ISPESL
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THE NATIONAL MESOTHELIOMA REGISTER (ReNaM)

(Decree of the President of the Council of Ministers N. 308/02)

Second Report
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ISPESL

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SECOND REPORT
OF THE NATIONAL MESOTHELlOMA REGISTER

(art. *36*, Legislative Decree *277/91* – Decree of the President of the Council of Ministers *308/02)*

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NATIONAL MESOTHELIOMA REGISTER
SECOND REPORT

REGIONAL SECTION

PREFACE

Benedetto Terracini

During the Twentieth Century, Italy was one of the countries worse hit by asbestos morbidity owing to both the modes of industrial development in our country, and to the unfortunate circumstance that, until the Nineteen Eighties, Italy was one of the biggest asbestos producers in the world. On average, twenty years ago, each Italian was consuming more than one kilo of asbestos per year. Italy was also, after the Scandinavian countries, among the first countries in the European Union to ban (in 1992) the import, export, manufacturing and sale of any asbestos based products. Given the latency of asbestos-related diseases and especially of mesotheliomas of the pleuroperitoneal serous membranes, a form of epidemiological monitoring was found to be necessary. The monitoring was cleverly set up by ISPESL (Italian National Institute for Occupational Safety and Prevention), in cooperation with the Regions, and this volume is the second report on this activity.

Among the many messages gleaned from by the report, it is difficult to establish a rank of importance. An important piece of news is certainly the analysis of asbestos exposure distribution by economic production sector in which those affected by mesothelioma have been working (Table 14). As confirmation of the opportuneness of having sanctioned a wholesale ban, there is a conspicuous proportion of cases attributable to asbestos exposure in sectors where exposures would have been impossible to be checked (as in the construction sector), other than the traditional ones of extraction, and production of textiles, brakes and clutches and asbestos cement. It was predictable taking into account the observations made in other countries, such as Australia, that for quite some time have had the privilege of having a national mesothelioma register that also includes the working history of victims.

For 53% of cases recorded by the Italian National Mesothelioma Register (ReNaM) a certain or probable past exposure to asbestos has been found in the working environment. For another 14% exposure to asbestos is considered possible. These proportions are not very different from the ones commonly outlined in the literature, and account should also be taken of the fact that 16.6% of cases have been classified as “unknown exposure”: a proportion set to decrease in future. Already today, a first consequence of the availability of the ReNaM should be the verification that procedures have begun towards compensation (to the survivors, in most cases) for each of those 53%. The refusal of the principle of the monetary quantification of the risk does not mean the denial of this right. Moreover, the high number of cases of mesotheliomas in subjects with past domestic and/or environmental exposure (almost 10%) highlights the urgent need to end the current difficulties of the Italian legal system in giving some form of recognition to all victims of asbestos.

As a scientific research tool, the ReNaM opens up new perspectives on different levels. It lends itself to the application of relatively sophisticated epidemiological approaches for measuring the descending phase of the epidemic, that can be predicted in relatively short times, especially for youngest generation Italians (those who started working in periods when limited protection measures for the initial perception of asbestos risk were starting to be adopted in work places). The database of the register lends itself to a quantification of the individual exposures, and thus to analytical epidemiology studies intended to improve knowledge of the role of temporal aspects on exposure. In particular, it is to be hoped that analyses will be made which allow us to separately estimate the role of the duration of exposure and of the time passed after the end of exposure to asbestos. As in other forms of carcinogenesis, these are important potential contributions to knowledge about the mechanism of the carcinogenic action of the various forms of asbestos. Especially in Italy, finally, attention has been focused in recent years on possible individual susceptibility indicators for asbestos-related pleural carcinogenesis. Even if it is unimaginable that this strand of research will find an application in the prevention of mesotheliomas (or their diagnostic anticipation), it has an undeniable potential to contribute to basic knowledge about the process of carcinogenesis.

NATIONAL SECTION

CONSUMPTION OF ASBESTOS IN ITALY AND WORLDWIDE

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Introduction

Total asbestos production in the world between 1900 and 2000 accounted for about 173 million tonnes and more than 80% of this production refers to the period starting from 1960. The increase in worldwide production levels is steady from the second post-war period to the mid 1970s, a period when it reaches its peak with more than 4.5 million tonnes/year produced. Knowledge about the effects on health due to the use of asbestos was developed since the 1960s and asbestos production (and consumption) start decreasing from the early 1980s. In 2000 global consumption accounted for 31% of that recorded in 1980 (it dropped from 4.7 million tonnes in 1980 to 1.5 million tonnes in 2000) [1].
Currently a complete or partial ban on asbestos is underway in several countries including Saudi Arabia, Argentina, Austria, Belgium, Chile, Denmark, Finland, France, Germany, Italy, Norway, The Netherlands, Poland, United Kingdom, Sweden, Switzerland (for a complete list see the web site of the International Ban Asbestos Secretariat http://www.btinternet.com/~ibas/index.htm). In 2000 Brazil, China, India, Japan, Russia and Thailand consumed more than 60,000 tonnes of asbestos and together they account for 80% of worldwide consumption.
Italy is the only country in the European Union together with Greece in which asbestos mines have been active and is therefore not only an importer but also a producer country. In 1992 asbestos was finally banned and its production, use and sale forbidden in all forms. The massive use of asbestos in many different industrial activities put Italy among the countries in which the situation is particularly alarming as shown by several mesothelioma incidence and mortality data analyses [2-4]. The relationship between the asbestos consumption curve and trends for asbestos-related neoplasia is widely documented and quantitative analyses of asbestos consumption trends over time have been published for several countries [5-13]. Recently the statistical correlations between incidence and/or mortality rates for pleural mesothelioma and/or tumour were studied for ten industrialised countries including Italy referring to latency periods that were not homogeneous between the various countries [14-15].
In Italy the recording and in-depth study of cases of incident mesothelioma started in 1988 in a few regions. In 1993 the ReNaM was set up at the Italian National Institute for Occupational Safety and Prevention (ISPESL), and currently covers large part of the national territory through the Regional Operative Centres (COR). The ReNaM published measures of incidence, survival and wider studies on the modes of exposure to asbestos for cases incident in the period 1993-1996 [16], for 1997 [17] - and in this second report it presents the data for the period 1998-2001. Given the relatively too recent availability of mesothelioma incidence measurements in Italy and the absence in the mortality statistics of a specific code for mesotheliomas (prior to the 10th review of the International Classification of

Diseases (ICD) coding system), mortality due to primary pleural tumour was often also considered to be a reliable index for mesothelioma even if there are difficulties in the quality of the coding for death registration in terms of diagnostics, high mortality and the tendency to avoid invasive examinations in patients with poor health [18].
The objective of this contribution is to present the annual national trends of production, imports and exports of asbestos in Italy and to compare these trends with those concerning other producer and consumer countries. Moreover, the correlation between these trends and the historical data series for mortality due to pleural tumour is evaluated in order to test whether aggregate level raw asbestos use indexes can be used as reliable indicators.

Methods

The data for imports, exports and national production of asbestos for Italy are taken from the publications of the Italian National Institute of Statistics (ISTAT), the Italian Institute for Foreign Trade and of the Directorate General of Mines of the Ministry of Industry. The selected commodity code is "raw asbestos in the form of dust, fibres, rock, staples or other form". A reconstruction is made of the historical data series from 1911 (the first year for which data are available). The quantities of imports and exports are not available for the period 1940-1945 due to the Second World War. The variable "consumption" has been defined as the quantity obtained from the sum between national production and the difference between imports and exports C = Prod + (Imp – Exp). Each of these variables was adjusted for the changes in resident population over the years by shifting to annual pro-capita quantities. The population used for this shift is the one published by the Italian National Institute of Statistics. The statistics for the other countries are provided by the 03-83 open-file report of the US Department of the Interior – US Geological Survey "Worldwide asbestos supply and consumption trends between 1900 and 2000" by Robert L Virta [1]. As to the analysis of the correlations with the historical data series for pleural tumour mortality, the data obtained from the national death certificate database at the Italian National Agency for New Technologies, Energy and Environment (ENEA) were used. The codes used for selecting the mortality data are 163.0 up to 1980 (ICD VIII) and 163.0-163.9 between 1980 and 2000 (ICD IX). The rates are standardised with the direct method and with reference to the resident population in 1991. With regard to pleural tumour mortality a temporal lag of 40 years was set in several studies shown as the average latency time of the disease. The correlation index is Pearson's r coefficient. All the statistical analyses were carried out by using the Statistical Package for Social Sciences software (SPSS) (ver. 10.0).

Results

3,748,550 tonnes of raw asbestos were produced in Italy between the post-war period and the ban in 1992. Until the end of the 1980s Italy was the second largest asbestos fibre producer in Europe after the Soviet Union and the largest one in the European Community. The national production trend was exponential up to the mid 1970s and reached its peak in 1976 with 164,788 tonnes produced. Up to 1987 production was kept above 100,000 tonnes-year and then rapidly decreased quickly to zero starting from 1992. Imports underwent a similar albeit less regular trend. In particular raw asbestos imports hit a peak in 1976 and 1979 with a little over 77,000 tonnes. Significantly, in the three-year period 1989-1991, and thus close to the time of the ban, Italian raw asbestos imports were still extremely high (equal to about 60,000 tonnes a year) and higher than the quantities produced. Raw asbestos exports were high starting from 1965 accounting for about 25,000 tonnes and reached the peak of 80,000 tonnes a year in the two-year period 1975-76. Up to 1988 they remained at around 50,000 tonnes and then decreased very quickly. Overall exports of processed asbestos (asbestos cement products and other goods) between the post-war years and 1992 amount to 2,258,934 tonnes. (Figures 1 and 2; Table 1)

The comparison with the trend curve for production (or for import for non-producing countries) in the other countries considered shows a significant time delay in reaching the peak. In particular in the Scandinavian countries (Finland, Norway, Sweden and Denmark) – which are not producing countries - imports reached a peak between 1967 and 1971 [13] [6] [9] [12], whilst they were already in decline at that time in the United Kingdom [19], United States [20] and Australia [11]. The pro-capita consumption of raw asbestos in Italy was higher than 1.5 tonnes per 1,000 inhabitants up to 1988 and exceeded that of the United States from 1974 onwards. (Figure 3).

Italian production comes almost wholly from the chrysotile mine of Balangero (twenty kilometres North of Turin), the largest deposit in terms of size and number of plants in Western Europe. The mine was active from the First World War (the registration of workers began in 1932) up to the whole of 1989, over an area of many dozens of hectares and the operations which were carried out can be briefly described in this sequence: excavation, first and second crushing, drying, selection and bagging. In 1970 the working population present was 242 (all men). The uses of asbestos produced in Balangero mainly concerned the asbestos cement industry, the production of friction materials and other manufactured products. The fibre produced due to the mineralogical features of the site is not long and is therefore not very well suited for use in textiles production. For the latter and for the use of asbestos in spray insulation imported fibres were used. In Italy long fibre chrysotile was also produced in the mines of Val Malenco in a proportion lower than that of Balangero, about 5% on average until the end of the 1950s; subsequently and no later than the mid 1970s there was only residual production [21] [22].

The composition by country of origin of Italian raw asbestos imports shows that Canada, South Africa, the former Soviet Union and Australia are, in this order, the biggest exporting countries (from which until the 1970s came more than 80% of total Italian imports). Imports from Australia, probably of crocidolite, drastically decreased since 1967 (the Wittenoom mine shut down in 1966) and those from South Africa and the Soviet Union dropped from the mid 1980s. Canada remained the main exporter to Italy for the entire period considered. The European countries and Japan were the main countries of destination of Italian raw asbestos exports for the entire period. Even for Italy the curve of standardised pleural tumour rates (a variable for which a homogeneous and long term historical data series is available) follows the trend for production (and for consumption of asbestos). The highest correlations (almost linear) and very close together are obtained between the production, the consumption of raw asbestos and rates in men with a 40 year lag (Pearson's r between 0.87 and 0.91; p value < 0.0001). For pleural tumours in women the correlation is lower albeit largely significant (Pearson's r between 0.76 and 0.81; p value < 0.001) (Table 2 and Figure 4). For imports the correlations are decidedly lower.

Discussion

Although the relationship between consumption of asbestos and incidence of mesothelioma (or pleural tumour mortality) is ascertained and reported in several analytical epidemiology studies, a time analysis of the dynamics of this relationship over time at the aggregate level for our country is not available. The consideration that this analysis is of interest, comes firstly from the circumstance that Italy has a temporally delayed trend for asbestos consumption compared to a great deal of European countries (and even more compared to the United States and Australia) and the pro-capita amounts are especially high. Worldwide production has been decreasing since 1980, but it is significantly contributed to by countries such as Brazil and China whose production levels are still very high and growing (in the case of China) and in which there are no planned restriction measures for the use of asbestos (Figures 5, 6, 7). In the United States the drop in consumption began in the mid 1970s and in 1986 the quantities accounted for about 1/10 compared to the peak year [20]. Similarly in Australia production was greatest in the decade 1970 to 1979 and subsequently rapidly decreased until it ceased in 1983 [11]. The data published for Denmark, Norway, and Sweden show an asbestos import trend (very similar between them) with a very rapid decrease starting from 1975 and zero quantities in the early 1980s [12], [6] [9]. In Finland the trend reversal occurred even earlier and stems from 1970 [13]. Among the European countries France has dynamics closest to the Italian ones and therefore delayed compared to the Scandinavian countries [5], whilst in the United Kingdom imports are almost zero from the mid 1980s [5]. In Italy consumption does not drop below 100,000 tonnes-year until 1990. As regards the type of asbestos, production was almost exclusively chrysotile, whilst imports from Australia and partly, from South Africa were presumably crocidolite. Therefore crocidolite can be estimated to be 20-30% of Italian asbestos fibre imports. The analysis of the relationship of the dynamics of consumption with an asbestos-related neoplasia occurrence index must necessarily refer to a hypothesis on the latency period. The latency range for the mesothelioma reported in the studies published ranges from 20 to more than 40 years. The National Mesothelioma Register estimated, only on cases with an occupational exposure and incident in 1997, a median latency of 44 years. The German Register estimates the average time between the first exposure and the beginning of the disease as 38.7 years with an extremely wide range (11-68) [10]. Average latencies longer than 40 years in subjects with occupational exposure are reported by the French Register [23] and by the Australian Register for cases incident between 1986 and 1995 [24]. Several studies on wide-ranging case histories and reviews show a variability in the average latency time associated with the type of exposure and the type of asbestos [25], [26].

In the correlation estimate exercise a 40 year period was taken as the average latency time. Given this assumption, asbestos consumption and mortality due to malignant pleural tumours are strongly correlated. In particular, this applies to the male gender and the correlations are lower if only imports are considered.

In Italy the adoption of measures geared towards reducing the intensity of the exposure and to changing the fibre used (reduction in the use of crocidolite) began in the mid 1970s even though limited to a few production sectors (asbestos cement, shipbuilding, production of railway rolling stock); in 1986 limits were introduced in the use of crocidolite and in 1992 (and operationally in 1994) the import, production and sale of any type of asbestos was banned. The relationship between consumption of asbestos and exposure depends on the type of use, on the working conditions, on the type of protection measures adopted, and on the number of subjects exposed, and these circumstances have certainly not been constant over time and have been difficult to measure. With these elements of caution in mind, however, our results seem to show that production or consumption of raw asbestos are variables that can be used at the aggregate level as proxy measurements of exposure.

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References

1. Virta R. Worldwide asbestos supply and consumptions trends from 1900 to 2000. Open-file report 03-83. U.S. Department of interior - U.S. Geological Survey
2. AIRT Working Group. I tumori in Italia - rapporto 2006. Epidemiol Prev 2006; 30(1):1-147 Supplemento 2.
3. Marinaccio A, Montanaro F, Mastrantonio M, Uccelli R, Altavista P, Nesti M, Seniori Costantini A, Gorini G. Predictions of mortality from pleural mesothelioma in Italy: a model based on asbestos consumption figures supports results from age-period-cohort models. International Journal of Cancer 2005 May 20; 115(1):142-7
4. Merler E, Biggeri A. Trends in mortality from primary pleural tumors and incidence of pleural mesothelioma in Italy: a very serious situation. Epidemiol Prev 1999; 23:316-26
5. Gilg Soint Ilg A, Bignon J, Valleron AJ. Estimation of the past and future burden of mortality from mesothelioma in France. Occup Environ Med 1998; 55:760-5
6. Ulvestad B, Kjaerheim K, Moller B, Andersen A. Incidence trends of mesothelioma in Norway, 1965-1999. Int J Cancer 2003; 107, 94-8
7. Richter ED, Berdugo M, Laster R, Westin JB, Fischbein A. Chrysotile and crocidolite asbestos in Israel: uses, exposure and risks. Med Lav 1995; 86(5):449-56
8. Harington JS, McGlashan ND. South African asbestos: production, exports and destinations, 1959-1993. Am J Ind Med 1998; 33:321-6
9. Järvholm B, Englund A, Albin M. Pleural mesothelioma in Sweden: an analysis of the incidence according to the use of asbestos. Occup Environ Med 1999; 56:ll0-3
10. Neumann V, Gunther S, Muller KM, Fischer M. Malignant mesothelioma – German mesothelioma register 1987-1999. Int Arch Occup Environ Health 2001, 74, 383-395.
11. Leigh J, Davidson P, Leigh H, Berry D. Malignant mesothelioma in Australia, 1945-2000. Am J Ind Med 2002; 41:188-201
12. Kjaergaard J, Anderson M. Incidence rates of malignant mesothelioma in Denmark and predicted future number of cases among men. Scand J Work Environ Health 2000; 26(2):112-7
13. Kaarjalainen A, Pukkala E, Mattson K, Tammilehto L, Vainio H. Trends in mesothelioma incidence and occupational mesotheliomas in Finland in 1960-1995. Scand J Work Environ Health 1997; 23:226-70
14. Takahashi K, Huuskonen MS, Tossavainen, Higashi T, Okubo T, Rantanen J. Ecological relationship between mesothelioma incidence/mortality and asbestos consumption in ten western countries and Japan. J Occup Health 1999:41:8-11
15. Tossavainen A. National mesothelioma incidence and past use of asbestos. Monaldi Arch Chest Dis 2003; 59(2):146-9
16. Nesti M, Marinaccio A, Silvestri S (eds). Primo Rapporto ReNaM. ISPESL Monograph, Rome 2001
17. Nesti M, Marinaccio A, Regional Operational Centers. Malignant mesothelioma in Italy,1997. Am J Ind Med 2004; 45:55-62
18. Gorini G, Merler E, Chellini E, Crocetti E, Costantini AS Is the ratio of pleural mesothelioma mortality to pleural cancer mortality approximately unity for Italy? Considerations from the oldest regional mesothelioma register in Italy. Br J Cancer 2002: 86:1970-1
19. HSE Statistical Report 2003, Mesothelioma mortality in Great Britain: estimating the future burden. HSE Press Release E242:03

20. Price B, Ware A. Mesothelioma Trends in the United States: an update based on surveillance, epidemiology and end results. Program Data for 1973 through 2003. Am J Epidemiol 2004; 159:107-I2
21. Ghezzi I, Aresini G, Vigliani C. II rischio di asbestosi in una miniera di amianto crisotilo. In Giornata sull'asbestosi. Proceedings of the 34° Congresso Nazionale di Medicina del Lavoro. St. Vincent, Aosta 12 October 1971. Società Italiana di Medicina del Lavoro (eds).
22. Merler E, Biggeri A. Trends in mortality from primary pleural tumors and incidence of pleural mesothelioma in Italy: a very serious situation. Epidemiol Prev 1999; 23:316-26
23. Desoubeaux N, Bouvier V, Gervais R, Galateau-Salle F, Thibon P, Leplumey T, Herbert C, Lecherbonnier Y, Daviet JP, Letourneux M. Mésothéliomes malins en Basse-Normandie: analyse descriptive, facteurs pronostiques et survie. Une étude de population. Rev Epidemiol Santé Publique. 2001 Dec; 49(6):523-529
24. Yeung P, Rogers A, Johnson A. Distribution of mesothelioma cases in different occupational groups and industries in Australia, 1979-1995. Appl Occup Environ Hyg. 1999 Nov; 14(11):759-67
25. Bianchi C, Giarelli L, Grandi G, Brollo A, Ramani L, Zuch C. Latency periods in asbestos-related mesothelioma of the pleura. Eur J Cancer Prev. 1997; 6(2):162-I66
26. Lanphear B, Buncher C. Latent period for malignant mesothelioma of occupational origin. Occup Med 1992; 34:718-721

Figura 1. Produzione nazionale ed importazioni di amianto in fibra. Istogramma a barre sovrapposte. Italia, anni: 1946-1992.

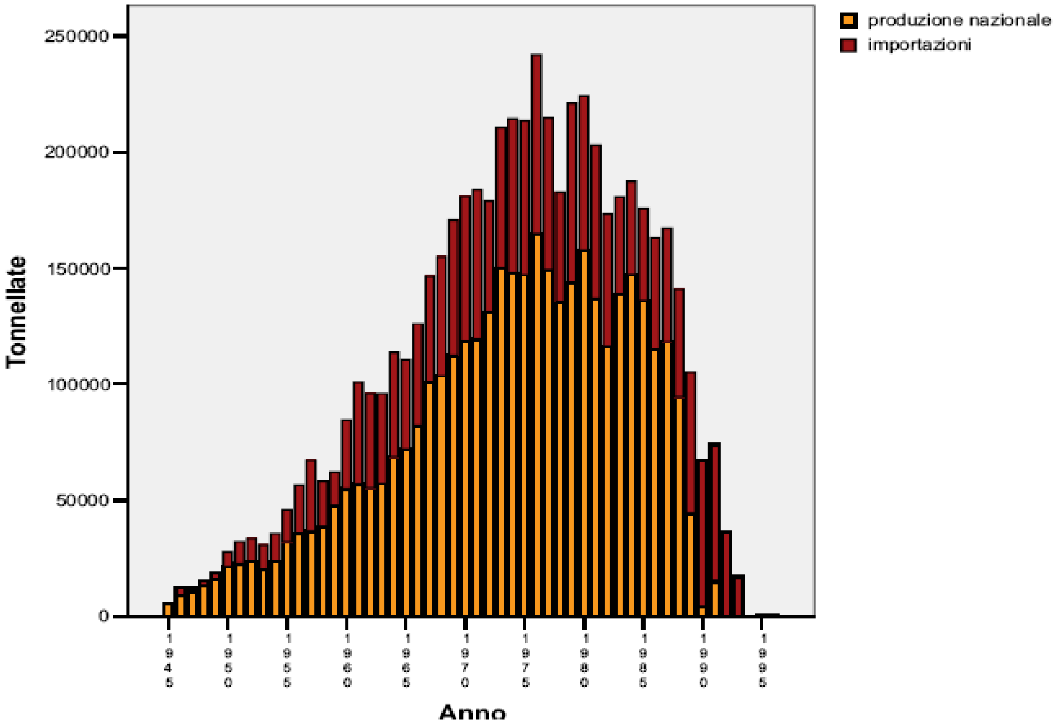

Figure 1. National production and imports of asbestos fibres. Stacked histogram. Italy, years: 1946-1992.

Key:

produzione nazionale	national production
importazioni	Imports
Tonnellate	Tonnes
Anno	Year

Figura 2. Esportazioni di amianto in fibra (tonnellate). Italia, anni: 1946-1992.

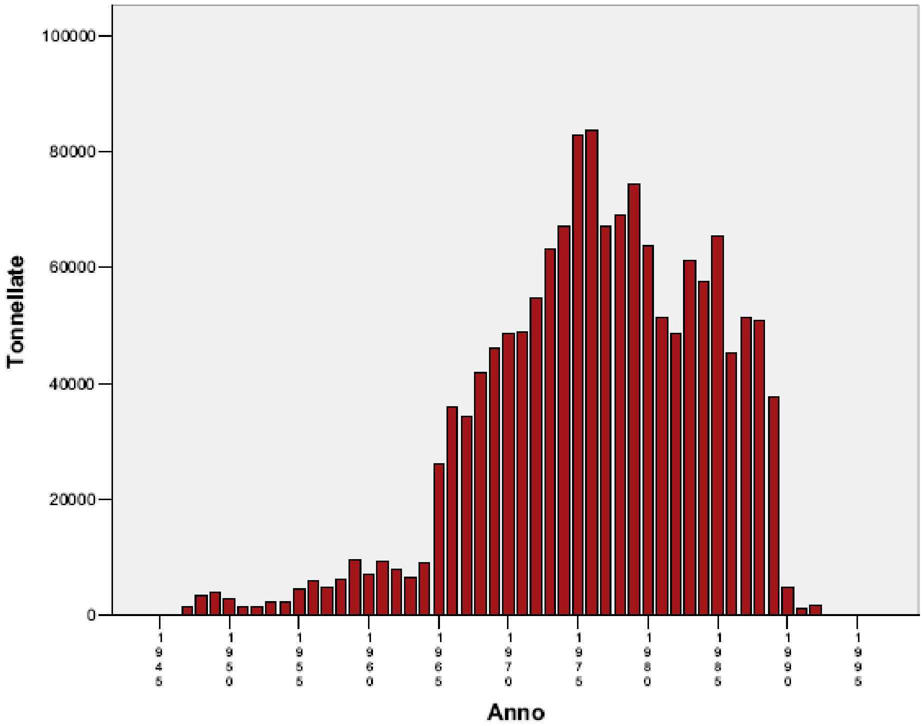

Figure 2. Exports of asbestos fibres (tonnes). Italy, years 1946-1992.

Key:

Tonnellate	Tonnes
Anno	Year

Figura 3. Produzione nazionale di amianto grezzo. Italia e Stati Uniti d'America; tonnellate; anni: 1945-1992.

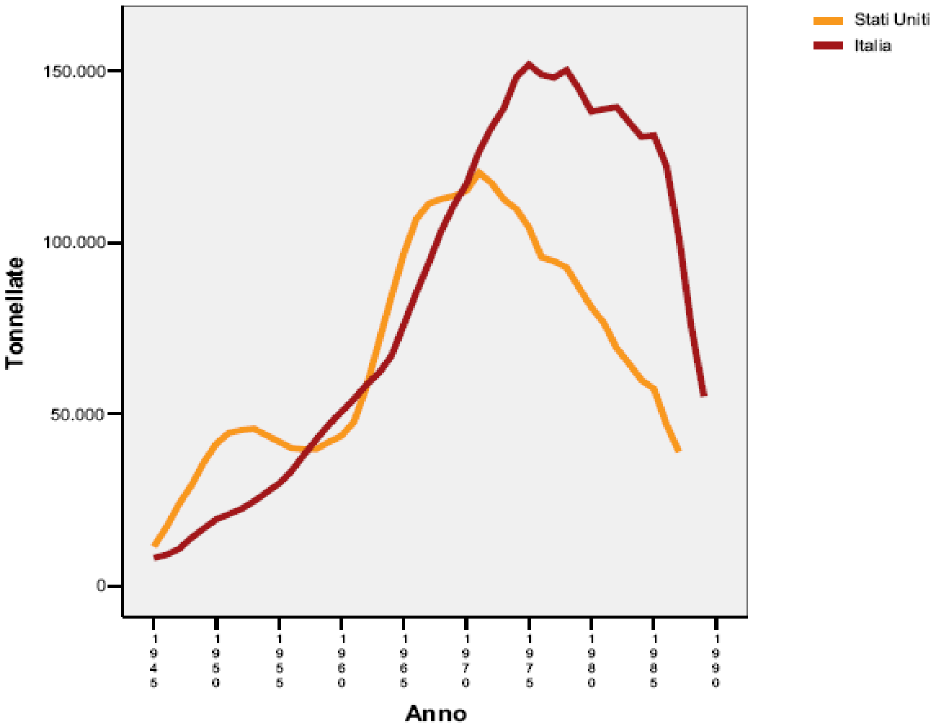

Figure 3. National production of raw asbestos. Italy and United States; tonnes; years: 1945-1992.

Key:

Stati Uniti	United States
Italia	Italy
Tonnellate	Tonnes
Anno	Year

Figura 4. Produzione nazionale di amianto e decessi per tumore maligno della pleura in Italia (uomini e donne) dopo 40 anni. Retta di interpolazione ed intervallo di confidenza al 95%.

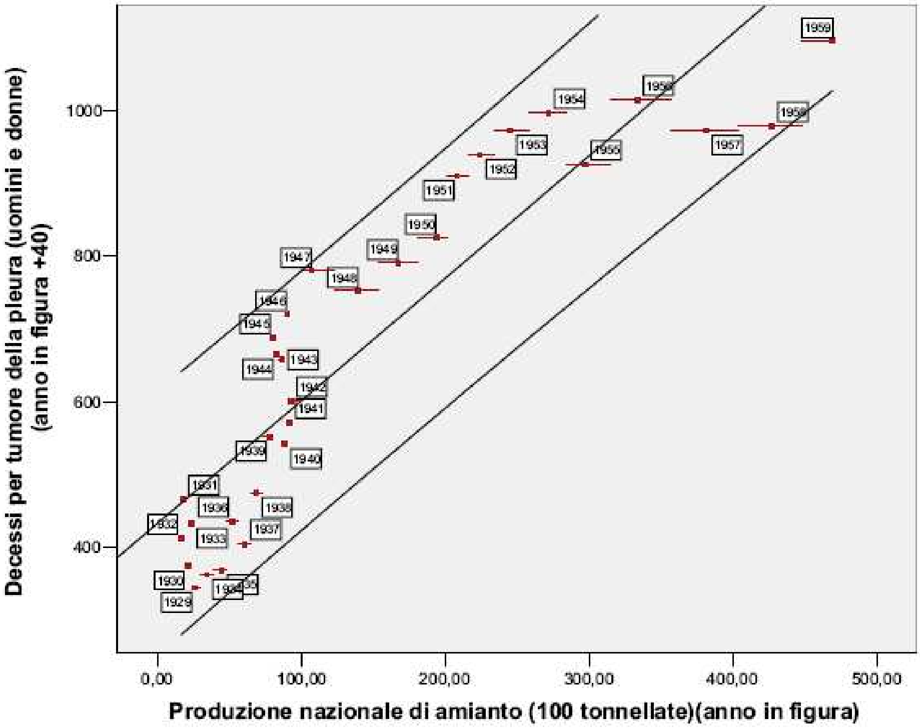

Figure 4. National production of asbestos and deaths due to malignant pleural tumours in Italy (men and women) after 40 years. Interpolation straight line and 95% confidence interval.

Key:

Decessi per tumore della pleura (uomini e donne)	Deaths due to pleural tumour (men and women)
(anno in figura + 40)	(year shown within the figure + 40)
Produzione nazionale di amianto (100 tonnellate) (anno in figura)	National production of asbestos (100 tonnes) (year shown within the figure)

Figura 5. Produzione mondiale di amianto in fibre (migliaia di tonnellate; 1900-2000).

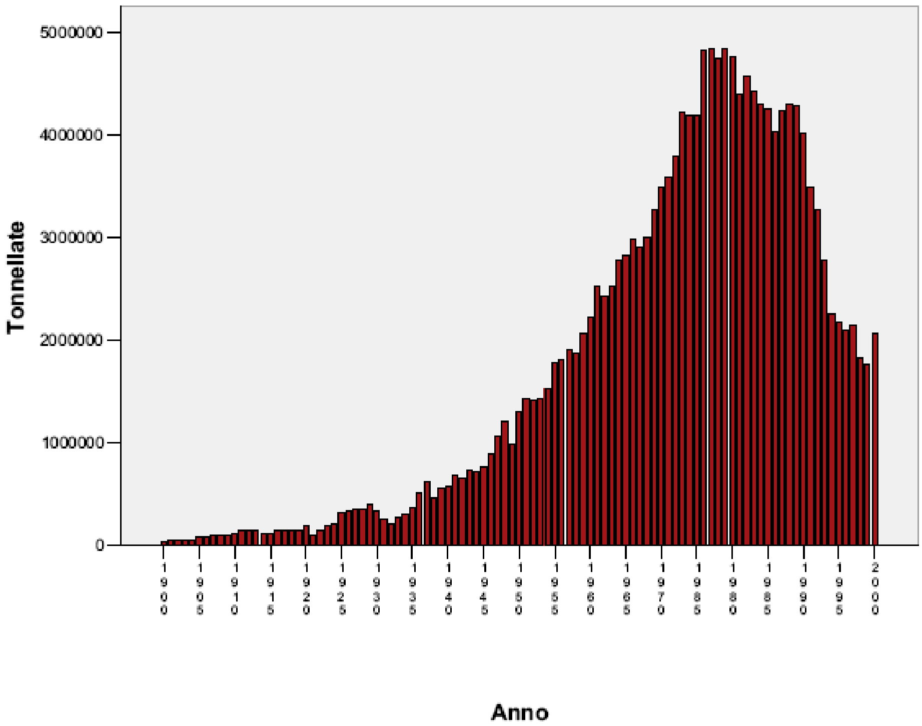

Figure 5. Worldwide production of asbestos fibres (thousands of tonnes; 1900-2000).

Key:

Tonnellate	Tonnes
Anno	Year

Figura 6. Produzione nazionale di amianto grezzo in Cina (tonnellate; 1980-2000)

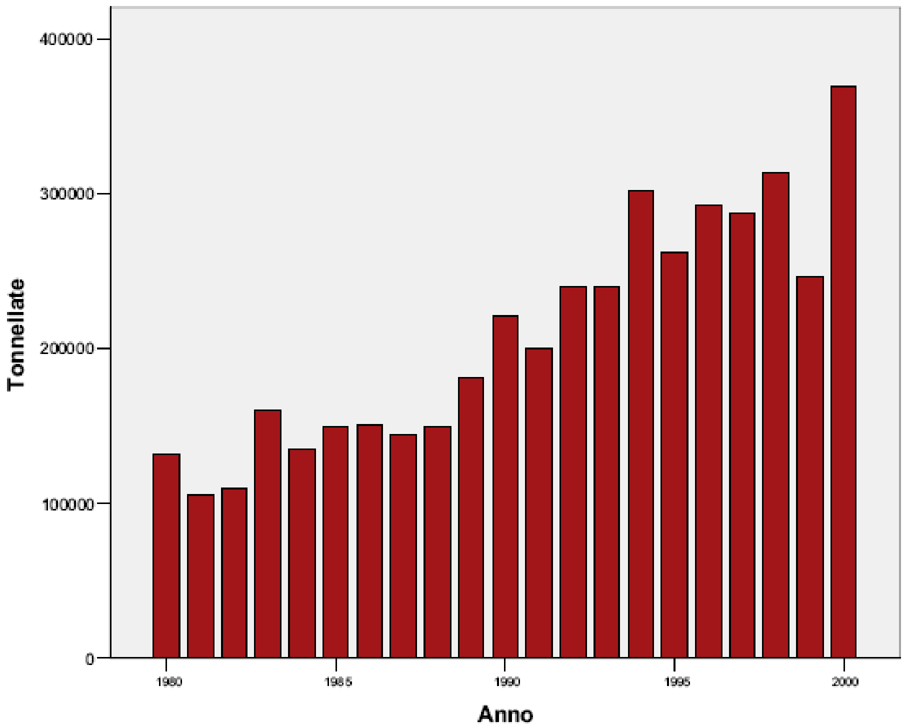

Figure 6. National production of raw asbestos in China (tonnes; 1980-2000).

Key:

Tonnellate	Tonnes
Anno	Year

Figura 7. Produzione nazionale di amianto grezzo in Brasile (centinaia di tonnellate; 1950-2000)

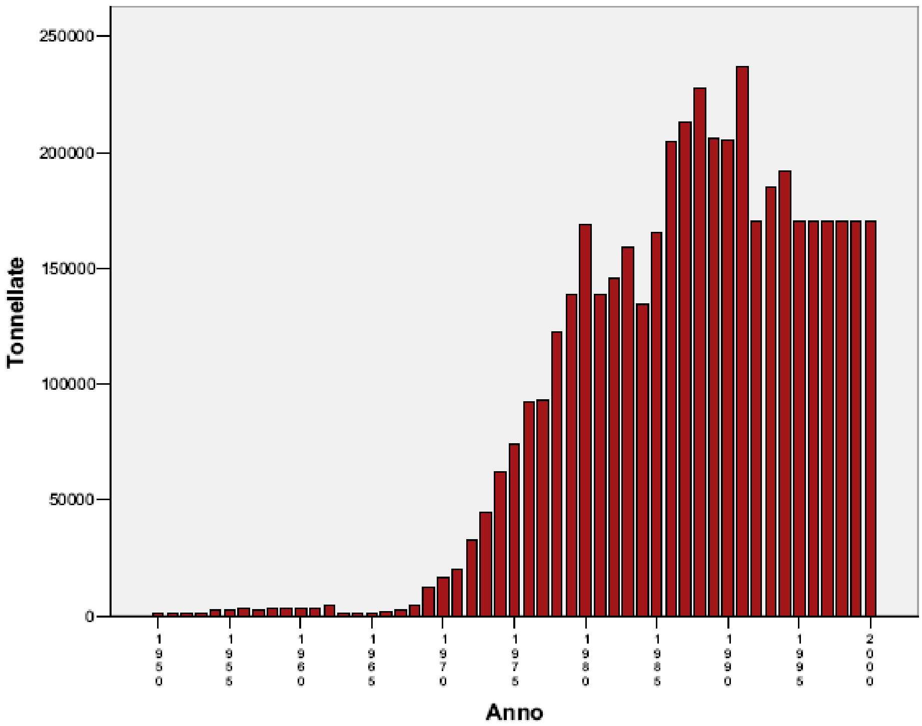

Figure 7. National production of raw asbestos in Brazil (hundreds of tonnes; 1950-2000)

Key:

Tonnellate	Tonnes
Anno	Year

Tabella 1. Produzione nazionale, importazioni, esportazioni e consumi di amianto in fibra in Italia; 1946-1992 (tonnellate)

Anno	Importazioni (I)	Esportazioni (E)	Produzione nazionale(P)	Consumi (P+I-E)
1946	3.476	173	8.814	12.118
1947	1.992	1.335	10.719	11.376
1948	2.098	3.346	13.044	11.796
1949	2.799	4.037	15.877	14.640
1950	6.271	2.891	21.433	24.813
1951	9.435	1.421	22.612	30.625
1952	9.588	1.577	23.938	31.948
1953	10.378	2.407	20.397	28.368
1954	11.795	2.325	23.784	33.254
1955	13.828	4.636	32.101	41.293
1956	20.644	6.070	35.785	50.359
1957	30.652	4.802	36.615	62.466
1958	19.667	6.242	38.555	51.980
1959	14.536	9.587	47.662	52.611
1960	29.606	7.176	54.914	77.344
1961	43.892	9.209	56.975	91.658
1962	40.842	7.891	55.211	88.162
1963	38.760	6.412	57.167	89.515
1964	45.219	9.033	68.556	104.742
1965	38.649	26.247	71.928	84.330
1966	43.764	35.965	82.325	90.124
1967	45.529	34.173	101.062	112.419
1968	51.554	41.847	103.437	113.143
1969	58.229	46.075	112.526	124.680
1970	62.402	48.662	118.536	132.276
1971	64.257	48.971	119.568	134.854
1972	47.753	54.668	131.272	124.357
1973	60.288	63.181	150.256	147.364

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Table 1. National production, imports, exports and asbestos fibres consumption in Italy; 1946-1992 (tonnes).

Key:

Anno	Year
Importazioni (I)	Imports (I)
Esportazioni (E)	Exports (E)
Produzione nazionale (P)	National production (P)
Consumi (P+I-E)	Consumption (P+I-E)

Anno	Importazioni (I)	Esportazioni (E)	Produzione nazionale(P)	Consumi (P+I-E)
1974	66.373	67.067	148.099	147.406
1975	66.457	82.749	146.995	130.703
1976	77.179	83.752	164.788	158.215
1977	65.468	67.106	149.327	147.690
1978	47.189	68.958	135.402	113.633
1979	77.151	74.479	143.931	146.603
1980	66.545	63.815	157.794	160.525
1981	65.942	51.438	137.086	151.591
1982	56.884	48.624	116.410	124.671
1983	41.620	61.164	139.054	119.510
1984	40.127	57.540	147.272	129.859
1985	39.737	65.502	136.006	110.241
1986	47.895	45.187	115.208	117.916
1987	48.864	51.541	118.352	115.674
1988	46.315	50.936	94.549	89.928
1989	60.687	37.532	44.348	67.503
1990	63.438	4.825	3.860	62.473
1991	58.906	1.156	15.000	72.750
1992	36.205	1.686		34.519
Totale	1.900.885	1.475.416	3.748.550	4.174.025

Key:

Anno	Year
Importazioni (I)	Imports (I)
Esportazioni (E)	Exports (E)
Produzione nazionale (P)	National production (P)
Consumi (P+I-E)	Consumption (P+I-E)
Totale	Total

Tabella 2. Correlazioni (e significatività statistica) fra consumi, produzione ed importazioni di amianto in fibra e tassi di mortalità per tumore maligno della pleura (uomini, donne e totale) (periodo di latenza 40 anni).

	Tasso standardizzato di mortalità (uomini) Lag =40 years	Tasso standardizzato di mortalità (donne) Lag =40 years	Tasso standardizzato di mortalità (totale) Lag =40 years
Importazioni	r di Pearson = 0.59 p-value <0.01	0.46 =0.02	0.56 <0.01
Produzione nazionale	0.91 <0.01	0.81 <0.01	0.89 <0.01
Consumi (Pr+Imp-Exp)	0.87 <0.01	0.77 <0.01	0.85 <0.01

Table 2. Correlations (and statistical significance) between consumption, production and imports of asbestos fibres and death rates by pleural malignant tumour (men, women and total) (latency period: 40 years).

Key:

Tasso standardizzato di mortalità (uomini) Lag = 40 years	Standardised death rate (men) Latency period = 40 years
Tasso standardizzato di mortalità (donne) Lag = 40 years	Standardised death rate (women) Latency period = 40 years
Tasso standardizzato di mortalità (totale) Lag = 40 years	Standardised death rate (total) Latency period = 40 years
Importazioni	Imports
Produzione nazionale	National production
Consumi (Pr+Imp-Exp)	Consumption (Pr+Imp-Exp)
r di Pearson	Pearson’s r

EPIDEMIOLOGICAL SURVEILLANCE EXPERIENCES FOR CASES OF MESOTHELIOMA IN OTHER COUNTRIES: A COMPARATIVE ANALYSIS

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The epidemiological surveillance of mesotheliomas and the analysis of asbestos exposure is currently underway in many countries. In Denmark, Finland, Iceland, Norway and Sweden there are no specialised registers set up, but the recording of nationwide data on the incidence of all tumours on the entire population is instead used. The mesothelioma incidence data and the risk analysis by economic sector takes place through linkage procedures which involve population-based tumour registers, census data and occupational data archives. In Great Britain the system is based on death certificates in which the working activity prevalently carried out by the subject during his or her life needs to be recorded. Similarly in the United States the "work-related Lung Diseases Program" promoted by the Division of Respiratory Disease of the National Institute for Occupational Health and Safety (NIOSH) analyses the outbreak of mesothelioma in relation to death certificates and the Surveillance, Epidemiology and End Results (SEER) collects incidence data, although excluding exposure data, on delimited local areas, whilst in Germany the register is mainly oriented to setting out the criteria for compensation. In France and Italy (like in Australia and New Zealand) the epidemiological surveillance of mesothelioma is based on the active research of cases through a network of health organisations where the disease is diagnosed and treated (pathological anatomy institutes, chest surgery wards, oncology, pneumology, etc.). Occupational, residential and environmental history in relation to possible exposure to asbestos is entrusted to trained interviewers by means of a questionnaire adopted at the national level and using pre-established criteria for the mesothelioma diagnosis and the attribution of the exposure modes. The summary features of the surveillance systems are shown in Table 1.

Great Britain

The Mesothelioma Register was set up in the United Kingdom in 1967. The data are collected by the Epidemiology and Medical Statistics Unit, which is part of the Health Policy Division of the HSE (Health and Safety Executive) [www.hse.gov.uk]. The HSE is the technical organisation responsible for checking that work places are properly controlled in relation to health risks and it must also report to the Health and Safety Commission which is in charge of carrying out legislative interventions through the Parliament. The register gathers data on mesothelioma cases identified through death certificates, population-based tumour registers, notified occupational diseases. For each case the gender is noted as is the area of residence at time of death, the last full-time job and the anatomical site of the mesothelioma (pleura, peritoneum or not specified). Until 1993, if there was insufficient data on the death certificate in order to make an adequate coding, the ONS (Office for National Statistics) carried out an additional medical investigation. The annual number of mesothelioma deaths in Great Britain has rapidly increased from 153 in 1968 (the first year that the register was set up) to 1,862 deaths in 2002. The rate of increase seems to decrease in more recent years. Projections indicate the years between 2011 and 2015 as the maximum frequency period, with an estimate of 1950-2450 total deaths; of these, 250-310 deaths are expected among women [1]. As regards the occupational risks, the proportion of mesothelioma cases found amongst workers dealing with activities traditionally showing a greater incidence (such as shipbuilding or insulation workers) seems to be decreasing. However, it must be assessed whether this result arises from the progressive reduction in the number of workers employed in certain sectors and the consequent transfer of workers to other activities, as reported on the death certificate. Yet, what does emerge is the growing relevance gained by some categories of workers such as construction workers and plumbers [2] according to the increase in the number of new mesothelioma cases.

France

In France the National Mesothelioma Register was set up in 1975, but in the first few years it only included five Departments and two Regions. In January 1998, with the impetus given by EU legislation, the “Mesothelioma Register” was turned into a National Mesothelioma Surveillance Programme (PNSM) financed by the Labour Relations Directorate and the Health Directorate General of the Ministry of Employment and Solidarity. In 2003 the PNSM is actively operating for twenty-one Departments in France (out of a total of ninety), about 15 million inhabitants, including 4 million inhabitants resident in areas showing a high incidence. The sources identified for the notification of mesothelioma cases are represented by the laboratories of pathological anatomy, pneumology, chest surgery and oncology. A project in cooperation with the National Sickness Insurance Fund is currently being arranged in order to urge occupational physicians to notify cases. A procedure for the confirmation of histological diagnosis (the experience of the Mesopath group, the French Panel of Pathologists) is applied to each case. Besides the incidence analysis, the aim of the PNSM is to examine in detail the causative factors of mesothelioma and therefore to study the mesothelioma risk attributable to occupational and non-occupational exposure to asbestos as well as to study other potential risk factors. The register revealed a constant growth in the number of cases from 141 in 1998 to 298 in 2002. In the areas controlled by the register, the incidence rate in 1998 was 1.18 cases per 100,000 inhabitants. The gender ratio is equal to 5. The average age is 71 years amongst men and 72 years amongst women. [3]. The incidence of mesothelioma in France is relatively low in comparison with other industrialised countries but this difference, linked to the utilisation of asbestos that in France began at a later stage, tends to diminish since a constant increase in the incidence is observed. Researchers estimate an increase in the number of cases up to 2010-2020 [4] or even later [5].

Germany

In Germany the Mesothelioma Register was set up in 1973 at the Institute of Pathological Anatomy of the University Hospital in Bochum, Ruhr Region [<www.uv.ruhr-uni-bochum.de>]. The Register deals with morphological, epidemiological, experimental and medico-legal issues regarding lung and pleural diseases caused by asbestos (asbestosis, mesothelioma, asbestos-related bronchial carcinoma). Macroscopic, microscopic, histochemical, and immunohistochemical examinations are made of materials sent by the various pathology institutes of the Federal Republic of Germany as well as by professional associations. The main objective of the register is to perform the anatomopathological assessment of the diagnoses and the measurement of the asbestos fibres in the biological material. The numbers of recorded cases increased from 168 in 1988 to 515 cases of malignant mesothelioma recorded in 1999; the register recently published data on 3,942 cases of malignant mesothelioma diagnosed between 1987 and 1999 [6].

The Netherlands

In The Netherlands the *Nederlands Mesotheliomen Panel* was set up since 1969 at The Netherlands Cancer Institute. With reference to malignant mesotheliomas, the incidence and survival rates in the southern part of The Netherlands were studied, starting from 1970. Most mesotheliomas affected the pleura, the anatomical site for 119 cases (88%). Between 1975 and 1994, incidence rates for pleural mesotheliomas (taking age into account) almost doubled (from 10 to 19 per million inhabitants in the case of men and from 2.4 to 3.8 in the case of women). Mesothelioma mortality is constantly increasing and the total number of deaths in the period 1969-1998 (6.5 men per each woman) was 5,526. The mortality rate increased from 1 out of 100,000 in 1969 to 3.9 out of 100,000 in 1993. The scenario considered to be most plausible by the researchers foresees a peak around 2017 with an estimate of 490 deaths per year and a subsequent rapid decrease. [7]. A study of special interest published recently compares the incidence rate dynamics between The Netherlands and Sweden [8] suggesting that the differences in the two countries may be explained in terms of asbestos consumption and characteristics of exposure. The introduction of hygiene control measures in the 1960s and 70s is now starting to show its effect on the resulting decrease in the incidence for 60-year-old subjects.

