québec	26	0.795	(0.451-1.292)	27	0.957	(0.549-1.542)
05 Estrie	26	1.406	(0.797-2.285)	17	1.061	(0.515-1.922)
06 Montréal	139	0.993	(0.790-1.231)	134	1.238	(0.980-1.541)
07 Outaouais	15	1.043	(0.479-1.958)	11	0.789	(0.310-1.634)
08 Abitibi-Témiscamingue	8	1.108	(0.356-2.573)	5	0.658	(0.142-1.863)
09 Côte-Nord	5	1.260	(0.272-3.567)			
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine	12	1.814	(0.747-3.650)			
12 Chaudière-Appalaches	26	1.160	(0.658-1.885)	21	1.006	(0,531-1.723)
13 Laval	21	1.175	(0.619-2.011)	20	1.217	(0,630-2.109)
14 Lanaudière	21	1.233	(0.650-2.110)	14	0.815	(0,363-1.563)
15 Laurentides	16	0.771	(0.365-1.421)	20	0.964	(0,499-1.671)
16 Montérégie	61	0.918	(0.643-1.266)	58	0.948	(0,658-1.319)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	440			384		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-9 SMR of asbestosis among men by health region, 1981-2003

Region	Number of deaths	SMR	99% CI
01 Bas-Saint-Laurent			
02 Saguenay–Lac-Saint-Jean			
03 Capitale-Nationale	7	0.420	(0.122-1.029)
04 Mauricie and Centre-du-Québec			
05 Estrie	30	3.638	(2.155-5.726)
06 Montréal	49	0.876	(0.587-1.253)
07 Outaouais			
08 Abitibi-Témiscamingue			
09 Côte-Nord			
10 Nord-du-Québec			
11 Gaspésie–Îles-de-la-Madeleine			
12 Chaudière-Appalaches	56	5.309	(3.660-7.425)
13 Laval	6	0.768	(0.197-2.003)
14 Lanaudière			
15 Laurentides	7	0.696	(0.202-1.703)
16 Montérégie	22	0.754	(0.404-1.275)
17 Nunavik			
18 Terres-Cries-de-la-Baie-James			
Province	191		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

Table A-10 SIR of a first hospitalization with a diagnosis of asbestosis by sex and health region, 1992-2004

Region	Women[1]			Men[1]		
	Number of cases	SIR	99% CI	Number of cases	SIR	99% CI
01 Bas-Saint-Laurent				5	0.074	(0.016-0.210)
02 Saguenay–Lac-Saint-Jean				21	0.283	(0.149-0.485)
03 Capitale-Nationale				104	0.586	(0.449-0.751)
04 Mauricie and Centre-du-Québec				48	0.323	(0.216-0.464)
05 Estrie	8	2.417	(0.777-5.612)	193	2.282	(1.881-2.741)
06 Montréal	28	1.175	(0.682-1.878)	584	1.067	(0.957-1.187)
07 Outaouais				27	0.380	(0.218-0.612)
08 Abitibi-Témiscamingue				9	0.237	(0.083-0.527)
09 Côte-Nord				9	0.404	(0.141-0.898)
10 Nord-du-Québec						
11 Gaspésie–Îles-de-la-Madeleine				15	0.434	(0.199-0.815)
12 Chaudière-Appalaches	12	2.979	(1.227-5.995)	367	3.400	(2.960-3.884)
13 Laval				64	0.698	(0.494-0.956)
14 Lanaudière	6	1.839	(0.471-4.799)	131	1.414	(1.116-1.764)
15 Laurentides				86	0.765	(0.569-1.004)
16 Montérégie	16	1.314	(0.622-2.422)	329	1.033	(0.892-1.189)
17 Nunavik						
18 Terres-Cries-de-la-Baie-James						
Province	79			1 993		

[1] The data are not presented for regions with fewer than 5 cases, so the total for the province does not always match the sum of the populations presented.

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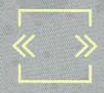

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