Scandinavian countries

In the Scandinavian countries, the population size as well as the presence of consolidated registration systems for all tumours that have been in existence for a few decades allowed the epidemiological surveillance of mesothelioma cases to be carried out through linkage procedures involving the available data sources without the need of setting up a specialised register. In Finland, during the five-year period 1990-1994 the age-adjusted incidence rate was 10 cases per million inhabitants in men and 2.9 cases in women. The trend seems to show that the peak was reached in the 1990s and currently the incidence is starting to decrease. [9]. In Sweden, between 1961 and 1998, 1,298 cases of mesothelioma were identified amongst men and 233 amongst women. The incidence rate for pleural mesothelioma increased until the mid 1990s, whilst recent analyses have shown a levelling off in the number of cases [10]. It is interesting to note that in Sweden the first laws governing the use of asbestos have been implemented since 1964, and that in the mid nineteen-seventies raw asbestos imports drastically decreased and dropped to zero around 1980 [11-12]. A similar trend in asbestos consumption and an almost complete cessation of imports (no Scandinavian country is an asbestos producer) occurring in the period 1980-1985 may also be documented for Denmark [13], Finland [9] and Norway [14].

United States

The Surveillance, Epidemiology and End Results (SEER) programme contains data on the incidence of all tumours and it included nine registers between 1973 and 1991 and 11 registers between 1992 and 2000. 14% of United States population is represented by the register. Approximately 2,000 cases are estimated amongst men and 560 amongst women. Data on the sector of economic activity in which the subjects affected by the disease were involved are only available through the death certificates recording the subject’s last occupation before death. The analysis of the incidence and mortality data has recently shown that the trend appears to be levelling off after the peak reached in the period 2000-2004, either in terms of age-standardised rates or absolute values. The total number of mesothelioma cases expected between 2003 and 2054 is 71,000 cases [15].

Australia and New Zealand

Australia used to be an asbestos producing country and the imports of chrysotile asbestos (from Canada) as well as crocidolite and amosite (from South Africa) reached significant volumes throughout the 1970s. The Wittenoom crocidolite mine (Western Australia) was in operation between 1937 and 1966. The consumption peak was reached in 1975 with a production of 70,000 tonnes/year. Its uses mainly concerned the construction sector and the manufacturing of asbestos cement products. The Australian Mesothelioma Surveillance Programme began in January 1980. For each case reported, there was a complete reconstruction of the occupational and environmental history to be made, based on the patient’s or the relatives’ direct account. Starting from January 1986, a less detailed notification system was introduced involving a short questionnaire and only histologically confirmed cases are then recorded. Checks are regularly made with the tumour registers. A marked growth in the incidence rates of mesothelioma cases has been recorded in the last ten years [16] and there are about 450-600 cases reported each year (out of a total population of less than 20 million inhabitants). The trend is still upwards and is expected to continue like that for another 5-15 years. The most affected working activities are shipbuilding, the repair and maintenance of materials containing asbestos and the activities associated with the Wittenoom mine. The average latency period between initial exposure to asbestos and disease diagnosis is ranging between 35 and 40 years.
In New Zealand, the National Asbestos Register was set up in 1992 following the recommendations of the Asbestos Advisory Committee (established in 1990). The register contains data reported by the subjects who were significantly exposed to asbestos and is divided into two parts: the first section records those subjects who were exposed to asbestos while the second part refers to those subjects who have an asbestos-related disease. Before being recorded, all cases of asbestos-related diseases are subject to verification by the experts of the National Asbestos Medical Panel. In 1995, the incidence rate for mesothelioma was 25 cases per million inhabitants in men and the incidence is expected to double by 2010. [17]

References

1. Hodgson JT, McElvenny DM, Darnton AJ, Price MJ, Peto J. The expected burden of mesothelioma mortality in Great Britain from 2002 to 2050. Br J Cancer 2005, 92:587-593
2. HSE Statistical Report 2003, Mesothelioma mortality in Great Britain: estimating the future burden. HSE Press Release E242:03.
3. Meier A, Le Bacle C. Affections profesionelles liées à l'amiante. Situation en France. Documents pour le medecin du Travail, 1999; 20(3):169-76
4. Ilg AG, Bignon J, Valleron AJ. Estimation of the past and future burden of mortality from mesothelioma in France. Occup Environ Med 1998; 55(11):760-5.
5. Banaei A, Auvert B, Goldberg M, Gueguen A, Luce D, Goldberg S. Future trends in mortality of French men from mesothelioma. Occup Environ Med. 2000 Ju1; 57(7):488-94
6. Neumann V, Gunthe S, Mulle KM, Fischer M. Malignant mesothelioma--German mesothelioma register 1987-1999. Int Arch Occup Environ Health. 2001 Aug; 74(6):383-95
7. Segura O, Burdorf A, Looman C. Update of predictions of mortality from pleural mesothelioma in the Netherlands. Occup Environ Med. 2003 Jan; 60(1):50-5
8. Burdorf A, Järvholm B, Englund A. Explaining differences in incidence rates of pleural mesothelioma between Sweden and the Netherlands. Int J Cancer 2005 Jan 10; 113(2):298-301
9. Karjalainen A, Pukkala E, Mattson K, Tammilehto L, Vainio H. Trends in mesothelioma incidence and occupational mesotheliomas in Finland in 1960-1995. Scand J Work Environ Health. 1997 Aug; 23(4):266-70.
10. Hemminki K, Li X. Mesothelioma incidence seems to have levelled off in Sweden. Int J Cancer 2003; 103:145-6].
11. Järvholm B, Englund A, Albin M. Pleural mesothelioma in Sweden: an analysis of the incidence according to the use of asbestos. Occup Environ Med 1999; 56:110-113
12. Hillerdal G, The Swedish experience with asbestos: history of use, diseases, legislation and compensation. Int J Occup Environ Health 2004; 10:154-158
13. Kjaergaard J, Anderson M. Incidence rates of malignant mesothelioma in Denmark and predicted future number of cases among men. Scand J Work Environ Health 2000; 26:112-117
14. Ulvestad B, Kjaerheim K, Moller B, Andersen A. Incidence trends of mesothelioma in Norway, 1965-1999. Int J Cancer 2003; 107:94-98
15. Price B, Ware A. Mesothelioma Trends in the United States: an update based on surveillance, epidemiology and end results. Program Data for 1973 through 2003. Am J Epidemiol 2004; 159:107-12
16. Leigh J, Davidson P, Leigh H, Berry D. Malignant mesothelioma in Australia, 1945-2000. Am J Ind Med 2002; 41:188-201
17. Kjellstrom T, Smartt P. Increased mesothelioma incidence in New Zealand: the asbestos cancer epidemic has started. N Z Med J. 2000 Nov 24; 113(1122):485-90

Table 1. Concise description of the features of the epidemiological surveillance systems for mesothelioma cases in the countries where significant experiences are currently underway.

Country	**Specialised register**	**Setting-up year**	**Methods of recording data**	**Pleura - incidence/mortality rates (*100000)**	**Territorial extension**	**Methods of exposure survey**	**Institute**	**Web site (if any)**
Great Britain	Yes	1967	Death registers. No active research	2000-2002 Mortality Men 5.47 Women 0.89	National	Last occupation shown on death certificate	Health and Safety Executive (HSE)	www.hse.gov.uk
France	Yes. The National Mesothelioma Surveillance Programme (PNSM)	1975	Active research	2000 Incidence Men 2.1 Women 0.4	21 Departments out of 90	Direct or telephone interview – questionnaire	Institute de Veille Sanitaire	www.invs.sante.fr
Germany	Yes. German Mesothelioma Register	1973	Notifications to the register. No active research	Not available	Not available	Not available	Institution of the Central Federation of Industrial Berufsgenossenschaften	www.uv.ruhr-uni-bochum.de
The Netherlands	Yes. Nederlands Mesotheliomen Panel	1969	Tumour registers. No active research	1998 Mortality Men 3.9 Women 0.25	Not available	Not available	Eindhoven Cancer Registry	www.ikcnet.nl
Sweden	No		Record linkage (Population-Based Tumour Register, occupational history)	2000-2002 Mortality Men 5.47 Women 0.89	National	Record linkage	Swedish Cancer Register	www.roc.se
Norway	No		Record linkage (Population-Based Tumour Register, occupational history)	1995-1999 Incidence Men 2.61 Women 0.89	National	Record linkage	Cancer Registry of Norway	www.kreftregisteret.no
Finland	No		Record linkage (Population-Based Tumour Register, occupational history)	1990-1994 Mortality Men 1.0 Women 0.29	National	Record linkage	Finnish Cancer Registry	www.occuphealth.fi
USA	No		Tumour registers. No active research	2000 Incidence Men 1.9 Women 0.4	13 areas; 14% of the population	Last occupation shown on death certificate	Surveillance, Epidemiology and End Results (SEER)	www.seer.cancer.gov
Australia	Yes. Australian Mesothelioma Register	1986	Active research	2001 Mortality Men 3.34 Women 0.69	National	Direct or telephone or mail interview – questionnaire	National Occupational Health and Safety Commission (NOHSC)	www.nohsc.gov.au

THE NATIONAL MESOTHELIOMA REGISTER (ReNaM): LEGISLATIVE FRAMEWORK, INFORMATION SYSTEM, EPIDEMIOLOGICAL INDICATORS

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Following the implementation of Article 17 of Community Directive No. 83/477 setting out “for Member States the obligation to keep a register of recognized cases of asbestosis and mesothelioma”, on 15 August 1991 Legislative Decree 277 was issued in Italy which in Article 36 – “Cancer Register” – provides for “the setting up of a register of recognized cases of asbestosis and asbestos-related mesothelioma at the Italian National Institute for Occupational Safety and Prevention (ISPESL)”. The “Rules for the definition of the model and the procedures for keeping the register...” were set out by Decree of the President of the Council of Ministers no. 308 dated 10 December, 2002 published in Official Journal No. 31 dated 7 February, 2003.
The National Mesothelioma Register (ReNaM) provides for a regional structure boosted by the fact that during the 1990s in a few local organisations active case research experiences had already been developed. ISPESL agreed with the Regions both the adoption of joint operative standards and the setting up of Regional Operative Centres (COR) which, upon the specific mandate of the respective Health Departments, must carry out the activation, control, transmission and collection of information flows, regarding the epidemiological surveillance of cases of mesothelioma. The main objectives of the Register are the estimate of the incidence of cases of malignant mesothelioma in Italy, the collection of data on past exposure to asbestos, the identification of unexpected sources of past occupational exposures and of asbestos environmental contamination or any other causal agents.

The information system

The mesothelioma case survey is carried out by Regional Operative Centres (COR) at the local health organisations located in the area falling within their competence, which diagnose and treat cases of mesothelioma (Pathological Anatomy and Histology Services, pneumology wards, thoracic surgery and oncology wards, etc.). Exhaustiveness and completeness checks for the case histories collected are carried out through Hospital Discharge Forms (SDO) and ISTAT (Italian National Institute of Statistics) Death Certificates. Diagnostic reference protocols for mesothelioma diagnosis criteria standardisation allow us to set out the different level of diagnostic certainty achieved.
The survey of the occupational medical history, the life habits and the residential history of each case is performed by interviewing the subject (direct interview) or, if unavailable, a close acquaintance (indirect interview) which can provide data on the working and life history with a standard questionnaire for which the interviewer has been specifically trained. Some Regional Operative Centres are aided, for the collection of the data relating to the occupational and residential exposure of the cases identified, by the cooperation of the Prevention Departments of the Local Health Units (AASSLL). The classification of the probability of exposure to asbestos is carried out in each Regional Operative Centre on the basis of the working activity, of the personal life history of the subject, of any

environmental conditions and according to an agreed coding system. As to the identification of cases, the definition of the diagnostic certainty level achieved, the clinical and etiological data collection, the definition of the histories of exposure of the cases verified and the relevant classification and coding systems, the procedures adopted are set out by the recently updated National Guidelines. [1]

Descriptive analyses

The data presented in the National Section of this volume refer to the cases of mesothelioma reported to ReNaM by the Regional Operative Centres with an incidence date included in the period 1993-2001. Currently the Regional Operative Centres of Piedmont, Valle d'Aosta, Lombardy, Autonomous Province of Trento, Veneto, Friuli-Venezia Giulia, Liguria, Emilia-Romagna, Tuscany, The Marches, Umbria, Abruzzo, Campania, Apulia, Basilicata, Calabria and Sicily have been set up. A few Centres (Valle d'Aosta, Autonomous Province of Trento, Umbria, Abruzzo, Calabria), due to their being established only recently, have not yet sent data to the National Register. Non-mesotheliomas and benign mesotheliomas were excluded from the data analysis.
The ReNaM Archive contains data on 5,173 cases. For 3,945 cases (76.3%), the MM has been classified as certain, for 777 cases as probable (15%) and for 451 cases as possible (8.7%). 2.6 cases of mesothelioma were found in men for every case in women. This indicator is strongly correlated with the geographical reference area. In particular the share of cases in women (which is equal to 27.6% according to the national register) ranges from 8% in Friuli-Venezia Giulia to 37% in Piedmont. Pleural mesothelioma affects 93% of cases, but there are also 334 recorded cases of peritoneal mesothelioma, 15 cases of pericardial mesothelioma and 14 cases affected by mesothelioma of the vaginal tunic of the testicle. The percentage of cases of peritoneal mesothelioma in women is particularly high (41.6%). The percentage of cases with an age at time of diagnosis lower than 35 years is extremely low (28 cases equal to 0.6% of the total) whilst more than 50% of cases have an age at diagnosis between 55 and 74 years. The average age is 67.4 years for the set of cases recorded with a gradient compared to the level of diagnostic certainty (65.5 years for cases defined as “certain”, 72.7 years for “probable” cases and 74.4 for “possible” cases) and to the anatomical site (67.6 years for pleural mesotheliomas, 64.2 for peritoneal mesothelioma, 61.6 for pericardial mesothelioma and 58.9 for cases of mesothelioma of the vaginal tunic of the testicle).

The morphology of slightly more than half of the recorded cases is epithelioid (50.1%), while it is biphasic and fibrous respectively in the 7% and 12% of the cases. This distribution is decidedly constant in the two genders and does not show any appreciable differences by anatomical site.

Incidence measurements

Prior to this report the ReNaM published the incidence data for the five Regions which where the first sources of the register (Piedmont, Liguria, Emilia-Romagna, Tuscany and Apulia) with reference to the period when diagnosis was made comprised between 1993 and 1996 [2] and, for the same Regions, for the year of incidence 1997 [3-4].
This report presents incidence measurements for the period between 1998 and 2001 for the Regions of Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily. The data which the Regions of Friuli-Venezia Giulia, Campania and Basilicata sent to the National Register are shown in the tables as well, but the gathering cannot yet be considered exhaustive and therefore the measurements of occurrence cannot be considered as having regional incidence. The total incidence rates (raw and standardised) are only calculated with reference

to the areas with exhaustive data gathering. For the rate standardisation the direct method was chosen and the reference population is the one resident in Italy in 1991. In 2001 the standardised rate on the pool of the regions was equal to 2.98 cases in men per 100,000 residents for cases of pleural mesothelioma (certain, probable and possible) and 0.98 cases in women (Table 10). As to peritoneal mesothelioma the rate goes to 0.18 and 0.06 respectively in men and women (Table 12). These measurements are reduced by about 20% (see Tables 9 and 11) if only “certain” malignant mesothelioma is considered, excluding cases of possible and probable MM. The rates show significant local variability, especially for pleural MM, ranging from 10.4 cases per 100,000 resident people of Liguria to 1.05 for Apulia (men). The analysis of the time trends is not easy due to the different geographical reference areas and will have to be evaluated on longer and more uniform historical series.

Exposure data

The analyses of the data relating to the modes of exposure refer to the whole set of data with a diagnosis made between 1993 and 2001 (5,173 cases). The modes of exposure were examined in detail for 3,552 cases (68.7%) whilst they are being defined (or else the modes of exposure can no longer be investigated due to objective conditions) for 1,621 cases (31.3%). Exposure reconstruction procedures have almost always taken place through an interview targeted at the subject or the family (or cohabitees) of the subject (respectively in 46.8% and 45.6% of cases).
In the set of cases with definite exposure, 67.4% shows an occupational exposure (certain, probable, possible), 4.3% presents domestic exposure, 4.2% has environmental exposure whilst exposure for 1.3% of cases relates to a non occupational activity e.g. recreation or hobby. It is very significant that in women the percentage of cases with occupational exposure (compared to the cases defined) drops to 30.1%. In 22.8% of cases exposure is improbable or unknown. Therefore the percentage of cases of mesothelioma for which the medical history analysis showed an occupational, environmental, domestic, or hobby-related exposure to asbestos is equal to 77.2% out the entire set of data. This indicator is dependent on the exposure surveying procedures, on the anatomical site and on gender in a non negligible way; if in fact it is estimated only for cases for which a direct interview is available, it rises to 83.3% and reaches 89.2% if it is further limited to cases of pleural mesothelioma in men. Latency, defined as the difference between the date of the diagnosis and the beginning of exposure was measured for the 2,544 cases of mesothelioma for which a date for the beginning of exposure is available. The average and median latency is equivalent respectively to 43.6 years and 44 years with a 12 year standard deviation and a normal distribution around the mean. No appreciable differences were found in the latency by gender, mode of exposure to asbestos and anatomical site.

The analysis of the sectors involved highlights a lower risk for workers employed in the mineral extraction sector, whilst secondary asbestos processing workers prove to be the most affected. In particular, in the context of the set of subjects affected by the disease due to occupational exposure, the sectors of economic activity most affected are construction, shipyards, heavy industry (engineering and metallurgy), railway rolling stock and the asbestos cement industry. The picture however is extremely varied (Table 14) and there is occupational exposure in several other sectors partly due to the presence of asbestos insulation material in working places (sugar-refineries, the chemical industry, petroleum extraction and refining, electrical power production, etc.), and partly caused by indirect and in many cases unwitting exposure (the glass industry, transport vehicle maintenance sector, the textiles sector, etc.).
The exposure distribution by economic sector is undergoing important changes over recent years. If the weight of each economic sector is defined as the percentage of exposure in this sector compared to the

total set of cases with defined exposure (i.e. for which one of the categories provided for by the ReNaM guidelines was assigned), the weight of the "traditional" sectors of shipyards, railway rolling stock and the asbestos cement industry is decreasing, though still very significant. In particular for shipyards it decreased from 19.7% in the incidence period 1993-1998 to 10.3% in the period 1999-2001, for the railway rolling stock from 5.5% to 4%, and for the asbestos cement industry from 3.9% to 3.5%. The opposite goes for the so-called "emerging" sectors (i.e. those sectors for which the weight of total exposure is growing): the textiles industry and construction sector; for the latter occupational sphere in the last few years we have witnessed an especially large growth in the number of cases reported. Compared to the case histories described in the First Report [2], the analysis of the entire set of data (incidence period 1993-2001), shows the presence of a non-negligible number of cases in the service sector (public administration, health, education) due to the presence of asbestos in the working places.
The modes of exposure in the textiles (not asbestos) and agriculture sectors, recently highlighted in the framework of the ReNaM activity (see the final research project report of the Italian National Institute for Occupational Safety and Prevention (ISPESL) on cases previously classified as "unknown" exposure, available on the web site of the Register at the following address: (http://www.ispesl.it/ispesl/sitorenam/ricerca/Relazione_conclusiva_ignoti.pdf) and further discussed in this report, represent an important contribution to knowledge on the phenomenon of exposure to asbestos in our country and stress the importance of epidemiological surveillance of rare events with a view to prevention.

In this report specific in-depth sections are dedicated to the sectors of shipyards, railway rolling stock, and to maritime, textiles and agricultural workers (as well as to exposures detected in the environmental or residential sphere).These sections report the state of current knowledge that can be inferred from the studies published and the picture emerging from the National Register data.

Guide to interpreting the tables

Table 1 shows the distribution by level of diagnostic certainty and anatomical site and Table 2 shows the distribution of the absolute values by year of diagnosis and Region. Tables 2A-2D show the distribution of cases by year of diagnosis and Region split into anatomical site (pleura and peritoneum), gender and diagnostic certainty level ("certain MM " and "certain, probable, possible MM "). Table 3 shows the distribution by age groups, gender and anatomical site of cases of certain, probable and possible mesothelioma and Tables 5-8 and 9-12 respectively show the raw and standardised rates (per 100,000 residents) by gender, anatomical site and diagnostic certainty. Table 13 shows the distribution of cases by mode of exposure and gender and Table 14 shows the sectors of exposure for cases with occupational exposure. In subjects for which an occupational exposure with an equal level of certainty (certain, probable, possible) was attributed in different economic sectors, a multiple exposure is assigned (i.e. more than one exposure for the same subject). Therefore the number of exposures may fail to coincide with the number of cases. On the other hand in subjects to which an occupational exposure was attributed in an economic sector with reference to more than one duty (and/or to more than one time period), a single exposure is assigned. The classification of the economic sectors and the transitional table with respect to the ISTAT Ateco91 coding system are shown in the Appendix.

References

1. Nesti M, Adamoli S, Ammirabile F et al. (eds). Linee Guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei centri operativi regionali. ISPESL Monograph, Rome 2003. Available at http//www.ispesl.it/ispesl/sitorenam/index.asp
2. Nesti M, Marinaccio A, Silvestri S (eds). II Registro Nazionale dei Mesoteliomi: I Rapporto. ISPESL, Rome 2001. Available at http//www.ispesl.it/ispesl/sitorenam/index.asp
3. Nesti M, Marinaccio A, Chellini E & Regional Operational Centers. Malignant mesothelioma in Italy, 1997. Am J Ind Med 2004 Jan; 45(1):55-62
4. Nesti M, Marinaccio A, Chellini E & Regional Operational Centers. Surveillance of malignant mesothelioma cases and definition of asbestos exposure: 1997 data of ReNaM. Epidemiologia e Prevenzione 2003 May-Jun; 27(3):147-153

INCIDENCE AND EXPOSURE DATA: STATISTICAL TABLES

Tabella 1. Numero di casi per livello di certezza diagnostica e sede anatomica (periodo di incidenza 1993 – 2001)

Diagnosi	Pleura	Peritoneo	Pericardio	Testicolo	Totale casi
MESOTELIOMA MALIGNO CERTO	3.631	288	12	14	3.945
MESOTELIOMA MALIGNO PROBABILE	737	37	3		777
MESOTELIOMA MALIGNO POSSIBILE	442	9			451
DA DEFINIRE	21	2			23
TOTALE	**4.831**	**336**	**15**	**14**	**5.196**

Table 1. Number of cases by level of diagnostic certainty and anatomical site (incidence period 1993–2001).

Key:

Diagnosi	Diagnosis
Pleura	Pleura
Peritoneo	Peritoneum
Pericardio	Pericardium
Testicolo	Testicle
Totale casi	Total of cases
MESOTELIOMA MALIGNO CERTO	CERTAIN MALIGNANT MESOTHELIOMA
MESOTELIOMA MALIGNO PROBABILE	PROBABLE MALIGNANT MESOTHELIOMA
MESOTELIOMA MALIGNO POSSIBILE	POSSIBLE MALIGNANT MESOTHELIOMA
DA DEFINIRE	TO BE DEFINED
TOTALE	TOTAL

Tabella 2. Numero di casi di mesotelioma maligno certo, probabile e possibile per anno di diagnosi e Regione (periodo di incidenza 1993 – 2001)

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	101	85	104	121	151	161	163	183	178	1.247
LOMBARDIA	0	0	0	0	0	0	0	266	191	457
VENETO	45	45	69	55	54	67	77	90	85	587
FRIULI-VENEZIA GIULIA	0	0	16	26	14	19	23	0	0	98
LIGURIA	0	44	90	122	137	135	145	138	150	961
EMILIA-ROMAGNA	21	30	52	72	79	83	73	85	95	590
TOSCANA	21	23	31	39	45	66	64	67	74	430
MARCHE	0	0	0	22	20	14	28	26	31	141
CAMPANIA	0	0	0	0	0	0	0	22	54	76
PUGLIA	24	29	32	43	44	41	36	34	26	309
BASILICATA	0	0	0	0	0	0	0	8	7	15
SICILIA	0	0	0	0	0	60	62	74	66	262
TOTALE	**212**	**256**	**394**	**500**	**544**	**646**	**671**	**993**	**957**	**5.173**

Table 2. Number of cases of certain, probable and possible malignant mesothelioma by year of diagnosis and Region (incidence period 1993-2001).

Key:

Regione	Region
Totale Casi	Total of Cases
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL

Tabella 2.A Numero di casi di mesotelioma maligno certo della pleura per anno di diagnosi e Regione (periodo di incidenza 1993 – 2001).

Donne

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	27	25	30	19	38	37	28	46	40	290
LOMBARDIA								63	46	109
VENETO	9	6	17	12	12	18	17	22	11	124
FRIULI-VENEZIA GIULIA			1	1	1		2			5
LIGURIA		7	6	10	10	16	13	14	16	92
EMILIA-ROMAGNA	3	4	11	14	18	17	14	12	15	108
TOSCANA	4	5	3	6	6	6	4	11	17	62
MARCHE				4	3	1	5	6	5	24
CAMPANIA								3	9	12
PUGLIA	9	9	6	4	10	5	6	5	4	58
BASILICATA								2	2	4
SICILIA						6	5	8	11	30
TOTALE	**52**	**56**	**74**	**70**	**98**	**106**	**94**	**192**	**176**	**918**

Uomini

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	47	47	52	74	73	72	61	73	70	569
LOMBARDIA								119	90	209
VENETO	32	28	35	30	31	37	51	56	58	358
FRIULI-VENEZIA GIULIA			12	23	10	16	18			79
LIGURIA		20	45	47	58	63	73	63	71	440
EMILIA-ROMAGNA	7	17	18	33	34	39	38	48	51	285
TOSCANA	16	14	25	28	24	45	44	49	45	290
MARCHE				10	12	9	15	16	19	81
CAMPANIA								17	42	59
PUGLIA	13	14	20	32	29	23	21	25	20	197
BASILICATA								3	1	4
SICILIA						30	31	41	40	142
TOTALE	**115**	**140**	**207**	**277**	**271**	**334**	**352**	**510**	**507**	**2.713**

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Table 2.A Number of cases of certain pleural malignant mesothelioma by year of diagnosis and Region (incidence period 1993-2001).

Key:

Donne	Women
Regione	Region
Totale Casi	Total of Cases
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL
Uomini	Men

Tabella 2.B Numero di casi di mesotelioma maligno certo, probabile o possibile della pleura per anno di diagnosi e Regione (periodo di incidenza 1993 – 2001).

Donne

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	33	27	33	30	49	50	54	72	59	407
LOMBARDIA								92	60	152
VENETO	9	7	20	13	15	23	18	24	14	143
FRIULI-VENEZIA GIULIA			1	1	1		3			6
LIGURIA		14	15	28	24	28	29	27	30	195
EMILIA-ROMAGNA	4	5	19	17	23	22	18	19	20	147
TOSCANA	4	5	3	6	9	6	8	11	22	74
MARCHE				6	4	2	8	7	6	33
CAMPANIA								3	9	12
PUGLIA	9	9	6	5	11	8	8	5	4	65
BASILICATA								2	4	6
SICILIA						9	7	12	15	43
TOTALE	**59**	**67**	**97**	**106**	**136**	**148**	**153**	**274**	**243**	**1.283**

Uomini

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	59	51	58	83	88	88	94	98	103	722
LOMBARDIA								164	114	278
VENETO	35	32	38	34	35	39	55	59	62	389
FRIULI-VENEZIA GIULIA			13	24	11	18	18			84
LIGURIA		30	72	92	105	102	115	110	119	745
EMILIA-ROMAGNA	11	23	31	45	47	55	49	56	67	384
TOSCANA	16	16	28	32	32	57	54	54	50	339
MARCHE				11	14	11	17	17	21	91
CAMPANIA								17	42	59
PUGLIA	14	18	25	37	31	31	24	28	20	228
BASILICATA								5	2	7
SICILIA						47	48	57	49	201
TOTALE	**135**	**170**	**265**	**358**	**363**	**448**	**474**	**665**	**649**	**3.527**

Table 2.B Number of cases of certain, probable or possible pleural malignant mesothelioma by year of diagnosis and Region (incidence period 1993–2001).

Key:

Donne	Women
Regione	Region
Totale Casi	Total of Cases
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL
Uomini	Men

Tabella 2.C Numero di casi di mesotelioma maligno certo del peritoneo per anno di diagnosi e Regione (periodo di incidenza 1993 – 2001).

Donne

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	4		4	4	7	11	7	5	6	48
LOMBARDIA								3	3	6
VENETO		1	3	5	1	3	3	2	2	20
FRIULI-VENEZIA GIULIA				1	1					2
LIGURIA				1	2					3
EMILIA-ROMAGNA	3	1		3	3	4		6	2	22
TOSCANA	1	1		1	2	2				7
MARCHE				2	1			1		4
CAMPANIA									1	1
PUGLIA						1	1			2
BASILICATA								1		1
SICILIA							2	1		3
TOTALE	**8**	**3**	**7**	**17**	**17**	**21**	**13**	**19**	**14**	**119**

Uomini

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	4	4	5	3	6	10	6	3	5	46
LOMBARDIA								4	9	13
VENETO		3	7	2	2	1	1	5	6	27
FRIULI-VENEZIA GIULIA			2		1	1	2			6
LIGURIA			2		6	3			1	12
EMILIA-ROMAGNA	3			4	2		5	2	4	20
TOSCANA		1			2		2	2	2	9
MARCHE				3	1		2	1	4	11
CAMPANIA								1	1	2
PUGLIA										
BASILICATA	1	2	1		2		2	1	2	11
SICILIA						3	4	3	2	12
TOTALE	**8**	**10**	**17**	**12**	**22**	**18**	**24**	**22**	**36**	**169**

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Table 2.C Number of cases of certain peritoneal malignant mesothelioma by year of diagnosis and Region (period of incidence 1993-2001).

Key:

Donne	Women
Regione	Region
Totale Casi	Total of Cases
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL
Uomini	Men

Tabella 2.D Numero di casi di mesotelioma maligno certo, probabile o possibile del peritoneo per anno di diagnosi e Regione (periodo di incidenza 1993 – 2001).

Donne

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	4	1	7	4	7	12	8	7	7	57
LOMBARDIA								5	4	9
VENETO	1	1	3	5	1	3	3	2	2	21
FRIULI-VENEZIA GIULIA				1	1					2
LIGURIA			1	1	2			1		5
EMILIA-ROMAGNA	3	1	1	3	3	4	1	7	2	25
TOSCANA	1	1		1	2	2				7
MARCHE				2	1		1	1		5
CAMPANIA									1	1
PUGLIA						1	2			3
BASILICATA								1		1
SICILIA							2	1		3
TOTALE	**9**	**4**	**12**	**17**	**17**	**22**	**17**	**25**	**16**	**139**

Uomini

Regione	1993	1994	1995	1996	1997	1998	1999	2000	2001	Totale Casi
PIEMONTE	4	5	5	4	7	11	7	6	8	57
LOMBARDIA								5	10	15
VENETO		4	8	2	3	1	1	5	6	30
FRIULI-VENEZIA GIULIA			2		1	1	2			6
LIGURIA			2	1	6	5	1		1	16
EMILIA-ROMAGNA	3			5	3		5	2	4	22
TOSCANA		1			2		2	2	2	9
MARCHE				3	1	1	2	1	4	12
CAMPANIA								1	1	2
PUGLIA	1	2	1		2	1	2	1	2	12
BASILICATA									1	1
SICILIA						3	5	3	2	13
TOTALE	**8**	**12**	**18**	**15**	**25**	**23**	**27**	**26**	**41**	**195**

Table 2.D Number of cases of certain, probable or possible peritoneal malignant mesothelioma by year of diagnosis and Region (incidence period 1993-2001).

Key:

Donne	Women
Regione	Region
Totale Casi	Total of Cases
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL
Uomini	Men

Tabella 3. Numero di casi di mesotelioma maligno certo, probabile o possibile per sede anatomica, classe di età alla diagnosi e sesso (periodo di incidenza 1993 – 2001).

	Pleura		Peritoneo		Pericardio		Testicolo	Totale Casi		Totale Casi
Classe Età	M	F	M	F	M	F	M	M	F	
0-24	2		1	1			1	4	1	5
25-34	9	6	5	1	1		2	17	7	24
35-44	75	35	10	3	2		1	88	38	126
45-54	350	112	22	16			1	373	128	501
55-64	931	278	61	35	1	2		993	315	1.308
65-74	1.230	419	67	51	5	3	6	1.308	473	1.781
75-84	759	326	26	25	1		3	789	351	1.140
85+	171	107	3	7				174	114	288
TOTALE	**3.527**	**1.283**	**195**	**139**	**10**	**5**	**14**	**3.746**	**1.427**	**5.173**

Table 3. Number of cases of certain, probable or possible malignant mesothelioma by anatomical site, age group referred to the time when diagnosis was made and gender (incidence period 1993-2001).

Key:

Pleura	Pleura
Peritoneo	Peritoneum
Pericardio	Pericardium
Testicolo	Testicle
Totale casi	Total of cases
Classe Età	Age group
M	M
F	W
TOTALE	TOTAL

Tabella 4. Numero di casi di mesotelioma maligno certo, probabile o possibile per sede anatomica e codice morfologico (periodo di incidenza 1993 – 2001).

Morfologia	Pleura	Peritoneo	Pericardio	Testicolo	Totale casi
MESOTELIOMA MALIGNO	935	102	6	6	1.049
MESOTELIOMA MALIGNO FIBROSO	329	9	1	0	339
MESOTELIOMA MALIGNO EPITELIOIDE	2.176	168	3	7	2.354
MESOTELIOMA MALIGNO BIFASICO	525	29	2	1	557
NON DISPONIBILE	845	26	3	0	874
TOTALE	**4.810**	**334**	**15**	**14**	**5.173**

Table 4. Number of cases of certain, probable or possible malignant mesothelioma by anatomical site and morphological code (incidence period 1993-2001).

Key:

Morfologia	Morphology
Pleura	Pleura
Peritoneo	Peritoneum
Pericardio	Pericardium
Testicolo	Testicle
Totale casi	Total of cases
MESOTELIOMA MALIGNO	MALIGNANT MESOTHELIOMA
MESOTELIOMA MALIGNO FIBROSO	FIBROUS MALIGNANT MESOTHELIOMA
MESOTELIOMA MALIGNO EPITELIOIDE	EPITHELIOID MALIGNANT MESOTHELIOMA
MESOTELIOMA MALIGNO BIFASICO	BIPHASIC MALIGNANT MESOTHELIOMA
NON DISPONIBILE	NOT AVAILABLE
TOTALE	TOTAL

Tabella 5. Tassi grezzi (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo della pleura

Donne

Regione	1998	1999	2000	2001
PIEMONTE	1,69	1,28	2,11	1,83
LOMBARDIA			1,36	0,99 *
VENETO	0,79	0,74	0,95	0,48
FRIULI-VENEZIA GIULIA *		0,33		
LIGURIA	1,89	1,54	1,67	1,92
EMILIA-ROMAGNA	0,84	0,69	0,59	0,73
TOSCANA	0,33	0,22	0,61	0,94
MARCHE	0,13	0,67	0,8	0,66
CAMPANIA *			0,10	0,31
PUGLIA	0,24	0,29	0,24	0,19
BASILICATA *			0,65	0,66
SICILIA	0,23	0,19	0,31	0,43
TOTALE **	**0,73**	**0,63**	**0,97**	**0,82**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	3,51	2,98	3,58	3,44
LOMBARDIA			2,74	2,07 *
VENETO	1,71	2,35	2,57	2,64
FRIULI-VENEZIA GIULIA *	2,84	3,20		
LIGURIA	8,30	9,68	8,41	9,53
EMILIA-ROMAGNA	2,06	2,00	2,52	2,66
TOSCANA	2,68	2,62	2,92	2,68
MARCHE	1,28	2,13	2,26	2,67
CAMPANIA *			0,61	1,51
PUGLIA	1,17	1,07	1,28	1,02
BASILICATA *			1,01	0,34
SICILIA	1,23	1,28	1,70	1,66
TOTALE **	**2,33**	**2,45**	**2,73**	**2,74**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

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Table 5. Crude rates (x 100,000 inhabitants) by gender, period of incidence (1998–2001) and Region. Cases of certain pleural malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).

** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 6. Tassi grezzi (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo, probabile, possibile della pleura

Donne

Regione	1998	1999	2000	2001
PIEMONTE	2,28	2,47	3,30	2,70
LOMBARDIA			1,99	1,29 *
VENETO	1,01	0,78	1,04	0,60
FRIULI-VENEZIA GIULIA *		0,49		
LIGURIA	3,30	3,44	3,22	3,60
EMILIA-ROMAGNA	1,09	0,89	0,93	0,98
TOSCANA	0,33	0,44	0,61	1,21
MARCHE	0,27	1,07	0,93	0,80
CAMPANIA *			0,10	0,31
PUGLIA	0,38	0,39	0,24	0,19
BASILICATA *			0,65	1,31
SICILIA	0,35	0,27	0,47	0,58
TOTALE **	**1,02**	**1,03**	**1,4**	**1,17**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	4,30	4,60	4,80	5,06
LOMBARDIA			3,78	2,62 *
VENETO	1,81	2,54	2,71	2,83
FRIULI-VENEZIA GIULIA *	3,20	3,20		
LIGURIA	13,43	15,25	14,69	15,98
EMILIA-ROMAGNA	2,91	2,58	2,94	3,50
TOSCANA	3,39	3,22	3,22	2,98
MARCHE	1,57	2,41	2,40	2,96
CAMPANIA *			0,61	1,51
PUGLIA	1,57	1,22	1,43	1,02
BASILICATA *			1,69	0,68
SICILIA	1,93	1,98	2,36	2,04
TOTALE **	**3,15**	**3,34**	**3,58**	**3,60**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

Table 6. Crude rates (x 100,000 inhabitants) by gender, period of incidence (1998–2001) and Region. Cases of certain, probable, possible pleural malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).
** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 7. Tassi grezzi (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo del peritoneo

Donne

Regione	1998	1999	2000	2001
PIEMONTE	0,50	0,32	0,23	0,27
LOMBARDIA			0,06	0,06 *
VENETO	0,13	0,13	0,09	0,09
FRIULI-VENEZIA GIULIA *				
LIGURIA				
EMILIA-ROMAGNA	0,20		0,29	0,10
TOSCANA	0,11			
MARCHE			0,13	
CAMPANIA *				0,03
PUGLIA	0,05	0,05		
BASILICATA *			0,33	
SICILIA		0,08	0,04	
TOTALE **	**0,14**	**0,09**	**0,09**	**0,07**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	0,49	0,29	0,15	0,25
LOMBARDIA			0,09	0,21 *
VENETO	0,05	0,05	0,23	0,27
FRIULI-VENEZIA GIULIA *	0,18	0,36		
LIGURIA	0,40			0,13
EMILIA-ROMAGNA		0,26	0,10	0,21
TOSCANA		0,12	0,12	0,12
MARCHE		0,28	0,14	0,56
CAMPANIA *			0,04	0,04
PUGLIA		0,10	0,05	0,10
BASILICATA *				
SICILIA	0,12	0,16	0,12	0,08
TOTALE **	**0,12**	**0,16**	**0,12**	**0,19**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

Table 7. Crude rates (x 100,000 inhabitants) by gender, period of incidence (1998-2001) and Region. Cases of certain peritoneal malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).
** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 8. Tassi grezzi (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo, probabile, possibile del peritoneo

Donne

Regione	1998	1999	2000	2001
PIEMONTE	0,55	0,37	0,32	0,32
LOMBARDIA			0,11	0,09 *
VENETO	0,13	0,13	0,09	0,09
FRIULI-VENEZIA GIULIA *				
LIGURIA			0,12	
EMILIA-ROMAGNA	0,20	0,05	0,34	0,10
TOSCANA	0,11			
MARCHE		0,13	0,13	
CAMPANIA *				0,03
PUGLIA	0,05	0,10		
BASILICATA *			0,33	
SICILIA		0,08	0,04	
TOTALE **	**0,15**	**0,12**	**0,12**	**0,08**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	0,54	0,34	0,29	0,39
LOMBARDIA			0,12	0,23 *
VENETO	0,05	0,05	0,23	0,27
FRIULI-VENEZIA GIULIA *	0,18	0,36		
LIGURIA	0,66	0,13		0,13
EMILIA-ROMAGNA		0,26	0,10	0,21
TOSCANA		0,12	0,12	0,12
MARCHE	0,14	0,28	0,14	0,56
CAMPANIA *			0,04	0,04
PUGLIA	0,05	0,10	0,05	0,10
BASILICATA *				0,34
SICILIA	0,12	0,21	0,12	0,08
TOTALE **	**0,16**	**0,18**	**0,14**	**0,21**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

Table 8. Crude rates (x 100,000 inhabitants) by gender, period of incidence (1998-2001) and Region. Cases of certain, probable, possible peritoneal malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).

** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 9. Tassi standardizzati (x 100.000 abitanti) per sesso, periodo di incidenza e regione. Casi di mesotelioma maligno certo della pleura

Donne

Regione	1998	1999	2000	2001
PIEMONTE	1,41	1,09	1,79	1,49
LOMBARDIA			1,23	0,87
VENETO	0,74	0,68	0,86	0,45
FRIULI-VENEZIA GIULIA *		0,27		
LIGURIA	1,33	1,02	1,18	1,36
EMILIA-ROMAGNA	0,66	0,54	0,46	0,62
TOSCANA	0,26	0,18	0,49	0,73
MARCHE	0,13	0,55	0,63	0,47
CAMPANIA *			0,11	0,35
PUGLIA	0,25	0,30	0,26	0,19
BASILICATA *			0,61	0,65
SICILIA	0,23	0,22	0,32	0,43
TOTALE **	**0,65**	**0,56**	**0,87**	**0,71**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	2,86	2,41	2,90	2,72
LOMBARDIA			2,47	1,82
VENETO	1,58	2,14	2,36	2,42
FRIULI-VENEZIA GIULIA *	2,35	2,40		
LIGURIA	5,88	6,58	5,79	6,57
EMILIA-ROMAGNA	1,63	1,55	1,93	2,06
TOSCANA	2,16	2,01	2,20	2,13
MARCHE	0,93	1,63	1,83	2,20
CAMPANIA *			0,67	1,69
PUGLIA	1,26	1,09	1,33	1,05
BASILICATA *			0,69	0,26
SICILIA	1,24	1,29	1,65	1,62
TOTALE **	**2,04**	**2,09**	**2,35**	**2,33**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

Table 9. Standardised rates (x 100,000 inhabitants) by gender, period of incidence and Region. Cases of certain pleural malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).
** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 10. Tassi standardizzati (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo, probabile, possibile della pleura

Donne

Regione	1998	1999	2000	2001
PIEMONTE	1,87	2,06	2,59	2,13
LOMBARDIA			1,74	1,12
VENETO	0,92	0,72	0,94	0,53
FRIULI-VENEZIA GIULIA *		0,39		
LIGURIA	2,22	2,24	2,04	2,31
EMILIA-ROMAGNA	0,83	0,68	0,69	0,77
TOSCANA	0,26	0,32	0,49	0,91
MARCHE	0,24	0,82	0,74	0,57
CAMPANIA *			0,11	0,35
PUGLIA	0,39	0,40	0,26	0,19
BASILICATA *			0,61	1,31
SICILIA	0,36	0,31	0,49	0,58
TOTALE **	**0,89**	**0,89**	**1,20**	**0,98**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	3,48	3,70	3,83	3,95
LOMBARDIA			3,42	2,33
VENETO	1,66	2,33	2,49	2,55
FRIULI-VENEZIA GIULIA *	2,64	2,40		
LIGURIA	9,20	9,94	9,78	10,40
EMILIA-ROMAGNA	2,17	1,95	2,21	2,58
TOSCANA	2,69	2,44	2,40	2,34
MARCHE	1,13	1,83	1,92	2,43
CAMPANIA *			0,67	1,69
PUGLIA	1,68	1,24	1,48	1,05
BASILICATA *			1,39	0,56
SICILIA	1,94	2,00	2,22	1,96
TOTALE **	**2,71**	**2,82**	**3,05**	**2,98**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

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Table 10. Standardised rates (x 100,000 inhabitants) by gender, period of incidence (1998-2001) and Region. Cases of certain, probable, possible pleural malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised)

** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 11. Tassi standardizzati (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo del peritoneo

Donne

Regione	1998	1999	2000	2001
PIEMONTE	0,40	0,26	0,18	0,21
LOMBARDIA			0,05	0,06
VENETO	0,13	0,10	0,09	0,08
FRIULI-VENEZIA GIULIA *				
LIGURIA				
EMILIA-ROMAGNA	0,17		0,25	0,07
TOSCANA	0,09			
MARCHE			0,06	
CAMPANIA *				0,03
PUGLIA	0,06	0,05		
BASILICATA *			0,34	
SICILIA		0,07	0,04	
TOTALE **	**0,13**	**0,07**	**0,08**	**0,06**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	0,41	0,26	0,11	0,21
LOMBARDIA			0,08	0,18
VENETO	0,05	0,04	0,21	0,24
FRIULI-VENEZIA GIULIA *	0,13	0,30		
LIGURIA	0,28			0,08
EMILIA-ROMAGNA		0,21	0,07	0,18
TOSCANA		0,10	0,11	0,09
MARCHE		0,23	0,13	0,42
CAMPANIA *			0,03	0,04
PUGLIA		0,11	0,05	0,10
BASILICATA *				
SICILIA	0,11	0,15	0,13	0,07
TOTALE **	**0,11**	**0,14**	**0,10**	**0,16**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

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Table 11. Standardised rates (x 100,000 inhabitants) by gender, period of incidence (1998-2001) and Region. Cases of certain peritoneal malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).

** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 12. Tassi standardizzati (x 100.000 abitanti) per sesso, periodo di incidenza (1998 – 2001) e regione. Casi di mesotelioma maligno certo, probabile, possibile del peritoneo

Donne

Regione	1998	1999	2000	2001
PIEMONTE	0,43	0,30	0,25	0,24
LOMBARDIA			0,09	0,08
VENETO	0,13	0,10	0,09	0,08
FRIULI-VENEZIA GIULIA *				
LIGURIA			0,08	
EMILIA-ROMAGNA	0,17	0,04	0,29	0,07
TOSCANA	0,09			
MARCHE		0,13	0,06	
CAMPANIA *				0,03
PUGLIA	0,06	0,09		
BASILICATA *			0,34	
SICILIA		0,07	0,04	
TOTALE **	**0,13**	**0,10**	**0,11**	**0,06**

Uomini

Regione	1998	1999	2000	2001
PIEMONTE	0,44	0,30	0,23	0,33
LOMBARDIA			0,10	0,20
VENETO	0,05	0,04	0,21	0,24
FRIULI-VENEZIA GIULIA *	0,13	0,30		
LIGURIA	0,50	0,08		0,08
EMILIA-ROMAGNA		0,21	0,07	0,18
TOSCANA		0,10	0,11	0,09
MARCHE	0,11	0,23	0,13	0,42
CAMPANIA *			0,03	0,04
PUGLIA	0,05	0,11	0,05	0,10
BASILICATA *				0,26
SICILIA	0,11	0,19	0,13	0,07
TOTALE **	**0,14**	**0,16**	**0,12**	**0,18**

* I dati per le Regioni del Friuli-Venezia Giulia, Campania e Basilicata e della Lombardia per l'anno 2001 devono essere considerati parziali o mancanti e quindi escluse dalle elaborazioni aggregate dei tassi (grezzi e standardizzati)

** I tassi (grezzi e standardizzati) totali per anno di diagnosi sono ottenuti con riferimento alle sole regioni del Piemonte, Lombardia (per il solo anno 2000), Veneto, Liguria, Emilia-Romagna, Toscana, Marche, Puglia e Sicilia.

Table 12. Standardised rates (x 100,000 inhabitants) by gender, period of incidence (1998-2001) and Region. Cases of certain, probable, possible peritoneal malignant mesothelioma.

Key:

Donne	Women
Regione	Region
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA *	FRIULI-VENEZIA GIULIA *
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA *	CAMPANIA *
PUGLIA	APULIA
BASILICATA *	BASILICATA *
SICILIA	SICILY
TOTALE **	TOTAL **
Uomini	Men

* Data concerning Friuli-Venezia Giulia, Campania, Basilicata and Lombardy for the year 2001 must be considered as partial or missing and they must therefore be excluded by the aggregate processing of the rates (raw and standardised).

** The total rates (raw and standardised) by year of diagnosis collected refer to Piedmont, Lombardy (only for the year 2000), Veneto, Liguria, Emilia-Romagna, Tuscany, The Marches, Apulia and Sicily.

Tabella 13. Numero di casi e per percentuale sul totale dei casi con definizione dell'esposizione per modalità di esposizione ad amianto *. Casi di mesotelioma maligno certo, probabile, possibile; periodo di incidenza 1993-2001

Esposizione	Uomini		Donne		Totale	
	N. casi	%	N. casi	%	N. casi	%
Professionale Certa	1.391	51,5	123	14,5	1.514	42,6
Professionale Probabile	346	12,8	37	4,4	383	10,8
Professionale Possibile	402	14,9	95	11,2	497	14,0
Familiare	24	0,9	128	15,1	152	4,3
Ambientale	73	2,7	77	9,1	150	4,2
Extra Lavorativa	29	1,1	18	2,1	47	1,3
Improbabile	104	3,8	114	13,4	218	6,1
Ignota	333	12,3	258	30,4	591	16,6
TOTALE CASI DEFINITI	2.702	**100**	850	**100**	3.552	**100**
Da Definire	970		510		1.480	
Non Classificabile	74		67		141	
TOTALE	**3.746**		**1.427**		**5.173**	

** Per i criteri di definizione e classificazione dell'esposizione si veda Nesti M, Adamoli S, Ammirabile F et al. (a cura di). Linee Guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei centri operativi regionali. Monografia ISPESL, Roma 2003. Disponibile a http//www.ispesl.it/ispesl/sitorenam/index.asp*

Table 13. Number of cases and by percentage on the total of cases with definition of the exposure for mode of exposure to asbestos*. Cases of certain, probable, possible malignant mesothelioma; incidence period 1993-2001.

Key:

Esposizione	Exposure
Uomini	Men
Donne	Women
Totale	Total
N. casi	Number of cases
Professionale Certa	Certain Occupational exposure
Professionale Probabile	Probable Occupational exposure
Professionale Possibile	Possible Occupational exposure
Familiare	Domestic
Ambientale	Environmental
Extra Lavorativa	Non Occupational
Improbabile	Improbable
Ignota	Unknown
TOTALE CASI DEFINITI	TOTAL OF CASES DEFINED
Da Definire	To be Defined

Non Classificabile	Unclassifiable
TOTALE	TOTAL

** With regard to the definition and classification criteria for exposure see Nesti M, Adamoli S, Ammirabile F et al. (eds.). Linee Guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei centri operativi regionali. Ispesl Monograph, Rome 2003. Available at http//www.ispesl.it/ispesl/sitorenam/index.asp*

Tabella 14. Numero di esposizioni* per settore economico di esposizione (ricodifica ReNaM**) e periodo di diagnosi per i casi di mesotelioma maligno certo, probabile o possibile ed esposizione professionale certa, probabile o possibile (periodo di incidenza 1993 – 2001).

Categoria	1993-1995	%	1996-1998	%	1999-2001	%	Totale	%
Edilizia	50	13,1	105	12,9	252	16,1	**407**	**14,7**
Cantieri navali	65	17,0	150	18,4	161	10,3	**376**	**13,6**
Industria metalmeccanica	21	5,5	59	7,2	111	7,1	**191**	**6,9**
Fabbricazione di prodotti in metallo	23	6,0	36	4,4	88	5,6	**147**	**5,3**
Industria tessile	2	0,5	30	3,7	103	6,6	**135**	**4,9**
Rotabili ferroviari	21	5,5	45	5,5	63	4,0	**129**	**4,7**
Industria metallurgica	17	4,5	35	4,3	64	4,1	**116**	**4,2**
Difesa militare	16	4,2	42	5,1	49	3,1	**107**	**3,9**
Produzione e manutenzione mezzi di trasporto; officine di autoveicoli e motoveicoli (esclusi cantieri navali e rotabili ferroviari)	11	2,9	32	3,9	63	4,0	**106**	**3,8**
Industria del cemento-amianto	21	5,5	26	3,2	54	3,5	**101**	**3,7**
Industria chimica e materie plastiche	15	3,9	20	2,5	62	4,0	**97**	**3,5**
Trasporti terrestri ed aerei	9	2,4	24	2,9	62	4,0	**95**	**3,4**
Trasporti marittimi	13	3,4	25	3,1	37	2,4	**75**	**2,7**
Movimentazione merci trasporti marittimi	13	3,4	27	3,3	34	2,2	**74**	**2,7**
Commercio (all'ingrosso e al dettaglio)	15	3,9	20	2,5	37	2,4	**72**	**2,6**
Industria alimentare e bevande (ecluso zuccherifici)	9	2,4	8	1,0	39	2,5	**56**	**2,0**
Altre industrie manifatturiere (mobili, gioielli, strumenti musicali, articoli sportivi, etc.)	5	1,3	12	1,5	26	1,7	**43**	**1,6**
Zuccherifici	10	2,6	9	1,1	22	1,4	**41**	**1,5**
Produzione di energia elettrica e gas	7	1,8	13	1,6	21	1,3	**41**	**1,5**
Industria del vetro e della ceramica	3	0,8	12	1,5	24	1,5	**39**	**1,4**
Sanità e servizi sociali	4	1,0	8	1,0	26	1,7	**38**	**1,4**
Industria della gomma	5	1,3	8	1,0	23	1,5	**36**	**1,3**
Industria dei minerali non metalliferi (escluso cemento-amianto)	7	1,8	10	1,2	18	1,2	**35**	**1,3**

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Table 14. Number of exposures* by economic sector of exposure (ReNaM** classification) and diagnosis period for the cases of certain, probable, possible malignant mesothelioma and certain probable, possible occupational exposure (incidence period 1993-2001).

Category	1993-1995	%	1996-1998	%	1999-2001	%	Total	%
Construction	50	13.1	105	12.9	252	16.1	407	14.7
Shipyards	65	17.0	150	18.4	161	10.3	376	13.6
Engineering industry	21	5.5	59	7.2	111	7.1	191	6.9
Metal product manufacture	23	6.0	36	4.4	88	5.6	147	5.3
Textile industry	2	0.5	30	3.7	103	6.6	135	4.9
Railway rolling stock	21	5.5	45	5.5	63	4.0	129	4.7
Metallurgical industry	17	4.5	35	4.3	64	4.1	116	4.2
Military defence	16	4.2	42	5.1	49	3.1	107	3.9
Production and maintenance of transport vehicles; car and motor-vehicle workshops (excluding shipyards and railway rolling stock yards)	11	2.9	32	3.9	63	4.0	106	3.8
Asbestos cement industry	21	5.5	26	3.2	54	3.5	101	3.7
Chemical industry and plastics	15	3.9	20	2.5	62	4.0	97	3.5
Land and air transport	9	2.4	24	2.9	62	4.0	95	3.4
Sea transport	13	3.4	25	3.1	37	2.4	75	2.7
Maritime transport cargo handling	13	3.4	27	3.3	34	2.2	74	2.7
Trade (wholesale and retail)	15	3.9	20	2.5	37	2.4	72	2.6
Food and drinks industry (except sugar-refineries)	9	2.4	8	1.0	39	2.5	56	2.0
Other manufacturing industries	5	1.3	12	1.5	26	1.7	43	1.6

(furniture, jewellery, musical instruments, sports goods etc.)								
Sugar-refineries	10	2.6	9	1.1	22	1.4	41	1.5
Electricity and gas production	7	1.8	13	1.6	21	1.3	41	1.5
Glass and ceramics industry	3	0.8	12	1.5	24	1.5	39	1.4
Health and social services	4	1.0	8	1.0	26	1.7	38	1.4
Rubber industry	5	1.3	8	1.0	23	1.5	36	1.3
Non-metalliferous mineral industry (excluding asbestos cement)	7	1.8	10	1.2	18	1.2	35	1.3

Categoria	1993-1995	%	1996-1998	%	1999-2001	%	Totale	%
Estrazione e raffinerie di petrolio	6	1,6	10	1,2	15	1,0	**31**	**1,1**
Pubblica amministrazione	2	0,5	7	0,9	17	1,1	**26**	**0,9**
Agricoltura e allevamento	1	0,3	8	1,0	13	0,8	**22**	**0,8**
Estrazione di minerali	3	0,8	2	0,2	10	0,6	**15**	**0,5**
Industria della carta e prodotti (inclusa l'editoria)	3	0,8	2	0,2	8	0,5	**13**	**0,5**
Confezione di articoli di vestiario (abbigliamento)	1	0,3	0	0,0	10	0,6	**11**	**0,4**
Istruzione	1	0,3	0	0,0	9	0,6	**10**	**0,4**
Banche, assicurazioni, poste	0	0,0	5	0,6	5	0,3	**10**	**0,4**
Recupero e riciclaggio	0	0,0	1	0,1	7	0,4	**8**	**0,3**
Industria del legno e prodotti	0	0,0	2	0,2	5	0,3	**7**	**0,3**
Alberghi, ristoranti, bar	0	0,0	3	0,4	4	0,3	**7**	**0,3**
Industria conciaria, fabbricazione articoli in pelle e pelliccia	0	0,0	1	0,1	3	0,2	**4**	**0,1**
Pesca	0	0,0	1	0,1	2	0,1	**3**	**0,1**
Industria del tabacco	0	0,0	0	0,0	1	0,1	**1**	**0,0**
Non Codificata	0	0,0	1	0,1	0	0,0	**1**	**0,0**
Altro	3	0,8	17	2,1	16	1,0	**36**	**1,3**
Totale	**382**	**100**	**816**	**100**	**1.564**	**100**	**2.762**	**100**

* la tabella si riferisce alle esposizioni. Sono possibili più esposizioni a fronte di un caso (si veda pag. 38).
** per la tabella di codifica ReNaM dei settori economici si veda Appendice 2.

Categoria	1993-1995	%	1996-1998	%	1999-2001	%	Total	%
Petroleum extraction and refineries	6	1.6	10	1.2	15	1.0	31	1.1
Public Administration	2	0.5	7	0.9	17	1.1	26	0.9
Agriculture and rearing	1	0.3	8	1.0	13	0.8	22	0.8
Mineral extraction	3	0.8	2	0.2	10	0.6	15	0.5
Paper industry and paper products (including publishing sector)	3	0.8	2	0.2	8	0.5	13	0.5
Clothes manufacturing (clothing industry)	1	0.3	0	0.0	10	0.6	11	0.4
Education	1	0.3	0	0.0	9	0.6	10	0.4
Banks, insurance,	0	0.0	5	0.6	5	0.3	10	0.4

Postal services								
Recovery and recycling	0	0.0	1	0.1	7	0.4	8	0.3
Wood industry and wood products	0	0.0	2	0.2	5	0.3	7	0.3
Hotels, restaurants, bars	0	0.0	3	0.4	4	0.3	7	0.3
Tanning industry, manufacture of leather and fur articles	0	0.0	1	0.1	3	0.2	4	0.1
Fishing	0	0.0	1	0.1	2	0.1	3	0.1
Tobacco industry	0	0.0	0	0.0	1	0.1	1	0.0
Not codified	0	0.0	1	0.1	0	0.0	1	0.0
Other	3	0.8	17	2.1	16	1.0	36	1.3
Total	382	100	816	100	1.564	100	2.762	100

* the table refers to the exposures. For each case more than one exposure is likely to occur (see page 38).

** for the ReNaM coding table of economic sectors see Appendix 2.

SURVIVAL IN CASES OF MALIGNANT MESOTHELIOMA: A REVIEW OF PUBLISHED STUDIES

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[4] National Institute for Cancer research (IST), Scientific Disciplinary Area (SSD) Descriptive Epidemiology and Tumour Register
[5] Regional Mesothelioma Register of Veneto region c/o Workplace Prevention, Hygiene and Safety Department (SPISAL), Local Health and Social Services Authority (AULSS) 16, Padua

Introduction

The prognosis of malignant mesothelioma is still unfavourable but in the last decade new therapy approaches have been attempted, including radiotherapy, chemotherapy, and intrapleural chemotherapy, immunotherapy and their association with surgery in multimodal treatments [1,2].
A systematic review of survival studies carried out on a population basis is useful for evaluating whether survival has increased following the introduction of the new therapy protocols and to identify the prognostic factors that can affect it. The research is limited only to studies of population to avoid the selection errors typical of clinical case histories and to assess the impact of the treatments effectively carried out on a specific population in a given period.

Materials and methods

The selection of articles considered for the systematic review was carried out by searching MedLine, with the PubMed search engine. The key words used were ‘mesothelioma and survival and population’. Articles for which an “abstract” was not available were excluded as were any found to be irrelevant after reading. Original works that did not arise out of the computerised research, but were present in the bibliography of the articles consulted were also included. Finally analyses on original data, not yet published *in extenso*, carried out at Regional Operative Centres (COR) of the National Mesothelioma Register (ReNaM) [3], and reported by the latter to the working group were included, and presented separately.

Results

Tables 1 and 2 show the results of the selected studies; the first one is dedicated to the studies published on “peer reviewed” journals, the second one is dedicated to those not yet published. Their

presentation is based on a standard format. Information was found on the size of the case histories, on its population base, on the time span for case collection and for observation of survival, and on the statistical methods of analysis.
For all the studies we sought (in the text, in the tables, or inferred from the graphs) and extracted the following results: (a) median duration of survival, by all MMs and by anatomical site, (b) survival at 6 month, 1, 2, 3 and 5 year intervals, by all MMs and by anatomical site, (c) prognostic factors associated with a statistically significant increase in survival with a univariate analysis and in multivariate analysis models.

Processing and analysis of the data

Many authors [4-13] adopted a non-parametric approach with the Kaplan-Meier method [14] and evaluated the significance of the differences between subgroups through the log-rank test (univariate analyses) and the Cox Proportional Hazard Model [15].
In the SEER (Surveillance, Epidemiology and End Results) study [12] the Cox model was used to select the variables to be introduced in an exponential Weibull model, for the purposes of estimating the significance level of the association between duration of survival and predictive variables.
In the Dutch study based on the Eindhoven Cancer Registry [16] the relative survival was calculated according to Hakulinen's method [17], estimating the expected results on the basis of specific survival tables by gender and Region, split into age bands and five-year calendar periods.
In the most recent analysis based on the data of the Italian Cancer Registries [18] relative survival was estimated according to Hakulinen's method, the effective sample size and the standard errors by using Greenwood's formula [19] and 95% confidence intervals were calculated according to the algorithm proposed by Verdecchia et al. [20].
In a "pooled" analysis [21] of 1975-1994 SEER data and of various European cancer registries, a parametric approach was used, assuming a log-normal distribution of the duration of survival. This work uses, amongst other things, data that have already been published [4,12,13,16]. Therefore it is not totally independent of the ones listed above.
The definition of the date of diagnosis is a critical aspect, in particular when the disease studied is characterised by short survival. Among the various registers only the German Mesothelioma Register [11] uses the start of the first symptoms as the date of diagnosis. All the others refer to standard rules, such as those of SEER [22] or ENCR (European Network of Cancer Registries) [23]. The Italian Mesothelioma Registers, on the basis of the ReNaM guidelines [24] follow the ENCR guidelines.

Survival Estimates

The median survival observed in the National Cancer Institute study [12], equivalent to 7 months, was also essentially confirmed in the subsequent studies. The cases of peritoneal MM have a systematically worse prognosis (between 5 and 6.9 months) compared to the pleural MMs (between 7.9 and 10 months).
Two works [16], [11] provide results that contrast with these. In the first work the peritoneal MMs show survival at one year that is very high (79%, out of 15 cases) and higher than the pleural one (38%). In the second one the median survival for all the cases is greater (13.5 months) than the one found in the other studies, and the survival is greater for the peritoneal ones (19.8 months) for the pleural ones (13.2 months). Even in the analysis based on the general Italian Cancer Registry data [18] and on the cases resident in the Province of Brescia [8] there is a greater survival at 1, 3 and 5 years for the peritoneal location compared to the pleural one; nevertheless, in these works, the difference is less

marked that in the previous two. Given the same location of the mesothelioma, the prognosis is affected by the age at which diagnosis was made [4-13] and by the histotype [4-9,11,13]. In particular, survival is greater for cases diagnosed in younger age groups and for the epithelial-like subtype.
Few studies have evaluated exposure to asbestos as a determining factor of survival [5,7,8,10,13]. In only one case [10] this was associated with a statistically significant increase in mortality, with a relative risk of 3.18 (95% confidence interval: 2,18-4,17).
In some works [5,7,8,12]an attempt was made to evaluate the effect on the prognosis of the diagnosis calendar period and that of the type of hospital where diagnosis was made or therapy treatments carried out. The calendar period and type of hospital where hospitalization occurred were used as "proxies" for the treatment, assuming that a higher proportion of cases diagnosed in more recent periods or passed in hospitals equipped with a thoracic surgery ward had had access to more aggressive treatments.
A higher survival rate was observed in SEER cases subject to treatments (of any kind) [12], but this difference could be ascribed to the fact that the other cases included subjects not suited to treatment, due to the extent of the disease or the general conditions.
In the study by the Malignant Mesothelioma Register (RMM) of the Piedmont Region neither cases diagnosed in more recent periods, nor ones with stays in hospitals equipped with thoracic surgery wards [9] had better survival rates.
In the series of the Mesothelioma Archive of Tuscany there was a non-statistically significant increase in survival for the pleural MMs diagnosed in the last period (1997-2000) and for the ones diagnosed in a hospital equipped with a thoracic surgery ward [5].
In the study of the Mesothelioma Register of the Province of Brescia [8] the proportion of subjects who underwent a non-palliative treatment grew from 10.8% (9 subjects out of 83) in the period 1982-95 to 46.7% (9 out of 105) in the period 1996-2000. A better survival rate was observed for subjects undergoing any form of treatment, considered overall, but the difference in their favour did not reach the conventional statistical significance threshold.

Discussion

The characteristics which systematically emerge are the short survival and the moderate influence on it of the site of primary tumour (in favour of the pleural one), of age when the diagnosis was made (in favour of the younger age bands) and of histotype (in favour of the epithelioid one). The variability of survival, with location being equal, is moderate. The median ranges between 7.9 [13] and 13.2 months [11] for malignant pleural mesotheliomas. The Register with the greatest survival [11] sets the beginning of the observation period starting from the first symptoms, thus anticipating the start date of survival compared to the registers which start from the date when the diagnosis was defined.
Some works [16], [11], [18], [8] have reported better survival in peritoneal cases. The peritoneal localisation has very much greater problems of histogenesis misclassification than the pleural one, and these results could also depend on the inclusion in the case histories of malignant tumours that are not mesothelial in origin. In two studies the number of cases of peritoneal MM was moderate, respectively 15 [16] and 16 [11], and one or two misclassified cases may have spoiled the result. In the third study [18] the case histories were higher in number (61 subjects), but its nosological classification is based on different criteria adopted by the general tumour registers with respect to that of the special registers for the MM. Barbieri and coll. [8] have observed that the best survival of the peritoneal cases is much more marked amongst women which may be explained with the hypothesis that part of the mesothelioma diagnoses are misclassified and actually regard neoplasias with a better prognosis.
In the population studies an improvement in the actual prognosis can become impossible to be documented if it has only recently occurred or applicable only to selected cases. Moreover, when several innovative therapy approaches are simultaneously introduced and none of them have

macroscopically clear advantages, it becomes difficult to attribute any change to one or any of them. From this point of view when performing population studies it is hard for researchers to highlight in a timely manner any benefits brought by new treatments. However they are the only ones that can measure the impact at the overall case history level.
Evidences of improvement in prognosis coinciding with the introduction of the most recent therapy protocols have not emerged. In no study of predictive variables indicative of treatment has a risk been estimated that is significantly different from one. Some works [8], [5] have reported a better result - non-statistically significant - for the more recently diagnosed cases, but apart from a single exception [8] there are no direct indications that these patients were administered a treatment any more frequently. In other works [12], [8], [5] less unfavourable results were observed - with differences that were not statistically significant - in patients subject to treatments of any type compared to the ones given only palliatives or not subject to therapies. Nevertheless this observation needs interpreting with caution, because it is likely that these cases were selected since they were diagnosed more precociously and/or under better general conditions, especially those subject to radical surgical interventions.
Randomised clinical studies are currently underway on new approaches to malignant mesothelioma therapy [25], the impact of which at the population level may be assessed in the next few years. This work underlines the importance that, alongside the clinical studies carried out on selected series of patients, which show which results can be obtained by applying the more advanced treatments, population level studies should also be carried out, measuring how these results impinge on the cases overall.

References

1. Stewart DJ, Edwards JG, Smythe WR, Waller DA, O'Byrne KJ. Malignant pleural mesothelioma - An update. Int J Occup Environ Health 2004; 10:26-39.
2. Robinson BW, Musk AW, Lake RA. Malignant mesothelioma. Lancet 2005; 366:397-408
3. Nesti M, Marinaccio A, Chellini E, and Regional Operational Centers. Malignant mesothelioma in Italy, 1997. Am J Ind Med 2004; 45:55-62.
4. Gennaro V, Benfatto L, Bianchelli M, Lazzaretto A, Montanaro F, Viarengo P. http//grellnet.org/2004/diapos/o24-o36/o39gennaro.pdf - http://registri.istge.it/italiano/rem/default.htm
5. Gorini G, De Gregorio G, Silvestri S, Chellini E, Cupelli V, Seniori Costantini A. Survival of malignant pleural mesothelioma cases in the Tuscan Mesothelioma register, 1988-2000: a population-based study. Eur J Cancer Prev 2005; 14: 195-199
6. Merler E, Roberti S (publishers). II ruolo dell'esposizione lavorativa e ambientale ad amianto nella genesi dei casi di mesotelioma insorti in residenti del Veneto (in press)
7. Marinaccio A, Nesti M, Regional Operational Centers. Analysis of survival of mesothelioma cases in the Italian Register (ReNaM). Eur J Cancer, 2003; 39: 1290-1295
8. Barbieri PG, Marinaccio A, Festa R, Nesti M, Marchetti G, Trigiani M, Tassi G. Analisi della sopravvivenza dei mesoteliomi maligni trattati a Brescia dal 1982 al 2000. Epidemiol Prev 2004; 28: 107-113
9. Magnani C, Viscomi S, Dalmasso P, Ivaldi C, Mirabelli D, Terracini B-Survival after pleural malignant mesothelioma. A population-based study in Italy. Tumori, 2002; 88: 266-269
10. Desoubeaux N, Bouvier V, Gervais R, Galateau-Salle F, Thibon P, Leplumey T, Herbert C, Lecherbonnier Y, Daviet J P, Letourneux M. Mésothéliomes malins en Basse-Normandie: analyse descriptive, facteurs pronostiques et survie. Une étude de population Rev Epidemiol Santé Publique, 2001; 49 : 523-529
11. Neumann V, Gunther K, Muller M, Fischer M. Malignant mesothelioma. German mesothelioma register 1987-1999. Int Arch Occup Environ Health, 2001; 74 : 383-395
12. Spirtas R, Connelly R R, Tucker M A. Survival patterns for malignant mesothelioma: the SEER experience. Int J Cancer, 1988; 41: 525-530
13. Van Gelder T, Damhuis R A M, Hoogsteden H C. Prognostic factors and survival in malignant pleural mesothelioma. Eur Respir J, 1994; 7: 1035-1038
14. Kaplan EL, Meier P. Non parametric estimation from incomplete observations. J Am Stat Assoc, 1958; 53:457-481
15. Cox D. Regression models and life-tables. J R Soc Stat, 1972; 34:187-220.
16. Janssen-Heijnen ML, Damhuis RA, Klinkhamer PJ, Schipper RM, Coebergh JW. Increased but low incidence and poor survival of malignant mesothelioma in the southeastern part of the Netherlands since 1970 : a population-based study. Eur J Cancer Prev, 1999; 8 : 311-314
17. Hakulinen T. Cancer survival corrected for heterogeneity in patient withdrawal. Biometrics, 1982; 39:933-942.
18. Rosso S, Casella C, Crocetti E, Ferretti S, Guzzinati S (eds). Sopravvivenza dei casi di tumore in Italia negli anni novanta: i dati dei Registri Tumori. Epidemiol Prev 2001; 25 (Suppl 1):1-375
19. Greenwood M. A report on the natural duration of cancer. London, Ministry of Health, HMSO; 1926.
20. Verdecchia A, Capocaccia R, Hakulinen T. Methods of data analysis. In: Berrino F, Sant M, Verdecchia A, Capocaccia R, Hakulinen T, Estève J. Survival of cancer patients in Europe: the EUROCARE study. IARC Scientific Publications n. 95. Lyon, IARC, 1995

21. Mould RF, Lahanas M, Asselain B, Brewster D, Burgers SA, Damhuis RAM, De Rycke Y, Gennaro V, Szeszenia-Dabrowska N. Methodology for lognormal modelling of malignant pleural mesothelioma survival time distributions: a study of 5580 case histories from Europe and USA. Phys Med Biol, 2004; 49:3991-4004
22. The SEER Program Code Manual. Third Edition. Fritz A, Ries L (Eds) 1998, pag. 88
23. Pheby D, Sauvage M, Martinez Garcia C, Schouten L. Incidence date. In: Tyczynsky JE, Demaret E, Parkin DM (Eds) Standards and Guidelines for Cancer Registration in Europe. The ENCR Recommendations. IARC Technical Publication n.40, vol. 1. Lyon. IARC, 2003
24. Linee guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'Ispesl da parte dei Centri Operativi Regionali. http://www.ispesl.it/ispesl/sitorenam/Linee_Guida/lineeguida2003.pdf
25. Favaretto A. Overview on ongoing or planned clinical trias in Europe. Lung Cancer 2005; 49 suppl 1: S117-21
26. Berrino F, Gatta G, Chessa E, Valente F, Capocaccia R, and the EUROCARE Working Group Introduction: the EUROCARE II study. Eur J Cancer, 1998; 34 (14): 2139-2153

Note
CRITERIA OF DEFINITION FOR THE INCIDENCE DATE

Criteria defined by the Surveillance, Epidemiology and End Results (SEER)

The diagnosis date refers to the first diagnosis of this cancer by any recognized medical practitioner. This is often a clinical diagnosis and may not ever be confirmed histologically. Even if confirmed, the diagnosis date refers to the date of the first clinical diagnosis and not to the date of confirmation. If medical and/or pathological review of a previous condition indicates that the patient had cancer an earlier date, then the earlier date is the date of diagnosis, i.e. the date of diagnosis is back-dated. The date of diagnosis for 'Death Certificate Only' cases is the date of death. The date of diagnosis for 'Autopsy Only' cases is the date of death.

Criteria defined by the “European Network of Cancer registries (ENCR)

The date of the first event to occur chronologically should be chosen as incidence date. If an event of higher priority occurs within three months of the date initially chosen, the date of higher priority event should take precedence.
Order of declining priority:

1. date of first histological or cytological confirmation of this malignity (with the exception of histology or cytology at autopsy). This date should be:
    - date when the specimen was taken (biopsy)
    - date of receipt by the pathologist
    - date of the pathologist report
2. date of admission to the hospital because of this malignity
3. when evaluated at an outpatient clinic only: date of first consultation at the outpatient clinic because of this malignancy
4. date of diagnosis, other than 1,2 or 3
5. date of death, if no information is available other than the fact that the patient has died because of this malignancy
6. date of death, if the malignancy is discovered at autopsy.

Table 1

Reference	Population and incidence period	Setting of the date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Spirtas et al. 1988	USA-SEER 1973-1984	Not specified, SEER[(1)] relevant registers	31/12/1984	**1475** cases confirmed by histological, diagnosis, any anatomical site	Gender Age Anatomical site Morphology Stage Type of treatment Ethnic group Period of diagnosis Register	7 months		In the multivariate analysis survival is associated with: **age** (p = 0.0001 younger subjects survive more) **stage** (p = 0.0012 better prognosis for diagnosis of localised MM) **treatment** (p = 0.0001 short survival for treated cases) (editor's note: HR (Hazard ratio) values r reported)
Van Gelder et al. 1994	The Netherlands: Rotterdam Cancer Registry 1987-1989	Date of diagnosis	31/12/1991	**167** pleural cases: 143 cases confirmed by histological diagnosis 24 cytological diagnosis	Gender Age Morphology Stage Period of diagnosis Exposure	242 days		**Variable** / **Category** / **HR (CI 9** Age: <65 / 1; 65-74 / 1.46 (0.96 2.23); >74 / 2.05 (1.58 3.32) Morphology: Not defined / 1; Epithelioid / 1.10 (0.68 1.79); Biphasic / 1.72 (1.10 2.66); Fibrous / 0.88 (0.48 1.65) Stage: I / 1; II / 1.9 (1.06-; III+IV / 4.1 (2.27-; Unknown / 1.3 (0.84-
Berrino et al. 1998 [26]	Europe Populations covered by EUROCARE II Tumour Registers 1985-1989	ENCR[(2)] Relevant registers	Between 12/1991 and 06/1997	**3849** pleural cases 241 cases from Italian registers Cases coded as 163 according to ICD-IX, in the whole of the participating registers			At 5 years: Italy: 3% Europe: 7%	

Referenza	Popolazione e periodo di incidenza	Definiz. data di incidenza	Termine follow up	Dimensione studio	Variabili predittive	Sopravvivenza mediana (IC 95%)	Sopravvivenza % (IC 95%)	Altro
Janssen-Heijnen et al. 1999	Olanda: Residenti in North Brabant e Limburg 1970-1992	Non precisato, registro afferente ENCR(2)	01/04/1994	**136** casi 119 pleurici 15 peritoneali 2 vaginale del testicolo Casi deceduti entro 1 mese dalla diagnosi (5%) esclusi	Sesso Età Sede		A 6 mesi: 68% A 1 anno: 42% MM pleurici: 38 % MM peritoneali: 79% A 3 anni: 8%	
Neumann et al. 2001	Germania: German Mesothelioma Registry 1987-1999	Primi sintomi		**404** casi (pari al 25.1% dei 1605 casi per cui è disponibile tessuto polmonare per il conteggio di fibre e corpuscoli, ed al 10.2% del totale di 3942 casi registrati) 387 pleurici 16 peritoneali 1 pericardico	Sesso Età Sede Morfologia Corpuscoli dell'asbesto	13.5 mesi MM pleurici 13.2 mesi MM peritoneali 19.8 mesi caso pericardico 2 mesi	A 1 anno: 29% A 3 anni: 5%	Sopravvivenza associata a morfologia ($p<0.001$). A 1 anno: epitelioide 51%, bifasico 37%, sarcomatoso 12%. Sopravvivenza media di 15.5 mesi casi fino a 60 anni, 12.1 mesi casi 60 + anni (log rank test $p=0.036$) Sopravvivenza non correlata al numero corpuscoli di asbesto (log rank test $p>0.59$)

Reference	Population and incidence period	Setting of the date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Janssen-Heijnen ed al. 1999	The Netherlands: Resident people in North Brabant and Limburg 1970-1992	Not specified, ENCR(2) relevant registers	01/04/1994	**136** cases 119 pleural cases 15 peritoneal cases 2 cases of mesothelioma of the vaginal tunic of the testicle Patients who died within 1 month since diagnosis (5%) are excluded	Gender Age Anatomical site		At 6 months: 68% At 1 year: 42% Pleural MM: 38% Peritoneal MM : 79% At 3 years: 8%	
Neumann et al. 2001	Germany: German Mesothelioma Registry 1987-1999	First symptoms		**404** cases (equal to 25,1% out of the 1605 cases for which pulmonary tissue is available to perform the count of fibres and corpuscles and equal to the 10,2% out of the 3942 cases registered)	Gender Age Anatomical site Morphology Asbestos corpuscles	13.5 months Pleural MM 13.2 months Peritoneal MM 19.8 months Pericardial case 2 months	At 1 year: 29% At 3 years: 5%	Survival associated with morphology ($p<0,001$). At 1 year: epithelioid 51%, biphasic 37%, sarcomatous 12% Average survival 15,5 months for 60 year old or younger patients, 12,1 months for

				387 pleural cases 16 peritoneal cases 1 pericardial				over 60 + year patients (log rank test p= 0,036) Survival not associated with the number of asbestos corpuscles (log rank test p>0,59)

Referenza	Popolazione e periodo di incidenza	Definiz. data di incidenza	Termine follow up	Dimensione studio	Variabili predittive	Sopravvivenza mediana (IC 95%)	Sopravvivenza % (IC 95%)	Altro
Desoubeaux et al. 2001	Francia: Residenti in Basse Normandie 01/09/1995-31/08/1999	Data di diagnosi	31/08/2000	**80** casi 66 pleurici 14 peritoneali	Sesso Età Sede Morfologia Stadio Esposizione ad amianto Periodo di latenza (tempo intercorso tra data di diagnosi e data inizio lavoro)	MM pleurici 9 mesi MM peritoneali 5 mesi	A 2 anni: MM pleurici 9.09% MM peritoneali 14.28 %	Variabile — RR(IC95%) — p Età — 1.05 (1.03-1.07) — 0.0002 Esposizione f — 1 3.18 (2.18-4.17) — 0.01 Non rc — 1.09 (0.56-2.13) — NS RR per l'esposizione corretto per età Latenza media 45.3 anni (IC95% 42.4-48.3) non significativamente correlata al sopravvivenza
Rosso et al. 2001	Italia Registri Tumori non specialistici 1990-1994	Non precisato, registri afferenti ENCR[(2)]		**801** casi 740 casi pleurici 61 peritoneali (Casi codificati come 163 e 158 secondo ICD-IX e con codici morfologici ICD-O ver 1 o 2 9050-9055)	Sede Sesso Età		A 1 anno MM pleurici: 34% MM peritoneali: 41% A 3 anni MM pleurici: 8% MM peritoneali: 20% A 5 anni: MM pleurici: 5% MM peritoneali: 11%	La sopravvivenza diminuisce al crescere dell'età in entrambe i sessi e per tutte e due le sedi.

Reference	Population and incidence period	Setting of the date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Desorbeaux et al. 2001	France: Resident people in Lower Normandie 01/09/1995-31/08/1999	Date of diagnosis	31/08/2000	**80** cases 66 pleural cases 14 peritoneal cases	Gender Age Anatomical site Morphology Stage Asbestos exposure Latency period (time elapsed between the date of diagnosis and the beginning of the work)	Pleural MM 9 months Peritoneal MM 5 months	At 2 years: pleural MM 9.09% Peritoneal MM 14.28%	**Variable** — **RR (CI 95%)** — **p** Age — 1.05 (1.03-1.07) — 0.0 Exposure — 1 3,18 (2,18-4,17) — 0,0 Not — 1,09 (0,56-2,13) — NS RR for the exposure is adjusted t age The average latency of 45,3 year (CI95% 42,4-48,3) is not signific correlated to survival
Rosso et al. 2001	Italy Non specialistic tumour registers 1990-1994	Not specified, ENCR[(2)] relevant registers		**801** cases 740 pleural cases 61 peritoneal cases (Cases codified as 163 and 158 according to ICD-IX and with ICD-O ver 1 and 2 9050-9055 morphologica	Anatomical site Gender Age		At 1 year: Pleural MM : 34% Peritoneal MM : 41% At 3 years: Pleural MM : 8% Peritoneal MM : 20% At 5 years: Pleural MM : 5%	Survival is inversely proportion for both genders and sites.

				l codes)			Peritoneal MM: 11%	

Referenza	Popolazione e periodo di incidenza	Definiz. data di incidenza	Termine follow up	Dimensione studio	Variabili predittive	Sopravvivenza mediana (IC 95%)	Sopravvivenza % (IC 95%)	Altro
Magnani et al. 2002	Italia: Registro dei Mesoteliomi Maligni del Piemonte, residenti in Piemonte 1990-98	Data prelievo materiale bioptico	01/01/2000	**590** casi pleurici istologicamente confermati	Sesso Età Morfologia Periodo di diagnosi Ospedale di diagnosi	259 giorni	A 1 anno 35.9% (32.0-39.8) A 2 anni 14.2% (11.2-17.1) A 3 anni 6.8% (4.5-9.1) A 5 anni 3.1% (1.1-5.0)	**Variabile / Categoria / HR (IC 95%)** Età: ≤55 1; 56-65 1.19 (0.92-1.54); 66-75 1.12 (0.88-1.43); ≥76 1.73 (1.31-2.28) Morfologia: Epiteliode 1; Fibroso 1.42 (1.02-2.00); Bifasico 0.67 (0.53-0.86); Non specif 0.88 (0.67-1.15) Non differenze statisticamente significative per periodo di diagnosi e tipo di ospedale
Marinaccio et al. 2003	Italia: Registro Nazionale dei Mesoteliomi, residenti in Piemonte, Liguria, Emilia-Romagna, Toscana, Puglia 1997	Applica regole ENCR[2]	Tra 06/1999 e 12/2001	**429** casi 392 pleurici 34 peritoneali 3 pericardici Piemonte 136 casi Liguria 135 casi Emilia 72 casi Toscana 45 casi Puglia 41 casi	Sesso Età Sede Morfologia Diagnosi Esposizione	MM pleurici 275 giorni (241-309) MM peritoneali 157 giorni (118-196)	A 1 anno: 35.3% pleurici 29.4% peritoneali A 2 anni: 16.3% pleurici 26.5% peritoneali A 3 anni: 7.1% pleurici 17.7% peritoneali	**Variabile / Categoria / RR adj (IC95%)** Età: ≤64 1; 65-74 1.23(0.86-1.76); ≥75 1.82 (1.16-2.86) Morfologia: Non specif 1; Bifasico 0.90 (0.44-1.84); Epiteliode 0.99 (0.67-1.47); Fibroso 2.96 (1.28-6.81) Esposizio. amianto: NO 1; SI 1.11(0.78-1.60) Diagnosi: Certa 1; Sospetta 1.85 (1.16-2.94) RR adj per sesso, età e regione

Reference	Population and incidence period	Setting of the date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Magnani et al. 2002	Italy: Regional Malignant Mesothelioma Register of Piedmont Region 1990-98	Date of the bioptical material sampling	01/01/2000	**590** pleural cases confirmed by histological analysis	Gender Age Morphology Period of diagnosis Hospital where diagnosis was made	259 days	At 1 year 35.9% (32.0-39.8) At 2 years 14.2% (11.2-17.1) At 3 years 6.8% (4.5-9.1) At 5 years 3.1% (1.1-5.0)	**Variable / Category / H 9** Age: <55, 56-65, 66-75, >76 — 1, 1., 1.5, 1., 1.4, 1., 2. Morphology: Epithelioid, Fibrous, Biphasic, Not specified — 1, 1.4, 2.0, 0., 0.8, 0.8, 1. Statistically significant differenc highlighted by period of diagnos type of hospital
Marinaccio et al. 2003	Italy: National Register of Mesotheliomas, resident people in Piedmont, Liguria, Emilia Romagna, Tuscany, Apulia 1997	ENCR[2] rules applied	Between 06/1999 and 12/2001	**429** cases 392 pleural cases 34 peritoneal cases 3 pericardial cases Piedmont: 136 cases Liguria: 135 cases Emilia: 72 cases Tuscany: 45 cases	Gender Age Anatomical site Morphology Diagnosis Exposure	Pleural MM 275 days (241-309) Peritoneal MM 157 days (118-196)	At 1 year: 35.3% pleural cases 29.4% peritoneal cases At 2 years: 16.3% pleural cases 26.5% peritoneal cases At 3 years: 7.1% pleural	**Variable / Category / RI 95** Age: <64, 65-74, >75 — 1, 1., 1., 1.8, 2.8 Morphology: Not specified, Biphasic, Epithelioid, Fibrous — 1, 0.9, 1.8, 0.9, 1.4, 2.9, 6.8 Asbestos: NO — 1

				Apulia: 41 cases			cases 17.7% peritoneal cases	exposure	YES	1, 1,
								Diagnosis	Certain Suspected	1, 2,
								RR adjusted by gender, age and		

Referenza	Popolazione e periodo di incidenza	Definiz. data di incidenza	Termine follow up	Dimensione studio	Variabili predittive	Sopravvivenza mediana (IC 95%)	Sopravvivenza % (IC 95%)	Altro
Barbieri et al. 2004	Residenti provincia di Brescia 1982-2000	Data refertazione, oppure data primo ricovero ove è posta la diagnosi clinica	31/12/2001	**215** casi 191 pleurici 24 peritoneali	Sesso Età Sede Morfologia Terapie effettuate Diagnosi Periodo di diagnosi Residenza Esposizione ad amianto	MM pleurici maschi 233 giorni (198-268) femmine 291giorni (210-372) MM peritoneali Maschi 242 giorni (31-453) femmine 625 giorni (0-1646)	MM pleurici: a 1 anno: maschi 31.2% femmine 40.9% MM peritoneali: a 1 anno: maschi 36.4% femmine 53.8%	Sopravvivenza più breve per i casi di MM pleurici probabili o possibili negli uomini: analisi univariata chi quadrato =10.73 p= 0.001; multivariata RR adj =1.35 (0.8-2.2). Non differenze statisticamente significative tra terapie considerate o tra periodi di diagnosi Variabile / Categoria / RR adj (IC 95%) Età: < 65 1; 65-74 1.63 (1.1-2.4); ≥75 1.58 (1.0-2.5) Morfologia: Non specif 1; Bifasico 1.37 (0.7-2.6); Epitelioide 0.98 (0.6-1.4); Fibroso 4.46 (2.0-9.8)
Mould et al. 2004	USA-SEER 1975-1994 Europa: Liguria Rotterdam Scozia Szczucin 1994-1997 1987-1997 1975-1997 1986-2003	Non precisato, registri afferenti SEER[(1)] ENCR[(2)]	2000 2003 2003 2003 2003	**5580** casi pleurici	Sesso Età		A 1 anno: Uomini: 40-49 43% 50-59 43% 60-69 41% 70-79 32% 80+ 19% Donne: 38% A 2 anni: Uomini: 40-49 18% 50-59 18% 60-69 17% 70-79 13% 80+ 7% Donne: 19%	

Reference	Population and incidence period	Setting of the date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Barbieri et al. 2004	Resident people in province of Brescia 1982-2000	Date of medical report, or date of the first hospitalization during which the clinical diagnosis was made	31/12/2001	**215** cases 191 pleural cases 24 peritoneal cases	Gender Age Anatomical site Morphology Therapies performed Diagnosis Period of diagnosis Place of residence Asbestos exposure	Pleural MM men 233 days (198-268) women 291 days (210-372) Peritoneal MM men 242 days (31-453) women 625 days (0-1646)	Pleural MM: at 1 year: men 31,2% women 40,9% Peritoneal MM: at 1 year: men 36,4% women 53,8%	Shorter survival in men for proba possible pleural MM: chi-square univariate analysis = 10,73 p = 0 multivariate RR adj = 1,35 (0,8-2 Statistically significant differenc highlighted between therapies considered and periods of diagno Variable / Category / R (C Age: <65 1; 65-74 1.6; >75 2.4 1.5 2.5 Morphology: Not specified 1; Biphasic 1.3 2.0; Epithelioid 0.9 1.4; Fibrous 4.4 9.8
Mould et al. 2004	USA-SEER 1975-1994 Europe: Liguria Rotterdam Scotland Szczucin 1994-1997	Not specified, SEER[(1)] ENCR[(2)] relevant registers	2000 2003 2003 2003 2003	**5580** pleural cases	Gender Age		At 1 year: Men: 40-49 43% 50-59 43% 60-69 41% 70-79 32% 80+ 19% Women: 38% At 2 years:	

	1987-1997 1975-1997 1986-2003						Men: 40-49 18% 50-59 18% 60-69 17% 70-79 13% 80+ 7% Women: 19%	

Referenza	Popolazione e periodo di incidenza	Definiz. data di incidenza	Termine follow up	Dimensione studio	Variabili preditive	Sopravvivenza mediana (IC 95%)	Sopravvivenza % (IC 95%)	Altro
Gorini et al. 2005	Italia: Registro Mesoteliomi della Toscana, residenti in Toscana 1988-2000	Applica regole ENCR[(2)]	31/12/2002	**381** casi pleurici con diagnosi istologica 318 maschi 63 femmine	Sesso Età Morfologia Trattamento* Periodo di diagnosi Ospedale di diagnosi Esposizione ad amianto *Riferito a soli 161 casi del periodo 1997-2000	324 giorni (297-366)	A 1 anno: 45.7% (40.6-50.6) A 2 anni: 24.2% (20.0-28.5)	Variabile / Categoria / HR (IC 95%): Ospedale c/ chirurgia toracica: No 1; Si 0.80 (0.63-1.01) Morfologia: Epitelioide 1; Fibroso 1.41 (0.92-2.18); Bifasico 1.23 (0.95-1.60); Non specif 1.45 (1.06-1.99) Analisi multivariata aggiustata per sesso, età, morfologia e tipo di ospedale: non differenze statisticamente significative tra casi trattati e casi non trattati (HR= 0.73; IC 0.49-1.08) Sesso, età, periodo di diagnosi ed esposizione all'amianto: non differenze statisticamente significative né nelle analisi univariate, né in quelle multivariate.

Reference	Population and incidence period	Setting of date of incidence	End of follow up	Size of study	Predictive variables	Median survival (Confidence Interval 95%)	Survival % (Confidence Interval 95%)	Other
Gorini et al. 2005	Italy. Malignant Mesothelioma Register of the Tuscany Region, resident people in Tuscany 1988-2000	ENCR[(2)] rules applied	31/12/2002	**381** pleural cases confirmed by histological diagnosis 318 men 63 women	Gender Age Morphology Treatment * Period of diagnosis Hospital where diagnosis was made Asbestos exposure * Referred only to 161 cases of the 1997-2000 period	324 days (297-366)	At 1 year: 45.7% (40.6-50.6) At 2 years: 24.2% (20.2-28.5)	Variable / Category / H 9: Hospital thoracic surgery: No 1; Yes 0,8 1,0 Morphology: Epithelioid 1; Fibrous 1,4; Biphasic 2,; Not specified 1,2 1,0 1,4 1,9 Multivariate analysis adjusted by age, morphology and type of hos statistically significant difference not highlighted between treated a treated cases (HR = 0,73; CI 0,49 Gender,age, period of diagnosis a asbestos exposure: statistically si differences were not highlighted the univariate analyses nor in the multivariate ones.

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Tabella 2

<table>
<tr><th>Referenza</th><th>Popolazione e periodo di incidenza</th><th>Definiz. data di incidenza</th><th>Termine follow up</th><th>Dimensione studio</th><th>Variabili preditive</th><th>Sopravvivenza mediana (IC 95%)</th><th>Sopravvivenza % (IC 95%)</th><th>Altro</th></tr>
<tr><td>Merler et al. 2005</td><td>Italia, Registro Mesoteliomi del Veneto: residenti in Veneto

1990-2002</td><td>Data prelievo materiale bioptico</td><td>30/06/2004</td><td>693 casi con conferma istologica

624 pleurici
62 peritoneali
3 vaginale del testicolo
3 pleurici/ peritoneali
1 pericardico

656 casi dispongono di valutazione dell'esposizione</td><td>Sesso
Età
Sede
Morfologia
Periodo di diagnosi
Provincia di residenza</td><td>9.9 mesi
(9.2-10.8)

MM pleurici
10 mesi
(9.2-10.9)

MM peritoneali
6.9 mesi
(4.3-11.0)</td><td>A 1 anno:
MM pleurici
43% (39-47)
MM peritoneali
34% (22-46)

A 3 anni:
MM pleurici
11% (9-14)
MM peritoneali
18% (9-28)</td><td>MM pleurici
<table>
<tr><th>Variabile</th><th>Categoria</th><th>HR (IC 95%)</th></tr>
<tr><td>Età</td><td><55
55-64
65-74
≥ 75</td><td>1
1.38 (1.1-1.8)
1.78 (1.4-2.3)
2.61 (1.9-3.5)</td></tr>
<tr><td>Morfologia</td><td>Epitelioide
Bifasico
Fibroso
Non specif</td><td>1
2.10 (1.7-2.6)
2.38 (1.8-3.2)
1.51 (1.1-2.0)</td></tr>
</table>
MM peritoneali
<table>
<tr><th>Variabile</th><th>Categoria</th><th>HR (IC 95%)</th></tr>
<tr><td>Età</td><td><55
55-64
65-74
≥ 75</td><td>1
0.93 (0.4-2.3)
1.23 (0.5-3.0)
5.04 (1.8-13.8)</td></tr>
<tr><td>Morfologia</td><td>Epitelioide
Altri</td><td>1
2.42 (1.2-4.8)</td></tr>
<tr><td>Sesso</td><td>Femmine
Maschi</td><td>1
2.75 (1.3-5.6)</td></tr>
</table></td></tr>
<tr><td>Gennaro et al. 2005</td><td>Italia, Registro Mesoteliomi della Liguria: residenti nel Comune di Genova
1994-2001

residenti in provincia di Genova
1995-2001
residenti in Liguria
1996-2001</td><td>Applica regole ENCR[2]</td><td>31/12/2002</td><td>924 casi pleurici con differenti livelli di conferma diagnostica (come da linee-guida ReNaM)</td><td>Sesso
Età
Morfologia
Diagnosi</td><td>8.9 mesi

Uomini
9.4 mesi
(8.5-10.3)

Donne
7.7 mesi
(6.5-8.9)</td><td>A 1 anno:
40% uomini
34% donne

A 2 anni:
17% uomini
12% donne</td><td><table>
<tr><th>Variabile</th><th>Categoria</th><th>HR (IC 95%)</th></tr>
<tr><td>Età</td><td><67
67-76
>77</td><td>1
1.38 (1.16-1.63)
1.80 (1.50-2.14)</td></tr>
<tr><td>Morfologia</td><td>Epitelioide
Non specif
Fibroso
Bifasico
No istolog</td><td>1
1.10
1.35 (0.98-1.85)
1.50 (1.12-2.01)
1.48 (1.08-2.04)</td></tr>
<tr><td>Diagnosi</td><td>Certa
Probabile
Possibile</td><td>1
0.96
0.74 (0.51-1.05)</td></tr>
</table></td></tr>
</table>

Table 2

<table>
<tr><th>Reference</th><th>Population and incidence period</th><th>Setting of the date of incidence</th><th>End of follow up</th><th>Size of study</th><th>Predictive variables</th><th>Median survival (Confidence Interval 95%)</th><th>Survival % (Confidence Interval 95%)</th><th>Other</th></tr>
<tr><td>Merler et al. 2005</td><td>Italy: Malignant Mesothelioma Register of the Veneto Region; resident people in Veneto

1990-2002</td><td>Date of bioptical material sampling</td><td>30/06/2004</td><td>693 cases confirmed by the histological analysis

624 pleural cases
62 peritoneal cases
3 cases of mesotehlioma of the vaginal tunic of the testicle
3 pleural / peritoneal cases
1 pericardial case

For 656 cases exposure assessment is available</td><td>Gender
Age
Anatomical site
Morphology
Period of diagnosis
Province of residence</td><td>9.9 months
(9.2-10.8)

Pleural MM
10 months
(9.2-10.9)

Peritoneal MM
6.9 months
(4.3-11.0)</td><td>At 1 year:
pleural MM:
43% (39-47)
peritoneal MM:
34% (22-46)

At 3 years:
pleural MM:
11% (9-14)
peritoneal MM :
18% (9-28)</td><td>Pleural MM
<table>
<tr><th>Variable</th><th>Category</th><th>H
9</th></tr>
<tr><td>Age</td><td><55
55-64
65-74
>75</td><td>1
1.
1.
1.
2.
2.
3.</td></tr>
<tr><td>Morphology</td><td>Epithelioid
Biphasic
Fibrous
Not specified</td><td>1
2.
2.
2.
3.
1.
2.</td></tr>
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Peritoneal MM
<table>
<tr><th>Variable</th><th>Category</th><th>H
9</th></tr>
<tr><td>Age</td><td><55
55-64
65-74
>75</td><td>1
0.
2.
1.
3.</td></tr>
</table></td></tr>
</table>

								(continued in the nested table below)
Gennaro et al. 2005	Italy: Mesothelioma Register of Liguria Region: resident people in the commune of Genoa 1994-2001 resident people in the province of Genoa 1995-2001 resident people in Liguria 1996-2001	ENCR[(2)] rules applied	31/12/2002	**924** pleural cases with different levels of diagnostic confirmation (according to ReNaM guidelines)	Gender Age Morphology Diagnosis	8,9 months Men 9,4 months (8.5-10.3) Women 7,7 months (6.5-8.9)	At 1 year: 40% men 34% women At 2 years: 17% men 12% women	(see nested table below)

		5. 13
Morphology	Epithelioid Other	1 2. 4.
Sex	Women Men	1 2. 5.

Variable	**Category**	**H** **9**
Age	<67 67-76 >77	1 1. 1. 1. 2.
Morphology	Epithelioid Not specified Fibrous Biphasic No histological analysis	1 1. 1. 1. 1. 2. 1. 2.
Diagnosis	Certain Probable Possible	1 0. 0. 1.

DISCUSSION ON EXPOSURE DATA FOR A FEW PRODUCTION SECTORS

CASES OF MALIGNANT MESOTHELIOMA WITH ENVIRONMENTAL AND DOMESTIC AETIOLOGY: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (ReNaM) DATA

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In the ReNaM Archive there are at present sufficient data to assess the exposure for 3,552 cases out of 5,173, equivalent to about 69%. In 302 cases, equivalent to about 9% of cases with defined exposure, the reporting COR attributed a domestic or environmental exposure, in the absence of occupational exposure.

A review of the exposure profile has led to the reclassification of some cases as being attributable to other circumstances of non-occupational exposure, not included in this group based on the ReNaM Guidelines, such as, for instance, the presence of materials containing asbestos in a domestic environment, or their handling in a non-occupational context. As a matter of fact, by definition domestic exposure is that linked to cohabitation with someone exposed to asbestos, and environmental exposure is that due to living within the estimated range of influence of an external source of asbestos pollution (for more detail see the exposure classification adopted by ReNaM, included in the national guidelines [1]). There are 294 cases included in this chapter (Tables 1 and 2). Altogether, the cases in the Archive to which a non-occupational aetiology has been attributed (according to the ReNaM classification, cases with exposure in the non-occupational, environmental, and domestic sphere and with exposure classified as unknown or improbable), and which therefore also include the ones excluded here, exceed only by a fraction 10% of all the ones evaluated.

This proportion by and large matches the facts emerging from the literature. Since the first reporting [2] of the association between asbestos and malignant mesothelioma (MM) the substantial risk has emerged correlated to exposure linked to the environment in the wider sense, including the fallout of emissions from mines and processing plants in residential areas, the presence in the immediate proximity of or inside the living quarters of material contaminated by asbestos, cohabitation with workers exposed to asbestos, daily activities, including children playing with or in the presence of contaminated materials. In the original series of 33 cases of mesothelioma reported by Wagner and colleagues, occurrences of non-occupational exposure were the only ones present in the medical history of a good 14 of them. Ever since then the epidemic of mesotheliomas in South African crocidolite mining areas has provided further proof of the importance of environmental exposure [3]; furthermore

the mining area of Wittenoom Gorge in Australia, similar because it relates to crocidolite extraction, underwent extensive studies in which it was possible to investigate the dose-response relationship at the levels of environmental exposure thanks to the availability of environmental measurements [4]. Even the investigation carried out in London a few years after Wagner's report [5], in a totally different context, highlighted, through a case-control approach, a high risk of MM from exposure defined as " neighbourhood-related". By and large, in 9 cases out of 76 where the complete history was available the only significant condition was a relative who had worked in an asbestos plant and another 11 had lived within half a mile of an asbestos plant.
The description of the MM epidemic linked to environmental exposure to erionite, in the villages of Karain in Central Anatolia, Turkey [6-7] caused a shift in the perception of the problem of non-occupational exposure to asbestiform fibres. In the case of erionite, in fact, which is poorly used at commercial and industrial level, the cases observed could not be attributed to occupational conditions from the viewpoint of aetiology. Almost simultaneously another group of cases was reported in the population of Tuzkoy, about 50 km from Karain [8], in an area also contaminated with erionite, and a further aggregation in the population of Cermik, in South-eastern Anatolia [9], this time in relation to the use of local materials as plaster materials which were heavily contaminated by fibrous tremolite.
More recently, several works [10-13], have contributed to update the mesothelioma incidence data in the areas of Eastern Anatolia in relation to environmental asbestos exposure. Epidemics with features very similar to these were described in Greece [14], Cyprus [15], Corsica [16], New Caledonia [17], China [18], Italy [19], Montana and California [20-21].
Two systematic reviews [22], [23] summarised the current status of knowledge, even though they did not include the results of the study on the residents of Wittenoom, mentioned above. In particular it was pointed out that today non-occupational exposure plays a crucial role in an effort to explain an important share of the observed cases of MM, and that the strength of association between these exposures and the risk of MM is not to be underestimated. It was also suggested that in the absence of adequate countermeasures these very exposures could prolong the MM epidemic in the countries in which the industrial use of asbestos has ceased.
In our case histories there are important intraregional differences in the proportion of domestic or environmental cases: they account for almost 25% of the cases etiologically defined in Piedmont, dropping to about 13% in Apulia, and then to 8-9% in Veneto, Emilia-Romagna and Lombardy, and they are only about 5% in Liguria and Sicily, and 2% in Tuscany. These differences could be explained by methodological aspects as far as the collection and evaluation of the exposure data are concerned. For instance they could be emphasised by a difference in completeness of interviews in the Regions which had a low proportion of interviewees in the past. In Piedmont before 1998 interviews were limited to the cases involved in the case-control studies, and these studies were carried out in areas where it was suspected that non-occupational exposure played an important role. However, even in the period 1999-2001, in which the proportion of interviewed cases reached 70%, those with a domestic/environmental cause aetiology accounted for about 21%. Therefore the differences observed cannot be attributed to this factor. Another limit of comparability could derive from the proportion of direct interviews, given that those with interviewees decrease the ability to identify circumstances of exposure to asbestos. The proportion of direct interviews is about 75% in Piedmont, against 48% in the other regions as a whole, among the environmental cases, and respectively 78% against 56% for all the other cases irrespective of the aetiology. This however does not explain interregional differences, even if we assume that indirect interview leads to erroneously classifying half the cases actually exposed due to environmental circumstances as not being exposed.
In fact the circumstances of exposure were described, as was their weight in the range of cases of MM in the populations affected, in the industrialised areas of Casale Monferrato, of Turin and neighbouring towns, of Broni, of La Spezia and Bari [24-29], as well as around the mine of Balangero [30]. Therefore the biggest efforts, in the form of ad hoc studies, were concentrated in those areas which

have the highest proportion of non-occupational cases, and the predominant exposures in the ReNaM Archive match that already reported in the works outlined above. Out of the total of 187 cases of environmental exposure attributed to the cases classified as having an environmental aetiology, a good third (76) relate to the proximity to asbestos cement production plants. Also to be noted are various periods with people living near shipyards and ports (16 periods), iron and steel plants/foundries or chemical/petrochemical plants or electrical power plants (15), railway lines (12), asbestos textile industries (9).
Exposure from living near asbestos cement plants in subjects suffering from MM are a further aspect of the impact on health of this production sector, in addition to the one documented amongst workers. In several companies which turned out to be the main cause of environmental exposure, in fact, cohort studies were carried out on the workers, which highlighted increases in total mortality, mortality due to tumours and respiratory diseases. Among the tumours the increase was especially in respiratory tumours, and in particular pulmonary tumours and pleural MMs, and tumours of the digestive system, due to the increase in peritoneal MMs. For at least one asbestos cement plant (as shown below) a high risk of MM was shown as a consequence of cohabitation with subjects exposed at work. This production sector shows it has caused in Italy the neoplastic risk to be extended to the non-working population neighbouring the plants.
Generally the production sectors most frequently associated with environmental cases of MM also turn out to have used amphiboles (amosite and crocidolite). However the type of asbestos most widely used was certainly chrysotile and it should not be forgotten that there is an epidemiological demonstration of an increased risk of mesothelioma due to environmental pollution arising from the extraction and processing of chrysotile [31].
For two cases among the 144 included here, taking into consideration the entire profile of exposure, a possible relationship can be noted with the activity of the chrysotile mine of Balangero. The first case refers to a period spent living at an estimated distance of about 1000 m from the site; however the causal interpretation of this observation is unclear, as the subject began to live in Balangero when the extraction activity had ceased and a few years (about seven) before falling ill. The second case reported the use of the tailings of Balangero in the courtyard of the subject's house as a substitutive for gravel, and therefore in small pieces. A further case, finally, was attributed to the proximity of the habitation to a different extraction activity; this is the serpentine quarry in Trana, in the province of Turin, significantly contaminated by fibrous tremolite (the gravelly material was sold to build road and railway road-beds, and to cover courtyards and similar areas).
As a footnote to these cases, which are very difficult to interpret, we note that a very particular situation emerged in Biancavilla, in the province of Catania. A concentration of deaths due to malignant pleural tumours [32] led to an investigation, which confirmed many cases to be MM-related and to identify the aetiology of the epidemic as the use of materials from a local quarry, contaminated with a previously unknown fibrous asbestiform mineral, fluoroedenite [33, 34].
The potential damage to health from exposure to asbestos linked to the presence of natural sources in the living environment, once these sources have been disturbed by some human activity, has also been highlighted by two investigations on small clusters of cases, carried out in two areas apparently very far apart in the country, one in Piedmont and one in Basilicata, but in fact linked by the presence of outcrops of serpentinites contaminated with tremolite [35, 36].
Another aspect of the problems linked to current exposure to asbestos in our country is the considerable amount of materials containing asbestos still on site, and subject to progressive degradation. There is a clear risk linked to the presence of asbestos in friable matrices in confined environments, for instance in industrial plants, both for workers subject to passive exposure, and for those working on the materials, such as maintenance engineers. Is not known on the other hand if a risk can be associated with levels of exposure resulting from the release of the fibre in the general urban environment (a) from compact materials exposed to erosion, such as asbestos cement, extensively present in the urban

environment, and/or (b) from friable materials, much more rarely present and generally inside buildings. Should that be the case, however, even though the risk is light in itself the consequences could be serious given the large number of exposed persons. A few recent observations [37, 38] have led to a hypothesis for this type of exposure. The extreme difficulty of studying a risk profile of this kind using a strict analytical approach is clear. In a largely industrialised city, where asbestos manufacturing industries have been present or which have used large quantities of materials and manufactured asbestos products, it is unlikely that the conditions exist to do this successfully. Therefore, without any pretension of going beyond a pure description of what has emerged from the interviews of cases and been recorded by the surveyors, we note that the profile of exposure "background urban pollution" occurs 17 times amongst the environmental cases presented here: 7 times as the first profile, 7 as the second and 3 as a third, distributed overall amongst 9 cases. The one relating to the presence of significant surfaces of asbestos cement exposed to weather erosion close to residential areas was reported 13 times.

The latency, measured between the start of the first exposure and the diagnosis, goes from a minimum of 6 years up to 84, with an average of 46.5 (± 14.7). The duration of the exposure ranges between 2 and 84 years, with an average of 32.1 (± 19.6).

Out of 144 cases, 137 (67 men and 70 women) experienced pleural localisation, 6 (3 men and 3 women) experienced peritoneal localisation, and one pericardiac localisation. Non-pleural localisation cases are rare in themselves, and analytical studies geared towards evaluating the environmental risk have never been carried out; however there are well documented cases [39]. Five out of the six peritoneal cases are histologically confirmed, whilst for one the diagnosis is only suggested by clinical elements. For three of them the exposure was determined by residence close to asbestos cement production plants, for one by the presence in the immediate vicinity of the house of surfaces made out of asbestos cement, for one by residence on a wharf in Monfalcone; latencies varied between 21 and 63 years. The sixth case did not report periods of residence near obvious specific sources of asbestos pollution, and was attributed to the general environmental contamination in Turin [40, 41], with a 27 year latency. The case with pericardiac localisation was histologically confirmed and it is well known that the person lived about 500 meters from a port and a shipyard; however there is no data on the time of residence, and therefore duration and latency are unknown.

In many, if not all areas in which a significant percentage of cases with an environmental aetiology was reported, domestic cases were also reported, due in particular to one or more relatives working in asbestos manufacturing who were taking fibres home on their person and work clothes, or other materials, as further reported in the literature [42]. These are not isolated cases: currently in the ReNaM Archive their number is equivalent to that of the environmental ones. The distribution by age bands of the environmental and domestic cases is similar. Instead there is a clear predominance of women in the domestic cases, against an overall equilibrium between the two genders in the environmental case. Another feature of domestic exposure is the wider range of manufacturing processes connected to it, compared to the observations for the environmental cases. The description of at least one profile of domestic exposure also has data on the occupational activity carried out by the exposed relative in 147 cases out of 150 classified as relatives by the reporting work of the COR. Overall 181 different circumstances of exposure are reported. A significant share refers to manufacturing or jobs for which there is clear exposure to asbestos, given the period of work and the job title: asbestos cement production (22 working periods), weaving of asbestos (9), ship building and repair (21), building and repair of railway rolling stock (11). Nevertheless more than half of the working periods involving exposure were spent in activities and jobs where asbestos is not present as a raw material, but is installed on the plants, as in the chemical, or rubber industry and sugar-refineries (10 working periods), in the production of electricity (6), in steelworks/foundries/forge shops (9), in textiles (8), in railways (8), or else it is found in certain more or less extensively used materials or goods, as in the construction sector (18 working periods), in the installation and maintenance of machinery and electrical or hydraulic systems (11), in the manufacturing of motor vehicles (5).

The relative most often involved in exporting the risk from the factory to the domestic environment is the spouse (86 periods of exposure out of 181), followed by a parent (53); it is to be noted that in 10 cases the cause was the work of a son or daughter.

Latency, measured between the start of the first exposure and diagnosis, goes from a minimum of 19 years up to 86, with an average of 47.8 (± 14.6). The duration of exposure varies from less than one year to 78 years, with an average of 21.6 (± 13.5).

Out of 150 cases, 146 (23 men and 123 women) experienced pleural localisation, whereas 4 (1 man and 3 women) experienced peritoneal localisation. Cases with peritoneal location in the body all have histological confirmation of diagnosis, with conclusions of certain mesothelioma in two cases and probable mesothelioma in another two cases. Exposed relatives were employed, respectively, in a cast iron foundry, in forging, in construction, in glass manufacture. Latency could only be assessed in two cases, and turned out to be very long: 49 and 70 years.

The contribution of environmental and domestic exposure to the total incidence of malignant mesothelioma is anything but negligible, especially among women [8]. The risk for exposed persons can reach levels comparable to that of professional cohorts [43]. The strength of association is actually of the same order of magnitude which can be observed following occupational exposure [26].

We would like to highlight a few particularly worrying (and bitter) aspects of what looks to be an epidemic of malignant mesotheliomas in the relatives of the exposed persons. The first is that people who were totally unaware of the risk itself become victims of an industrial hazard. Some of them underwent exposure since early childhood. The second is that up to now no insurance or legal protection has been offered to these people. A significant proportion of cases (see Table 2) was affected at a young or adult age, and therefore presumably leaves behind young children or youths without the support of (at least) one parent. A third aspect is that these cases, in particular, show the vainness of the argument put forward by supporters of the asbestos industry, that a “controlled” and “safe” use of asbestos is possible, because it is without risks. Controlled use has not been shown to be effective in Italy, in years when even all the scientific, technical and legal instruments necessary for prevention were available. One wonders thus how this could happen in countries that, despite having an extraordinarily dynamic economy, leave their workers and their population in general completely deprived of contractual power, and the knowledge required to be aware of the risks and the ways in which to prevent them.

References

1. Nesti M, Adamoli S, Ammirabile F et al. (eds). Linee Guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei centri operativi regionali. ISPESL Monograph, Roma 2003. Available at http//www.ispesl.it/ispesl/sitorenam/index.asp
2. Wagner JC, Sleggs CA, Marchand P. Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province. Brit J Industr Med. 1960; 17: 260-271.
3. Rees D, Myers JE, Goodman K, Fourie E, Blignaut C, Chapman R, Bachmann MO. Case-control study of mesothelioma in South Africa. Am J Ind Med. 1999; 35:213-222.
4. Hansen J, De Klerk NH, Musk AW, Hobbs MST. Environmental exposure to crocidolite and mesothelioma. Exposure-response relationships. Am J Respir Crit Care Med. 1998; 157: 68-75.
5. Newhouse ML, Thompson H. Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Brit J Industr Med. 1965; 22: 261-269.
6. Baris YI, Sahin AA, Ozesmi M, Kerse I, Ozen E, Kolacan B, Altinors M, Goktepeli A (1978). An outbreak of pleural mesothelioma and chronic fibrosing pleurisy in the village of Karain/Urgup in Anatolia. Thorax. 1978; 33: 181-192.
7. Baris YI, Saracci R, Simonato L, Skidmore JW, Artvinli M. Malignant mesothelioma and radiological chest abnormalities in two villages in central Turkey. Lancet. 1981; i: 984-987.
8. Artvinili M, Baris YI. Malignant mesotheliomas in a small village in the Anatolian region of Turkey: an epidemiologic study. JNCI. 1979; 63: 17-22
9. Yazicioglu S, Ilçayto R, Balci K, Sayli BS, Yorulmaz B. Pleural calcification, pleural mesotheliomas, and bronchial cancers caused by tremolite dust. Thorax. 1980; 35: 564-569.
10. Zeren EH, Gumurdulu D, Roggli VL, Zorludemir S, Erkisi M, Tuncer I. Environmental malignant mesothelioma in southern Anatolia: a study of fifty cases. Environ Health Perspect. 2000; 108:1047-50
11. Senyigit A, Babayigit C, Gokirmak M, Topcu F, Asan E, Coskunsel M, lsik R, Ertem M. Incidence of malignant pleural mesothelioma due to environmental asbestos fiber exposure in the southeast of Turkey. Respiration 2000; 67:610-4.
12. Metintas S, Metintas M, Ucgun I, Oner U. Malignant mesothelioma due to environmental exposure to asbestos: follow-up of a Turkish cohort living in a rural area. Chest. 2002; 122:2224-9.
13. Hasanoglu HC, Yildirim Z, Ermis H, Kilic T, Koksal N. Lung cancer and mesothelioma in towns with environmental exposure to asbestos in Eastern Anatolia. Int Arch Occup Environ Health. 2005; published on-line 30 august 2005
14. Costantopoulos SH, Goudevenos JA, Saratzis N, Langer AM, Selikoff IJ, Moutsopoulos HM. Metsovo lung: pleural calcification and restrictive lung function in Northwestern Greece. Environmental exposure to mineral fiber as etiology. Environ Res. 1985; 38: 319-331.
15. Mc Connochie K, Simonato L, Mavrides P, Christofides P, Pooley FD, Wagner JC. Mesothelioma in Cyprus: the role of tremolite. Thorax. 1987: 42:342-347
16. Steinbauer J, Boutin C, Viallat JR, Dufour G, Gaudichet A, Massey DG, Charpin D, Mouries JC. Plaques pleurales et environnement asbestosique en Corse du Nord. Rev Mal Resp. 1987; 4 :23-27.
17. Goldberg P, Luce D, Billon-Galland MA, Quénel P, Salomon-Nekiriai C, Nicolau J, Brochard P, Goldberg M. Role potentiel de l'exposition environnementale et domestique à la trémolite dans le cancer de la plèvre en Nouvelle Caledonie. Rev Epidemiol et Santé Publ. 1995; 43 :444-450.

18. Luo SQ, Mu SH, Wang JT, Zhang Y, Wen QB, Cai SP. A study on risk of malignant neoplasm and environmental exposure to crocidolite. Sichuan Da Xue Xue Bao Yi Xue Ban. 2005; 36:105-7
19. Magnani C, Terracini B, Ivaldi C, Botta M, Mancini A, Andrion A. Pleural malignant mesothelioma and non-occupational exposure to asbestos in Casale Monferrato, Italy. Occup Environ Med. 1995; 52: 362-367
20. Maynard C. Asbestos problem in Montana e California. Environ Sci Technol 2004; 1; 38(3):46°
21. Pan XL, Day HW, Wang W, Beckett LA, Schenker MB. Residential proximity to naturally occurring asbestos and mesothelioma risk in California. Am J Respir Crit Care Med. 2005; 172:1019-25
22. Hillerdal G. Mesothelioma: cases associated with non-occupational and low dose exposures. Occup Environ Med. 1999; 56: 505-513.
23. Bourdès V, Boffetta P, Pisani P. Environmental exposure to asbestos and risk of pleural mesothelioma: review and meta-analysis. Eur J Epidemiol. 2000; 16: 41 1-417
24. Dodoli D, Del Nevo M, Fiumalbi C, Iaia TE, Cristaudo A, Comba P, Viti C, Battista G. Environmental household exposures to asbestos and occurrence of pleural mesothelioma. Am J Ind Med. 1992; 21:681-7.
25. Magnani C, Agudo A, Gonzalez CA, Andrion A, Calleja A, Chellini E, Dalmasso P, Escolar A, Hernandez S, Ivaldi C, Mirabelli D, Ramirez J, Turuguet D, Usel M, Terracini B. Multicentric study on malignant pleural mesothelioma and non-occupational exposure to asbestos. Br J Cancer. 2000; 83:104-11
26. Magnani C, Dalmasso P, Biggeri A, Ivaldi C, Mirabelli D, Terracini B. Increased risk of malignant mesothelioma of the pleura after residential or domestic exposure to asbestos: a case-control study in Casale Monferrato, Italy. Environ Health Perspect. 2001; 109:915-9
27. Magnani C, Comba P, Di Paola M. Pleural mesotheliomas in the Po River valley near Pavia; mortality, incidence and the correlations with an asbestos cement plant. Med Lav. 1994 Mar-Apr; 85(2):157-60.
28. Amendola P, Belli S, Binazzi A, Cavalleri A, Comba P, Mastrantonio M, Trinca S. Mortality from malignant pleural neoplasms in Broni (Pavia), 1980-1997. Epidemiol Prev. 2003 Mar-Apr; 27(2):86-90.
29. Bilancia M, Cavone D, Pollice A, Musti M. The assessment of risk of mesothelioma: a case study concerning asbestos-cement plant in Bari, southern Italy. Epidemiol Prev, 2003; 27:277-284.
30. Camus M, Siemiatycki J, MeekB. Nonoccupational exposure to chrysotile asbestos and the risk of lung cancer. NEJM 1998; 338: 1565-1571
31. Silvestri S, Magnani C, Calisti R, Bruno C. The experience of the Balangero chrysotile asbestos mine in Italy: health effects among workers mining and milling asbestos and the health experience of people living nearby. Can Mineral. 2001; 5:177-186
32. Di Paola M, Mastrantonio M, Carboni M, Bessi S, De Santis M, Grignoli M, Trinca S, Nesti M, Comba P. Esposizione ad amianto e mortalità per tumore maligno della pleura in Italia (1988-1994). Rapporti ISTISAN 00/9. Roma, Istituto Superiore di Sanità, 2000
33. Paoletti L, Batisti D, Bruno C, Di Paola M, Gianfagna A, Mastrantonio M, Nesti M, Comba P. Unusually high incidence of malignant pleural mesothelioma in a town of eastern Sicily: an epidemiological and environmental study. Arch Environ Health. 2000; 55:392-8
34. Biggeri A, Pasetto R, Belli S, Bruno C, Di Maria G, Mastrantonio M, Trinca. S, Uccelli R, Comba P. Mortality from chronic obstructive pulmonary disease and pleural mesothelioma in an area contaminated by natural fiber (fluoro-edenite). Scand J Work Environ Health. 2004; 30:249-52

35. Mirabelli D, Cadum E. Mortality from pleural and peritoneal malignancies in the Upper Susa Valley. Epidemiol Prev. 2002; 26:284-286.
36. Pasetto R, Bruni B, Bruno C, Cauzillo G, Cavone D, Convertini L, De Mei B, Marconi A, Montagano G, Musti M, Paoletti L, Comba P. Pleural mesothelioma and environmental exposure to mineral fibres: the case of a rural area in the Basilicata region, Italy. Ann Ist Super Sanità. 2004; 40:251-65.
37. Ascoli V, Comba P, Pasetto R Urban mesothelioma: is there an emerging risk of asbestos in place? Int J Cancer. 2004 Oct 10; 111(6):975-6
38. Hamilton WT, Round AP, Sharp DJ, Peters TJ. High incidence of mesothelioma in an English city without heavy industrial use of asbestos. J Public Health 2004; 26:77-8.
39. Rosenthal R, Langer I, Dalquen P, Marti WR, Oertli D. Peritoneal mesothelioma after environmental asbestos exposure. Swiss Surg. 2003; 9:311-4.
40. Chiappino G, Sebastien P, Todaro A. Atmospheric asbestos pollution in the urban environment: Milan, Casale Monferrato, Brescia, Ancona, Bologna and Florence. Med Lav. 1991; 82:424-38.
41. Chiappino G, Todaro A, Blanchard 0. Atmospheric asbestos pollution in the urban environment: Rome, Orbassano and a control locality (II) Med Lav 1993; 84:187-92.
42. Miller A. Mesothelioma in household members of asbestos-exposed workers: 32 United States cases since 1990. Am J Ind Med. 2005; 47:458-62.
43. Magnani C, Terracini B, Ivaldi C, Botta M, Budel P, Mancini A, Zanetti R. A cohort study on mortality among wives of workers in the asbestos cement industry in Casale Monferrato, Italy. Br J Ind Med. 1993; 50:779-84.

Tabella 1. Casi ambientali e familiari, per sesso e anno di diagnosi

	Ambientali			Familiari					
Anno	Donne	Uomini	Totale	Donne	Uomini	Totale	Donne	Uomini	Totale
1993	5	5	10	3	3	6	8	8	16
1994	4	2	6	3		3	7	2	9
1995	9	9	18	5	2	7	14	11	25
1996	8	6	14	4	1	5	12	7	19
1997	4	7	11	11	1	12	15	8	23
1998	7	4	11	17	1	18	24	5	29
1999	4	7	11	20	4	24	24	11	35
2000	18	16	34	31	6	37	49	22	71
2001	15	14	29	32	6	38	47	20	67
Tutti gli anni	74	70	144	126	24	150	200	94	294

Table 1. Environmental and domestic cases, by gender and year of duiagnosis.

Key:

Ambientali	Environmental
Familiari	Domestic
Anno	Year
Donne	Women
Uomini	Men
Totale	Total
Tutti gli anni	All years

Tabella 2. Casi ambientali e familiari, per sesso e fascia d'età

	Ambientali			Familiari			Tutti		
Classe Età	Donne	Uomini	Totale	Donne	Uomini	Totale	Donne	Uomini	Totale
25-34		1	1	2		2	2	1	3
35-44	6	4	10	8	1	9	14	5	19
45-54	10	8	18	10	4	14	20	12	32
55-64	19	21	40	33	6	39	52	27	79
65-74	25	20	45	45	7	52	70	27	97
75-84	13	14	27	23	5	28	36	19	55
85+	1	2	3	5	1	6	6	3	9
Tutte età	74	70	144	126	24	150	200	94	294

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Table 2. Environmental and domestic cases, by gender and age groups.

Key:

Ambientali	Environmental
Familiari	Domestic
Tutti	All
Classe Età	Age groups
Donne	Women
Uomini	Men
Totale	Total
Tutte età	All ages

CASES OF MALIGNANT MESOTHELIOMA DUE TO OCCUPATIONAL EXPOSURE TO ASBESTOS IN THE CONSTRUCTION, REPAIR, MAINTENANCE AND DECONTAMINATION OF RAILWAY VEHICLES: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (ReNaM) DATA

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The case histories reported to the National Mesothelioma Register (ReNaM)

Occupational exposure to asbestos due to working activities performed in companies involved in the construction, repair or decontamination of railway vehicles is attributed to 129 subjects among the ones reported to the ReNaM Archive.
Exposure to asbestos in this production sector could also have affected other workers, and have therefore generated other cases of mesothelioma, especially cases arisen in workers who were in charge of spray-applied asbestos insulation and employed by contractor companies belonging to the construction sector and cases of mesothelioma arisen in railway crews and therefore assigned to the railway transport sector.
Cases of mesothelioma arising from environmental and domestic exposure determined by these production activities (8 cases), discussed in another chapter, must then be added to the 129 cases of mesothelioma in the railway sector identified here. Only for 7 out of the 129 subjects was the diagnosis carried through instrumental investigations other than histological or cytological tests or else they were defined as cases on the basis of the death certification.
Among the cases of mesothelioma, 122 developed in the pleural area, and 7 in the peritoneal area.
The cases were reported by different Regional Operative Centres (COR) and relate to different years.
The highest number of cases is identified in the Regions of Emilia-Romagna (40 cases), Veneto (39 cases), Tuscany (21 cases) and Piedmont (14 cases); a smaller number of reports concerns the Regions of Lombardy (7 cases) Liguria (4 cases), Apulia (2 cases), The Marches and Sicily (1 case).
Basically, the distribution of cases reported so far shows a significant presence in some Central and Northern Regions of Italy: Emilia-Romagna, Veneto, and Tuscany. Nevertheless this distribution, being a consequence of well known occupational exposures, may not adequately represent various situations of occupational risk existing in the Regions of Southern Italy, since they are not yet controlled by Regional Operative Centres (COR). Before evaluating more specific aspects, it is useful to refer to general data which need to be compared with the information resulting from the analysis of mesothelioma cases attributed to other production sectors.
There are 53 recorded cases of mesothelioma in the period up to 1997, and 76 in the period 1998-2001.

In the first period (1993-1997) cases of mesothelioma are only reported by the Regional Operative Centres (COR) of Emilia Romagna (19 cases), Veneto (18 cases), Tuscany (10 cases), Liguria (2 cases), Apulia (2 cases), and Piedmont (2 cases).
In these case histories, occupational exposure to asbestos was considered to be present with different degrees of probability: a certain occupational exposure was considered to be present in 84% of cases (108 subjects), a probable occupational exposure in 12% (16 subjects) and a possible exposure in 4% of cases (5 subjects). This distribution shows some differences in each Regional Operative Centre (COR), given that the cases of Liguria, The Marches and Sicily all have a small certainty attribution (Figure 1), and this might be explained by the incomplete knowledge of the sector gained by those subjects in charge of assigning attributions.
The average number of years spent working in this sector is 20.2 years (± 11.9) with a minimum of 1 year and a maximum of 44 years. A duration of a work experience lasting only one year was found in the case histories of several Regional Operative Centres (COR) (Lombardy, Veneto and Tuscany), thus providing an indication of the non-exceptionality of "short"-duration exposures deemed to be associated, in this production sector, with the subsequent onset of mesothelioma. The average latency period is 42.3 years (± 10.9): the average latency period of mesothelioma cases in this production sector is, for instance, almost 5 years lower than that recorded for shipbuilding.
It is agreed that the figures (Table 1) resulting from the case histories and referring to the year of entry into work are significantly important with reference to mesothelioma cases: 15.7% of subjects entered work prior to 1944, 41.4% between 1955 and 1964, 17.2% of subjects entered work after 1965. This distribution clearly shows a trend towards more recent years compared to that recorded in other working sectors (for instance, shipbuilding). The importance of such data relies on public health implications: compared to other sectors, in this case there was an exposure to asbestos prolonged for a longer period which therefore produced, for those involved, higher cumulative exposure whilst the exposure itself kept on involving new subjects, thus increasing the number of the exposed ones. It was possible to split mesothelioma cases into two categories: subjects who exclusively worked in railway construction (53 subjects) and those who worked exclusively on railway repair (25 cases). The two groups of subjects differ by starting year of exposure, respectively 1956 for the railway construction workers (range 1934-1974) around 1958 (range 1940-1990) for railway repair workers. This difference worsens the comment previously expressed as regards workers operating in plants where railway vehicle repair was carried out.
Finally, among the cases reported to the ReNaM Archive, mesothelioma cases attributed to this sector were caused by asbestos exposure occurring in production plants where the construction of railway vehicles (engines or carriages) was being carried out (not necessarily in exclusive manner) or in plants which were carrying out the repair ("large-scale" or "small-scale" repair) of such vehicles, either in private plants or in those belonging to the Italian State Railways (FFSS): the geographical distribution of mesothelioma cases reflects the locations of such production plants (and the current distribution of Regional Operative Centres (COR). In the Regions showing the highest number of cases were located both, railway production and repair plants carrying out their activities in engineering industries which employed, in each work place and in each period, a few hundred workers.

Asbestos exposure in this sector occurring in Italy and in other countries

The assessment of mesothelioma cases in this production sector may take advantage of both, in-depth analysis carried out on the uses of asbestos and the conditions for use in the railway sector and also the results deriving from different epidemiological studies [1-15].
In the first decades of the 1900s asbestos was already used in Italy in the railway sector for the insulation of some parts of steam locomotives (boiler pipes and gaskets).

Data on this application are scant. If we consider the evidences and the information relating to the Verona Large Repair Workshop of the Italian State Railways – a workshop that since the early 1800s was specialised in the repair of steam locomotives, and which then began maintenance activities on electric locomotives insulated with sprayed asbestos – it seems we can exclude the possibility that in Italy extensive use was made of asbestos in the construction of locomotives.
This is different from what is reported in other countries and is reflected in the mesothelioma risk assessment [16-21].
In Italy the practice was not to coat the whole boiler with asbestos, nor to use the sprayed asbestos, but rather asbestos fabrics would have been used probably made up of chrysotile asbestos. This conclusion seems to be confirmed by the absence of mesothelioma cases in the cohort of these workers, if considering the subjects that only worked as boilermakers in the Verona Large Repair Workshop (OGR) [22-23], although the cohort of employees was reconstructed and controlled over time and cases of mesothelioma are being investigated in the Region of Veneto at least for the period going from 1987 to today.
One should also consider that in the history of Italian railways, railway vehicles from other countries made their appearance or left the country several times: some examples are the Austro-Hungarian stock left in Italy as spoils of the First World War; the American trains brought to Italy according to the Marshall Plan in the second post-war period; the construction or repair companies obtaining job orders for railway vehicles to be destined for foreign markets, especially the European one. Furthermore it must not be assumed that the railway network and vehicles were just those belonging to the Italian State Railways: there existed in Italy an important private rail network, made up of several subjects who were ordering and using railway vehicles other than those produced for the Italian State Railways.
The more extensive description of mesothelioma cases resulting from the use of asbestos in steam locomotives is that compiled by Mancuso and coll. relating to the United States of America and focusing on subjects that had worked in the 1920s [17-19]. During the interwar period, in Italy asbestos was used on railway carriages in the form of manufactured products: tapes, ropes and cardboard-like materials made of chrysotile asbestos and used in steam couplings (steam transfer ducts running from the boiler or heating wagon to the carriage), in steam transport pipes located in the under body and, inside the carriage, in the areas reserved for heat emission (heating units) located under the passenger seats or in the back of the seats in some types of carriages. In electric locomotives asbestos was present in the contactor flues, the rheostats, as a coating for cables subjected to thermal stress and in the driving cab's heating units.
Therefore, in Italy this first-type of asbestos exposure concerns the areas where locomotives and carriages were constructed while the railway plants where repair and maintenance operations were carried out for small, medium and large-scale maintenance interventions were subsequently involved only at a later stage. The great change took place in Italy with the Italian State Railways' (FFSS) decision, which subsequently also gave rise to similar decisions in the private railways, to use railway vehicles whose carriage body was insulated with sprayed asbestos.
The request dates back to 1956 for brand new vehicles and a few years later it was applied to those vehicles already in circulation. The type of asbestos required for this treatment was crocidolite, the use of which continued at least until the beginning of the 1970s. A spray application technique was used (crocidolite fibres mixed with water and vinyl glue) through which engines and carriages were insulated with approximately 20-30 mm thick asbestos applied on the internal surface of the carriage body, in more or less extensive areas and surfaces according to the type of railway vehicles (for instance, in postal carriages, sleeping cars and luggage vans the insulation had to be applied throughout the internal surface, sides, ceilings and floors; in the so-called "vicinal railways" the insulation was applied on the whole of the outer surface of the under body, and this may have caused asbestos to be dispersed during the train circulation).
The new railway vehicles insulated with sprayed asbestos were built in the private companies where,

equally, the insulation of the whole pre-existing railway carriage fleet would be carried out progressively as job orders were assigned for the transformation, maintenance and restructuring of carriages. Conversely, work on asbestos insulation would involve those plants belonging to the Italian State Railways (FFSS) that were in charge of small and medium-scale maintenance of carriages (SR, Vehicle lifting squads), the Locomotive Depots (DL) for traction vehicles, the facilities destined to large-scale maintenance of engines or carriages (OGR, Large Repair Workshops). The asbestos insulation in fact, had to be removed and then replaced during interventions on the carriage body sheets and for a wide range of maintenance interventions which required the stripping of the insulation and the need of "touching it" with mechanical instruments, thus causing considerable environmental pollution.
It follows that, for the entire period subsequent to spray-applied insulation, sectors affected by asbestos risk were that of the private carriage-manufacturing and repair industry and that of public rail transport largely represented by the Italian State Railways and to a lesser extent by local railway operators.
The spraying operations were carried out by insulation workers belonging to contractor companies, except for a few rare cases in which private sector staff or employees of the Large Repair Workshops (OGR) belonging to the Italian State Railways (FFSS) were carrying out spraying operations by themselves on (small) areas subject to maintenance. The spraying operations took place within the manufacturing cycle of the carriage construction and repair workshops: they were carried out in buildings (in a few cases even outdoors) in which work activities were sequential, thus following a planned progression, while simultaneously involving several stocks of carriages positioned on various tracks. During the construction process, various equipping phases followed insulation and they included operations involving the mechanical stress of sprayed crocidolite layers. However, as regards the maintenance plants, one should consider that the type of insulation used on the bodywork involved over time the progressive instability of the insulating material and a progressively increasing dispersion of asbestos fibres due to the strong mechanical stresses to which a railway carriage is subject. It is interesting to note that the use of asbestos in railway vehicles did not exclusively take place in Italy, and cases of mesothelioma or epidemiological studies that report its use and describe its effects are indeed present for various Europeans countries (Switzerland, the Scandinavian countries, England, Germany, The Netherlands) [24, 25, 20, 26, 27, 28] or non-European countries (Australia, South Africa) [16, 29].
On the other hand it seems odd that the consequences of the decision to insulate with sprayed crocidolite are not evaluated in Italy until the 1980s, an aspect that differentiates Italy from other countries.
The decision of the Italian State Railways to insulate with sprayed crocidolite the entire railway fleet is not a strange one, even as regards the work technique, but it appears that it was not affected by the influence of epidemiological data on the neoplastic risk from asbestos increasingly published along the way. A useful comparison may be drawn with England. From the analysis of environmental surveys it appears that England started insulating railway vehicles with sprayed asbestos since the end of the 1930s, a technique that is also widely used in shipbuilding.
Spray-applied insulation was patented and entered into use immediately after the first asbestos protection law was implemented in England in 1931 and this method of application is, unfortunately, excluded from the ones regulated. The Health and Safety Executive (HSE) which monitored its application decided to proceed with environmental measurements in order to assess the exposure intensity which was considered to be high and told employers that not only insulation workers but also those working in the vicinity required respiratory protective equipment. The extension of these protection measures to "*bystanders*" concerned the employers and led to a conflict which would only be resolved with the new asbestos regulations of 1969 [30].
Returning back to England in the early nineteen sixties, given that the work contract he had was interrupted following the publication of data on exposure to crocidolite and the onset of mesothelioma in the mining area of the Cape Province in South Africa [31], Wagner began an assessment on the

presence of mesothelioma in English subjects exposed to asbestos. The study by Newhouse and Thompson [32], concerning cases of mesothelioma identified amongst subjects hospitalised in London, is a response to this appeal. The study had a strong impact, since it confirmed the high level of mesothelioma risk among both workers and the general population affected by residential and environmental pollution (among the 83 cases, working and residential history data were collected for 76 cases and among these latter ones a mesothelioma case was present in one railway carriage construction worker who was using asbestos boarding and also in the wife of a railway carriage construction worker who used to line compartments with asbestos sheeting), and since it was carried out with a case-control epidemiological design, therefore by using a model that goes beyond the simple collection of case histories and its in-depth medical history analysis. The British media picked up on it and workers or their organisations asked questions on the neoplastic risks to the Health and Safety Executive and decided to stop working if there was exposure to asbestos, for instance deciding to no longer unload asbestos in sacks at the Port of London. The results of the study and the trade union protests led to some decisions including the one of the British railways to suspend the use of asbestos ("In 1967 the British railways announced that they would no longer use asbestos as insulating material (instead opting for the use of glass fibres) due to the health hazards for workers ") [30] (incidentally, the British Navy had decided to abandon the practice of using sprayed asbestos since 1963).
As regards job duties that were at risk for exposure to asbestos in the transport sector, railway engine-drivers were among those who first underwent exposure due to the presence of spray-applied insulation easily accessible from inside the driving cabs. Among the jobs most directly exposed in railway construction and repair we should consider that of boilermaker and pipe-maker, jobs requiring the need of working on the steam heating lines running from the boiler carriage to the passenger carriages. Riggers, pipe-makers and electricians were intervening in the assembly of equipment and fittings on newly-built carriages. Panel installers, carpenters, upholsterers, pipe-makers and electricians were the ones suffering direct exposure during the repair and maintenance of carriages. As regards indirect exposure the list of jobs is obviously much longer, because in all the work places where equipping, repair and maintenance of carriages took place, the lack of partitions and of exposure reduction measures caused widespread pollution of the entire sheds where the manufacturing was being carried out, a verdict confirmed by the environmental measurements carried out in some organisations.

The epidemiological studies carried out in Italy

This production sector underwent almost a dozen epidemiological cohort studies (Table 2) commented in two recent reviews [33-34].
The cohort studies highlighted the presence of a high risk of death due to primary pleural tumour, which appears even higher in the studies with a longer follow-up, and showed the presence of an increased risk of death due to lung tumours for larger cohorts or for the ones controlled over a longer follow-up. As well as the studies on employees of these engineering companies, a moderately large cohort study [35] involved the employees of a company carrying out insulation activities, including spray-applied crocidolite asbestos insulation in railway vehicle construction and repair companies.
Unfortunately, the studies published so far analyse the risk in the absence of exposure estimates, since these are practically absent until the 1980s. Among the cases of mesothelioma identified by the regional registers with reference to this production sector, we have more detailed information for the regions of Tuscany [36] and Veneto [22, 23].
The case histories of Tuscany region relates to a longer time period than that reported to the National Mesothelioma Register (ReNaM) and consist of 44 cases of mesothelioma. The frequency of job duties amongst construction workers and separately among repair workers is reported, thus showing in the former high frequencies for welders, riggers and electricians.

The case histories of Veneto region, also referring to a longer time period than the one reported to the National Mesothelioma Register (ReNaM), relate to 115 cases of mesothelioma dating from 1987 to today. There are about fifteen production plants behind these cases that include both, the plants in Veneto region and those belonging to other areas, with quite large clusters for a few plants, both private and Italian State Railways-owned (FFSS), so that a single plant in the region of Veneto has absolutely the highest number of mesothelioma cases identified in that Region. The work places include plants located abroad, such as the ones belonging to a company situated in Zurich, Switzerland, already mentioned [24], an aspect which emphasizes the importance of work migration and the presence of occupational exposure in migrant workers.

The job duties involved match the ones outlined before, given that mesotheliomas have occurred in those subjects who were carrying out interventions onto units insulated with asbestos after spray-applied insulation had been carried out (e.g. carpenters and varnishers) and, with reference to repair company workers, also among welders, blacksmiths and latteners.

An aspect of interest in the data referring to Veneto region is the information on the difference between cases of mesothelioma reported at the beginning of the 1990s and cases reported at the end of the Register activities: the result is a completion of the survey and the indication of a progression in the number of case histories. The most serious aspect is represented by the "number of case histories, the fact that cases of mesothelioma arose among workers belonging to all the work places having a high number of employees and where railway vehicle construction and or repair was carried out in Veneto, and by the presence of mesothelioma cases due to environmental and domestic pollution and affecting various working categories (the Italian State Railways (FFSS) crew, etc.)".

In this production sector exposure to asbestos took place for a long time without using any kind of environmental and personal protection. Some moderate change on the control of the risk was put in place in the 1970s in single private industries. In 1983 the Italian State Railways started a process of reorganisation of working conditions according to the explicit recognition of the asbestos risk (circular letter of 1983). A few years before, the use of sprayed asbestos ceased in the private construction industry. Private companies carrying out repairs on behalf of the Italian State Railways (FS) tried to comply with the provisions contained in the first circular letter of 1983, but significant differences emerge between the various companies.

After 1983, the Italian State Railways (FFSS) reached the decision to close the chapter of asbestos insulation begun in the 1950s and proceed with the deinsulation of the railway carriages, thus leading to the permanence of asbestos exposure conditions in this working sector for a further period, or the scrapping of those carriages deemed by then to be obsolete. This process would not turn out to be so clear and would see the intervention of a new body, the Judicial Authority. The demand of the Italian State Railways (FFSS) workers of the Large Repair Workshop (OGR) to work in safe environments, following the regulations prescribed by the circular letter of 1983, and at the same time the refusal to carry out the full insulation of the carriages, would lead to the decision requiring deinsulation processes to be contracted out to private companies. Several of the companies who would come across these various job orders were located in the South of Italy. The Judicial Authority would intervene at the end of the 1980s in relation to the working conditions, closing down entire plants, one of which, the largest by then in terms of working volume produced, would never reopen again. In the early 1990s the insulation programme would undergo a lull and would then start again only to be ended in the early 2000s, again entrusting it to private companies, after the intervention of the Judicial Authority to block the sale of insulated carriages to Eastern European countries.

References

1. Battista G, Belli S, Comba P, et al. Mortality due to asbestos-related causes among railway carriage construction and repair workers. Occup Med.1999 49: 536-9
2. Blasetti F, Bruno C, Comba P, Fantini F, Grignoli M. Studio di mortalità relativo agli addetti alla costruzione di carrozze ferroviarie a Colleferro. Med Lav 1990; 81:407-13
3. Gerosa A, Ietri E, Belli S, Grignoli M, Comba P. Alto rischio di morte per mesotelioma pleurico in un'Officina Grandi Riparazioni delle Ferrovie dello Stato. Epidemiol Prev. 2000; 24: 117-119
4. Magnani C, Nardini I, Governa M, Serio A. Uno studio di coorte degli addetti ad una officina grandi riparazioni (OGR) delle ferrovie dello stato. Med Lav. 1986; 77: 154-61
5. Magnani C, Ricci P, Terracini B. A mortality historical cohort study in the Verona repair workshop of Italian railways. Acta Oncol. 1989; l0: 201-7
6. Maltoni C, Pinto C, Dominaci R. Mesoteliomi tra i meccanici delle ferrovie in Italia: un problema di attualità. Med Lav. 1989; 80: 103-110
7. Menegozzo M, Belli S, Bruno C et al. La mortalità per cause correlabili all'amianto in una coorte di addetti alla costruzione di carrozze ferroviarie. Med Lav. 1993; 84: 193-200
8. Merler E, Ricci P, Carnevale F et al. Identificazione dei casi di mesotelioma insorti in Italia per l'esposizione ad amianto usato nella coibentazione di mezzi ferroviari. Rass Med Lav. 1990; 16: 1-25
9. Merler E, Ricci P, Carnevale F, Ventura F, Silvestri S, Terracini B. Mesothelioma in Italy among railroad workers and among employees of industries related to the railroad system (FS). Acta Oncologica 1990; 11: 213-217
10. Merler E, Chellini E, Baldasseroni A, Carnevale F et al. Aggiornamento dei casi di mesotelioma dovuti all'esposizione ad amianto usato nel settore del trasporto ferroviario. Rass Med Lav. 1991; 20: 3-14
11. Merler E, Ricci P, Silvestri S. Crocidolite and not chrysotile was mainly used by the Italian railroad system. Med Lav. 1996; 87: 268-269
12. Merler E, Roberti S, Gioffrè F. Lo standard della comunicazione scientifica e i morti attribuibili all'esposizione ad amianto nella coorte citata dal prof. E. Gaffuri. (letter to editorial board). Med Lav. 2004; 95: 412
13. Seniori-Costantini A, Ercolanelli M, Silvestri S, et al. Studio di coorte sugli addetti ad una Azienda di costruzione e riparazione di rotabili ferroviari (Breda): aggiornamento del follow-up del precedente studio al 31/12/2000. In, Regione Toscana Giunta regionale. L'intervento sanitario per gli ex-esposti ad amianto della ditta Breda, Pistoia 2002, 10-20
14. Silvestri S, Ventura F. Azienda Ferrovie dello Stato: gli impianti in Toscana. In: Silvestri S, Merler E (publ.) C'era una volta l'amianto. Ti Con Erre Ed, Regione Toscana, 1995
15. Tessari R, Canova C, Simonato L. Indagine epidemiologica sullo stato di salute degli addetti alla produzione e riparazione carrozze ferroviarie: uno studio prospettico di mortalità. Med Lav. 2004; 95: 381-2391
16. Wagner JC, Sleggs CA, Marchand P (1960). Diffuse pleural mesothelioma and asbestos exposure in the North Western Cape Province. Brit J Industr Med. 1960; 17: 260-271
17. Mancuso TF. Mesothelioma among machinists in railroad and other industries. Am J Ind Med. 1983; 4: 501-513
18. Mancuso TF. Relative risk of mesothelioma among railroad machinists exposed to chrysotile. Am I Ind Med. 1988; 13: 639-657

19. Mancuso TF Mesothelioma among railroads workers in the United States. Ann N Y Acad Sci. 1991; 643:333-46
20. Ohlson CG, Klaesson B, Hogstedt C. Mortality among asbestos-exposed workers in a railroad workshop. Scand J Work Environ Health 1984; l0: 283-291
21. Schenker MB, Garshick E, Munoz A et al. A population-based case-control study of mesothelioma deaths among US railroad workers. Am Rev Respir Dis. 1986; 134: 461-465
22. Merler E, Roberti S, Gioffrè F, Contin G e il Gruppo regionale sui Mesoteliomi Maligni. I mesoteliomi tra gli addetti alla costruzione e riparazione di mezzi ferroviari e tra il personale che ha lavorato per le Ferrovie, in Veneto. Ambiente, risorse e salute 2004; 97: 55-58
23. Merler E, Roberti S et al. Il ruolo dell'esposizione lavorativa ed ambientale ad amianto nella genesi dei casi di mesotelioma insorti in residenti del Veneto (in press)
24. Rüttner JR, Reber P, Schüler G, Srpycher MA, Stolkin P, Wälchi P. Endemie von Pleuramesotheliomen in Eisenbah-waggonbau- und-reparaturarbeiten. Arbetismed Sozialmed Präventivmed 1986; 20: 128-131
25. Malker HS, Laughlin JK, Malker BK et al. Occupational risks for pleural mesothelioma in Sweden, 1961-79. J Natl Cancer Inst. 1985; 74: 61-66
26. McElvenny DM, Darnton AJ, Price MJ, Hodgson JT. Mesothelioma mortality in Great Britain from 1968 to 2001. Occup Med.2005; 55: 79-87
27. Neumann V, Gunther S, Muller KM et al. Malignant mesothelioma. German mesothelioma register 1987-1999. Int Occup Environ Health. 2001; 74: 383-395
28. Burdof A, Dahhan M, Swuste P. Occupational characteristics of cases with asbestos-related diseases in the Netherlands. Ann Occup Hyg. 2003; 47: 485-492
29. Leigh J, Driscoll T. Malignant mesothelioma in Australia, 1945-2002. Int J Occup Environ Health 2003; 9: 206-217
30. Tweendale G. Magic mineral to killer dust. Oxford University Press, London, 2000
31. McCullogh J: Asbestos blues. Labour, capital, physicians & the state in South Africa. Indiana University Press, 2002
32. Newhouse ML, Thompson H (1965). Mesothelioma of pleura and peritoneum following exposure to asbestos in the London area. Brit J Industr Med. 1965; 22: 261-269
33. Comba P, Pasetto R. Impatto sanitario dell'esposizione ad amianto nel settore della costruzione e riparazione dei rotabili ferroviari. Eur J Oncol. 2004; 9: 87-90
34. Comba P, Merler E, Pasetto R. Asbestos related diseases in Italy: Epidemiologic evidence and public health issues. Int J Occup Environ Med. 2005; 11: 36-44
35. Menegozzo M, Belli S, Borriero S et al. Studio di mortalità di una coorte di coibentatori. Epidemiol Prev. 2002; 26: 71-75
36. Gorini G, Merler E, Silvestri S, Cacciarini V, Seniori Costantini A. Archivio regionale toscano dei mesoteliomi maligni. Rapporto sulla casistica 1988-2000. TiConErre editore, Firenze 2002

Figura 1. Distribuzione dei casi di mesotelioma segnalati all'Archivio ReNaM tra gli addetti alla costruzione e riparazione di mezzi ferroviari per Regione (COR) e livello di esposizione

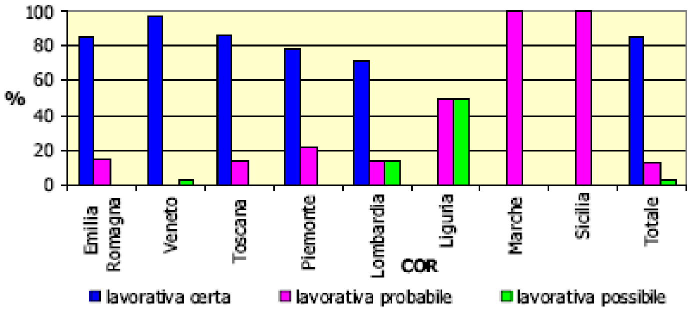

Figure 1. Distribution by Region (Regional Operative Centre - COR) and exposure levels of mesothelioma cases amongst railway vehicle construction and repair workers reported to the ReNaM Archive.

Key:

lavorativa certa	certain occupational exposure
lavorativa probabile	probable occupational exposure
lavorativa possibile	possible occupational exposure
EMILIA-ROMAGNA	EMILIA-ROMAGNA
VENETO	VENETO
TOSCANA	TUSCANY
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
LIGURIA	LIGURIA
MARCHE	THE MARCHES
SICILIA	SICILY
Totale	Total

Table 1. Year of entry into work with reference to mesothelioma cases amongst railway construction and repair workers reported to the National Mesothelioma Register (ReNaM). * For one subject the year of entry into work is not specified.

Year of entry into work	**N**	**%**
<1935	2	1.6
1935-1944	18	14.1
1945-1954	33	25.8
1955-1964	53	41.4
1965-1974	18	14.1
1975-1984	3	2.3
after 1985	1	0.8
Total	128	100.0

Table 2. Cohort studies carried out in Italy on railway vehicle construction or repair workers (from Comba P et al., 2005, mod).

Plant location (reference)	**n. of subjects (follow-up period)**	**Primary pleural tumours**		**Lung tumours**	
		Observed Deaths	Expected Deaths	Observed Deaths	Expected Deaths
Foligno (Magnani, 1986)	1,037 (1967-1983)	1	N.S.	11	12.7
Verona (Magnani, 1989)	2,628 (1967-1980)	1	1.0	27	32.0
Colleferro (Blasetti, 1990)	276 (1968-1988)	2	0.2	8	6.2
Pozzuoli (Menegozzo, 1993)	1,534 (1970-1989)	3	0.63	28	19.2
Arezzo (Battista, 1999)	734 (1945-1997)	5	0.38	26	20.9
Bologna (Gerosa, 2000)	173 (1979-1997)	6	0.09	3	6.46
Pistoia (Seniori Costantini, 2002)	3,739 (1960-2000)	10	2.24	139	114.6
Padua (Tessari, 2004)	a) 1,621 (1946-2001) b) 1,190 (1946-2001)	a) 23 b) 3	a) 1.07 b) 0.46	a) 90 b) 33	b) 71.65 b) 27.99
Padua (Merler 2004)	a) idem	a) 27	a) 1.07	108	b) 71.65

CASES OF MALIGNANT MESOTHELIOMA DUE TO OCCUPATIONAL EXPOSURE TO ASBESTOS IN THE SHIPBUILDING SECTOR: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (ReNaM) DATA

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The case histories reported to the National Mesothelioma Register (ReNaM)

Among the case histories included in the ReNaM Archive occupational asbestos exposure resulting from working activities carried out in the shipbuilding sector is attributed to 376 subjects affected by mesothelioma. For 334 subjects this represented the only kind of asbestos exposure identified, whilst for 42 subjects multiple occupational exposures were recorded (shipyards and other sectors considered to be exposure sources having the same probability level). These subjects do not represent the total number of mesothelioma cases whose occupational history showed an exposure arising from this production sector, since 16 mesothelioma cases due to environmental or domestic exposure related to these activities, which are described and analysed in a specific chapter, must be also added together with a non-measurable number of cases where subjects have carried out activities as insulation workers, but are included among construction workers.
In fact, in Italy the activities dealing with asbestos insulation were contracted out by several shipyards to specialist companies, mostly registered as construction companies, which simultaneously carried out asbestos insulation job orders in civil and industrial construction, in the production and repair of railway vehicles, etc. It might have happened that insulation activities carried out in specific shipyards were substantial and justified the regular presence of workers, thus determining the creation of specific production units, but more often the asbestos insulation workers would stay in a shipyard for the time necessary to carry out a specific job, and would then move to other areas of production.
The 376 subjects involved in shipbuilding and affected by mesothelioma are all male.
The anatomical site of the neoplasia was found to be pleural for 368 cases and peritoneal for 8 cases, and a lower ratio was confirmed between the two sites, if compared to the one observed in the case histories belonging to other sectors. These data may have been influenced by the consequences shown in the study on extrapleural mesotheliomas (results in: www.ispesl.it/ispesl/sitorenam). There are in other words difficulties in the identification and study of extrapleural mesotheliomas in various Regions, especially Liguria, the area which has the highest number of mesothelioma cases determined by asbestos exposure in shipbuilding.
In accordance with the National Mesothelioma Register (ReNaM) classifications, the majority of subjects affected by mesothelioma who worked in shipbuilding had a diagnosis of certain MM (77.4%).

A diagnosis of probable mesothelioma was found in 15.2% of cases, whilst a possible mesothelioma diagnosis (based on clinical or radiological data or else on the death certificate) was only found in 28 cases (7.4%). Mesothelioma cases in shipbuilding workers were reported by the Regional Operative Centres (COR) of Piedmont (7 cases), Veneto (36 cases), Friuli Venezia Giulia (34 cases), Liguria (216 cases), Emilia-Romagna (6 cases), Tuscany (38 cases), The Marches (4 cases), Apulia (22 cases), and Sicily (13 cases).
This distribution mirrors, for each single Region, the exposure occurrences in the sector as well as the significance and features of shipbuilding. It emerges that Regions of Northern Italy (Veneto, Friuli-Venezia Giulia, Liguria) are strongly affected, while Regions of Central and Southern Italy also record a certain number of cases. Since we do not know the number of subjects who worked in this sector and were exposed to asbestos, we cannot assess the seriousness of the risk for each single Region.
As regards Piedmont, mesothelioma cases do not correspond to shipbuilding companies established in the regional territory: the cases of mesothelioma affecting the subjects living in this Region are the consequences of working activities carried out in Liguria.
An interregional migration due to work reasons and mainly concerning the shipbuilding sector also involved the region of Tuscany [1], since it was found that the mesothelioma cases affecting the resident subjects were caused by asbestos exposure resulting from working activities performed in La Spezia shipyards where Navy ships were being repaired.
The year of diagnosis referring to the notified cases is shown in Table 1. The high number of notifications recorded since 1998 may be explained by the increased number of Regional Operative Centres (COR) which began their activity since that date. The assessment of the probability of occupational asbestos exposure expressed for each single case of mesothelioma varies between the different Regional Operative Centres (COR): an occupational exposure that is certain may be attributed to 100% of cases analysed in Piedmont, approximately 90% of mesothelioma cases found in Veneto region, 84.2% of cases concerning the region of Tuscany and 69.4% of cases observed in Liguria. In the other Regions, a certain occupational exposure is found in lower percentages ranging from 25% in The Marches and 68.2% in Apulia (Table 2).
The average duration of the working activity performed in the sector (excluding working activities that involved exposure to asbestos and were carried out by the subjects before or after the activities performed in shipbuilding) is 22.01 years (± 14.39) with a range going from less than one year to 49 years.
The average latency (the interval between the start of the working activity at risk and the onset of the disease) is 47.1 years (± 12.0) with a range going from 5 to 77 years.
Out of the total number of cases, 60% of cases refer to subjects who started their working activity prior to 1954, while in 9.6% of cases subjects entered work in the decade between 1965 and 1974 and for 3.5% the entry into work falls after 1975 (Table 3). There is a subgroup made up of 64 subjects who have carried out working activities only in the shipbuilding sector: in this case, 11% of subjects started working in shipbuilding after 1970.

The epidemiological studies

The epidemiological literature on damage from asbestos in shipbuilding workers is too large to be summarised here. Since the 1940s, several studies have been published in various countries on the neoplastic risks in shipbuilding industry. The wealth of data testify the high levels of asbestos consumption which involved shipbuilding industry since the beginning of the 1900s, firstly because of the motive power conversion, from wind power to steam power, and then because of the increasing use of steel hulls. Until the 1970s there has been a growing demand for new ships as well as a continuous development of shipping companies. The Second World War gave a significant boost to this sector:

there was a forced development of military fleets involving Germany, Japan, Great Britain, and Italy and an even more remarkable development concerning the USA because of their involvement in the conflict and their decision to arm a fleet in a great hurry in order to simultaneously participate in both, the European and the Asian conflicts. The literature on the neoplastic risks provides, amongst other things, elements that indicate a chronology of decisions regarding workers' protection, including legislative decisions.

Only in the last decades has shipbuilding undergone a decline: in the EU-15 countries the number of workers employed was approximately 350,000 in 1975, but it then became 85,000 in 2002, and the disappearance of almost two thirds of the shipyards followed. As regards Italy, there were 36,260 workers employed in 1975, but only 13,438 in 2002.

In Italy shipbuilding is a historically important activity and a central one in the process of growth of a country traditionally associated with the sea. At the end of the 1800s it was concentrated in the cities of Genoa, Naples and Palermo, with Genoa being the hub of the most important industrial triangle, and it was mainly focused on military and merchant ship building. New shipyards were subsequently developed in different areas, thus creating production areas specialised in specific activities (for instance, military shipbuilding rather than civil one), by type of activity (construction rather than repair), depending on the size of the docks and the operating procedures of the shipyards (and therefore the length of the hulls), etc.. The literature on the neoplastic risks in the naval engineering sector also provides elements that show a chronology of the decisions regarding workers' protection, including legislative decisions.

The epidemiological studies carried out in Italy

As regards the assessment of asbestosis risk, the Italian medical literature matches that of other countries: since 1940s in-depth studies have been published on the working conditions and asbestos based materials used in shipbuilding, the results of environmental measurements and the presence of pneumoconiotic lesions in the subjects exposed. The in-depth studies initially concerned shipbuilding industry in the city of Genoa. No studies on the neoplastic risks had been published until the early 1970s, therefore later than other countries' publications.

In 1948 Canepa reported the presence and also showed a high frequency (9%, with reference to 52 subjects) of parenchymal asbestosis in insulation workers of the Port of Genoa [2]. In 1949 Castellino stated that "*all the categories are subject to the same aggressive and pathogenic influences to which the most exposed category is subjected*" (the insulation workers) [3]. In 1956 Molfino and Zannini released a volume published by the INAIL (Italian National Institute for Insurance against Occupational Accidents) on harbour work showing how noticeable this activity was in Genoa, where there was a significant good handling practice as well as an "industrial branch" constituted by ship construction, equipping, repair, ordinary and extraordinary maintenance activities [4].

The volume provides the following data on the conditions of exposure: "*of considerable importance is the work of those subjects assigned to the application of "insulating materials", mainly represented by asbestos and glass wool. Due to the environmental conditions already described, the work postures, the not infrequently high ambient temperature as well as the changes induced by these conditions on pulmonary ventilation, it can be stated that these workers are particularly exposed to the onset of pneumoconiotic effects. Asbestos, due to its insulating properties, is widely used as a coating for pipes in power installations, machine under decks, boilers, bulkheads, main overheated steam pipes, ducts for fresh air taken from the outside and artificially refrigerated air, flues, valves, ceilings, etc. For this reason, workers use various products: 100% asbestos plates, cords, cloth, mattresses and asbestos fibre, asbestos magnesium, amosite, etc. This material is applied by means of special manual skills and methods, in relation to the equipment to be coated (combined with lime, held together with asbestos* *cloth, sewn in situ, etc.). During the application large amounts of dust are emitted and since the working operations generally take place in confined environments under the aforesaid conditions, considerable amounts of dust may easily be inhaled. For some time now, a system is used in order to apply asbestos fibres suspended in a proper solution, by using a spray gun, onto walls and panels, for heat absorbing and noise insulation purposes; this system was widely adopted in the equipping of the "Normandie" (DESOILLE and DHERS). Indeed, our conimetric research often shows high values, between 280 and 3000 particles per cc, slightly lower results than those obtained by FLEISCHER and coll. under similar conditions*".

In the following years, other Authors of the University of Genoa's Occupational Medicine Institute would observe the increase in the frequency of subjects affected by asbestosis in the same working group formed by those insulation workers: the frequency of subjects affected by asbestosis rose to 50% [4-6] and reached almost 100% with 16 deaths due to asbestosis [7], whilst the presence of asbestosis cases (no longer only the potential risk) amongst shipyard workers in Genoa would be documented in carpenters, blacksmiths, scalers.

Zanardi and coll. [8] reported for the first time the presence of pleural mesotheliomas among shipbuilding workers: they referred to 8 pulmonary tumours and 1 case of mesothelioma observed in Liguria "*in the last four years of activity of the University of Genoa' s Occupational Medicine Institute and the Occupational Medicine Division of S. Martino hospital*" arising in 318 subjects affected by asbestosis "*observed in our wards during the same period of four years*". The mesothelioma case arose in a 54-year-old subject who worked as a "*shipyard insulation worker for about 15 years*". The Authors confirmed the association between occupational exposure to asbestos and respiratory tumours and they also emphasized two aspects in their own comments.

It was first highlighted that it "*is unfortunately predictable that over the next few years many of our subjects affected by asbestosis will develop pulmonary and pleural tumours*". Then the Authors underlined the concern over the high respiratory tumour rates found in men in the region of Liguria "*Liguria remains first*" in terms of regional incidence, if compared with all Italian regions and they asked themselves:

"*could asbestos be responsible for this high incidence?.. Elements of occupational nature do exist that enable researchers to deem such theory as quite probable: in fact Trieste, Genoa and La Spezia are actually the capitals of the shipbuilding industry and are also the very same towns which, over the last decade, recorded the highest increase in asbestosis morbidity amongst their inhabitants, a phenomenon which can be explained by the fact that insulation industry, and more specifically shipbuilding industry, involve by now the highest risk of asbestosis in the world*".

In 1972 Zannini stated that by examining "*several thousands of workers coming from all the shipyards in Liguria*" he found "*approximately 700 pleuropulmonary cases of asbestosis, some of which were associated to pulmonary and pleural neoplasias and more specifically, 6 cases of pulmonary neoplasia and 3 cases of pleural mesothelioma; it is important to specify that 5 of these neoplasias were found in insulation workers while 4 were found in workers who were in charge of other job duties [9] (report previously submitted at the XXXIV National Occupational Medicine Congress, October 1971-XXXIV Congresso Nazionale di Medicina delLavoro, ottobre 1971).*

The Authors indeed, in the printed volume declared:

"*the 684 cases reported by us resulted from an arbitrary, although targeted, selection carried out by patronage institutions and the insurance institution*".

As regards asbestosis "*most of our cases refer to subjects who were not insulation workers*" (e.g. 118 cases found in constructional platers, 65 in welders, 29 in boilermakers). The Authors stated they had observed

"*an increased incidence of pleuropulmonary neoplasias (in ship repair workers of the Port of Genoa) compared to other harbour workers and the population of the same town*".

In the same years, the first scientific contributions concerning the cases of mesothelioma found amongst shipbuilding workers in Friuli Venezia Giulia and relating to the shipyards in Trieste and Monfalcone were published [10-12].

The case histories thus described initially showed 20 cases of pleural mesothelioma (18 in men) diagnosed between November 1967 and November 1971 at the Institute of Pathological Anatomy and Histology of the University of Trieste, 12 of which occurring in male subjects employed in the shipyards [11], [13]. The Authors declared:

"*Shipyards are a well known source of exposure to asbestos, not only for those subjects handling the mineral such as insulation workers, but several categories of workers operating alongside the insulators on the ship under construction, often in restricted environments and with poor ventilation are also exposed*".

In order to understand the extent of the mesothelioma epidemic which subsequently developed amongst shipyard workers in Trieste and Monfalcone one must consider that in the most recent article the number of mesothelioma cases rose from 20 to 557, which were observed this time, by starting from the same date, 1968, to 2000 and that the vast majority of these mesothelioma cases experienced an occupational exposure in shipbuilding [13].

In 1976 a case-control study was published which analysed the job occupation involved in 60 cases of mesothelioma, identified through the autopsy registers of the Pathological Anatomy Departments and Institutes of the City of Genoa between 1960 and 1973, using as a control group a sample of subjects, doubled in number, who were deceased for different reasons and resulted from the same registers. The occupational history was gathered through the relatives' accounts and considered to be appropriate for 41 cases out of 60 and for 82 controls out of 120. Statistically speaking, harbour work was carried out more frequently in the subjects affected by mesothelioma (X^2: 31.3; $p<0.001$) [14].

The volume contains the following description of the shipbuilding industry in Genoa:

"*Due to its insulating properties, asbestos is used in large quantities and a variety of forms including cords, sacks, panels and even dust, which are mixed, during use, with cement and water. Even though the type of asbestos mostly used is chrysotile, crocidolite or blue asbestos is also widely used and is generally considered to be the most harmful. Protective equipment is practiclly lacking: the materials are moistened while masks are only occasionally used. Asbestos is directly handled and processed in the work place or on the main deck of the ship, in the presence of, and often in close contact with, other workers who carry out different job duties, for which the use of masks is not prescribed. All working residues are usually heaped up on the docks where they may remain exposed to the weather for entire days before being loaded onto barges for dumping at sea. One can easily imagine that in such a situation all staff working on the ship, or immediately close to it, are exposed to asbestos fibre inhalation*".

The same working group subsequently published some cohort studies on the mortality of workers in Genoa shipyards.

The first study concerned 2,348 subjects at work or retired from work in December 1959 for whom the corresponding life status was sought in 1970. The comparison was made with the mortality rate of Genoa population and with that of the male staff of the San Martino hospital in Genoa. Among the 659 deceased subjects there were 6 deaths due to asbestosis and one due to silicosis. There emerged an excess of respiratory diseases, all types of tumours, tumours of the trachea, bronchi and lungs (61 observed against 37 expected), the latter being a statistically significant excess ($p<0.001$). The Authors declared "*we may blame asbestos of being responsible for the excess of pulmonary tumours and respiratory diseases, bearing in mind the considerable spread of asbestos in the port*" [15]. In the study published in 1979, the mortality rate of 2,190 shipyard workers was analysed. The comparison was made with the mortality rates of Genoa population. There were statistically significant excesses in mortality due to all causes (1,070 deaths were observed), all the tumours, the lung tumours (123 observed, 55 expected). There were analyses made for lung tumour mortality in 20 different working groups or working activities [16].

These two studies did not show the number of deaths due to primary pleural tumour, and neither did these deaths undergo specific analyses.
Merlo [17] conducted a mortality study on 3,890 male subjects who, between 1960 and 1988, were working in the shipbuilding sector (construction and repair) of Genoa, the life status of whom was reconstructed for the year 1990, once again drawing the comparison with the mortality of Genoa population. 1,833 deaths were identified. An increased general mortality was found (SMR 108.8) and also a mortality due to tumour (SMR 122.6). There was an excess of mortality due to tumours in all the various sites of the respiratory system: SMR of 148.2, 442, 138.6 for lung tumours, primary pleural tumours, and tumours of the larynx.
The same study was updated and submitted as an article carrying out the analysis on 3,984 male workers, identified through the staff files of the "Independent Consortium of the Port of Genoa" Department, which allowed the identification of the subjects employed between 1960 and 1981 [18]. The follow-up period was up to 1996. The mortality of the subjects under study - indeed 2,376 deaths were identified - was compared with that of the Province of Genoa.
Over-mortality was found due to all causes, all the tumours, tumours of the liver, the larynx, the lung, and the bladder, due to respiratory diseases and cirrhosis of the liver.
60 deaths due to primary pleural tumour were identified, a mortality rate which appeared to be in excess (SMR 524; CI 95% 400-674) despite the fact that the reference rates being used are those of the Province which has the highest frequency of primary pleural tumours in Italy.
The Authors showed that mortality for pleural tumour increased as latency (time elapsed since the start of work) and work duration (indirect index of exposure intensity) increased, but it was higher among subjects employed when aged between 30 and 34 years than in those employed at younger ages (25-34 years). Entry into work in more recent years (1940-1960) determined an excess of mortality for pleural tumours, although of a lower degree: SMR of 729, 438, 309 in case of entry into of work occurring before 1940, between 1941 and 1960 and after 1960, respectively.
The results of the analyses enabled the authors to believe that the intensity of exposure to asbestos increased over time, within the time period considered by the mortality study. There was a decrease in the risk of pleural tumours depending on the hiring period, but the differences seemed to be moderate and there was also an excess of mortality for subjects entering into work after 1961.
Mortality due to primary pleural tumour appeared to be in excess amongst workers dealing with several activities, while a maximum mortality was found in insulation workers.
Finally it has to be mentioned a study of mortality conducted on the workers of the Davidson company based in Genoa which used to carry out insulation activities also by using asbestos materials and which even performed, amongst other things, spray-applied insulation in shipyards, including those of Genoa, in railway carriage construction companies and in the construction sector [18].
The study was relating to 893 subjects who were working for the company in the period 1960-1996, identified through imperfect and incomplete company records (so that it was not possible to proceed with the follow-up for 10% of those identified and for 12% of the deceased subjects the cause was not identified). 28.3% of the subjects identified was reported to be living in Liguria.
The assessment of mortality, compared with that of the Italian population, is based on 97 deaths which are in excess by 41% as regards total mortality, 65% for the tumours, 102% for the respiratory tumours. There was found a marked excess in mortality due to primary pleural tumours (based on 4 deaths) and primary peritoneal tumours (based on 2 cases) with SMR respectively equal to 2,667 (CI 90% 911-6,103) and to 1,853 (CI 90% 329-5,832).

To conclude, before that the information provided by the National Mesothelioma Register (ReNaM) was actually available, the Italian epidemiological literature only concerned two centres of Italian shipbuilding industry, Genoa and Trieste, for which high absolute numbers had been found along with increases in mortality due to mesotheliomas.

The cohort studies conducted on shipbuilding industry in Genoa also emphasized that, as far as tumours are concerned, there was also a marked excess of lung tumours besides that of mesotheliomas.
More recently, occupational exposure to asbestos was considered to be causally associated with an excess of pulmonary tumours in two case-control population-based studies carried out among the subjects living in Trieste as well as the subjects living in a few Italian areas which also included the subjects living in Venice. The first study concerned 756 cases of pulmonary tumour (and the same number of population controls) arisen among subjects living in Trieste at the end of the 1980s and it showed a high risk due to occupational exposure to asbestos and to having worked in shipbuilding [19].
A statistically significant increase in the risk is found among cases of lung tumour arising between 1990 and 1992 (1,171 subjects living in various Italian areas, including also Venice population, the only area under study characterized by the presence of shipbuilding) and 1,553 population controls [21]. As regards the working activity, there is an increase in the risk of tumours due to having experienced an occupational exposure to work-related carcinogens in shipbuilding and in railway vehicle construction or repair.
These data show that in Italy working in the shipbuilding sector leads, even in recent years, to an increase in the risk of lung tumours. Unfortunately these are only limited data since nowadays there is still a lack of data on the extent of the neoplastic risks determined by shipbuilding in various Italian areas where important shipyards are located, and there are no data on the extent of the risk in military shipbuilding and repair industry.
It has been noted that in recent years ships insulated with asbestos have been sent to the “Southern World”, to India or Turkey for demolition. This is a serious public health issue and if this were also true for ships flying the Italian flag, the export of such risks and the application of double “standards” would thus be facilitated. This way in fact, one avoids having to apply protection measures in force in this country by decentralising them to places where they are carried out without any controls.

Epidemiological studies on mesotheliomas in a few European countries and prevention measures introduced

We will only refer to studies which, in Europe, anticipated the 1970s data distributed in Italy on the presence of mesotheliomas in shipbuilding workers.
Therefore, we will not focus on the data which, since the 1940s, have highlighted the presence of pulmonary damage in subjects exposed to asbestos in shipbuilding, and we will not refer to the experiences of environmental measurements that represent significant experiences as they form the basis of any prevention measures adopted.
In addition, the results of the various recent cohort studies will not be likewise described.
In Germany Weiss [22] added 31 autopsies to the cases of mesothelioma already published in 1947, thus showing 2 cases of pleural tumour [41] - a new case arisen in a subject which had worked between 1920 and 1935 as an insulation worker in a Navy shipyard, also noticing the presence of asbestos in the lungs. In this country the in-depth studies continued in subsequent years in the area of Hamburg, where asbestos textile industries as well as civil and military shipyards were located, thus showing an increasingly wide range of mesothelioma case histories - 119 cases in 1966 [23], 251 cases between 1958 and 1968 [24] - of which dozens were shipbuilding related. Reference is made to the presence of mesothelioma cases found in subjects not directly exposed and in the asbestos insulation workers' relatives.
In 1958 in The Netherlands Van der Schoot reported three cases of malignant mesothelioma found in shipyard insulation workers [26].
Stumphius was an occupational physician in a shipyard situated on Walcheren Island. First in his thesis and then in the scientific literature, [27] he described the identification of asbestos corpuscles in about 60% of workers who had been subject to a health control. He presented case histories referring to 25 cases of mesothelioma identified in the period 1962-1968, for which he reconstructed the work place and the presence of exposure to asbestos: these were again subjects living in the area adjacent to shipyards and 22 subjects had a working relationship with the shipyard of Royal Schelde [28].
It turned out that these data attracted a great deal of media attention in that country and gave rise to various initiatives, for instance the 1971 publication by the Dutch Labour Inspectorate which suggested to proceed with the replacement of asbestos and, whenever used, it urged the need to apply technical prevention measures (*Publicatieblad P 116, 1971*).
As regards England the 1958 article by McCaughey has to be taken into consideration [29].
This dealt with preliminary case histories referring to 13 mesothelioma cases, all carrying a post-mortem confirmation, which were observed in Belfast, home to large shipyards. Out of these, 3 subjects had deceased before 1950, thus showing that in several areas the observation of mesotheliomas had been long-standing. The same author reported an increase in the problem, so that in a subsequent publication 45 mesothelioma cases were identified [30]. The deceased subjects were showing signs of the presence of asbestos corpuscles in the lung, whilst the presence of pulmonary asbestosis was infrequently observed. As described by the 1965 article published by Elmes [31], in Belfast shipbuilding and the consequent use of asbestos had been remarkably developing since the 1930s.
Therefore the Authors were suggesting that:
"*this* (the rapid increase in asbestos consumption in Belfast associated with shipyards, editor's note) *is too recent to show up through an increase in neoplasias"... "the precautions introduced for the protection of workers* (in 1931, editor's note) *in the asbestos manufacturing industries may have reduced the incidence of pulmonary fibroses and cardiac insufficiency but the problem of neoplastic diseases remains. The study described by us was carried out in an area where pulmonary fibrosis and cor pulmonale resulting from asbestosis are not common; nevertheless, there is a high incidence of*

mesotheliomas. This tumour is invariably fatal and causes prolonged disease usually associated with a great pain that cannot be controlled by palliative treatments. It usually strikes workers before they reach pensionable age. The association between this tumour and exposure to asbestos is clearly shown by our data which correlate mesotheliomas both, to a history of asbestos exposure and to the presence of asbestos corpuscles in the lungs. Three quarters of patients with mesothelioma had a history of asbestos exposure some time in their life and three quarters of the subjects examined had asbestos corpuscles in their lungs... The majority of patients with mesothelioma were not directly employed as insulation workers. A history of intermittent or random exposure was found in most cases and this sometimes took place many years earlier. (these facts) show that the exposure to asbestos needed for inducing a mesothelioma is much smaller than that accumulated by an insulation worker and that the population at risk is much larger than previously suspected".

Glyn Owen described 13 cases of mesothelioma identified between 1955 and 1963 in the Liverpool area. For all subjects an exposure to asbestos was found, and for 5 of these it took place in ship repair industry. Two subjects died at the age of 46 and 50 and more specifically, the first one had carried out deliveries of materials (including deliveries of asbestos sacks) in a shipyard, while the second one had worked in ship repair on the plumbing systems, using "magnesia", i.e. mixing cement and asbestos dust [32].

In a subsequent article, the cases of mesothelioma became 17 out of 30 which were identified and considered to be probable mesotheliomas. Amongst the shipbuilding workers, two subjects had worked as carpenters, but their work involved the handling of asbestos sheets while working "*in confined spaces and in close contact with other workers who were using asbestos*" [33].

21 cases of mesothelioma were identified in Glasgow in the two years preceding the publication, most of which were associated with shipbuilding. The author concluded his work with the following appeal: *"in view of the serious effect on health which even short periods of exposure to asbestos may induce in the end, the increase in the use of asbestos must be viewed with great concern. We believe that the time has come to seriously consider the possible use of alternative materials to asbestos, before a serious and irreparable epidemic of respiratory diseases breaks out" [33].*

Examples of other mesothelioma case histories were those provided by McEwen who referred to 83 mesothelioma cases observed in Scotland in the period 1950-1967 [35] as well as Wagner's broad study relating to 622 cases of mesothelioma, with an exposure to asbestos mainly associated with shipbuilding [36].

In order to provide a few dates concerning the introduction of prevention measures intended not so much for workers' personal protection as for the replacement of asbestos, the abandonment of working procedures and techniques considered to be dangerous, or the limitation to only certain uses, we can thus mention the following examples.

The relationship between the Navy and the Health and Safety Executive in England went through a difficult phase at first, as a consequence of the Second World War. On the basis of a survey concerning those shipyards in which the technique of spraying asbestos was used along with environmental measurements, in 1952 an Order defining use clauses was issued [37], [38], [39] and in 1963 the asbestos insulation processes were "completely abandoned" while "shipyards replaced asbestos with other materials" so that in a 1970's publication aimed at the workers in shipyards and referring to the precautions described in an Act dated 1969, the Ministry of Defence stated "*since 1966 the Navy has drastically reduced the amount of asbestos required for ships and machinery: The quantity now included is ten times lower than that used in 1966" (Defence Council Instruction (RN) 510/69; British Ministry of Defence. (Working with asbestos, 1970).*

In 1971, in Helsinki, Finland, a convention took place involving the International Labour Organisation (ILO), the proceedings of which were published by this international body (*ILO, 1972*): a convention promoted in order to prepare the issuing of ILO guidelines and recommendations on working

conditions in shipbuilding and that, according to ILO working procedures, involved both employers' organisations and trade unions, as well as experts in the sector [40].
In O. Hagdlind's report on the Gotaverken shipyard, Gothenburg, Sweden (the opening report at the convention) and in the one compiled by N. Sunstedt regarding the same shipyard it was stated that: "*Today asbestos is completely forbidden in any new ship produced in the shipyards of the Gotaverken group. We have found equivalent materials for the insulation, which we consider safe*". In that shipyard the search for substitute materials has proceeded "*since 1958*" [41], [42].

The use of asbestos in Italian shipyards

In the past large-scale use was made of asbestos and materials which contained it for seacrafts. The main purposes were: the insulation of naval structures and fluid ducts, protection against fire, sound-deadening and noise absorption insulation as well as use in personal protection equipment.
In Italian shipyards asbestos was used aboard ships under construction both as a material to be installed (thermal insulator of walls, ceilings, pipes, bundles of cables, etc.) and as an aid in the construction process. An example is asbestos cloth used for the protection of workers and equipment against "flame sprays" and from sparks during electrical welding and when cutting with oxyhydrogen flame. There is a further example, the use of insulating cushions when preheating metal parts for welding. Cushions and mattresses were manufactured from asbestos on site around pipes and ducts subject to high temperatures. For covering the walls and ceilings of lodgings panels were used made of asbestos (marinite), coated with plastic laminate or formica type materials. Bulkheads or the ceilings of rooms which could be subject to fire risks (such as the machine room, partitions between garages and lodgings etc). were covered with a layer of asbestos sprayed with variable thickness according to the degree of protection required. The sprayed layer was contained in a chain link fabric which served as a skeleton for the cement and asbestos plastering manufactured on site, shortly before being applied.
Spraying was used in new constructions and especially on board, but it could be also used in the processing of pre-fitted blocks which was instead carried out on the ground.
In a few shipyards, in order to improve the sound absorbent characteristics of the covering, the surface of the entire plaster, once it had solidified, was perforated with holes in a chequerboard fashion with portable electrical drills. The holes were usually 8 mm in diameter and were made 5 cm apart, so that there were about 400 for every square metre of surface area.
The occupational exposure to asbestos by shipyard staff coincides with the beginning of industrial asbestos use, which can be dated back to end of the 1800s. The first applications were for steam engine insulation, and this was then extended to the insulation of turbines, extended applications on pipes, spray applications on bulkheads and ceilings (begun after 1930 and continued right up to the mid 1970s) and to the use of marinite for the construction of cabins and lodgings.
Ships equipped with steam turbines used quantities of asbestos many times greater than those used on motorships. Passenger ships contained large quantities of insulation applied on bulkheads and ceilings distributed practically throughout the whole ship.
Only in 1977 in Genoa was an agreement reached on the "use of asbestos in shipbuilding by the Independent Port Consortium" which prescribed a ban on the use of crocidolite, a ban on the application of spray asbestos, and the replacement, as far as possible, of asbestos. Nevertheless it is documented that spray insulation was still carried out in 1979 in Genoese shipyards for the garage of a ferryboat under construction. In Italy the use of asbestos on military ships was continued up to the mid 1980s.

Conditions of exposure: on board ships

During the construction of hulls personal protection equipment made out of asbestos was used in the form of fabrics usually in chrysotile (gloves, aprons, covers) used to protect against burns caused by the welding operations. Constructional platers and welders were using asbestos covers to cover scaffold planks so that welding splashes did not fall on workers working below. Covers and cushions were also used to keep metal parts preheated for welding at the right temperature to avoiding rapid cooling. These asbestos fabrics were cut to measure, moved and used until they were completely worn out.

However the most significant exposure to asbestos took place during the fitting out of the ship.

Spraying with asbestos was often carried out by contractor companies which, if the parts to be insulated were large, usually worked at times that did not coincide with those of the yard workers; yard workers did not always go back to environments which had been sprayed, after the residues had been cleaned, and which were always very plentiful on the floors. If the spray insulation was made in individual sections of the ship under construction, in neighbouring areas the activity of the shipyard workers often continued.

Riggers, electricians, joiners, pipe-makers, varnishers and persons carrying out other duties when fitting out had several opportunities of exposure to asbestos, determined by the simultaneous presence (disturbance??) of the insulations and by their own use of materials containing asbestos. Among these, above all was marinite, a mixture of gypsum and amphibolic asbestos (usually amosite), externally covered with laminate used for interior insulation panels.

Exposure to asbestos involved the naval engineers who were assembling the large diesel engines: parts of these engines were already pre-insulated, but the engineers completed the insulation on site.

The transformation of the construction system from shipbuilding on stocks to that in docks, happened at the start of the 1970s in a few shipyards, which reduced construction times speeding up the rhythm and allowing the building of larger watercraft, but worsened the so-called "natural" air replacement. In fact, the air inside a ship under construction is only exchanged with artificial systems since it is practically without "windows" and the position of the hull in a semi-confined environment made things worse. One can well understand how exposure to several pollutants, not excepting asbestos, may have affected anyone working aboard irrespective of the duty carried out. In the 1970s there were no clear demarcations between jobs and between duties and it was usual for workers to change place continuously moving between the land and work stations on board.

Conditions of exposure: on the ground

The departments or workers in various jobs on the ground could be involved in significant exposure to asbestos.

Pipe-makers could be required to carry out insulation on the ground, before assembly on board. There was exposure when they were required to "replicate" pipe sections for their replacement, as happened in the conversion and repair yards: the pipe-makers de-insulated the sections to be replaced on site in order to note measurements and shapes and to build new ones.

Workers in the mechanical workshops on the ground were asked to carry out operations on the ships' engines and other mechanical parts of ships brought to the workshop, and maintenance on the braking devices. In this case again the situation was worse in the repair yards.

Joinery workers were asked to prepare marinite panels for fitting on new ships and to change or rearrange fittings in the case of ship conversion and repair.

Operations such as the insulation of insulating cushions were also carried out by teams on the ground.

These operations, often carried out without any separation from other activities, were required of insulation workers, but also of other workers.

Ship repairs, conversions and demolitions

These are activities which can involve worse exposure to asbestos than in shipbuilding. This derives from activity carried out on materials already worn out, from the uncontrolled removal of insulation, in restricted environments and with poor air replacement and in any case without the availability of protection equipment.
It is important to consider that significant exposure to asbestos continued for longer, than in construction yards: one can say that prevention measures were only actually introduced in ship repair activities after the entry into force in Italy of Legislative Decree 277 in 1991.

References

1. Gorini G, Merler E, Silvestri S, Cacciarini V, Seniori Costantini A. Archivio regionale toscano dei mesoteliomi maligni. Rapporto sulla casistica 1988-2000. TiConErre Editore, Firenze 2002
2. Canepa G. Lavoro e Medicina 1948,3: 18
3. Castellino N. In: Proceedings of the XV Congresso Nazionale Medicina del Lavoro, Genoa 22-25 September 1949, Fratelli Pagano, Genova, 1950 p. 434
4. Molfino F, Zannini D. II lavoro portuale. Fisiopatologia, clinica, prevenzione. Edizioni INAIL, Milano 1956
5. Zannini D, Odaglia G. Lavoro Umano 1956,8: 529
6. Bogetti B. Le pneumoconiosi nei lavoratori portuali. Edizioni Istituto Italiano di Medicina Sociale, Roma, 1964
7. Zanardi S, Fontana L. Osservazioni su possibili rapporti tra amianto e tumori pleuropolmonari in Liguria. La Medicina del Lavoro 1971, 62: 336-343
8. Ottenga F, Zannini D, Bogetti B, Robotti M, Spigno F, Monsignore AD. L'asbestosi nella cantieristica navale in Liguria. Proceedings of the XLII Congresso Nazionale Società Italiana di Medicina del Lavoro e Igiene Industriale, Trieste, 1979 pp 435-492
9. Zannini D, Bogetti B, Ottenga F. II rischio e la prevenzione dell'asbestosi nelle lavorazioni navali. La Medicina del Lavoro 1972, 63: 221-244
10. Gobbato F, Ferri R. Ricerca epidemiologica sull'incidenza del mesotelioma della pleura nella Provincia di Trieste. Lavoro Umano 1973, 25: 161-171
11. Bianchi C. Esposizione lavorativa all'amianto in 20 casi di mesotelioma diffuso della pleura. Minerva Medica 1973, 64,1724-1727
12. Biava PM et al. Cancro da lavoro a Trieste: il mesotelioma della pleura. Sapere 1976; 8, 41-45
13. Bianchi C, Brollo A, Ramani L, Bianchi T, Girelli L. Asbestos exposure in malignant mesothelioma of the pleura: a survey of 557 cases. Industrial Health 2001; 39, 161-167
14. Puntoni R., Valerio F, Santi L. II mesotelioma pleurico fra i lavoratori di Genova. Tumori 1976, 62 205-210,
15. Puntoni R, Russo L, Zannini D, Vercelli M, Gambero RP, Valerio F, Santi L. Mortality among dock-yard workers in Genoa, Italy. Tumori 1977, 63: 91-96
16. Puntoni R, Vercelli M, Merlo F, Valerio F, Santi L. Mortality among shipyard workers in Genoa, Italy. Annals of New York Academy of Science 1979, 330: 353-377
17. Merlo F et al. Cancer risk among 3890 workers employed at the industrial branch of the shipyard of Genoa, Italy: a retrospective cohort. Proceedings of the 9th International Symposium in Epidemiology and Occupational Health, Cincinnati, USA 23-25 September 1992: 229-232.
18. Puntoni R, Merlo F, Borsa L, Reggiardo G, Garrone E, Ceppi M. A historical cohort mortality study among shipyard workers in Genoa, Italy. American Journal of Industrial Medicine 2001, 40: 363-370
19. Bovenzi M, Stanta G, Antiga G, Peruzzo P, Cavalieri F. Occupational exposure and lung cancer risk in a coastal area of northeastern Italy. International Archives of Occupational Environmental Health 1993, 65: 35-41,
20. Menegozzo M, Belli S, Borriero S, Bruno C, Carboni M, Grignoli M, Menegozzo S, Olivieri N, Comba P. Studio di mortalità di una coorte di coibentatori. Epidemiologia e Prevenzione 2002, 26:71-75
21. Richiardi L, Boffetta P, Simonato L, Forastiere F, Zambon P, Fortes C, Gaborieau V, Merletti F. Occupational risk factors for lung cancer in men and women: a population based case-control study in Italy. Cancer Causes and Control 2004, 15: 285-294

22. Weiss A. Pleurakrebs bei Lungenasbestose, in vivo morphologish gesichert. Medizinische 1953, 3: 43-48
23. Wedler HW. Über den Lungenkrebs bei Asbestose. Dtsch Arch Klein Med 1943, 191: 189-209
24. Dalquen P, Dabbert AF, Hinz I. Zur Aetiologie der Pleuramesotheliome. Prax Pneumol 1969, 23: 547-558
25. Knappman J. Beobachtungen an 251 obduzierten Mesotheliom-Fallen in Hamburg (1958-1968). Pneumologie 1972, 148: 60-65
26. Van der Schoot HCM. Asbestosis en pleuragezwellen. Nedijdschr Geneeskd 1958,102: 1125-1126
27. Stumphius J, Meyer P. 'Asbestos bodies' in shipyard workers. Annals of Occupational Hygiene 1968, 11: 283-293
28. Stumphius J. Epidemiology of mesothelioma on Walcheren Island. British Journal of Industrial Medicine 1971, 28: 59-66
29. McCaughey WTE. Primary tumours of the pleura. Journal Path Bact 76: 517-529, 1958
30. McCaughey WTE et al. Exposure to asbestos dust and diffuse pleural mesothelioma. British Medical Journal 1962, 2: 1397
31. Elmes PC, Wade OL. Relationship between exposure to asbestos and pleural malignancy in Belfast. Annals of the New York Academy of Science 1965, 132: 549-557
32. Glyn Owen W. Diffuse mesothelioma and exposure to asbestos dust in the Meseyside area. British Medical Journal 1964,2: 214-218
33. Glyn Owen W. Mesothelial tumours and exposure to asbestos dust. Annals of the New York Academy of Science 1965,132: 674-684
34. Gold C, Cuthber J. Asbestos. A hazard to the community. Public Health 1966, 80, 6-13
35. McEwen J, Finlayson A, Mauir A, Gibson AA. Mesothelioma in Scotland. British Medical Journal 1970, 4: 575-578
36. Wagner JC, Gilson JC, Berry G, Timbrell V. Epidemiology of asbestos cancers. Br Med Bull 1971, 27: 71-76
37. Tweendale GF. Sprayed "Limpet" asbestos: technical, commercial and regulatory aspects. In: GS Petres & BJ Peters, eds. Sourcebook on asbestos diseases vol 19, Charlottesville VA, Lexis Law Publishing, 1999
38. Tweendale GF. Magic mineral to killer dust. Turner and Newall and the asbestos hazard. Oxford University Press, London, 2000
39. Bartip PWJ. The way from dusty death. Turner and Newall and the regulation of occupational health in the British asbestos industry, 1890s-1970. The Athlone Press, London, 2001
40. ILO, Occupational Safety and Health Series n. 27. Safety and health in shipbuilding and ship repairing, Geneva, 1972
41. Haglind O. Occupational health in the shipbuilding industry. In: ILO, Occupational Safety and Health Series n. 27. Safety and health in shipbuilding and ship repairing, Geneva, 1972, pp 5-12
42. Sustedt N. Introduction of asbestos substitutes in a Swedish shipyard. In: ILO, Occupational Safety and Health Series n. 27. Safety and health in shipbuilding and ship repairing, Geneva, 1972, pp 27-30

Tabella 1. Distribuzione dei casi di mesotelioma segnalati per COR e anno di diagnosi

Anno Diagnosi	Piemonte	Veneto	Friuli VG	Liguria	Emilia R	Toscana	Marche	Puglia	Sicilia	Totale
1993	0	3	0	0	0	2	0	4	0	9
1994	0	2	0	11	0	5	0	1	0	19
1995	0	6	4	19	0	5	0	3	0	37
1996	0	2	10	25	0	2	0	6	0	45
1997	2	2	5	21	1	5	2	2	0	40
1998	1	3	8	34	1	10	1	2	5	65
1999	0	5	7	38	2	5	0	0	3	60
2000	1	5	0	33	1	2	0	0	3	45
2001	3	8	0	35	1	2	1	4	2	56
Totale	7	36	34	216	6	38	4	22	13	376

Table 1. Distribution by the COR and year of diagnosis of the cases of mesothelioma reported.

Key:

Anno Diagnosi	Year of Diagnosis
Totale	Total
PIEMONTE	PIEDMONT
VENETO	VENETO
FRIULI VG	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA R	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
PUGLIA	APULIA
SICILIA	SICILY
TOTALE	TOTAL

Tabella 2. Distribuzione dei casi di mesotelioma segnalati all'Archivio ReNaM tra gli addetti alla cantieristica navale per COR e probabilità di esposizione

Cor	Lavorativa certa		Lavorativa probabile		Lavorativa possibile		Totale
	N	% di riga	N	% di riga	N	% di riga	N
Piemonte	7	100,0	0	0,0	0	0,0	7
Veneto	32	88,9	3	8,3	1	2,8	36
Friuli-Venezia Giulia	21	61,8	10	29,4	3	8,8	34
Liguria	150	69,4	39	18,1	27	12,5	216
Emilia-Romagna	3	50,0	1	16,7	2	33,3	6
Toscana	32	84,2	6	15,8	0	0,0	38
Marche	1	25,0	2	50,0	1	25,0	4
Puglia	15	68,2	7	31,8	0	0,0	22
Sicilia	6	46,2	7	53,8	0	0,0	13
ITALIA	267	71,0	75	19,9	34	9,0	376

Table 2. Distribution of cases of mesothelioma reported by the ReNaM Archive in workers employed in the shipbuilding sector by COR and probability of occupational exposure.

Key:

Cor	COR
Lavorativa certa	Certain occupational exposure
Lavorativa probabile	Probable occupational exposure
Lavorativa possibile	Possible occupational exposure
Totale	Total
N	N
% di riga	% of line
PIEMONTE	PIEDMONT
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
PUGLIA	APULIA
SICILIA	SICILY
ITALIA	ITALY

Tabella 3. Distribuzione dei casi di mesotelioma segnalati per inizio dell'esposizione lavorativa

Anno di Inizio	Numero	%	% cumulativa
<1935	23	6,3	1,7
1935-1944	93	25,4	31,7
1945-1954	104	28,4	60,1
1955-1964	98	26,8	86,9
1965-1974	35	9,6	96,4
1975-1984	10	2,7	99,2
>=1985	3	0,8	100
Totale	366	100	

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Table 3. Distribution of cases of mesothelioma reported by beginning of the occupational exposure.

Key:

Anno di Inizio	Year when it began
Numero	Number
%	%
% cumulativa	cumulative %
Totale	Total

CASES OF MALIGNANT MESOTHELIOMA DUE TO ASBESTOS OCCUPATIONAL EXPOSURE IN SAILING CREWS: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (RENAM) DATA

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General considerations

Exposure to asbestos of maritime workers on board is a consequence of the widespread use of asbestos over decades in the naval engineering industry in the processes of building, repair and conversion.
Occupational exposure to asbestos by crews on board, coincides with the start of industrial asbestos use, which dates back to the end of the 1800s.
More precisely the modern age of the use of asbestos can be dated back to an article which appeared in the prestigious journal *The Engineer* dated 22 June, 1883 entitled "Asbestos and its applications" [1]. In this article reference is made to the first industrial application of asbestos introduced by John Bell in 1879 consisting of the insulation of steam engines with materials containing asbestos. This application was immediately used by the British and German navies.
In particular the use of asbestos in the naval engineering sector was most extensive as it was used particularly in the military navies for its heat-insulating and fireproof properties since the end of the 1800s.
Subsequently "*precisely in the activities of ship building, maintenance and demolition it was widely used since the years following 1910, i.e. when it was used as an insulating material for motor equipment in steam ships". Its spread was also boosted by the compulsory use, imposed by the various naval registers of several countries, of insulating materials that met set standards (incombustibility, heat resistance). It was thus possible to create sectors inside the ships that could easily be isolated in case of fire, using suitable fireproof bulkheads; "furthermore other goals could be achieved such as the thermal and acoustic insulation of engine rooms and the relative heat systems*". [2].
In 1912 in a pamphlet from the company "Capamianto" located in Turin it is stated that the special pure Cape blue asbestos insulating fibre felt "is a favourite of the military and merchant navies of the main States and especially of the Italian Navy". We note – the pamphlet continues – that even recently on board the Navy Ships "Marsala" and "Nino Bixio" it was adopted for insulating all the lodgings and rooms on board, including the radiotelegraphy rooms. [3].
During the First World War asbestos was extensively used in the military navies worldwide and also the merchant navies.
Therefore we can affirm that the use of asbestos since the beginning of its use on an industrial scale found a privileged sphere of application in the naval sector.
A demonstration of this is the unanimous set of findings of the medical literature which identifies the

naval sector as the sector of production most affected by pathognomonic neoplastic pathology from exposure to asbestos, i.e. malignant pleural mesothelioma.
It should also be noted that the characteristic of exposure to asbestos in maritime workers is prolonged exposure which goes far beyond pure occupational exposure since the working environment coincides with the living environment, in fact leading to round-the-clock exposure.
Though occupational and environmental exposure to asbestos fibres in sailing crews seemed to be given for granted the Italian Law which was previously in force refused to recognise this exposure given that it was only reserved for exposed workers who were insured by the Italian National Institute for Insurance against Occupational Accidents (INAIL) (while sailing crews are insured against occupational risks by IPSEMA (The Insurance Institute for the Maritime Sector)).
Only with the issuing of Ministerial Decree dated 27 October 2004, implementing Article 47 of Decree No. 269 dated 30 September 2003 turned as amended into Law No. 236 dated 24 November, 2003, concerning the “Welfare benefits for workers exposed to asbestos” (O.J. No. 295 dated 12.17.2004) the limitations present in the regulations previously in force have been overridden also extending to workers not insured by the INAIL the benefit of asbestos assessment for pension purposes.
This provision therefore also allows sailing crews, registered in the list of members as per Articles 118 and 119 of the Navigation Code and covered by the mandatory insurance managed by IPSEMA to obtain acknowledgment of occupational exposure to asbestos.
For subjects affected by Mesothelioma and exposed to asbestos during compulsory national military service and/or a career in the Navy, the medical and legal procedure prescribes the reporting of occupational disease to the relevant Authorities (Legal Authority or Investigative Police, Local Health Unit, Provincial Labour Directorate, INAIL) in accordance with Article 139 of Presidential Decree (D.P.R.) 1124/1965 and subsequent amendments and integrations, with Article 21 of L. 833/1978, with Article 10 of Legislative Decree 38/2000, with Ministerial Decree 27.4.2004 and in accordance with the obligations ratified by Article 365 of the Italian Criminal Code and 334 of the Italian Code of Penal Procedure.
In order to achieve the acknowledgment of an occupational disease the patient or entitled heirs must file a “request for work related disease” to the Ministry of Defence; the legal deadline for the presentation of this claim is within 6 months of the date in which the person concerned became aware of the illness (Article 3 of Royal Decree No. 1024 dated 15 April 1928; and Article 36 of Presidential Decree (D.P.R.) No. (686) dated 3 May 1957. The deadline for appeal in case of adverse judgement is 60 days in case of appeal to the Regional Administrative Court (T.A.R.) (Art. 21 of Law No. 1034 dated 6 December 1971) and 120 days in case of extraordinary appeal to the President of the Republic (Article 8 and subsequent articles of Presidential Decree (D.P.R.) No. 1199 dated 24 November 1971).

The results of the analysis of the data of the National Mesothelioma Register (ReNaM)

For the incidence period 1993-2001 in the archives of the National Mesothelioma Register (ReNaM) 69 cases are identified in the sea transport sector, 101 in the military defence sector (38 of which have exposure ascribable to the Navy activity) and 6 cases with occupational exposure identified in both these sectors. Reference is made here to the personal, clinical and medical history data characteristics of the group of 176 cases thus identified. The data must be evaluated taking into account that these are not strictly speaking sailing crews, but persons exposed in the sea transport or National Defence sectors. Currently in fact data are not available for all cases which can provide a more precise characterization of the risk and more detailed analyses will be produced after this report.
The cases are almost all male (175 out of 176); in more than 80% of cases the diagnosis is certain MM. The average age is 68.3 years ranging between 42 and 87 years. The distribution by Region and year of diagnosis is shown in Table 1. Most cases have pleural localisation and only three subjects have been

affected by peritoneal malignant mesothelioma.
The average latency (interval between start of work at risk and beginning of the disease) is 47.8 years (± 11.3) ranging between 20 and 71 years.
Out of the cases, more than 67% show they started the activity before 1954.
The judgement on the probability of occupational exposure to asbestos expressed for the individual cases of mesothelioma varies from one Regional Operative Centres (COR) to another (Table 2).An occupational exposure that is certain is attributed on average to 57% of cases, whereas probable or possible is found in 22.7 and 20.5 percent of cases respectively.

Review of the scientific literature for occupational exposure to asbestos in sailing crews

Already in 1953 it was possible to find the following assertions in the **Manual of Occupational Medicine** by F. Molfino (Ed. Minerva Medica - Turin 1953) on page 24:
"*The properties of asbestos are exploited here in order to make a good thermal insulation of those parts of the motor equipment and hull that are most subject to sensitive temperature changes. To this end various products are used: capisolite (slabs made up of 100% asbestos), magnesia asbestos, amosite, asbestos cloth cords, asbestos fibre mattresses etc.. During the application large amounts of dust are produced and since the work typically takes place in confined environments, workers are exposed to the inhalation of large amounts of asbestos dust*".
As regards the allocation of asbestos in the ship's hull, with a consequent possibility of causing an occupational risk of exposure, reference is made to the document drafted by the Prevention at Work Coordination of the Regions and of the Autonomous Provinces of Trento and Bolzano on 30 August, 2000 [4].

Room	Material, equipment, furnishings	Type of material containing asbestos
GARAGE	Covering and/or lining of the ceiling of the room and the perimeter walls	➢ Flocked ➢ Sprayed on ➢ Panels
	Pipes	➢ Cement mixture ➢ Fabric ➢ Seals ➢ Cushions
	Electrical cable passages	➢ Plaits ➢ Packings ➢ Stuccoes ➢ Cement mixture
	Doors	➢ Panels ➢ Cement mixture
CORRIDORS AND STAIR WELLS	Walls	➢ Sprayed on ➢ Panels ➢ Cement mixture
	False ceilings	➢ Sprayed on ➢ Panels ➢ Cement mixture
	Doors	➢ Panels ➢ Cement mixture
	Ventilation ducts	➢ Seals ➢ Stuccoes
	Pipes	➢ Cement mixture ➢ Seals
LODGINGS OF ON BOARD STAFF	Cabin walls	➢ Sprayed on ➢ Panels ➢ Cement mixture
	False ceilings	➢ Sprayed on ➢ Panels ➢ Cement mixture
	Doors	➢ Panels ➢ Cement mixture
	Ventilation ducts	➢ Seals ➢ Stuccoes
	Pipes	➢ Cement mixture ➢ Fabric ➢ Seals
	Electrical cable passages	➢ Plaits ➢ Packings ➢ Stuccoes ➢ Cement mixture
HALLS FOR PASSENGERS	Walls	➢ Sprayed on ➢ Panels ➢ Cement mixture
	Ceilings and false ceilings	➢ Sprayed on

		➢ Panels ➢ Cement mixture
	Doors	➢ Panels ➢ Cement mixture
	Ventilation ducts	➢ Seals ➢ Stuccoes
	Pipes (hot water, washing water, fire fighting water etc.)	➢ Cement mixture ➢ Fabric ➢ Seals
	Electrical cable passages	➢ Plaits ➢ Packings ➢ Stuccoes ➢ Cement mixture
MOTOR EQUIPMENT AND AUXILIARY ROOM	Engine exhaust gas manifolds	➢ Insulating cushions ➢ Fabric ➢ Small mats ➢ Cement mixture ➢ Seals
	Boiler and incinerator exhaust fume ducts	➢ Insulating cushions ➢ Fabric ➢ Small mats ➢ Cement mixture ➢ Seals
	Pipes (hot water, washing water, fire fighting water etc.)	➢ Cement mixture ➢ Fabric ➢ Plaits ➢ Seals
	Electrical cable passages	➢ Plaits ➢ Packings ➢ Stuccoes ➢ Cement mixture
	Ventilation ducts	➢ Seals ➢ Stuccoes
VARIOUS SERVICES	Refrigerator rooms	➢ Sprayed on ➢ Panels ➢ Small mats ➢ Cement mixture
	Kitchen rooms	➢ Sprayed on ➢ Panels ➢ Cement mixture
	Ovens and stoves	➢ Panels ➢ Plaits ➢ Stuccoes ➢ Asbestos cement slabs
	Ventilation ducts	➢ Seals ➢ Stuccoes
	Pipes	➢ Cement mixture ➢ Seals

An assessment of the tables above concerning the distribution of materials containing asbestos in the structure of the ship, shows the existence of a widespread risk throughout the whole working environment of the ship.
In particular the following sectors turn out to be mostly involved in the potential occupational exposure of sailing crews:

a) Lodgings of on board staff: which demonstrates that the sailing crews, after their work shifts, were simultaneously exposed to the risk of asbestos, even in their own “living environment”.
b) Engine room: here an especially high exposure is found, due both to the massive use of materials containing asbestos as engine insulators, and to the confined environment and generally poorly ventilated state of the engine room. Furthermore the typical vibrations of engine rooms elements cause the dispersion of asbestos fibres from the matrix.
c) Passenger halls: which proves that even passenger stewards were at risk of occupational inhalation of airborne asbestos fibres.

In Italy the first reports on asbestos risk to maritime crews were made by Puntoni et al. [5] alongside a study on dockers in Genoa, and by Bianchi et al. [6]. These authors describe three cases of pleural mesothelioma in subjects on board various types of craft, and in discussing the cases highlight three points: exposure occurs especially when performing inspection, repair and maintenance operations; the fact that the exposure is neither massive nor continuous does not eliminate the risk; machinery maintenance workers are the most exposed. In a subsequent contribution, Bianchi and Brollo [7] described among sailing crews 5 pleural cases and one peritoneal case of mesothelioma.
In the USA Jones et al. [8] examined the chest radiographies of over 5,000 craft engine-drivers, which showed that 12% of subjects were affected by pleural asbestos-related disorders; the predominance of these disorders was higher (27%) among those who had been on board for a higher number of years. In the USA Selikoff et al. [9] studied over 3,000 sailors, observing pleural or pulmonary asbestos-related disorders in 35% of subjects.
The predominance of these disorders was higher in engine-drivers, intermediate in deck staff and lower in stewards. A confirmation to these findings came from a smaller study carried out in Greece [10]: in a group of 141 sailors, 41% had at least one sign of radiological asbestos damage.
The first quantitative reporting of a risk of mesothelioma among sailors is based on seven cases observed in a British cohort study on 13,000 naval officers and sailors, against 2 expected cases [11]. A subsequent report concerned two cases from Greece [12]. In Italy a cohort study on 984 sailors in Civitavecchia sailing at least once between 1936 and 1975 shows a significant increase in mortality due to pulmonary tumours, with a trend related to the duration of employment as a sailor; one subject died as a result of pleural mesothelioma [13].
On the basis of the set of data from the decade 1980-90, Greenberg [14] maintained that the presence of massive quantities of materials containing asbestos on ships, moreover subject to continuous vibrations and mechanical stresses, was the cause of the frequent radiological alterations observed in the sailors, as well as the increased risk of cancer emerging. Over the following decade the epidemiological evidence of a higher risk of mesothelioma among sailors was extending and becoming consolidated.
The first Report of the National Mesothelioma Register [15], based on the cases diagnosed in the period 1993-1996 in Piedmont, Liguria, Emilia-Romagna, Tuscany and Apulia, showed that the activity in the Navy and the shipping companies was the third ex aequo most frequent profession, out of water, reported by the patients being examined (32 reports out of a total of 390). With reference to the subsequent three-year period 1998-2000, the Tuscan Regional Archive for Malignant Mesotheliomas reports 9 cases in the sea transport sector, 7 of which have certain exposure to asbestos [16]. The most recent study by Bianchi et al. [17] relating to mesotheliomas in sailors in Trieste-Monfalcone reports 50 cases (including both merchant and military navies). In this activity, the average

latency of mesothelioma is 56.1 years, longer than in the activities of insulation, shipbuilding and harbour work.

In the period 2000-2005 the Regional Mesothelioma Register of the Lombardy Region collected 11 cases of pleural mesothelioma in subjects with exposure to asbestos exclusively suffered during military service and/or a career in the Navy. The average age of the start of the pathology was 76 years and the average latency was quite similar to that found by Bianchi et al. All these cases were concluded as having an occupational etiology; the duty carried out was mainly that of boiler maintenance engineer and stoker (6 cases) followed by two cases in gunners/maintenance engineers, an engineer responsible for electrical maintenance, a gunner and a seaman. In all these cases the asbestos exposure undergone due to the job performed, was added to by the one due to remaining in a living environment which in fact coincided with the working environment (all the subjects had been on board for a minimum of 2 years and up to a maximum of 39) [18].

The Australian Mesothelioma Registry (1945-2000) shows 224 reports by sailors out of a total of 3,008 activities involving exposure to asbestos [19].

In Finland [20], a case-control study on 10 cases of mesothelioma observed in one cohort study on 30,000 sailors who had sailed in the twenty-year period 1960-80, highlighted a significant increase of risk associated with machinery jobs (OR 7.50, confidence interval 95% 1.53-36.7 with 10 years of latency; OR 9.75, confidence interval 95% 1.88-50.6 (with 20 years of latency). Finally, in Sweden [21] the Standardised Incidence Ratio (SIR) for pleural mesothelioma in sailors in the period 1961-1998 was equivalent to 2.83 (confidence interval 95% (1.41-5.09).

References

1. Murray R. Asbestos: a chronology of its origin and health effects. British Journal of Ind Medicine 1990; 47:361-365
2. Vallestrisco M, Casadio S. Materiali a base di amianto, Torino 1997.
3. Bianchi C, Bianchi T. Amianto: un secolo di sperimentazione sull'uomo. Hammerle Editori 2002:p.40
4. Coordination of prevention at work activities of the Regions and Autonomous Provinces of Trento and Bolzano: Guidelines for implementing Art. 1 of the Ministerial Decree of 20 August 1999 "extension of rules and technical methods for remediation measures, including those for rendering the asbestos harmless, provided by Art. 5, paragraph 1, letter f), Law 27 March 1992, n. 257, banning asbestos." 30 August 2000
5. Puntoni R, Valerio FE, Sanit L. II mesotelioma pleurico fra i lavoratori di Genova. Tumori 1976; 62:205-210.
6. Bianchi C, Brollo A. Mesoteliomi maligni della pleura e del peritoneo: tumori professionali dei marittimi. Proceedings of the Studies Section, International Radio-Medical Centre, 5-12 Roma 1991.
7. Bianchi C, Brollo A, Bittesini L. Patologia da asbesto nei marittimi. Proceedings of the Studies Section, International Radio-Medical Centre 5-13, Rome1983.
8. Jones RN, Diem JE, Ziskand MM et al. Radiographic evidence of asbestos effects in American marine engineers. J Occup Med 1984; 26:281-284.
9. Selikoff IJ, Lilis R, Levin G. Asbestotic radiological abnormalities among United States merchant marine seamen. Br J Ind Med 1990; 47:292-297.
10. Velonakis EG, Tsorva A, Tzonou A, et al. Asbestos-related chest X-ray changes among Greek merchant marine seamen. Amer J Ind Med1989; 15:511-516.
11. Darby SC, Muirhead CR, Doll R, et al. Mortality among Unit Kingdom servicemen who served abroad in the 1950s and 1960s. Br J Ind Med 1990; 47:793-804.
12. Varouchakis G, Velonakis EG Amfilochiou S, et al. Asbestos in strange places: two case-reports of mesothelioma among merchant seamen. Am J Ind Med 1991; 19:673-676.
13. Rapiti E, Turi E, Forastiere F, et al. A mortality cohort study of seamen in Italy. Am J Ind Med 1992; 21:863-872.
14. Greenberg M. Cancer mortality in merchant seamen Annals N Y Acad of Sc 1991; 643:321-332.
15. Nesti M, Marinaccio A, Silvestri S. II Registro Nazionale dei Mesoteliomi (ReNaM). Roma: Primo Rapporto ISPESL 2001: 1-127.
16. Gorini G, Silvestri S, Merler E, Chellini E, Cacciarini V, Seniori Costantini A. La valutazione dell'esposizione ad amianto in Toscana attraverso i dati dell'Archivio Regionale Toscano dei Mesoteliomi Maligni (1988-2000). La Medicina del Lavoro 2002; 93(6): 507-518.
17. Bianchi C, Bianchi T, Grandi G. Malignant mesothelioma of the pleura among seafarers. Med Lav 2005; 96:490-495.
18. Mensi C., Canti Z., Rivolta G., Riboldi L., Chiappino G. II mesotelioma maligno nelle professioni marittime. Med Lav 2006; 97: 82 [letter].
19. Leigh J., Davidson P., Hendrie L., Berry D. Malignant mesothelioma in Australia, 1945 - 2000. Am. J. Ind. Med. 2002; 41: 188-201
20. Saarni H, Pentti J, Pukkala E. Cancer at sea: a case-control study among male Finnish seafarers. Occupational Environmental Medicine 2002; 59: 613-619.

21. Hemminki K, Li X. Time trends and occupational risk factors for pleural mesothelioma in Sweden. Journal of Occupational Medicine 2003; 45(4): 456-463.

Tabella 1. Casi di MM negli archivi ReNaM con un'esposizione nel settore dei trasporti marittimi o della Difesa Nazionale per Regione ed anno di diagnosi.

	Piemonte	Lombardia	Veneto	Friuli-Venezia Giulia	Liguria	Emilia-Romagna	Toscana	Marche	Puglia	Sicilia	ITALIA
1993	0	0	1	0	0	0	1	0	2	0	4
1994	0	0	1	0	1	0	0	0	5	0	7
1995	0	0	2	1	5	1	1	0	8	0	18
1996	1	0	0	0	0	1	1	1	12	0	16
1997	2	0	6	1	7	0	2	0	5	0	23
1998	1	0	1	0	13	0	3	0	7	1	26
1999	2	0	1	0	11	1	5	0	2	2	24
2000	4	2	1	0	9	0	5	0	7	1	29
2001	6	1	3	0	5	2	7	0	3	2	29
	16	3	16	2	51	5	25	1	51	6	176

Table 1. Cases of MM in the ReNaM archives with exposure in the sea transport or National Defence sectors by Region and year of prognosis.

Key:

PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
PUGLIA	APULIA
SICILIA	SICILY
ITALIA	ITALY

Tabella 2. Casi di MM negli archivi ReNaM con un'esposizione nel settore dei trasporti marittimi o della Difesa Nazionale per regione e tipo di esposizione.

	Professionale certa	% di riga	Professionale probabile	% di riga	Professionale possibile	% di riga	Totale
Piemonte	10	62,5	4	25,0	2	12,5	16
Lombardia	2	66,7	0	0,0	1	33,3	3
Veneto	11	68,8	2	12,5	3	18,8	16
Friuli-Venezia Giulia	1	50,0	0	0,0	1	50,0	2
Liguria	33	64,7	3	5,9	15	29,4	51
Emilia-Romagna	0	0,0	4	80,0	1	20,0	5
Toscana	16	64,0	3	12,0	6	24,0	25
Marche	0	0,0	1	100,0	0	0,0	1
Puglia	24	47,1	20	39,2	7	13,7	51
Sicilia	3	50,0	3	50,0	0	0,0	6
ITALIA	100	56,8	40	22,7	36	20,5	176

Table 2. Cases of MM in the RenaM archives with exposure in the sea transport or National Defence sectors by Region and type of exposure.

Key:

Professionale certa	Certain occupational exposure
Professionale probabile	Probable occupational exposure
Professionale possibile	Possible occupational exposure
Totale	Total
% di riga	% of line
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
PUGLIA	APULIA
SICILIA	SICILY
ITALIA	ITALY

CASES OF MALIGNANT MESOTHELIOMA DUE TO OCCUPATIONAL EXPOSURE TO ASBESTOS IN AGRICULTURE: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (ReNaM) DATA

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From the analysis of the agricultural sector risk profile there emerges a series of non-negligible risks which can cause rather a high degree of damage to health.
The most common ones include the use of plant protection products, exposure to ultraviolet rays and exposure to dust often containing crystalline silica.
As regards asbestos, until quite recently the best known and characteristic risk of exposure to farmers was that originating from the use of asbestos powder in the manufacturing of the filters for wine processing. Some cases of mesothelioma showing this type of exposure are documented. However, over the years several cases have been recorded in farmers-breeders which have often been entered into the unknown exposure category with the consequence that exposure to asbestos has only been assumed on the basis of data gathered on various occasions, but for which there have always been difficulties in making assessments. The duties possibly leading to a consequent exposure may include the use of such materials as asbestos employed as an inert filler for plant protection products, dust from Balangero employed in chicken feed and in the bedding of large cattlesheds, asbestos fibre waste to lighten soils. Nonetheless no technical documentation (data sheets or analyses) or relevant literature has ever been collected from any Regional Operative Centre (COR) proving these assumptions.
There is then another aspect characterizing the exposures which concerned the farmers during the execution of other duties, such as those of bricklayers or mechanics and maintenance workers and repair engineers. These activities have been directly described in the interviews. These cases are currently classified in the agricultural sector, even if the type of activity and the consequent exposure is attributable to other sectors. Another condition has emerged in the last few years which may have involved exposure to asbestos. This refers to the possible use of recycled jute sacks or similar items which could have previously contained asbestos. Until the early 1970s, asbestos used to be carried in sacks made of some textile fibres such as jute and also linen. Companies who were directly using asbestos in the production cycle used to recycle these sacks, giving them away to sack factories or simply to their own workers who in turn could give them to relatives or friends who asked for them. The study just concluded on the possible exposure characterizing the unknown cases has highlighted and proven this recycling activity (see the final report on the "unknown" research project available on the ISPESL (Italian National Institute for Occupational Safety and Prevention) Internet site at the following address:
http://www.ispesl.it/ispesl/sitorenam/ricerca/Relazione_conclusiva_ignoti.pdf.)

Case histories of mesothelioma in agriculture

In the archives of the National Mesothelioma Register (ReNaM), 22 cases of malignant mesothelioma are recorded with reference to the incidence period 1993-2001 and affecting subjects for whom an occupational exposure to asbestos in agriculture has been identified. Furthermore, there is a significant number of case histories (87 cases) referring to subjects with an exposure defined as “unknown”, but having an occupational history which includes agricultural activities; finally, for 53 cases (out of the 87 mentioned above) there is a documented occupational history entirely developed in the agriculture sector.

Table 1 shows the distribution of cases by year of incidence and area of residence.

Tabella 1. Distribuzione dei casi di mesotelioma con esposizione nel settore dell'agricoltura per anno di incidenza e regione di residenza

	Piemonte	Lombardia	Veneto	Liguria	Emilia-Romagna	Marche	Puglia	Basilicata	ITALIA
1994	0	0	0	0	0	0	1	0	1
1996	0	0	1	0	0	1	0	0	2
1997	0	0	0	0	1	2	0	0	3
1998	1	0	0	1	0	1	0	0	3
1999	1	0	0	0	0	2	0	0	3
2000	1	1	2	0	0	0	1	0	5
2001	1	1	0	0	0	1	1	1	5
TOTALE	4	2	3	1	1	7	3	1	22

Table 1. Distribution of cases of mesothelioma with exposure in the sector of agriculture by year of incidence and area of residence.

Key:

PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
MARCHE	THE MARCHES
PUGLIA	APULIA
BASILICATA	BASILICATA
ITALIA	ITALY
TOTALE	TOTAL

It may be noted that the Regions with the highest incidence are The Marches and Piedmont while the distribution by year of incidence shows the highest number of cases (5) in 2000 and 2001, probably in relation to the territorial extension ensured by the national register.
In men 15 cases (68.2%) occurred against 7 cases (31.8%) found in women with a ratio between the two genders of about 2/1. These are cases presenting a pleural localisation.
The diagnostic classification of the cases highlights that 12 cases (54.5%) are accompanied by a histological examination with or without confirmation by immunohistochemistry; the remaining 10 cases (45.5%) are included among the probable (8 cases) and possible (2 cases) mesotheliomas.
The distribution by age shows the 65-74 year age class as being predominant with 50% of cases (Table 2). The distribution of the diagnostic level by year of incidence does not confirm any improvement of diagnostic procedures over the period. But the non-definition or non-execution of more invasive examinations, such as a bioptic removal, could be explained by the advanced age of most subjects who

have an uncertain diagnosis.
Finally, by analysing the progression of the average age by year of incidence, no important variations from the general average, which is 67.1 years at time of diagnosis, are thus found.

Table 2. Distribution by age at diagnosis of cases of mesothelioma with exposure in the agricultural sector.

	ITALY	%
< 55	2	9.1
55-64	5	22.7
65-74	11	50.0
75-84	3	13.6
> 84	1	4.5
TOTAL	1	100.0

Interview procedures and classification of the exposure

The distribution by interview procedures highlights (Table 3) that more than 70% of interviews were carried out with relatives. The direct interviews are less than one third of the totals and this feature, in such a non-specific sector for the use of asbestos, does not help provide good quality data in order to attempt a faithful reconstruction of the working activities that were carried out.

Table 3. Distribution by methods of interview

	Certain occupational exposure	Probable occupational exposure	Possible occupational exposure	Total
With the subject	3	0	3	6
With the relatives	6	1	9	16
Total	9	1	12	22

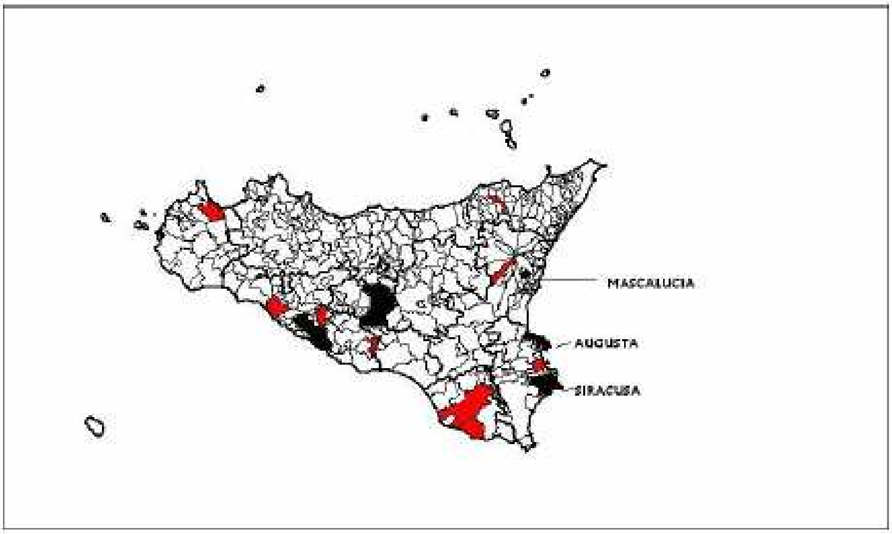
By taking into consideration the exposure level, it may be noted that less than half of the 22 cases shows an occupational exposure that is certain.

In-depth study on the modes of exposure in agriculture and the reclassification of cases characterized by an "unknown" exposure. Activities promoted by the Regional Operative Centre of Sicily

The Regional Operative Centre (COR) of Sicily, withing the framework of the study conducted on the cases characterized by an unknown exposure, started gathering data on the use of jute sacks in the agricultural sector and it thus identified a commercial recycling chain involving sacks coming from Eastern Europe which had previously contained asbestos. In Sicily furthermore, several companies

have been operating which were producing cement asbestos products and could distribute sacks used for transporting asbestos around the area. It was therefore decided to reconstruct the route taken by these sacks after they were cast off.
Thus, each provincial reference person for the Archive acquired data in order to document this route. Firstly cement asbestos plants were located which were found to be in the municipalities of San Filippo del Mela (Province of Messina), San Cataldo (Province of Caltanissetta) and Priolo (Province of Syracuse).
Figure 1 shows the distribution of pleural mesothelioma cases in farmers (red) and the distribution of areas where asbestos was used (in black).

Figure 1



In the other Provinces on the other hand, the aim was to identify the local route of the sacks which could take place through the agricultural consortiums and through the centres for commercial collection of agricultural products. In particular, attention was paid to the Provinces of Agrigento, Ragusa and Catania where, despite the lack of companies which directly used asbestos, the use of jute sacks was rather considered to be highly plausible for the collection of several agricultural products (olives, almonds, hazel-nuts, carobs). This was carried out with the aim of assessing a possible distribution of cases in the neighbouring agricultural areas surrounding these settlements.
As regards the investigation carried out in the production sites, the results obtained highlighted various situations, in particular:

- **the Nuova Sacelit company** (former Sacelit company operating in the manufacturing of asbestos cement products between 1958 and 1993 in the Municipality of San Filippo del Mela) contacted directly, was not able to provide data on the ultimate disposition of the sacks prior to 1986; from this date on however, the sacks which had contained asbestos were shredded with a special grinding machine and then added to the mixture for producing the manufactured goods.
- as regards one company that had operated in the Municipality of San Cataldo, as verified by the occupational physician who acted as the reference person for the Province, the re-use of the sacks was not possible since in this company the supply and transport of asbestos took place with sacks

made out of non-reusable perishable material and in any case jute was not involved. The only materials which could have been given away to the farmers were the waste materials derived from sheets which might have been used in order to build small roofs.

- regarding the **Eternit company** of Priolo, a former worker was interviewed. The worker claimed that the asbestos was reaching Syracuse by ships coming from Russia (especially white asbestos), Canada and partly from Balangero. The relevant period was between 1957 and 1973 and only in the last years asbestos was also arriving by railway. From the ports, the sacks containing asbestos reached the factory situated in Capo di Targia near Syracuse, and they were carried by lorry. It was verified that production waste was entrusted to a kind of "Cooperative" for disposal. This waste, including the jute sacks, while awaiting disposal, was temporarily stored on a forecourt outside the company, freely available to anyone. Many people, especially farmers, came to get anything that was still considered to be reusable. Among production waste there were several jute sacks and also the felts used in the sheet and pipe moulding machines. The latter ones, given their considerable size, were reused in agricultural areas as cloths for the protection of roofs or in order to cover equipment.

The investigation carried out in order to trace back the route of the jute sacks in the Provinces of Agrigento, Ragusa and Catania, which were not characterized by the presence of cement manufacturing factories, allowed the identification of a carob collection and sale centre in Ragusa where still today the manager supplies the agricultural pickers with recycled jute sacks previously used for the transport of foodstuffs coming from South America (coffee, cocoa) (Picture 1).

Picture 1

Through this manager it was possible to check that recycled jute sacks bought in a company based in Catania had always been supplied to farmers. The latter company, still in operation, contacted by the occupational physician acting as reference person for Catania Province, gave the following information:

The company with the current trade name was established in 1977 and ever since has been exclusively dealing in the sale of sacks of several dimensions and capacities, made out of materials and fabrics of several kinds (natural and artificial) intended for a large variety of uses (food and non-food products). The owner claims to remember perfectly well that in the previous activity, from about 1960 to 1975, besides being directly engaged in the manufacturing of jute sacks, it was buying sacks already used and reselling them to local buyers. In particular the owner maintains that, in those years, many tens of thousands of used sacks were imported and resold locally, being clearly marked with the wording

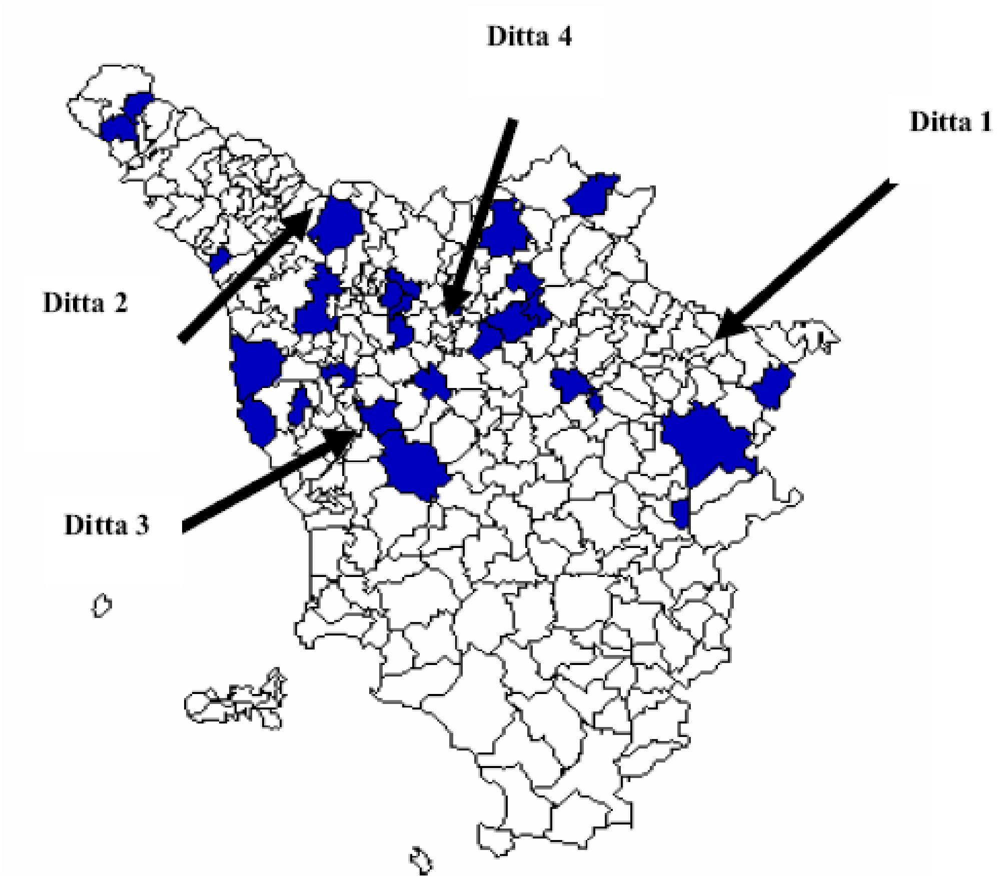
“ASBESTOS” as well as an indication of the weight of the substance contained (50 kg). These sacks, bought in large quantities, which were mainly carried by railway but also by road, were subject to a cleaning treatment before being resold. The operation was carried out by means of an automatic electric duster that, due to the suction force, used to turn the sack inside out and clean it against the flow by removing any residues of substance left inside following the previous use. The duster was bought precisely in that period in view of the large request for used sacks by local buyers. These sacks were very resistant and were also suitable for several uses. No sack was ever purchased from local industries which were using asbestos as a raw material, but all sacks came only from abroad and, besides The Netherlands and West Germany, especially from Eastern European countries and above all, the former USSR and Yugoslavia. In some cases they also came from non-European countries (USA, India, Pakistan, China). The used sacks coming from Eastern European countries and especially the former USSR, besides having, as already mentioned, the inscription “ASBESTOS” were manufactured by using linen instead of the cheaper jute fibre, probably for self-sufficiency reasons. The company in question was very well-known and the buyers of the used sacks, according to the owner, were mainly small farmers who were using them in order to store or transport fruit and vegetable products. In the periods when the available sacks were made of linen, their sale was quicker since they were very much in demand. The buyers, a list of more than 700 customers overall, almost all farmers, came from all over the Province of Catania but it is certainly not to be excluded that part of these sacks also reached the areas of the surrounding Provinces. The used sacks were always bought in small quantities and there was never a customer who asked for or bought a large number. The sale of these items totally ceased from 1975 onwards.

Following these investigations, the unknown cases belonging to the agricultural sector were reviewed during the research project just concluded and financed by the ISPESL (Italian National Institute for Occupational Safety and Prevention).

In-depth study on the modes of exposure in agriculture and reclassification of cases characterized by an “unknown” exposure. Activities promoted by the Regional Operative Centre of Tuscany

There is a total number of 98 cases included in the archive which refer to subjects who worked for at least one period of their life in agriculture. For 67 of them (68.4%), the exposure took place in other production sectors. Of the remaining 31 cases (31.6%), 5 cases (16.1%) suffered exposure (1 certain, 4 possible) in agriculture whilst 26 cases (83.9%) are still classified with an unknown exposure. These are cases referring to subjects who worked for their whole life in the agricultural sector. There are 24 men against 7 women. As regards the diagnosis, 22 of them have a histology diagnosis, 4 present a cytology one and 5 have only a clinical diagnosis.
As regards the incidence, the most significant period is falling between 1996 and 1999 with 9 cases notified (29%), whilst in the last few years we are witnessing a decrease in the incidence. The Regional Operative Centre (COR) of Tuscany, with regard to the agricultural sector, is undertaking research to find and document sources of supply for recycled sacks previously containing asbestos. Currently, there is only one trace available regarding the Province of Pistoia which leads to a sack factory situated in the Province of Reggio Emilia, a town well known for the presence of a few asbestos cement production companies. In the sack factory in question, a case of mesothelioma has already occurred (Personal communication: A. Romanelli Regional Operative Centre (COR) Emilia Romagna) most probably due to the exposure arising from the recycling of sacks previously containing asbestos. In the Pistoia area, where an important nursery and garden centre is found, the jute was, and still is today, used in order to contain by binding, the plant roots during their handling and moving. Being highly biodegradable, the jute allows transplanting without the need to unbind the root ball. The research is also proceeding in other Provinces of Tuscany.
As regards the distribution of cases in Tuscany region, the only data currently available refer to the Municipality where the subjects last resided. In Figure 2, these municipalities have been highlighted and the areas belonging to 4 companies producing asbestos cement products are shown. Figure 3 again highlights the municipalities where the subjects resided and the areas are shown belonging to 6 companies responsible for the production/recycling of the sacks.

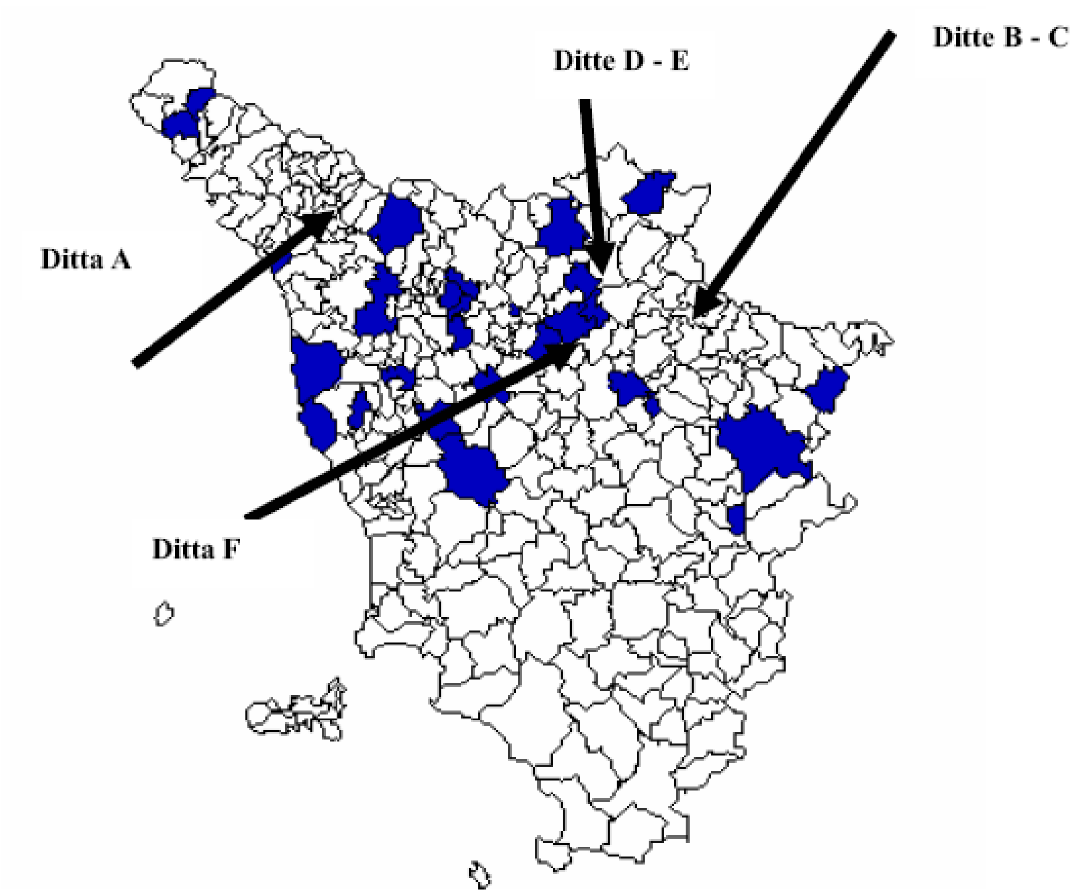
Figure 2



Key:

Ditta	Company

Figure 3



Key:

Ditta	Company
Ditte	Companies

It may be noted that the data on the residence by municipality cannot be directly correlated with the presence of the industries which were using asbestos and therefore the sacks which contained it. Since we do not know the complete residential history of the cases it is not possible to make a final assessment. The assumption that the sacks were being moved over short distances is not confirmed by this mapping, on the other hand one can observe a localization of cases and industries in the central and northern sector of the Region, whilst in the southern one, despite the predominance of the agricultural economy, cases of mesothelioma are not found.

In-depth study on the modes of exposure in agriculture and the reclassification of the cases characterized by an "unknown" exposure. Activities promoted by the Provincial Register of Brescia

In the past decades, the Province of Brescia was an important agricultural area stretching within the Po valley and characterized by a strong development of cereal cultivation. The Malignant Mesothelioma Register of the Province of Brescia gathered 370 cases between 1978 and 2005, while the occupational histories were reconstructed for 352 of these cases (95%). For 24 cases (6.8%) there is at least one working period (more than 1 year) spent in agriculture; the estimate of the probability of exposure to asbestos referring to these time periods has led to the attribution of the "unknown" category according to the criteria indicated in the 2003 Re.Na.M. Guidelines. The cases characterized by an "unknown" exposure in agriculture represent 22% of the total number of cases to which this category has been attributed. These agricultural workers were largely labourers working in small-sized farms or small entrepreneurs themselves; 20 out of 24 cases had worked in the countryside stretching over the lower Province of Brescia.

In the lower Lake Iseo, between the Provinces of Bergamo and Brescia, the most important Italian production centre of asbestos gaskets and cords was active from the 1930s until the end of the 1980s; the raw mineral that was usually carried in jute sacks, was also coming from the mines of Balangero and Val Malenco for chrysotile, and probably from South Africa for crocidolite, and it used to be ground, carded and spun for subsequent manufacturing of asbestos plaits and fabrics. At the same time in the Municipality of Calcio (BG) there was also the Vezzoli sack factory, specialising in the recycling of jute sacks used for the transport of various goods (corn, soybean, coffee, flours etc.) but which certainly also came from these industries. The sacks to be recycled came from several areas of Italy including harbour and industrial areas, as well as Balangero and Casale Monferrato for those sacks containing asbestos; the period of greatest recycling of the latter ones is said to be around the 1960s. Among its workers and some subjects living in close proximity, several cases of mesothelioma and asbestosis [1] were found.

In the second post-war period the Vezzoli family extended this activity to other small plants in Calcio (BG) and in the Province of Brescia.

In 1950 Vezzoli also opened a plant in Rovato (BS), employing about 20 female workers who were in charge of the recycling of the jute sacks which were first turned inside out, beaten manually and then repaired by means of sewing machines. Two of these workers, affected by pleuroperitoneal mesothelioma (with pleural plaques) stated that on average they used to sew about 60 sacks each per day and frequently even up to 100. They were unaware of the possible asbestos content of the sacks and claimed that those sacks, very dusty, contained visible residues from various materials, mainly of agricultural origin. At the end of the 1950s the Vezzoli family opened a third plant in the Municipality of Pontevico (BS), close to the "Amiantit" company which since 1962 was producing flat and corrugated sheets of asbestos cement; the owner's wife, who worked in the sack factory, and their adolescent daughter, who was living in the dwelling adjacent to the small factory, fell ill with mesothelioma.

During the investigations carried out in the course of the criminal proceedings concerning asbestos-related diseases in workers of the former "Amiantit" of Verolanuova (1993) it was found out that jute sacks which had contained asbestos could be bought directly from the factory at a low price and that farmers were the ones making most use of them.

In the Municipality of Provaglio (BS), not far from the lower Lake Iseo production centre of cords and gaskets a fourth plant for jute sack recycling was opened; among the female workers there arose one case of pleural plaques and one case of mesothelioma (with pleural plaques), with a pulmonary

concentration of asbestos fibres equal to 400 million per gram of dry tissue [2,3], where the subject had also worked in the Calcio sack factory. These female workers had claimed that they did not know whether asbestos had been kept in the sacks but certainly all the sacks had contained agricultural products.
Currently, we are not aware of any other small jute sack recycling factories situated in the Province of Brescia, besides the aforementioned 3 factories to which 5 cases of mesothelioma found in women are associated. In the Municipality of Provaglio (BS), not far from the lower Lake Iseo production centre of cords and gaskets a fourth plant for jute sack recycling was opened; among the female workers there arose two cases of pleural plaques and two cases of pleural mesothelioma (with pleural plaques), one of which had a pulmonary concentration of asbestos fibres equal to 400 million per gram of dry tissue [4], where the subject had also worked in the Calcio sack factory. These female workers had claimed that they did not know whether asbestos had been kept in the sacks but certainly the majority of the sacks had contained agricultural products.

To conclude, the preliminary investigations generated by the observation of these cases allow us to assume that: 1) the presence of asbestos products manufacturing plants also involved the simultaneous activity of small factories specialised in the recycling of the jute sacks which dealt with huge numbers of pieces and from which they were getting large amounts of trade; 2) whilst on the one hand it appears certain that these sacks had contained asbestos, on the other it is also certain that, once recycled, they were abundantly used in agriculture; 3) the widespread availability and use of jute sacks, which had contained asbestos, carried out in the farms operating in the second post-war period (coincident with the significant increase in asbestos consumption found in a few geographical areas) reasonably represents a source of "possible" exposure to asbestos in farmers, without excluding the possibility that other exposures may be associated.

Discussion

The study of the possible recycling in agriculture of sacks previously containing asbestos which is undertaken through specific activities not strictly linked to the interviews involving the subjects of the cases is thus obtaining good results and it is therefore important that the methodology used is also followed by other regional organisations. Further studies must include the distribution of the cases in agriculture as well as its comparison with the localization of cement/asbestos plants. It is necessary nevertheless to prescribe the reconstruction of the residential history (space/time) of each single case. The mapping of the companies will have to include, besides asbestos cement plants, also the sector of the sack factories. The execution of works which lie outside agricultural activities, especially construction work or machinery repair, must find a correct ATECO entry so as not to introduce bias in the asbestos risk profile in the sector. The review of the interviews, both direct and by proxy, indicates that with reference to the question on the possible use of sacks the majority of respondents answered affirmatively only to the use of sacks, but they often did not know whether those sacks were new or recycled. They were not even able to understand the inscriptions shown on some sacks.
It is therefore important that during the interviews the type of agricultural production is at least well defined so as to fully understand if a need did exist for the use of the sacks during crops. The data on the time period and those on the recycled sacks trade developed in the area of interest could allow the attribution of an exposure that is at least "possible" for the cases arising in farmers.

References

1. Ascoli V, Carnovale-Scalzo C, Nardi F, Efrati C, Menegozzo M. A one-generation cluster of malignant mesothelioma within a family reveals exposure to asbestos-contaminated jute bags in Naples, Italy. Eur J Epidemiol. 2003; 18(2):171-4
2. Tomasini M, Rivolta G, Forni A, Chiappino G. An unusual exposure to asbestosis risk in a bag manufacturing plant: observations on 22 cases. Med Lav. 1990 Jul-Aug; 81(4):290-5
3. Porru S, Placidi D,Scotto di Carlo A, Campagna M, Mariotti O, Barbieri PG, Lombardi S, Candela A, Tassi GF, Alessio L. Malignant mesothelioma and the working environment: the viewpoint of the occupational physician. Med Lav 2005; 96,4:312-329

CASES OF MALIGNANT MESOTHELIOMA DUE TO ASBESTOS OCCUPATIONAL EXPOSURE IN THE TEXTILE SECTOR: GENERAL CONSIDERATIONS AND ANALYSIS OF THE NATIONAL MESOTHELIOMA REGISTER (ReNaM) DATA

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The textile industry, which in Italy flourished especially in the North (area around Biella and Bergamo) and the Centre (area around Prato), mainly consists of the sectors of preparation and spinning, weaving and finishing and in the more specialised sectors of synthetic textiles, roperies and net manufacturers, felt manufacturers and rag recovery for recycling. The latter sector is characteristic only of the area around Prato. Each of these sectors in turn includes a series of typical work phases which can involve occupational exposure to airborne vegetable, animal, mineral, or synthetic fibres, as well as organic substances, in the form of fumes and aerosols, such as mineral oils, solvents, aldehyde colouring agents, and others.
For the assessment of the risk associated with occupational exposure considered to be potentially carcinogenic the reference point is generally the International Agency for Research on Cancer (IARC). IARC, on the basis of a limited evidence of carcinogenicity surveyed from the available research findings on human beings [1], inserted the activities of the textile sector in group 2B. This assessment is based on findings of an increased incidence of bladder tumours among dyers and weavers (azoic colouring agents) and of carcinoma of the paranasal sinuses among weavers (dust from fibres and fabrics). This classification affected the subsequent studies, which concentrated on these types of neoplasia, which however do not complete the picture of possible risks of carcinogenicity in the textile industry. In a review of case histories at the Sloan-Kettering Cancer Center in 1982 the mesotheliomas affecting the textile sector workers were not even suspected as being caused by asbestos and are classified among those from other causes [2]; even a more recent review has not taken into account the textile industry [3].
The result was that in the last decade attention to occupational exposure in the textile sector decreased; this was also partly due to the general improvement in working conditions and the shifting of many activities to non-European countries. In this context therefore we understand why in the past, except for the rare situations where fireproof fabrics were produced (containing asbestos), the asbestos risk in the textile industry has never been adequately examined in detail.
In the subsequent years some studies started documenting a possible occupational risk of exposure to the mineral in workers of this sector:

- studies carried out in the Prato area have highlighted an increased risk of pulmonary tumours among rag sorters (exposed in the 1950s) and weavers (employed in the 1970s) suggesting asbestos and

mineral oils, respectively, as being carcinogenic factors [4-8];
- for a few cases of Malignant Mesothelioma (MM) affecting silk spinners in Lombardy a possible exposure to asbestos dispersed by the insulation and seals of the pipes [9] was reported;
- in Piedmont a case of mesothelioma is described in a worker in charge of the maintenance of pipes conducting water and steam into the dyeing and finishing departments of the textile industry [10];
- the Tuscany Mesothelioma Register highlighted the need to examine in more detail the occasions for exposure in the textile sector since subjects are affected that have carried out different jobs [11];
- some components of textiles machinery (bushings, seals) are indicated as points of potential dispersion [12].

From the year 2000 to today only four studies have in fact tackled this problem [10], [12-14]. The most recent study of these[13], [14] is the result of the review of the case histories held by the Mesothelioma Register of Lombardy (RML) carried out in the context of the research project financed by the Italian National Institute for Occupational Safety and Prevention (ISPESL) entitled "*Survey and in-depth medical history study of cases of mesothelioma defined as "of unknown exposure" by Epidemiological Monitoring systems which use the standards of the National Mesothelioma Register*" [15].

In the archives of the National Mesothelioma Register (ReNaM) there are 135 cases of malignant mesothelioma with occupational exposure in the textile sector. From this case history only the cases with an exposure in the "non-asbestos" textile sector were selected and are commented below, i.e. not taking into consideration workers in companies weaving and spinning fireproof material containing asbestos. Having thus redefined the case histories we refer to 90 cases incident in the period 1993-2001 reported by 7 Regional Operative Centres (COR) (Emilia-Romagna, Liguria, Lombardy, Piedmont, Apulia, Tuscany, Veneto). These refer to 53 female (58.9%) and 37 male (41.1%) subjects. The age at the start of the neoplasia ranges from a minimum of 45 to maximum of 91 years; the median age was 70 years. For the collection of the working medical history through the standardised ISPESL questionnaire the interview was direct in 53 cases (about 58.8%), indirect in 36 cases (40%). In 1 case it was not carried out (1.2%). The most involved anatomical site of the disease is the pleura with 88 cases (97.8%). Then there are 2 peritoneal cases (2.2%) and no case involving the pericardium and the vaginal tunic of the testicle. The clinical diagnosis according to the ISPESL criteria [16] was certain in 80 cases (88.9%), probable in 7 cases (7.8%) and possible in 3 cases (3.3%). The occupational etiology was certain in 49 cases (54.4%), probable in 15 cases (16.7%) and possible in 26 cases (28.9%).

Only 3 subjects (3.3%) had worked prior to the 1950s, whilst 86 subjects (95.5%) had worked for at least 1 year even after this period. For 1 case there are no data on the years in which that person worked.

In the in-depth medical history study of mesothelioma cases of "unknown" exposure and during the comparison of issues of asbestos risk to textile workers there emerged a diversity of approach between the Regional Operative Centres (COR) (and especially the Regional Operative Centre (COR) of Lombardy and the Regional Operative Centre (COR) of Tuscany) on the exposure level attribution criteria. The assessment group of the Regional Operative Centre (COR) of Lombardy maintains it assigns an occupational exposure that is certain for all workers working after the 1950s in the spinning and weaving sectors since the use of asbestos is certain in these environments, whilst in the Tuscany Region it is deemed more adequate to also attribute preliminarily to workers in these sectors a possible exposure and to assign a certain exposure only where the criteria prescribed by the National Mesothelioma Register (ReNaM) Guidelines are complied with.

These different outlooks, which remain, will be discussed during the periodical review and updating of the National Guidelines trying to define a shared line of behaviour which does not prejudice the autonomy of the individual regional organisations and at the same time guarantees the homogeneity and legibility of the aggregate data.

In-depth study of the modes of exposure in the textile sector. Activities of the Regional Mesothelioma Register of the Lombardy region

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Since the beginning of its activity, the Regional Operative Centre (COR) of Lombardy has observed a progressively growing number of cases of MM in textile sector workers, without apparent concentrations in particular processes of the production cycle and/or of the type of yarn, recorded according to the ISPESL classification [16] as "of unknown exposure to asbestos". Therefore following the indication emerging from the case histories, which recalls the hypothesis of an ubiquitous risk of asbestos in textile production facilities, the current situation and that of the recent past were analysed gathering data from technicians, maintenance engineers and experts, carrying out inspections in environments not yet decontaminated and inspecting machines used today and in decades gone by.
Irrespective of the type of fibre processed (wool, cotton, silk, artificial fibres, synthetic fibres) and of the production phase (spinning, weaving, dye and print shops, finishing) in the textile industry the use of asbestos has been documented in *building structures, in plants and in machinery*. This use was very widespread and still persists today in a few production activities.
Building structures: until the 1970s flocked asbestos was being applied on ceilings with the purpose of reducing the phenomena of steam condensation (heat-insulating capacity) and noise (sound absorbing capacity); to this end all types of asbestos were used. In certain environments asbestos spray application was also extended to walls. In these environments maintenance interventions (electrical, hydraulic, construction work), most probably carried out without interrupting the production activity, could cause the dispersion of fibres into the environment as could any other event that "disturbed" the flocked asbestos surface (interventions on the walls, sprays of steam under pressure, vibrations, collisions, air currents, infiltrations of water).
Plants: many phases of textile production take place in warm and damp conditions; boilers and pipes insulated with asbestos also characterised other environments of the sector besides dye and print shops. Again all maintenance interventions could take place without interrupting the production activity (as confirmed by a few patients during the interview) and when insulated parts of some walls or pipes were involved, there was even quite considerable dispersion into the environment.
Machinery: all textile machinery in the second post-war period had slowing or stop brakes; until the entry into force of the ban laws all brakes were operating with friction materials containing asbestos. Shoe or ribbon brakes used to be made out of strips of asbestos woven or pressed with weak binders and fixed with riveting; in braking the dispersion of fibres due to friction was therefore especially high. In certain situations the machine was operated with continuous braking (shuttle looms, warping machines); if one considers that in a weaving shed there used to be dozens of looms in operation one can guess the size of the contribution of continuous braking to the increase in the atmospheric concentration of fine, breathable fibres [13]. For the shoes of the big ribbon brake looms there were quite frequent impromptu replacements of worn out parts with materials found on the market and often

of poorer quality in terms of compactness, and more easily dispersing fibres. The wear and tear of the brake shoes was such as to require replacement after a working period of about two years. The carding machines were equipped with big brakes to stop the heavy flywheel. The continuous spinning-wheel was equipped with large big ribbon brake, to be manually activated, operating on the driving shaft, and with pad brakes installed onto the individual spindle to stop it if the thread broke; on the twisting machines it was also possible to stop every single spindle by pushing using one's knee against a brake pad equipped with a single or double asbestos shoe against the rotating pivot; the spooler was equipped with a motorcar type shoe brake operating on a special drum as well as a "pulley" coated in material containing asbestos for transferring the rotating motion to another axis. All the looms used in the second half of the century had both clutches and brakes with asbestos shoes on the main shaft. The technological modifications made to these machines from the largest manufacturers (Saurer in Austria, Schultzer in Switzerland, Picanol in Belgium, Galileo in Italy) were significant in that period, but all concerned the traction of the weft thread and geared towards faster operating speeds; up to the start of the 1990s no innovation was brought to clutches and brakes on the other hand.
It should also be remembered that the number of machines in each environment, depending on the production type, was normally high: each worker was operating on several carding machines, combing machines, spindle frames, spinning-wheels, spoolers, twisting machines or looms, in accordance with the production efficiency of the machinery/task of the operator.
The fine dusts produced in the atmosphere were kept in suspension by the air jet cleaning systems ("travelling blowers"), installed on all the machines with various operating solutions depending on their type, in order to keep the thread clean removing any impurities adhering to it. Of particular seriousness as regards the dispersion of the asbestos fibres in the atmosphere was the widespread and indispensable operation of cleaning the machinery after every shift with a compressed air jet. The frequent repetition of the removal of dust with this technique, added to the constant automatic action of the "travelling blowers", the indispensable ambient air conditioning system and the periodical planned maintenance on the various machine equipment, were not only continuously raising the breathable fibres in the atmosphere again but, considering the properties of asbestos, acted on the larger bundles with a repeated mechanical action capable of splitting them up into a very high number of finer fibres, more breathable and more pathogenic. Obviously, this not only occurred for the fibres produced by the materials present in the machinery, but also the ones released from the building structure and from the service system insulation which settled on the machines due to gravity [14].
From a review of the case histories of the Regional Operative Centre (COR) of Lombardy in the period 2000-2004 72 cases of certain and probable MM emerged in subjects who had worked in the textile sector; 41 of these had been previously classified as having an unknown occupational aetiology. These are 54 (75%) female and 18 (25%) male subjects. 91.7% of cases was aged between 55 and 84 years; the median age of the cases is 70.5 years. Out of the 72 subjects considered 49 were directly interviewed (68%); for the other 23 cases (32%) the ISPESL questionnaire was given out to the closest relatives.
The re-evaluation of the data on exposure to asbestos carried out in the light of the recent knowledge acquired on working conditions in the sector and according to the National Guidelines of the National Mesothelioma Register (ReNaM) [16] led to the conclusion of occupational etiology as being certain in 66 cases (91.7%), probable in 2 (2.7%), and possible in 1 (1.4%); for 3 cases (4.2%) it remained of unknown origin. On the basis of the data contained in the medical history questionnaires the subjects worked with all types of yarn: cotton, wool, silk, linen, hemp, synthetic. Most subjects (69 cases, 95.8%) worked in the textile sector after the second post-war period; only 3 subjects were found to have exclusively worked in the period preceding the 1950s. In 8 subjects radiological signs of calcified pleural plaques were reported. One of these subjects had worked only in the period preceding the 1950s.
Overall the 72 subjects worked in 82 companies, for 15 of which the asbestos risk was also documented

by the Workplace Prevention and Safety (PSAL) services of the relevant Local Health Unit (ASL). Clusters of MM emerged in 15 textiles companies; for 6 of these the presence of asbestos was also documented by the Local Health Unit (ASL).

To conclude, based on the above jobs at risk of exposure to asbestos in a few textile industry sector are, besides the ones already suspected in the past (maintenance engineer and/or insulation worker of heating systems; maintenance engineer in general) also those involving spinning and spooling, the management of the mechanical looms, the processing of yarns and fabrics, the printing of fabrics and tailoring. In fact the data collected in recent years on the basis of inspections in working environments, interviews with technicians in the largest industries producing machinery for the textile industry, interviews with workers and direct inspection of machinery both cast off and still in use, allow us to consider the presence of asbestos as being certain 1) in the friction materials used, at least from the 1950s onwards, and on the spinning and weaving machines, 2) in the insulating materials in installations and, where present, 3) in the building structures of installations.

Consequently it appears necessary to pay special attention to the cases of MM in textile workers with "unknown" exposure to asbestos. For workers who worked in the sector only before the 1950s, it is reasonable, first of all, to attribute a possible occupational exposure.

If the conditions prescribed by the National Mesothelioma Register (ReNaM) are verified (i.e.: explicit declaration by the subject, declaration of the relative/cohabitant, presence of pleural plaques or positive Bronchoalveolar Lavage (BAL), environmental audits, reports of supervisory bodies, administrative-environmental documentation, declarations of colleagues/employers) [16] this exposure may instead be defined as certain. An occupational exposure that is certain must be attributed to subjects that worked for at least one year after the 1950s.

In-depth study of the modes of exposure in the textile sector.
Activities of the Regional Mesothelioma Register of the Tuscany region

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The cases present in the archive mostly come from the Prato area, where there is the highest concentration of textile industries in Central Italy. The discussion of the cases in this paragraph regards the entire “textiles” case history of the Tuscan archive. The number of people who spent at least a working period in the textile sector is 155. For 41 of these the exposure took place in other departments or sectors of production.

Of the remaining 114, for 39 (34.3%) of them occupational exposure was attributed to having worked in the preparation, weaving and finishing sectors, and 4 of them have occupational exposure that is certain, 7 probable, 28 possible. In the archive there are 49 cases (42.9%) which worked in the rag sorting sector, a flourishing raw material recovery activity centred around the Prato textile sector until not long ago. For only 6 cases it has been possible to assign certain occupational exposure and the remaining 43 are classified with possible occupational exposure. The other 26 textile workers (22.8%) remain in the unknown exposure class. As regards the quality of diagnosis, if one considers the total of those exposed in the non-sorting textile sector and the unknown ones (65 cases) for 56 (86%) we only have histology, for 8 (12.3%) clinical diagnosis and for 1 (1.7%) cytological diagnosis. In the 49 sorters 42 (85.7%) have histological diagnosis, 2 (4.1%) cytological analysis, 4 (8.2%) only clinical analysis and for 1 (2%) only the death certificate is available.

As regards the incidence of those exposed in the non-sorting textile sector the most significant period is between 1997 and 2001 with 22 cases (56%) whilst in the last 3 years there has been a dramatic drop with the recording of only one case/year. The average latency of cases arising in this period is 42.5 years; the high frequency of cases in this short period can only be attributed to a significant exposure spanning the 1960s, since there is no data on the labour force.

The Regional Operative Centre (COR) of Tuscany, with regard to the textile sector, does not have data that can attribute exposure to asbestos with certainty to a high percentage of cases. With the information originating in interviews and research carried out directly in the field some periods have been identified with certainty in which asbestos fibre became integral to the textile production cycle, for instance in 1971, but for an extremely short period (less than a year) when wool pieces were produced with 8% asbestos to be exported to the United States. Braking equipment on textiles looms started to be manufactured with friction materials containing asbestos only from 1970 whilst for the other machinery this use of asbestos occurred about 15 years earlier (witnessed by two maintenance mechanics). The insulation of the surroundings with sprayed or plastered asbestos has been discovered for the time being only at two manufactures (drycleaners-laundries) in which no case was recorded, to date. For the sorting sector an investigation carried out in the field at the end of the 1980s highlighted the presence of sacks previously containing asbestos, but which had copious mineral residues and which were being used as rag containers [5], [7]. The latter currently seems the most creditable hypothesis for the exposure of sorters, even if the vast majority of the cases interviewed did not exactly mention the presence of sacks previously containing asbestos. It must be noted that the sorters were not using any type of machinery and therefore we should exclude for this category possible exposure due to the wear and tear of friction materials. Further research is underway to reconstruct exactly how and when the recycling of the jute was taking place which could also come from sacks previously containing asbestos and which was used as a reinforcement fibre in carded wool fabrics.

The in-depth study just concluded on the cases with unknown exposure, which especially concerned the textile sector, allowed us to attribute the possible occupational band to 27 cases (formerly unknown), on the basis of the data gathered on the use of friction materials applying the criteria contained in the 2003 National Mesothelioma Register (ReNaM) guidelines. However some doubts still remain about the attribution of the cause of exposure to the wear and tear of friction materials and the reasons can be briefly summarised as follows:

- the fibre used in these materials was mainly chrysotile, which has decidedly lower mesotheliomatogenous features than amphibole asbestos, as also confirmed by the data of the Tuscan archive;
- the wear produced an unknown level of pollution which was hard to estimate and measure (the textile environments are literally invaded by vegetable and animal fibres) and was also made up of microfibres totally like the ones discovered in urban asbestos pollution [17] which up to not has not produced an appreciable number of cases in the general Tuscan population (raw rate 1.76*106) despite the very high number of exposed persons.

A confirmation of the reliability of this attribution can only be provided after having carefully evaluated the relative risk by comparing it with that of car repairers. This assessment is currently ongoing at the Regional Operative Centre (COR) of Tuscany.

References

1. IARC. Monographs on the evaluation of the carcinogenic risks of chemicals to humans (Lyon). Vol n. 48, 1990.
2. Brenner J, Sordillo PP, Magill GB, Golbey RB. Malignant mesothelioma of the pleura: review of 123 patients. Cancer 1982; 49(11): 2431-5.
3. Huncharek M. Changing risk groups for malignant mesothelioma. Cancer 1992; 69(11): 2704-11.
4. Paci E, Buiatti E, Geddes M. A case-referent study of lung tumors in non-asbestos textile workers. Am J Ind Med 1987; 11 (3): 267-73.
5. Paci E, Dini S, Buiatti E, Seniori Costantini A, Lenzi S, Zappa M. Malignant mesothelioma in non-asbestos textile workers in Florence. Am J Ind Med 1987; 11(3): 249-54.
6. Paci E, Buiatti E, Zappa M, Di Natale M, Vannucchi G, Dini S, Biancalani M. Inquinamento da asbesto nel ciclo tessile pratese: l'evidenza epidemiologica. Med Lav 1987; 78(4): 283-92.
7. Paci E, Zappa M, Paoletti L, Buiatti E, Chellini E, Merler E, Seniori Costantini A. Further evidence of an excess of risk of pleural malignant mesothelioma in textile workers in Prato (Italy). Br J Cancer 1991; 64(2): 377-8.
8. Zappa M, Paci E, Seniori Costantini A, Kriebel D. Lung cancer among textile workers in the Prato area of Italy. Scand J Work Environ Health 1993; 19(1): 16-20.
9. Barbieri PG, Migliori M, Merler E. Incidenza del mesotelioma maligno (1977-1996) ed esposizione ad amianto nella popolazione di un'area limitrofa al Lago d'Iseo, Nord Italia. Med Lav 1999; 90(6): 762-75.
10. Colli G, Terzi M, Vinci L, Terzi R, Candura SM. Un caso di mesotelioma pleurico da inusuale esposizione professionale ad amianto nell'industria della lana. G Ital Med Lav Ergon 2001; 23(1): 18-20.
11. Gorini G, Silvestri S, Merler E, Chellini E, Cacciarini V, Seniori Costantini AS. La valutazione dell'esposizione ad amianto in Toscana attraverso i dati dell'Archivio Regionale Toscano dei Mesoteliomi Maligni (1988-2000). Med Lav 2002; 93(6): 507-18.
12. Yu IJ, Choi JK, Kang SK, Chang HK, Chung YH, Han JH, Song KS, Lee YM, Chung HK. Potential source of asbestos in non-asbestos textile manufacturing company. Environ Int 2002; 28(1-2): 35-9.
13. Chiappino G, Mensi C, Riboldi L, Rivolta G. II rischio amianto nel settore tessile: indicazioni dal Registro Mesoteliomi Lombardia e definitiva conferma. Med Lav 2003; 94(6): 521-530.
14. Chiappino G, Pellissetti D, Moretto O, Picchi O. II rischio amianto nel settore tessile: i sistemi frenanti delle macchine di penultima generazione. Med Lav 2005; 96(3): 250-57.
15. http://www.ispesl.it/ispesl/sitorenam/ricerca/Relazione_conclusiva_ignoti.pdf
16. ISPESL. Linee Guida per la rivelazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei Centri Operativi Regionali. Seconda edizione. Roma: ISPESL 2003.
17. Chiappino G. Sebastien P, Todaro A. L'inquinamento atmosferico da amianto nell'ambiente urbano: Milano, Casale Monferrato, Brescia, Ancona, Bologna e Firenze. Med Lav 1991; 82(5): 424-38.

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Key:

I CENTRI OPERATIVI REGIONALI	THE REGIONAL OPERATIVE CENTRES
Centri Operativi Regionali istituiti	Regional Operative Centre already established

PIEDMONT REGION

REGIONAL OPERATIVE CENTRE (COR) OF THE NATIONAL MESOTHELIOMA REGISTER

D. Mirabelli[1], C. Magnani[1]

[1]*Register of Malignant Mesotheliomas of Piedmont region c/o Centre for Oncological Prevention of Piedmont, S. Giovanni Battista Hospital*

The Piedmont Region Malignant Mesothelioma Register (RMM) was set up by the Regional Council with resolution No. 51-2180 dated February 5, 2001, therefore earlier than Decree of the President of the Council of Ministers (DPCM) 308 dated December 10, 2002. The operative part of the resolution complies with the provisions of Article 2 of the aforementioned Decree of the President of the Council of Ministers (DPCM) 308.

The Regional Operative Centre (COR) is based at the “Tumour Epidemiology” University Department of the San Giovanni Battista Hospital in Turin that belongs to the Reference Centre for Oncological Prevention in Piedmont (CPO Piedmont). The funding of the Malignant Mesothelioma Register (RMM) is included in the overall CPO Piedmont one, with funds allocated annually by the Region on the basis of the work programmes and activities carried out.

The manager, Dr. Dario Mirabelli, and Prof. Corrado Magnani supervise the activity. Basic, specialist and support functions are entrusted to various qualified colleagues; even though this staff is not structurally organized, everyone has been working for years at the Malignant Mesothelioma Register (RMM) and is engaged in further epidemiological study and research programmes at CPO Piedmont.

Demographic aspects and the subdivision of health and prevention services in Piedmont

The Malignant Mesothelioma Register (RMM) makes use of the cooperation offered by the Workplace Safety and Prevention Departments (SPreSAL), some of which actively take part in the ordinary surveying and/or interview of cases.
In Piedmont (source: Evolving Demographic Database, BDDE) as at 31.12.2002, there were 2,044,362 men and 2,186,972 women resident, making up a total of 4,231,334 people. Since 1996 the Region has included eight provinces: Alessandria (418,203 inhabitants), Asti (209,116), Biella (187,962), Cuneo (561,729), Novara (345,952), Turin (2,172,226), Verbano-Cusio-Ossola (159,636), Vercelli (176,510).
The health service is guaranteed by 22 Local Health Units (ASL) to which five Hospitals are added. The network of the prevention services includes 19, not 22, SPreSAL and Public Hygiene Departments (SIP), since Turin, although divided into four Local Health Units (ASL), has a single SPreSAL and a single SIP. Since 1996 environmental protection has been entrusted to the Regional Environmental Protection Agency (ARPA) which has set up an Asbestos Centre as well as an Environmental Epidemiology department.
Diagnostic activity of the greatest importance for malignant mesothelioma is being carried out at present in four chest surgery wards (one in Turin, one in the Province of Turin, one in Cuneo, one in Novara). In various other centres (Alessandria, Casale Monferrato, Ovada, Turin, Verbania) the cooperation between pneumologists and surgeons allows the routine execution of thoracoscopies or videothoracoscopies and biopsies.
Furthermore, in several centres there is experience in the execution of CT-guided transthoracic needle biopsies and from Eastern Piedmont there is a significant health migration towards chest surgery centres in Milan, Como, Pavia and Genoa. It is not possible to identify departments where admission for the purposes of diagnoses, stadiation and treatment of peritoneal location cases takes place preferentially, even if some oncological and emergency surgeries are included in the network of the ordinary Malignant Mesothelioma Register (RMM) survey (see below). There are 36 laboratories and Pathological Anatomy departments currently included in the active research case network, belonging to public and private bodies of Piedmont region.

Main sources of occupational and environmental exposure

In Piedmont asbestos works underwent large scale development from the start of 1900 until the early 1980s. In Balangero, near Lanzo, the largest chrysotile mine in Western Europe was actively operating until 1985. In Turin and the Turin area, including Nole, Ciriè, Grugliasco, Moncalieri, Villastellone, various historical industries produced asbestos yarns and fabrics, paper and board loaded with asbestos, and friction materials. Other important asbestos textile industries and plants producing friction material were operating in Bruzolo, Mondovì, Ovada and Santhià. In Casale Monferrato and Cavagnolo there were two asbestos cement plants, the former used to be the biggest in Italy and one of the biggest plants in Europe. Still, the production and maintenance of railway rolling stock in Turin, Santhià and Savigliano needs also to be reminded, as well as the production in Turin of armoured military vehicles, war planes, air and sea craft engines. The use of asbestos materials in structures and installations was quite considerable. At the industrial level, metallurgy represented a significant and widespread economic activity with several steelworks, cast iron and non-ferrous metal foundries, hot rolling and hot forming works. Furthermore, the chemical and rubber industry as well as electricity production involved many installations and numerous workers. The textile industry with plants and departments for dyeing or other yarn or fabric treatments (or with dedicated plants) was very significant in the

Chieri and Biella areas. In addition to these works, in which asbestos materials were widely used in the production plants for the purposes of insulation and protection from fire risk, the industry in Piedmont region until recent years was characterised by large plants which, also because of their size, were equipped with imposing heating plants and used asbestos in order to insulate boiler shells, steam pipes, smoke stacks, equipment as well as auxiliary and user plants. The use of asbestos cement materials for making coverings, external padding, and partitions was very common. All this involved the exposure of many workers in the construction sector and in the field of installation, mechanical and electrical maintenance of heat and production plants.
The use of asbestos materials became almost generalised to the construction and civil installation industry. People were even using asbestos cement manufacturing waste very often as gravel substitutes in courtyards or as insulation in attics, and tailings from the Balangero mine as material for railway, tram and road-beds, river embankments etc..

Procedures for surveying and assessing cases, based on Decree of the President of the Council of Ministers (DPCM) 308/2

The activity of the Malignant Mesothelioma Register (RMM) extended throughout the Region from 1990. The Malignant Mesothelioma Register (RMM) estimates the incidence of malignant pleural and peritoneal mesothelioma in Piedmont, in time and space, in order to identify excesses which can provide cues for analytical investigations. The data are also used for comparisons with those of the other national or international registers.

Active research of malignant mesothelioma cases
On a weekly basis, ordinary surveying is carried out in a necessarily limited series of hospitals and, within these, in the Pathological Anatomy departments and a few main departments. The choice of hospitals and departments has been determined by the frequency of admission of pleural localisation cases for the purposes of diagnosis and treatment. One of the purposes of ordinary surveying is to identify cases more quickly, in order to obtain a direct interview right from the first admission, when the highest level of response is obtained. Furthermore, ordinary surveying is the basis of the recruitment of cases in case-control studies. The cases are surveyed by Malignant Mesothelioma Register (RMM) staff members and in two centres by staff members belonging to Local Health Unit (ASL) departments.

On an annual basis, extraordinary surveying is carried out involving all the laboratories and departments of Pathological Anatomy of public and private organisations in Piedmont region (36, currently). The aim is to supplement ordinary surveying, tracing all the cases for which there is a histological or cytological confirmation of diagnosis. The surveying of cases with histological confirmation is supposedly complete since 1990, but that of cases with cytological confirmation appears to be complete only since 2000. In fact until the year 2000, the two most important regional Pathological Anatomy departments did not have computerised archives which allowed research by diagnostic codes and/or terminology. Here it would have been necessary to carry out manual searches on the paper copies of the report archive, not feasible for the cytological reports, since they are too numerous. The extraordinary surveying is complete (in theory) but untimely, compared to the ordinary one, since it refers to reports drawn up during the previous year.

Active research in computerised current data archives
In order to check the exhaustivity of the Malignant Mesothelioma Register (RMM) survey (ordinary and extraordinary survey) and to estimate the frequency of further cases of possible MM without

histological or cytological diagnosis, a comparison is made with the archives of the Hospital Discharge Forms (SDO). From the admission data we have selected those with a ICD rev IX code for the main and accessory discharge diagnoses of primary malignant pleural tumour (163) or peritoneal tumour (158.8-158.9); the list is compared with that of cases of malignant mesothelioma already recorded. For the diagnoses from Hospital Discharge Forms (SDO) without comparison in the Malignant Mesothelioma Register (RMM) a photocopy of the medical record is requested. Any previously unknown cases for which an histological or cytological examination is available, possibly alongside an immunophenotypical assessment, are recorded. Even the cases for which diagnosis is only supported by clinical-medical history as well as radiological data and in a way consistent with the criteria of the National Mesothelioma Register (ReNaM) Guidelines are recorded. The first Hospital Discharge Form (SDO) archive used is the one dated 1996, when the completeness and quality of Hospital Discharge Form (SDO) collections became adequate.

Review of diagnoses and classification of the assessment level

During ordinary and extraordinary surveying, besides the set of data necessary for uniquely identifying the case, a copy of the relevant clinical documentation is collected, i.e. the histological or cytological or immunohisto/ cytochemical reports and, for the cases supported only by a clinical-radiological base, a copy of the relevant reports.

The Hospital Discharge Form (SDO) survey leads to the acquisition of a copy of the entire medical records, from which only a copy of the reports is extracted for filing which is relevant for the purposes of the Malignant Mesothelioma Register (RMM).

On the basis of the material gathered each case is classified from the point of view of the diagnostic background in accordance with the National Mesothelioma Register (ReNaM) Guidelines. The assessment, classification and identification of the date of incidence are carried out under the supervision and conclusive assessment of the manager for the Malignant Mesothelioma Register (RMM).

Archiving of data

An alphabetical paper archive is kept of the relevant clinical documentation for every case included in the register, and one for every excluded case. For practical reasons the current archive is kept separate from the historical one, which contains documentation relevant to incident cases in calendar periods for which:

(i) the survey is deemed exhaustive and

(ii) the diagnostic assessment, that of the etiology and the transmission of the data to the Italian National Institute for Occupational Safety and Prevention (ISPESL) have been concluded. Currently the historical archive is extended to 31/12/2001.

The computerised archive also includes a current archive and a historical one.

In this case the separation is dictated by the structure of the data.

The current archive includes the incident cases starting from 01/01/1999and it has a relational structure compatible with that of the National Mesothelioma Register (ReNaM). Furthermore, it allows the management of the activities for surveying, collecting spontaneous reports, assigning and undertaking the interview, assessing the exposure, programming schedules and others. It allows the possibility of ascribing to the same person several diagnoses over time and for each of these an non pre-defined number of clinical-diagnostic assessments. It collects the other data prescribed by the National Mesothelioma Register (ReNaM) Guidelines, such as the life status follow-up, the profile of exposures (occupational and non-occupational) and the relevant qualitative and quantitative assessments.

The historical archive is in a single table; this structure is suited to the recording of personal data, of the life status and of data referring to the diagnostic background, but with the limitation of a single diagnosis per person and a single diagnostic assessment per type, only for a few pre-defined types. It does not allow the recording of exposure profiles. These limits make it incompatible with the National Mesothelioma Register (ReNaM) Guidelines. All incident cases until 31-12-1998 are kept in this archive.

Interview and assessment of exposure

The documentation referring to the exposure profiles of the cases is based on the direct interview of the subject concerned or, subordinately, on that of a respondent. The interviews are carried out by Malignant Mesothelioma Register (RMM) staff or by the staff belonging to a few Local Health Unit (ASL) Prevention Departments, which have shown special interest in the active research of cases and the assessment of etiology.

The questionnaires are examined by an auditor, one of two expert industrial hygienists, that:

(i) records the occupational and residential histories in full, and the other circumstances of exposure limited to those which have given rise to exposure;

(ii) identifies and describes the profiles of exposures and their determinants;

(iii) carries out the qualitative assessment according to the National Mesothelioma Register (ReNaM) Guidelines and the quantitative assessment according to a protocol internal to the Malignant Mesothelioma Register (RMM).

Malignant mesotheliomas in Piedmont region: period 1999-2001

The epidemiology of MMs in Piedmont region has been the subject of two reports, published respectively in 1999 for the period 1990-1995 and in 2004 for the 1996-1998 updating. Here we present the 1993-2001 cumulative data, relating to the activity of the National Mesothelioma Register (ReNaM) and included in this second report.

Incidence

In the period 1993-2001 1,247 (783 men and 464 women) new diagnoses of certain, probable or possible MM were recorded (definitions in accordance with the National Mesothelioma Register (ReNaM) Guidelines), in 90.5% with pleural localisation (92.2% men, 87.7% women), in 9.1% with peritoneal localisation (7.3% men, 12.3% women). The diagnosis has been supported by histological examination in 77% of cases with an anatomopathological assessment clearly orientated to the MM. If we also include the assessments expressed as compatibilities with MM of the morphological and/or immunophenotypical pattern the proportion rises to 86%. In a further 8% of cases the clinical and morphological pattern was supported by one or more cytological examinations.

The distribution of cases by age groups and year of incidence is shown, respectively, in Tables 1 and 2.

Definition of exposure

The definition of the occupational exposure to asbestos is made in accordance with the National Mesothelioma Register (ReNaM) Guidelines. The proportion of cases for which exposure data are available has increased over time. In particular, the proportion of cases for which an etiological assessment has been carried out grew from 13% to 70% between 1997 and 2001. Previously, the exposure data were only gathered for cases included in the population-based case-control studies.

Focusing on the three-year period 1999-2001, in 213 cases out of 299 evaluated there was at least one period of occupational exposure (72%): for 140 the exposure was certain, for 37 probable and for 36 possible. For 86 cases there were no working periods with exposure (two of which were subjects who had never worked). However 78 of them reported occurrences of non-occupational exposure (34 domestic, 28 environmental and 16 of other kinds in a domestic environment). Only 8 cases were classified as “unknown” (exposure class 8 according to the National Mesothelioma Register (ReNaM)). Sectors with occupational exposure most frequently represented do not belong to traditional asbestos manufacturing. The construction industry is by far the best represented, especially in relation to the laying and removal of asbestos cement material. A significant number of cases is concentrated in activities that use large amounts of asbestos insulation materials, especially the chemical and rubber industry and in metallurgy.

Acknowledgments

The data collection was made possible thanks to the cooperation of chest surgery, pneumology, and general surgery wards, and all the Pathological Anatomy and Histology departments. Professionals in the local departments and the Occupational Diseases Observatory of the Turin Public Prosecutor’s Office also contributed. A special thanks to Dr. Anna Maria Cacciatore (Local Health Unit –ASL- No. 15) and to Dr. Rossana Prosperi (Local Health Unit –ASL- No. 22) and to their colleagues.

Tabella 1. Distribuzione dei casi per sede di primitività, sesso e classe d'età

	Pleura		Peritoneo		Totale	
Classe d'età	Uomini	Donne	Uomini	Donne	Uomini	Donne
00-49	60	30	8	6	68	36
50-59	125	59	13	9	138	68
60-69	241	105	21	19	264	124
70-79	210	145	12	16	224	161
80+	86	68	3	7	89	75

Table 1. Distribution of cases by site of primary tumour, gender and age groups.

Key:

Pleura	Pleura
Peritoneo	Peritoneum
Totale	Total
Classe d'età	Age groups
Uomini	Men
Donne	Women

Tabella 2. Distribuzione dei casi per anno di incidenza e sesso e per anno di incidenza e sede di primitività

	Sesso			Sede		
Anno	Uomini	Donne	Totale	Pleura	Peritoneo	Tutte
1993	64	37	101	92	8	101
1994	57	28	85	78	6	85
1995	64	40	104	91	12	104
1996	87	34	121	113	8	121
1997	95	56	151	137	14	151
1998	99	62	161	138	23	161
1999	101	62	163	148	15	163
2000	104	79	183	170	13	183
2001	112	66	178	162	15	178

Table 2. Distribution of cases by year of incidence and gender and by year of incidence and site of primary tumour.

Key:

Sesso	Gender
Sede	Site
Anno	Year
Uomini	Men
Donne	Women
Totale	Total
Pleura	Pleura
Peritoneo	Peritoneum
Tutte	All

AUTONOMOUS REGION OF VALLE D'AOSTA

REGIONAL MESOTHELIOMA REGISTER

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The mesothelioma register of the Valle d'Aosta Region was set up in May 2005 and is based at the Occupational Medicine Department of the Local Health Unit (AUSL) of Valle d'Aosta.
It makes use of the part time activity carried out by the manager Dr. Marina Verardo in cooperation with Dr. Enrico Detragiache.
In the Region, with only Aosta as a Province, according to the National Institute of Statistics (ISTAT) 2004 data, 122,868 people are resident as at 31 December (60,534 men and 62,334 women). There is a single Local Health Unit (AUSL) for the whole territory; the reference diagnosis and care organisations for the register are: the Chest Surgery Ward, and the Ward of Pneumology, Oncology and Pathological Anatomy. The only public Occupational Medicine Department is the Department of Occupational Medicine within the Public Health and Hygiene Budgetary Unit.
The main industrial activities of the Region were and currently are the iron and steel industry, particularly active in the production of special steels, a sector which employs the highest number of workers (24%). Furthermore, until the early 1970s an asbestos quarry (serpentine) was active at Emarèse (near Settarme). This area, like others in the region, is geologically known for the presence of asbestos producing serpentine rocks.
Chrysotile production has undergone an intermittent trend, associated with production methods, market demand, wartime requirements and the availability of the labour force. Reliable estimates, supplied by the Mineral Office in Turin, indicate a production of about 1300 tonnes/year for the years 1940/1947, of about 1000 tonnes/year for the period 1948/1960 and of about 400 tonnes/year for the period 1961/1970.
The Emarèse site is currently subject to a reclamation project included in the prescriptions of Ministerial Decree No. 471 of October 25, 1999 and was entered into the national programme for environmental restoration and reclamation of polluted sites, while the intervention for the reclamation and restoration of these areas is already in its advanced planning stage.
The data collection was carried out in cooperation with a few departments of the Aosta Hospital (Pathological Anatomy, Chest Surgery, Oncology, Pneumology) and with the Workplace Prevention and Safety Department (SPreSAL) of the Local Health Unit (AUSL) of Valle d'Aosta.

Procedure for surveying and assessing cases

The surveying of incident cases was carried out through research:
- of the Diagnosis Related Group (DRG) codes shown in the Hospital Discharge Forms (SDO) of the hospital admissions records at the Hospital of Aosta;
- among the causes of death shown in the death certificates;

- of histology and cytology data supplied by Pathology Anatomy;
- of occupational disease notifications addressed to the Workplace Prevention and Safety Department (SPreSAL) of the Local Health Unit (AUSL) of Valle d'Aosta;
- of the notifications directly reported by the hospital wards;
- that is active research of the medical records with codes for asbestos-related diseases (according to ICD IX).

The classification of cases under examination was based on the Italian National Institute for Occupational Safety and Prevention (ISPESL) criteria (2003 Guidelines).
We decided to consider the number of cases diagnosed in the period 2000-2004 (5 years) since the available data are homogeneous and complete.

Mesothelioma case histories over the period 2000-2004

Incidence year	Gender		Anatomical site				Total
	Women	Men	Pleura	peritoneum	pericardium	testicle vaginal	
2000	0	1	0	1	0	0	1
2001	2	2	4	0	0	0	4
2002	1	3	4	0	0	0	4
2003	1	3	4	0	0	0	4
2004	1	4	5	0	0	0	5

Distribution of mesothelioma cases subdivided by age class, gender and anatomical site where the mesothelioma developed

Age class	Gender		Anatomical site				Total
	Women	Men	Pleura	Peritoneum	Pericardium	Testicle Vaginal	
<50	0	1	1	0	0	0	1
50-59	1	1	2	0	0	0	2
60-69	1	4	5	0	0	0	5
70-79	2	6	7	1	0	0	8
>80	1	1	2	0	0	0	2
Total	5	13	17	1	0	0	18

18 cases (13 men and 5 women) have been so far assessed and defined for the years 2000-2004 (five-year period). In 16 cases out of 18 the report of the histological examination with immunohistochemistry was traced. For five of these cases, all recognised and compensated by the Italian National Institute for Insurance against Occupational Accidents (INAIL), it has also been possible to attribute with certainty a past occupational exposure (iron and steel metallurgical industry).
As regards the distribution by gender it emerges that 72% of mesotheliomas affected men, whilst 28% (5 cases) were manifested in women. By analysing the working activity of the five female cases, a possible correlation was highlighted in two cases with past working activity (ironers), whilst in the other three cases no occupational association was identified.
As regards the anatomical site, there is a marked predominance for the pleura (94%) and the group most affected is the one aged between 70 and 79 years (44%). Only one case (6%) was diagnosed in a 49-year-old male subject. The analysis of the data reported so far shows an increased incidence of mesothelioma cases occurring in Valle d'Aosta in the five-year period 2000-2004 compared to previous years. These data must certainly be carefully monitored, although they match what is currently happening at the national and international level. This increased incidence can be partly attributed to an improvement in the quality of oncology diagnostics and, in particular, to a greater sensitivity and diagnostic specificity associated with the histological and immunohistochemical investigations.
Moreover, it is necessary to consider the small figures characterizing the region of Valle d'Aosta, according to which a significant variation in terms of incidence between one year and the other may be obtained; it is therefore necessary to follow the trends in the next years in order to confirm or instead to

contradict such trend.
The known cases generally confirm that the latency period of these diseases is particularly long, but there remains a concern for the appearance of occupational diseases of this type and the need to examine in detail the causal factors as well as to improve the activities of diagnosis and prevention.

Acknowledgments

The data collection was made possible thanks to the cooperation of staff at the Data Flow Department of the Local Health Unit (USL) of Valle d'Aosta and the Workplace Prevention and Safety Department (SPRESAL) as well as the Departments of Oncology and Pathological Anatomy of the Regional Hospital of the Valle d’Aosta.

LIGURIA REGION

MESOTHELIOMA REGISTER OF LIGURIA REGION
REGIONAL OPERATIVE CENTRE (COR) LIGURIA 1994-2005.

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Introduction

The Liguria Region and the National Institute for Cancer Research (IST) of Genoa in 1994 created the Mesothelioma Register (Mesothelioma Register-REM) with the purpose of clarifying a few discordant aspects referring to an excess of asbestos tumours in Liguria as well as scientifically studying malignant mesothelioma (MM) under the epidemiological point of view. The Mesothelioma Register (REM) was devised as a population-based tumour register specialised in the study of mesothelioma especially based on legal guidelines, but also taking into account the specificity of the relationship with exposure to asbestos, the use of MM as an event pointing to other asbestos-related diseases, the scientific experience of staff and finally the economic limitations which were preventing more costly studies from being carried out although broader and more detailed.
The Mesothelioma Register (REM) was identified by the Italian National Institute for Occupational Safety and Prevention (ISPESL) as a Regional Operative Centre (COR) of Liguria and, together with other 4 Regional Operative Centres (Piedmont, Emilia Romagna, Tuscany and Apulia) it contributed to laying out the guidelines of the National Mesothelioma Register (ReNaM) of the Italian National Institute for Occupational Safety and Prevention (ISPESL) (Art. 36, Legislative Decree 277, 1991).
The research protocol for the Mesothelioma Register (REM) was approved by the ethical committee of the National Institute for Cancer Research (IST) and after a period of gradual expansion and organisational, geographical and scientific consolidation, since 1996 the Mesothelioma Register (REM) has been studying incidence, distribution and etiology of MM in the 4 Ligurian Provinces (overall, about 1.6 million resident subjects).
Since 2000 the Mesothelioma Register (REM) has been accredited by the International Association of Cancer Registries (IACR) which published its results on the monograph entitled Cancer Incidence in Five Continents (Vol. 8; IARC, 2002). In 2003 the Mesothelioma Register (REM) was also officially recognised as a Regional Operative Centre (COR) by the Liguria Region, which supplemented and confirmed the previous resolution. Since 2005 the Regional Operative Centre (COR) of Liguria has also been accredited by the Italian Association of Tumour Registers (AIRT).
The Regional Operative Centre (COR) of Liguria has been working alongside the main departments of diagnosis and treatment in Liguria, with other Regional Operative Centres (COR), other tumour registers, Workplace Prevention and Safety Operational Units (UOPSAL) of the Local Health Units (ASL), the Italian National Institute for Insurance against Occupational Accidents (INAIL), patronage institutions and judicial authorities in order to carry out scientific investigations on clinical,

epidemiological, statistical, legal, regulatory, and public health aspects and, not least, for the recognition of occupational diseases.

Staff

The Regional Operative Centre (COR) is based on the cooperation of a female technician and a female biologist employed for the project as well as a female technician of the University of Genoa working part-time at the Epidemiology and Biostatistics Centre of the Epidemiology and Prevention Department of the IST of Genoa acting as a deputy assistant. This staff has many years of experience with patient interviews, administering questionnaires, the collection, classification, coding and input of clinical and etiological data. Quality control, data analysis and production of reports has been carried out by two contract employees: a biologist specialised in statistics (1996-2003) and by a graduate in economics who is an expert in statistics (2003-2006).
The manager for the Regional Operative Centre (COR) is the medical director of the Descriptive Epidemiology and Tumour Register centre of the IST and is an occupational physician specialised in oncology, hygiene and preventive medicine geared towards public health. The deputy assistant and the Regional Operative Centre (COR) manager are structurally organized and carry out their activity part-time in the Regional Operative Centre (COR).

Objectives and methods

The main activity of the Regional Operative Centre (COR) consists of the timely identification, selection, analysis and spreading of the set of demographic, geographical, temporal, clinical and etiological data for patients with mesothelioma, in order to study its possible correlation with exposure to asbestos. The data is checked and on demand, returned to the patients and authorised bodies.
The Regional Operative Centre (COR) acts in three ways:
1) it surveys and audits all possible mesothelioma diagnoses in residents of Liguria;
2) it sets each patient (or spouse) a 30-60 minute interview, looking at the medical history to identify possible exposure to asbestos at work and outside of work;
3) it analyses the data and enters it into a computer and after a suitable quality control, publishes the results.
About half the patients with mesothelioma diagnosis are actively reported by the clinical departments, while the remainder mainly come from the analysis of the Hospital Discharge Forms (SDO) of the Liguria Region and from other Regional Operative Centres (COR).

Results

Incidence
In the period 1994-2005, the Regional Operative Centre (COR) identified about 1,500 new mesothelioma patients (80% men). About 140 new cases are recorded annually. The age at time of diagnosis is between 34 and 97 years (average = 71) in men and between 41 and 98 years (average = 74) in women. Due to the better accuracy in respiratory diagnostics, the incidence is deemed more complete and reliable for the pleural localisation where 99% of mesotheliomas are recorded. About 65% of diagnoses are morphologically confirmed. The remainder are assessed clinically and with radiodiagnostic methods.
In the whole Region, analysed since 1996, incidence appears to be slightly increasing in men, but

slightly decreasing in women.
The incidence of MM calculated in the period 1996-2002 confirms the already well known trend by age and gender and identifies Genoa as the province with the highest number of new cases per year, whilst La Spezia shows the highest incidence (in relation to a smallest number of resident subjects) in mens. In the province of Imperia we can observe the lowest regional incidence, comparable in the two fenders and more similar to the national value (Figures 1, 2).
For 614 (out of 945) cases it was possible to microscopically assess the morphology of MM. Overall the epithelial type was more frequent (66%) than the fibrous (10%), biphasic (9%) and non-specific (15%) types. In the distribution by gender, the epithelial type is more frequent in women (73.8%). For 924 new incident cases in the period 1994-2001 (follow-up at December 2002), it was possible to calculate the median survival rate which was 9.4 months (8.5 – 10.3) in men and 7.7 months (6.5 – 8.9) in women. The Cox regression analysis, adjusting for the main variables, allowed us to identify the best survival rate in men aged less than 67 years (first tertile), with *certain* diagnosis and epithelial morphology.

Occupational and environmental exposure to asbestos

In the period 1996-2002, 43.4% of questionnaires were given directly to the patients.
By applying the ReNaM exposure assessment and classification criteria, we examined the possible etiological factors in 83% of patients (786/945 cases).
As could have been predicted, despite analysing the same working areas, the sick subjects' relatives reported a lower frequency of exposure to asbestos than the patient. This confirms the importance of timeliness in surveying the medical history even if it is objectively impossible to undertake a complete survey of historical exposure.
For the cases of MM that are deemed to be certain under clinical and occupational aspects, we have estimated an induction and latency period of about 45 years (SD = 11.3) and an average period of 25 years from the cessation of the last exposure.
In men 53% of cases is defined as *certainly* exposed to asbestos in the workplace, whilst a further 30% can be classified with *probable* and *possible* occupational exposure to asbestos.
Certain exposure was identified in many working areas such as: *construction, shipbuilding, sea transport, handling of goods in harbours, mechanical industry, iron and steel industry, oil refineries, chemical industry*, etc., and in many different job duties within the same sectors.
La Spezia and Genoa are the provinces with the highest presence of production plants and the frequency of workers potentially exposed to asbestos is positively correlated with a higher frequency of MM.
The analysis by *first certain exposure* to asbestos, in men with certain and probable MM cases (n = 413), has shown that age at first exposure is between 9 and 55 years (average = 22.6), whilst the duration of the first exposure is between 1 and 53 years (average 16).
In women cases of domestic and family-related exposure are predominant (n = 28 cases).
The analysis of 1,486 working periods identified through direct interview of 378 patient (men), showed that many of the sick subjects (contrary to the beliefs of some people) do not emphasise contact with asbestos, nor do they report past occupational exposure identified by other patients and work colleagues. This may be linked to several problems (heterogeneity of the work environment, age, a patient's memory, stage of the disease, etc.) and suggests the need for further investigations to widen knowledge about the possible working areas and jobs at risk. An explorative analysis of these selected patients has highlighted that in 52.5% of working periods patients had undergone exposure to asbestos that is certain, probable or possible whilst in the remaining 47.5% of the periods the exposure was improbable or unknown.

Against 786 cases of MM with an etiological medical history, we attribute a very small number of cases *to the environment with reasonable certainty*: 0.16% in men and 6.16% in women (1 and 9 cases respectively). However, in the absence of plausible alternative explanations we are tempted to attribute *to the environment* with smaller certainty, since there is less evidence in the medical history, therefore 14.5% of men and 53.4% of women (171 cases) are classified with unknown exposure. We figured this explanation since we observe that the expected M/W ratio ≊ 4.0 (usually attributable to occupational exposure) and which is registered in the set of Ligurian case histories, contrasts with the equal distribution between genders of the absolute number of patients with unknown exposure (M/W ratio ≊ 1.0). A similar number of patients among the two genders can be observed in the whole regional population and within each province and also seems to emerge from other Regional Operative Centres (COR).
In support of this assumption we also need to remind that, the populations in the 4 Provinces are not historically characterised by particular *differences* in migration flows *between* provinces, but they show instead differences between hill and coastal areas within the same province. This estimate must in any case be examined in detail with new analyses and re-evaluated after a comparison with the results of other studies.

Perspectives

Given the increase in the number of different problems stressed by many of the subjects, we would like to: consolidate and increase the working group, maintain quality, completeness and timeliness in the survey, bring the temporal and geographical trends up to date, identify other possible populations, areas and jobs at risk and lastly, but not least, spread the *asbestos lesson* far and wide at the local and international level, so that people understand the importance of the *primary* prevention of diseases caused by asbestos and by other toxic and carcinogenic agents present in the work environment and outside of work.

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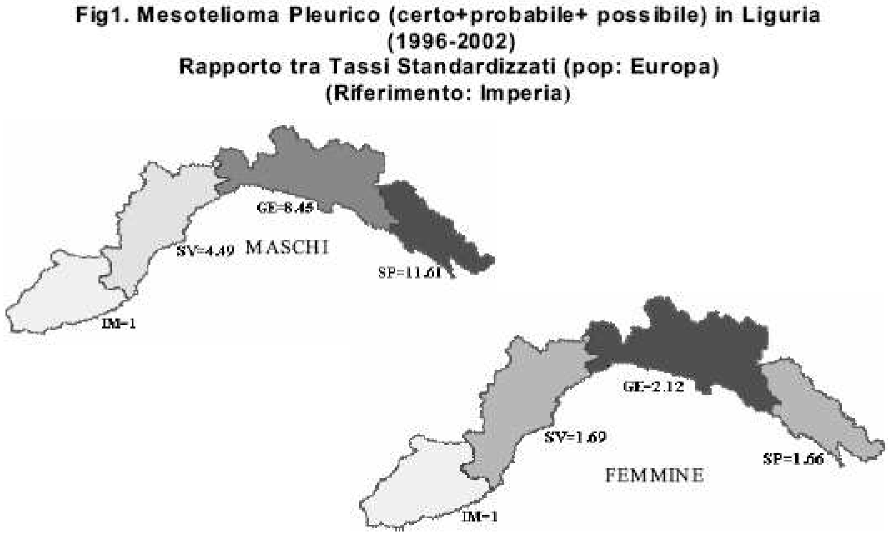
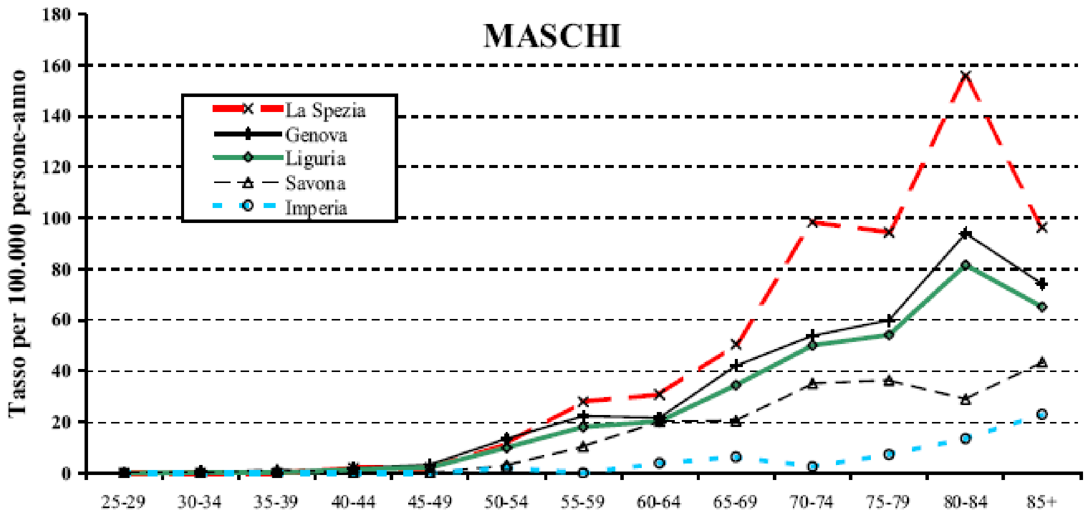


Figure 1. Pleural Mesothelioma (certain + probable + possible) in Liguria (1996-2002)
Ratio between Standardised Rates (pop. Europe) (Reference city: Imperia)

Key:

Maschi	Men
Femmine	Women
IM	Imperia
SV	Savona
GE	Genoa
SP	LaSpezia

Figura 2. Tasso età specifico (per 100.000 persone-anno) del Mesotelioma Pleurico (certo + probabile + possibile) - Liguria 1996-2002



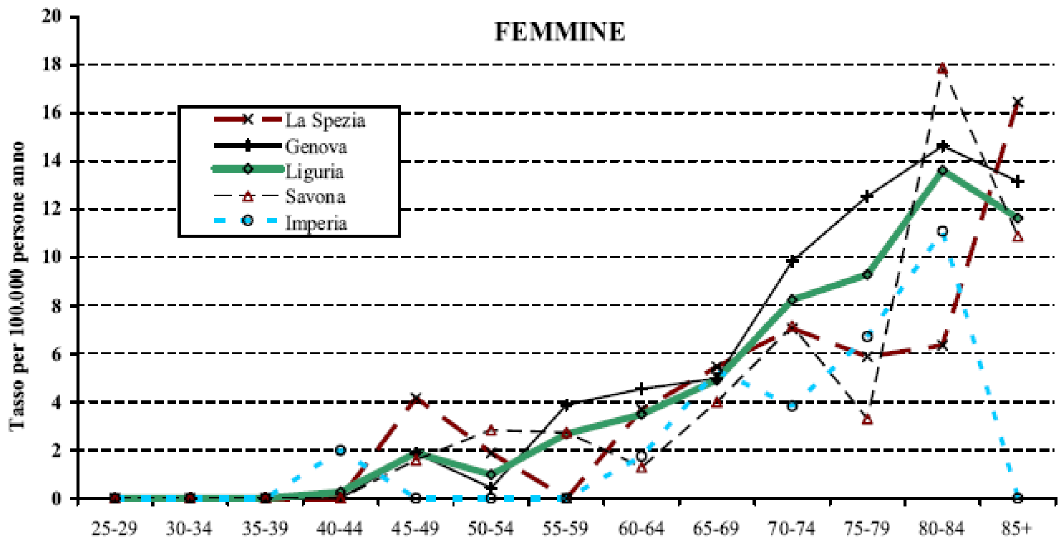


Figure 2. Age rate specific (per 100,000 persons-year) of the Pleural Mesothelioma (certain + probable + possible) Liguria 1996-2002

Key:

MASCHI	MEN
FEMMINE	WOMEN
Tasso per 100.000 persone-anno	Rate per 100.000 persons/year
La Spezia	LaSpezia

Genova	Genoa
Liguria	Liguria
Savona	Savona
Imperia	Imperia

COR-Liguria publications

Gennaro V, Ugolini D, Viarengo P, Lazzarotto A, Montanaro F, Bianchelli M, Benfatto L, Puntoni R. lncidence of pleural mesothelioma in Liguria Region, Italy (1996-2002) European Journal Cancer 2005,41: 2709-2714

Gennaro C, Tomatis L. Business Bias. How epidemiologic studies may underestimate or fail to detect increased risks of cancer and other diseases. Int J Occup Environ Health 2005,11:356-359. http:/hw.ijoeh.com/pfds/lJOEH_1104_Gennaro.pdf

Gennaro V, Parodi S, Ceppi M, Montanaro F. Cancer in oil refineries: absence of risk or misclassification? Epidemiol Prev May-Jun 2003, 27(3):173.

Gennaro V, Marinaccio A, Nesti M & Regional Operational Centers. Survival analysis for mesothelioma cases in the Italian register (ReNaM). Eur J Cancer2003 Jun, 39(9):1290-5.

Gennaro V, Ceppi M, Montanaro F. Reanalysis of mortality in a petrochemical plant producing vinyl chloride and polyvinyl chloride. Epidemiol Prev. 2003 Jul-Aug;27(4):221-5.

Gennaro V, Montanaro F. Mesothelioma as marker of both exposures and effects. Monaldi Arch Chest Dis. 2003 Apr-Jun, 59(2):101-2.

Gennaro V, Montanaro F, Ceppi M, Fontana V, Perrotta A, Puntoni R, Finkelstein MM, Silvano S. RE. Mesothelioma and lung tumors attributable to asbestos among Petroleum workers. Reply to Tsai et al.'s Letter to the Editor. Am J Ind Med 2001, 39:517-521.

Gennaro V, Montanaro F, Ceppi M, Fontana V, Perrotta A, Puntoni R, Finkelstein MM, Silvano S. RE. Mesothelioma and lung tumors attributable to asbestos among Petroleum workers. I Reply to Bailey's Letter to the Editor. Am J Ind Med 2001; 39:522-523.

Gennaro V, Montanaro F, Lazzarotto A, Bianchelli M, Celesia MV, Canessa PA. Mesothelioma registry of the Liguria region. lncidence and occupational etiology in a high risk area. Epidemiol Prev. Sep-Oct, 2000, 24(5):213-8.

Gennaro V, Finkelstein MM, Ceppi M, Fontana V, Montanaro F, Perrotta A, Puntoni R, Silvano S. Mesotheliomas and lung tumors attributable to asbestos among oil refinery workers. Am J Ind Med 2000. 37:275-282.

Gennaro V, Ceppi M, Boffetta P, Fontana V, Perrotta A Pleural mesothelioma and asbestos exposure among Italian oil refinery workers. Scand J Work Environ Health 1994, Jun, 20(3):213-5.
Italy, Liguria mesothelioma Cancer Registry, in Cancer Incidence in Five Continents Vol. Vlll 2002, IARC Scientific Publications No. 155:366-7,595.

Montanaro F, Bray F, Gennaro V, Merler E, Tyczynski JE, Parkin DM, Strnad M, Jechov'a M, Storm HH, Aareleid T, Hakulinen T, Velten M, Lefevre H, Danzon A, Buemi A, Daur'es JP, Menegoz F, Raverdy N, Sauvage M, Ziegler H, Comber H, Paci E, Vercelli M, De Lisi V, Tumino R, Zanetti R, Berrino F, Stanta G, et al; ENCR Working Group. Pleural mesothelioma incidence in Europe: evidence of some deceleration in the increasing trends. Cancer Causes Control. 2003 Oct;14(8):791-803. Erratum in: Cancer Causes Control. 2004 Feb,15(1):103.

Montanaro F, Ceppi M, Puntoni R, Silvano S, Gennaro V. Asbestos Exposure and Cancer Mortality among Petroleum Refinery Workers: A Poisson Regression Analysis of Updated Data. Archives of Environmental Health. 2004, 59 (3).

Montanaro F, Vitto V, Lagattolla N, Lazzarotto A, Bianchelli M, Puntoni R, Gennaro V. Occupational exposure to asbestos and recognition of pleural mesothelioma as occupational disease in the province of Genoa. Epidemiol Prev. 2001 Mar-Apr, 25(2):71-6.

Mould RF, Lahanas M, Asselain B, Brewster D, Burgers SA, Damhuis RA, De Rycke Y, Gennaro V, Szeszenia-Dabrowska N. Methodology for lognormal modelling of malignant pleural mesothelioma survival time distributions: a study of 5580 case histories from Europe and USA. Phys Med Biol. 2004 Sep 7,49(17):3991-4004.

Nesti M et al. (eds) Linee guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'lSPESL da parte dei centri operativi regionali. ISPESL Monograph, Rome 2003.

Nesti M, Marinaccio A, Chellini E & Regional Operational Centers. Surveillance of malignant mesothelioma cases and definition of asbestos exposure: 1997 data of ReNaM. Epidemiol Prev 2003 May-Jun, 27(3):147-153.

Nesti M, Marinaccio A, Chellini E & Regional Operative Centers. Malignant mesothelioma in Italy. 1997. Am J Ind Med 2003.

Nesti M, Marinaccio A, Silvestri S. (eds) II Registro Nazionale dei Mesoteliomi. Primo rapporto. ISPESL Monograph, Rome 2001.

Parodi S, Montanaro F, Ceppi M, Gennaro V. Mortality of petroleum refinery workers. Occup Environ Med. 2003 Apr, 60(4):304-5; author reply 305-6.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=16243515&query_hl=1

LOMBARDY REGION

THE MESOTHELIOMA REGISTER OF LOMBARDY

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The Mesothelioma Register of Lombardy (RML) was set up with a Council Resolution since 1995 (Regional Council Resolution –DGR- No. VI/2490 dated 22/09/1995) and started being operative on 01/01/2000. In 2003 in accordance with Decree of the President of the Council of Ministers (DPCM) No. 308/2002, RML was formally recognised as a Regional Operative Centre (COR) of the National Mesothelioma Register (ReNaM). The register is based at the "L. Devoto" Occupational Clinic of Milan (Department of Occupational Medicine of the University of Milan) and is located within two important University centres: EBPI (Inhaled Dust Biological Effects directed by Prof. G. Chiappino) and EPOCA (Occupational, Clinical and Environmental Epidemiology directed by Prof. P.A. Bertazzi); thus the RML is based on the experience gathered on occupational diseases due to asbestos by the staff of EBPI and, at the same time, makes use of the epidemiological skills of the EPOCA Centre.
The Register receives funding from the Lombardy Region which enables to employ two full-time staff (manager and secretary) and a part time data entry worker. Furthermore, the Regional Operative Centre (COR) makes use of the cooperation offered by 1-2 physicians specialising in Occupational Medicine.

The RML collects all the cases, even suspected, of malignant mesothelioma of the pleura, peritoneum, pericardium and vaginal tunic of the testicle, occurring since 1 January 2000 in subjects living in Lombardy. The population surveyed based on the 2001 census is 9,121,643 (4,433,244 men and 4,688,399 women). The Regional Health System is based on 15 health units (Local Health Unit-ASL), 29 Hospitals, 6 Scientific Institutes for Research, Hospitalization and Health Care (IRRCS) and 188 hospitalization and health care organisations set up in agreement with the National Health Service (SSN). In particular there are 12 chest surgery, 47 pneumology, and 38 Pathological Anatomy departments.

The first two years of the RML allowed us to confirm the effectiveness of the double-objective model proposed: the first objective concerning the collection of knowledge elements useful for protecting public health was easily reachable despite the difficulty of the long latency period found for the pathology studied. Situations at risk in fact emerged that are still important today and which may be addressed by means of appropriate prevention interventions. The second objective concerning the provision, through the register, of a service useful to patients and their relatives in terms of simplification of the insurance procedure and of possible specialist health services provided by the Occupational Clinic, was reached also thanks to the cooperation especially established with the Italian National Institute for Insurance against Occupational Accidents (INAIL), trade unions and the Public Prosecutor's Office.
The information useful for prevention provided by the register is all the more precise the more the case history is composed of mesotheliomas that are considered to be certain, because otherwise the

confusing effect of falsely positive cases may be strong enough to compromise the entire significance. The well known complexity of the diagnostic procedure for mesothelioma has produced many case histories outlined in the literature that were not found to be acceptable after a rigorous assessment of the case selection criteria.
In order to reach maximum accuracy in the identification of mesotheliomas, the Register of Lombardy Region has created a tool that has proved to be very effective, represented by an Assessment Group which is constituted by Specialists in Occupational Medicine, Pathological Anatomy, Oncology, Pneumology, Epidemiology, Hygiene and Industrial Technology. In the course of weekly meetings the Group, for each of the cases reported to the RML, evaluates first the documentation of the diagnostic assessments, and then the data regarding the asbestos risk collected in the standardised questionnaire. Thus the clinical diagnosis is either confirmed or contradicted and the possible causal relationship is reconstructed with the formulation of judgements accompanied by, where necessary, adequate justification. In general, the Group operates by considering that mesothelioma diagnosis cannot be only histological-histochemical, since none of the current investigation methods and not even the application of several morphological methods allows us to make diagnoses, when the clinical-radiological aspects are not compatible. The set of morphological data must therefore be compared with the clinical aspects before formulating a reliable diagnosis [Armed F., 1994]. In particular, when the bioptic samples are small, the "multimodal approach" to diagnosis is essential [William & Wilkins, 1996].
For each case therefore, having evaluated the clinical, radiological and histological-histochemical aspects reported in the documentation, an assessment is made about the degree of diagnostic accuracy (mesothelioma that is certain, probable, possible, and non-mesothelioma) before considering the data relating to a possible exposure to asbestos.
The first two-year period also allowed the satisfactory testing of the several collaborations external to the Register concerning the notification of cases by selected mesothelioma diagnosis and care departments and the submission of the clinical documentation by the Hospital Directorates. In particular, it has to be mentioned the valuable cooperation offered by the Workplace Prevention and Safety Departments (SPSAL) of the 15 Local Health Units (ASL) and the 9 Occupational Medicine Hospital Operational Units (UOOML) in the collection of the asbestos risk data for each case.

Comment on the results (National Mesothelioma Register –ReNaM- Tables)

Each year the Regional Operative Centre (COR) of Lombardy receives more than 300 reports. The case histories presented in the summary tables are to be considered almost fully complete for the year 2000 and complete by 70% for the year 2001: they consist of the cases assessed and concluded by the Assessment Group in accordance with the Italian National Institute for Occupational Safety and Prevention (ISPESL) Guidelines. Exposure to asbestos has been recognised in 62% of cases, of which about 50% are of occupational origin, a proportion which increases to over 60% if one considers cases with a higher degree of diagnostic certainty (certain and probable MM). About 5% of exposures are of the environmental type, mostly attributable to residence in the Municipality of Broni (PV) contaminated with asbestos fibres due to the manufacturing of asbestos cement products between 1919 and 1987. Cases classified as unknown or improbable are re-assessed annually by the aforementioned group following any emerging knowledge of technologies and exposure.

Descriptions of the surveillance activity carried out by the Regional Operative Centre (COR) of Lombardy are made in the annual report "Health and Environment in Lombardy" published by the Lombardy Region. Furthermore, the activity has been documented by 8 full length articles and 9 presentations submitted at national and international conferences.

The Regional Operative Centre (COR) of Lombardy has adhered to the biennial Project financed by the Italian National Institute for Occupational Safety and Prevention (ISPESL) for the in-depth study of mesothelioma cases with "unknown" exposure (B37/MDL/02 research) coordinated by the Regional Operative Centre (COR) of Tuscany; within the framework of this project the possible presence of asbestos has been examined especially in the textile sector [Chiappino G. *et al.*, 2003], [Chiappino G. *et al.*, 2005]. Furthermore, the COR of Lombardy also took part in the Project financed by the Italian National Institute for Occupational Safety and Prevention (ISPESL) for the in-depth study of "malignant mesothelioma cases with non-pleural localisation" (B45/MDL/03 research) coordinated by the Regional Operative Centre (COR) of Emilia-Romagna.

Training activities

The teaching activity of the Regional Operative Centre (COR) is mainly subdivided as follows:

1) Medical students as well as students specialising in Occupational Medicine visit the headquarters of the Regional Operative Centre (COR) for short information courses, or (2-3 people/year) for annual-biennial on-the-job-training periods aimed at promoting the participation in targeted studies constituting the subject of theses and/or scientific publications.

2) At least once a year the Regional Operative Centre (COR) of Lombardy organises training courses for the health staff (physicians, health operators and nurses) of the Local Health Unit (ASL) and Occupational Medicine Hospital Operational Units (UOOML) appointed to collect data for possible exposure to asbestos through a questionnaire arranged by the Italian National Institute for Occupational Safety and Prevention (ISPESL).

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For completeness checks, RML makes use of the cooperation offered by the Regional Epidemiological Observatory from which it acquires the Hospital Admission and Discharge Forms (SDO), the Tumour Registers present in the region (Varese, Sondrio, Mantua, Milan), the Epidemiology and Public Hygiene Departments of the Local Health Unit (ASL) for the acquisition of the mortality data.
In order to computerise the archived data the Regional Operative Centre (COR) of Lombardy uses the National Mesothelioma Register (ReNaM) software provided by the Italian National Institute for Occupational Safety and Prevention (ISPESL). Furthermore, two accessory databases linked to the National Mesothelioma Register (ReNaM) were specifically created for the archiving of variables in addition to the ones included in the original programme and for the drawing up of a file of companies at which the subjects had worked.

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We should thank the staff of the hospital wards involved in notifying the cases, especially that of the Pathological Anatomy, Pneumology and Chest Surgery Departments; also those who are involved in sending the clinical documentation (Health Departments, Medical Record Archives), but above all the staff of the Workplace Safety and Prevention Departments (PSAL) and the Occupational Medicine Hospital Operational Unit (UOOML) which actively works towards the reconstruction of possible exposure to asbestos in patients with professionalism and devotion.
We would also like to thank the members of the Assessment Group of the Register and the Specialist Practitioners, and especially in alphabetical order: Canti Z., Giordano S., Riboldi L., Rivolta G., Termine L.

References

Armed F. Tumors of Serous Membranes. Inst. Path. Washington 1994; 61

Chiappino G, Pellissetti D, Moretto O, Picchi O. II Rischio amianto nel settore tessile: i sistemi frenanti delle macchine di penultima generazione. Med Lav *2005*, 96(3): 250-257.

Chiappino G., Mensi C., Riboldi L., Rivolta G. II rischio amianto nel settore tessile: indicazioni dal Registro Mesoteliomi Lombardia e definitiva conferma. Med Lav *2003*, 94(6): 521-530.

William & Wilkins Pathology of Mesothelioma in Textbook of Thoracic Oncolog. 1996; 773

AUTONOMOUS PROVINCE OF TRENTO

MALIGNANT MESOTHELIOMA REGISTER OF THE AUTONOMOUS PROVINCE OF TRENTO

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Organisation of the Register and cases of interest

The Malignant Mesothelioma Register of the Autonomous Province of Trento is looked after by a few officers of the Workplace Prevention and Safety Department Operational Unit (U.O.P.S.A.L) of the Health Services Provincial Unit (APSS). The Register is based at the offices of U.O.P.S.A.L. in P.zza A. Leoni 11/A, 38068 Rovereto (TN).
The Mesothelioma Register (REM) includes all the incident cases of mesothelioma among the population resident in the Autonomous Province of Trento starting from 1997. The benign mesotheliomas and those found to be non-mesotheliomas after the subsequent in-depth studies are in any case entered into the archives but subsequently excluded from the incidence calculation. The cases of mesothelioma in persons not resident are sent to the local authorised registration centres and excluded from the incidence calculations.

Objectives of the Mesothelioma register

- Systematic collection and recording of all cases of malignant mesothelioma of the pleura, the peritoneum, the pericardium and the testicle diagnosed among the residents of the Autonomous Province of Trento in order to estimate the incidence, mortality and survival of the neoplasia in the reference population.
- Systematic collection of the individual data on the working and environmental history of the cases regarding the possible exposure to asbestos with a reconstruction of the history correlated to the exposure itself.

Sources of data

The sources of data include all the Pathological Anatomy Departments, of the Province and the neighbouring ones, the Departments of Pneumology and Chest Surgery, and the Hospital Discharge Forms (SDO). The primary source for surveying cases is the Operational Epidemiological Surveillance Unit of the Provincial Health Services Unit through the sending of the Central Statistics Institute (ISTAT) death certification.

Data collection procedures and definition of exposure to asbestos

The definition of the exposure takes place through the criteria proposed by the National Mesothelioma Register (ReNaM) and the data is collected on the basis of the standardised questionnaire, given out to the patient or their relatives, which collects the indicative data on the possible occupational, environmental and domestic exposures to asbestos.

Results

In the period 1997-2005, 50 cases were recorded, of which 11 were excluded, 10 because they resulted from the non-mesothelioma investigations carried out and one because the person was resident in another Province. Of the 39 remaining cases under the Mesothelioma Register (REM) (24 men and 15 women), 36 mesotheliomas are of pleural origin, 2 cases affected the peritoneum and one case affected both the pleura and the pericardium.
92%, equivalent to 36 cases, was defined on bioptic samples and only three cases, equal to 8%, were diagnosed with instrumental examinations (Rx, Computed Axial Tomography (CAT)).
In order to evaluate exposure to asbestos interviews were carried out on all incident cases: in 9 cases (23.1%) the patient was directly interviewed.
Exposure to asbestos (occupational, environmental, domestic) was found in 32 cases, equal to 82.5%. For 7 cases, equal to 17.5%, the data were incomplete and insufficient to assign an exposure category and therefore are classified as unknown exposure.
For 26 cases occupational correlations to asbestos were identified, of which 10 with certain exposure, 8 men and 2 women. The two women used to work in the asbestos grinding department of the company producing insulating material over the years 1928-73. Of the 8 men, three were former metalworkers assigned to the repair and maintenance of motor vehicles and railway locomotives, two were installers and maintenance engineers of ovens and thermohydraulic systems. The other three cases respectively belong to construction (installation of Eternit roofs), agriculture (extraction of fruit juices with asbestos filters) and furniture production (construction of kitchens with asbestos panels used for thermal insulation).

The first study of mortality due to diseases correlated to occupational exposure to asbestos in the Autonomous Province of Trento stems from 1977 and affects 428 former workers of a company which for 45 years, between 1928 and 1973, produced insulating materials called “superisolante (superinsulating)”, composed of magnesium carbonate (obtained from the processing of dolomite extracted from the local quarries) and asbestos (amosite, imported from abroad, especially South Africa).
Of the former workers, 373 were exposed to asbestos, 53 were not exposed, and lastly for 2 of them the exposure is still unknown. Of the cohort of 373 occupationally exposed persons, at the time of the update of the study in 1995, 203 had died: 74 due to cancer, 8 due to asbestosis, 121 due to other causes.
According to the studies carried out until the end of 1995, a proportion approaching 60% of cases of malignant tumour could be ascribed to asbestos exposure. It follows that, if we add the deaths due to asbestosis, to the more than 40 malignant tumours caused by asbestos, until that moment there were at least 50 work-related deaths in the factory. Therefore, if one worker in every four exposed at that time had died (or was set to die) due to the work in the factory, it seems we can assume that, of the cohort of 373 exposed persons, there will be altogether almost a hundred deaths caused by exposure to asbestos-

amosite occurring in the company in question between 1928 and 1973.
Since the Mesothelioma Register (REM) of the Autonomous Province of Trento was activated three reports of pleural mesothelioma arrived affecting the company producing insulating material, of which two were related to former workers and one was related to the domestic exposure of a woman who as a youngster used to brush the work clothes of her father who worked in the aforementioned company and who had died in 1960 due to a pulmonary neoplasia.

VENETO REGION

REGIONAL MESOTHELIOMA REGISTER OF VENETO

E. Merler[1]

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The Veneto Regional Register of Cases of Mesothelioma was set up in 2001, after a feasibility assessment and a training course for the operators (Regional Council Resolution (DGR) 508 dated 9 March, 2001). The implementation resolution is accompanied by a detailed description of the operating model adopted. In 2003 the Regional Council recognised that the Register was "*active and operational*" and, implementing Decree of the President of the Council of Ministers (DPCM) 308 dated 10 December, 2002 concerning the maintenance procedures of the national register of cases of asbestos-related mesothelioma, formalised the Register as a Regional Operative Centre (COR) i.e. as a "*coordination centre for the whole Region for the collection and management of the data and institutional link point of the national register of correlated cases of asbestos mesothelioma already operational at ISPESL*", appointing a manager for the activity (Regional Council Resolution (DGR) 1980 dated 4 July, 2003).

The Veneto Region register of cases of mesothelioma is held at the Workplace Prevention, Hygiene, and Safety Department (SPISAL) of Padua and a regional working group, made up of a referee for the Province, shadows the project manager. The register has been considered to be part of the Regional Epidemiological System. The aim of implementing it was included in the first Three-year Plan for the Promotion of Health and Safety at Work (Regional Council Resolution (DGR) 5083/98, 2811/99) and therefore its implementation contributed to the setting up of the Regional Socio-medical Plan 1999-2001. This was financed with funds targeted towards the Three-year Plan, with about 25,000 Euros per year.

Although the establishment resolution prescribed the execution of the activity starting from the new cases of mesothelioma arising in residents of Veneto since the start of 1999, it was agreed with the Regional Workplace Prevention, Hygiene and Safety Department (SPISAL) to reconstruct and examine in detail cases of mesothelioma arisen at least since 1987. This decision meant carrying out an intense work activity right from the start.

The reasons behind the decision to undertake a retrospective activity alongside a perspective activity were the wish to align the Veneto Region to the Regions which had already developed epidemiological surveillance of mesothelioma and to annul the accumulated delay between European Directive and legal implementation of the National Mesothelioma Register; also to contribute to the development of the National Register with a consistent case history and concerning a wider time span; also to have rapidly available information useful for evaluating the effects of past industrial use of asbestos in the regional context.

The Veneto Region register of cases of mesothelioma made a clear choice on the criteria and the priorities of work. It identified the instruments with which to prioritise research into the cases of mesothelioma supported by a histological or cytological diagnosis and for these subjects it stressed the

undertaking of interviews targeted towards the subjects or their relatives. For the subjects for which the affirmation of being affected or having died due to mesothelioma was not based on histological or cytological investigations, it did not emphasise data collection through interviews.
The identification of cases of mesothelioma is made possible by the cooperation of various regional Health Service bodies (e.g. the Socio-medical Resource Directorate of the Veneto Region periodically sends to the Register the data on the hospital admissions coded upon discharge for primary pleuroperitoneal tumour, which are subsequently checked by the Workplace Prevention, Hygiene and Safety Department (SPISAL), by the regional diagnosis and treatment health facilities (e.g. the main Pathological Anatomy and Chest Surgery bodies of the Region have reconstructed the subjects diagnosed or treated by them for mesothelioma and report each new diagnosis to the Workplace Prevention, Hygiene and Safety Department (SPISAL) or to the Register, by specialist bodies (e.g. the Tumour Register of Veneto, which currently covers half of the regional population, managed the communication of data on new cases known to them).
The population of Veneto is estimated at 4,527,694 subject to the 2001 census, of which 2,204,420 are male.
In the Veneto Region there are 22 Socio-medical units and 2 Hospitals.
Each year there are between 900 and 1,000 hospital admissions of residents of Veneto in regional health facilities coded as diagnosis upon discharge of primary pleural tumour and primary peritoneal and retroperitoneal tumour, concerning about 500 subjects, admissions which are checked separately to identify, also using this source, the 80 or so new cases of mesothelioma which occur each year among the residents of Veneto.
The reconstruction of the possible past exposure to asbestos pivots on the activity of the staff of the Workplace Prevention, Hygiene, and Safety Departments (SPISAL) who approach the subject or their cohabitants and carry out an interview and then use their historical memory to express a preliminary judgement on the probability of exposure to asbestos which may be present for those specific situations. A particular effort is made towards reconstructing the whole working history of each subject: a copy of the employment record card is always sought, (the National Social Security Institute –INPS- researches the data on all the periods of contribution), and a database has been developed concerning all the companies in which subjects affected by mesothelioma have undertaken a period of work and for each, information is researched, through various sources, on consumption of asbestos or use of asbestos-based products.
It was possible (in May 2005) to identify 1,093 new cases of pleural or non-pleural mesothelioma, mostly arising from 1987 onwards, and for 1,000 of these (91.5% of the case histories identified) activities were carried out to reconstruct possible past exposure to risk factors.
The modest discrepancy, which is also not final, between cases of mesothelioma identified and cases studied in-depth is an indicator of the high level of compliance with the regional and national project on mesotheliomas, of the justified adhesion by the Regional Workplace Prevention, Hygiene and Safety Department (SPISAL), of the success of the working procedures adopted.
The cases of mesothelioma have been, in general, examined in detail by the local SPISAL (with two exceptions: the staff of the Department of Medicine and Public Health, University of Verona, carries out the interviews of cases of mesothelioma admitted in the two City Hospitals of Borgo Trento and Borgo Roma; the in-depth studies concerning the residents of Local Health Unit (ULS) 5, Arzignano, were carried out, in general, by the staff of the register); various SPISALs interview the cases admitted in the hospitals of the Local Health and Social Services Unit (AULSS) irrespective of the residence of the subjects and send the result to the subject's local SPISAL.
The SPISALs of the Local Health and Social Services Units (AULSS) of Venice and Padua carried out proportionally the highest number of in-depth studies (for 200 and 150 cases of mesothelioma, respectively), so that alone they contributed to 35% of the regional activity. In the Provinces of Treviso and Verona over a hundred cases were examined in-depth.

The failures consist at present of about fifty cases not followed up because the person died and did not have relatives or had relatives who refused to give an interview.
The Register has already sent the Italian National Institute for Occupational Safety and Prevention (ISPESL) the data on cases of mesothelioma identified and examined in detail for the years between 1993 and 2001, the last year for which ISPESL requested information from the regional registers.

Results

The Veneto Region register of cases of mesothelioma, at the end of the activity now shown, has a large history of mesothelioma cases studied in-depth.
The progression of the work carried out was documented in a few publications shown in full in the bibliography, of which two were made up of detailed reports, the second of which, now sent for publication [Merler E. et al., in publication], [Merler E. et al., 2005], illustrates various issues.
Assessments are presented on the mortality and incidence of the pathology in Veneto and of the temporal trend of incidence of mesothelioma: in the Veneto Region the incidence of mesothelioma is experiencing net growth for the entire period under analysis, more marked for men.
As regards mortality and incidence the survey confirms (Figure 1) the difference between mortality due to primary pleural tumour (which is higher) and the incidence of pleural mesothelioma, a difference which is accentuated with age of subjects at diagnosis (Figure 1). The incidence has been evaluated by us on the basis of the availability of anatomopathological diagnoses and an explanation of the difference resides in the recourse to diagnostic thoracoscopies, differentiated according to the age at "mesothelioma" diagnosis.
The current publication includes an assessment of survival of the mesotheliomas arising in the population of Veneto, an assessment which allows an understanding of the impact of the treatments effectively carried out in this specific population and in the period analysed (the results are included in the chapter relating to the issue in this report).
As regards the studies regarding the presence of exposure to asbestos in cases of mesothelioma it has been possible to make estimates - on the entire case history and subdivided by gender – of the probability due to work-related, environmental or domestic exposure, and to formulate frequency assessments of cases of mesothelioma in relation to the production activity carried out or to the sector.
The in-depth study of the insurgent cases of mesothelioma in residents of Veneto shows that a past exposure to asbestos is considered to be present in 92.6% of men and 83.7% of women, when one considers cases of pleural mesothelioma set in after 1990, supported by histological diagnosis, directly interviewed. These percentages are reduced (89.3 and 70.5% respectively) if one considers the whole set of cases of mesothelioma analysed, i.e. including cases not interviewed directly. This is a worsening caused by a lower quality of data collected with indirect interviews. In men the probability of exposure to asbestos is determined predominantly through occupational exposure, whilst in women the probability of occupational exposure is of the same order of magnitude of that due to environmental and domestic exposure to asbestos.
The working activity which, in the period examined, produced the highest number of cases of mesothelioma is work in construction, an activity which includes insulation using asbestos, present in a small number of subjects, however.
Among the original aspects there emerges the risk of having worked abroad as a migrant for a period, so that even clusters of cases of mesothelioma are reported, caused by work in single companies [Merler E. et al., 2003], [Merler E. et al., 2001], [Merler E. et al., 2000].
The availability of the data obtained on the individual work places allows us to illustrate, for the period considered, which the specific production activities were that produced the highest number of cases of mesothelioma in the Veneto Region.

These assessments are accompanied by an estimate, expressed only for men, of the mesothelioma risk (not the highest number of cases but the highest frequency in those exposed) due to having worked in 14 sectors of production, an estimate obtained starting from a reconstruction of the number of workers in each sector obtained from the population surveys.
The working activities shown to cause the highest risk of mesothelioma in the residents of Veneto, with a rate higher than 100 cases of mesothelioma per 100,000 subjects at risk per year, are work in the asbestos cement industry, railway rolling stock building and repair, and shipbuilding.

Widening the activities

Through the cases of mesothelioma analysed it has been possible to identify the areas of production of Veneto that have been behind cases of mesothelioma and in which, therefore, one must hypothesise that an exposure to asbestos has been present which has involved other workers, a judgment that is reinforced when there are clusters of cases of mesothelioma per individual production activity. Among the objectives of the regional register of cases of mesothelioma indicated in the Establishment Resolution there is that of “evaluating the effects of past industrial use of asbestos in order to analyse the impact and the spread of the pathology”.
In order to achieve this objective it is indispensable to collect personal data of people who worked in a series of production activities, an activity that has already been started, in collaboration with the Workplace Prevention, Hygiene and Safety Department (SPISAL) where some companies were located, and with other collaborations. Currently, although for some companies it has not been possible to reconstruct the personal data of all the workers exposed to the asbestos risk, it has already been possible to reconstruct the employees that in Veneto worked in construction and in large railway vehicle repairs (approximately 8,500 workers have been identified) and in the production of asbestos cement products (approximately 1,000 workers have been identified). In December 2003 a new Regional Resolution (Regional Council Resolution (DGR) 4078/2003) required the Registry of cases of mesothelioma to carry out an epidemiological survey on the subjects exposed to asbestos at work, researching cases of lung tumour set in or due to arise. The activity will consist on the one hand of the enlargement of the initiatives of finding the personal data of those exposed to asbestos in residents of Veneto, and on the other of the use of computer sources (chiefly the Hospital Discharge Forms (SDO)) and of the formalisation of a cooperation between the Register of cases of mesothelioma and the Tumour Register of Veneto.
The activity of collecting personal data is made easier by the presence of thousands of requests for early retirement made to the National Social Security Institute (INPS) and assessed by the Italian National Institute for Insurance against Occupational Accidents (INAIL) as regards the reconstruction of the periods of work at risk. INAIL correctly evaluated that these data can be useful for the activities of epidemiological surveillance which the Health Service may be interested in developing and guaranteed the transfer of data.

Here follows the members’ list of the malignant mesothelioma regional group who are permanent members of the Register as well:

Maria Nicoletta Ballarin, physician, SPISAL (Workplace prevention, Hygiene and Safety Department) AULSS (Local Health and Social Services Unit) 12 for the province of Venice
Ernesto Bellini, physician, SPISAL AULSS 18 for the province of Rovigo
Vittoria Bressan, statistician, SPISAL AULSS 16
Rosanna Bizzotto, physician, SPISAL AULSS 15 for the province of Padua
Francesco Gioffrè, physician, SPISAL AULSS 16, deputy manager of the Register

Daniela Marcolina, physician, SPISAL AULSS 1, for the province of Belluno
Barbara Mazzuccato, nurse, SPISAL AULSS 16
Enzo Merler, physician, SPISAL AULSS 16, manager of the Register
Luciano Pillon, physician, SPISAL AULSS 9, for the province of Treviso
Sara Roberti, statistician, SPISAL AULSS 16
Luciano Romeo, physician, Department of medicine and Public Health, University of Verona, for the province of Verona
Giovanna Tessadri, physician, SPISAL AULSS 6, for the province of Vicenza

The following members joined the malignant mesothelioma regional group during the period 2001-November 2005:

Roberto Bronzato, physician, SPISAL AULSS 6 for the province of Vicenza
Patrizia de Matteis, physician, SPISAL AULSS 8 for the province of Treviso
Maria Mion, health operator, SPISAL AULSS 16

Figura 1. Mortalità età-specifica per tumore primitivo pleurico e incidenza del mesotelioma pleurico registrati nei residenti della Regione Veneto nel periodo 1990-1999

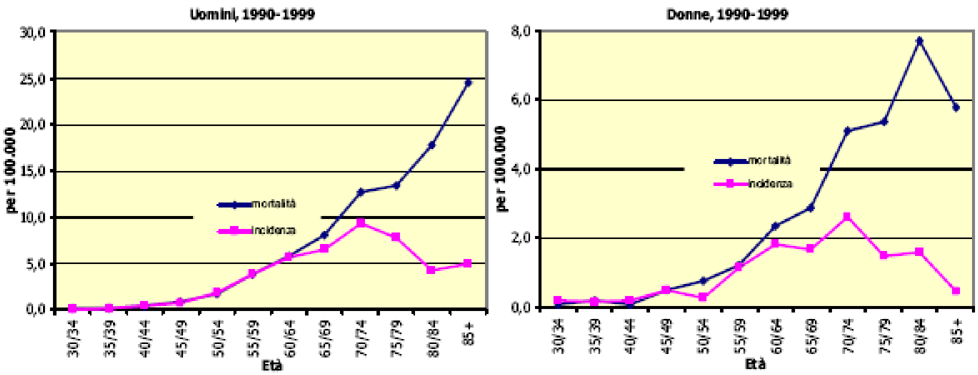

Figure 1. Mortality by age–specific of the primary pleural tumour and incidence of the pleural mesothelioma. Data collected among resident people of the Veneto Region over the period 1990-1999.

Key:

Uomini, 1990-1999	Men, 1990-1999
Donne, 1990-1999	Women, 1990-1999
mortalità	mortality
incidenza	incidence
Età	age
per 100.000	Per 100.000

References

Merler E, Roberti S. (eds) II ruolo dell'esposizione lavorativa ed ambientale ad amianto nella genesi dei casi di mesotelioma insorti in residenti del Veneto (in press)

Merler E. II Registro regionale veneto dei casi di mesotelioma: contesto e risultati. In: Regione Veneto. In: La promozione della salute negli ambienti di lavoro. La pianificazione delle attività nella regione Veneto 1999-2004. Officine Grafiche Litosei, Rastignano, Bologna 2005; 45-52

Merler E, Roberti S e il Gruppo regionale veneto sui mesoteliomi. L'esposizione ad amianto come causa di mesoteliomi nel Veneto: risultati ed attività del Registro regionale veneto dei casi di mesotelioma. Proceedings of the Convegno nazionale amianto lsola di San Servolo, Venezia, 8 March 2004. Stamperia Cetid, Venezia, marzo 2005; 32-40

Merler E, Roberti S, Gioffrè F, Contin G e il Gruppo regionale sui Mesoteliomi Maligni. I mesoteliomi tra gli addetti alla costruzione e riparazione di mezzi ferroviari e tra il personale che ha lavorato per le Ferrovie, in Veneto". Ambiente, risorse e salute 2004, 97: 55-58

Merler E, Bazzotto R, Calisti R, Cavone D, De Marzo N, Gioffrè G, Mabilia T, Marcolina D, Munafò MG, Zambon P. Mesotheliomas among Italians, returned to the home country, who worked when migrant at a cement-asbestos factory in Switzerland2. Sozial und Präventivmedicine 2003, 48: 54-58

Merler E. II Registro regionale veneto dei casi di mesotelioma. In: Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro. Rapporto Annuale Regionale 2001, Veneto. Tipografia INAIL, Milano, ottobre 2002, 59-63

Merler E, Gioffrè F, Mabilia T, De Marzo N, Bazzotto R, Sarto F, Zambon P. Emigrazione di ritorno: un cluster di mesoteliomi in Veneto tra ex-lavoratori della ETERNIT AG di Niederurnen, Svizzera. Epidemiologia e Prevenzione 2001, 25: 161-163

Merler E, Gioffrè F, Rozio L, Bazzotto R, Mion M, Sarto F. Mesoteliomi pleurici insorti in donne, residenti del Veneto, addette alla cernita di stracci presso robe vecchie e cartiere. La Medicina del Lavoro 2001, 92: 181-186

Merler E, Gioffrè F, Sarto F, Tognazzo S, Zambon P ed il Gruppo regionale sui Mesoteliomi Maligni (eds). II ruolo dell'esposizione lavorativa ed ambientale ad amianto nella genesi dei casi di mesotelioma insorti in residenti del Veneto. Primo report. Regione Veneto, Padova, 2001

Merler E, Ercolanelli M, de Klerk N. Identificazione e mortalità dei migranti italiani, ritornati in Italia, che hanno lavorato alla miniera di crocidolite di Wittenoom Gorge, Western Australia. Epidemiologia e Prevenzione 2000, 6: 255-261

FRIULI-VENEZIA GIULIA REGION

REGIONAL OPERATIVE CENTRE (COR) OF THE NATIONAL MESOTHELIOMA REGISTER

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The Mesothelioma Register of the Friuli Venezia Giulia Region was set up by resolution of the Regional Council No. 1279 dated 8 May 2003, in the transposition of Article 2 of Decree of the President of the Council of Ministers (DPCM) 308/2, and benefits from targeted funding.
The Regional Operative Centre (COR) is based at the "Occupational Medicine" SCDU of the University Hospital "Ospedali Riuniti in Trieste". The activity is guaranteed by the head of the centre, Dr. Renata De Zotti and by Prof. Corrado Negro. Support cooperation is given, in the collection of the data, through occasional services provided by qualified staff.
The Regional Operative Centre (COR) set up a close collaboration with the six Workplace Prevention and Safety Operational Units (UOPSAL) working in the Health Units (ASS) of the Region.
in the Region, according to the registry office data updated as of 31.12.2002, there are 1,196,512 residents of which 577,734 are men and 618,778 are women. The Region is made up of 4 Provinces: Trieste (243,903 inhabitants), Udine (523,548 inhabitants), Pordenone (289,540 inhabitants), and Gorizia (139,521 inhabitants).
There are six Health Units covering the whole Region (No. 1 Triestina, No. 2 Isontina, No. 3 Alto Friuli, No. 4 Medio Friuli, No. 5 Basso Friuli, No. 6 Friuli Occidentale). As well as the "Occupational Medicine" SCDU of the University Hospital in Trieste, there are six Occupational Medicine Departments (one for each Health Unit (ASS)). In the Region there are: a department of Chest Surgery, three of Pneumology, eight Pathological Anatomy Wards and thirteen structures with beds for oncology patients.
Centres of industry of particular significance, for the specific risk, can be identified in shipbuilding and the harbour areas.

Procedures for surveying and assessing cases based on the Decree of the President of the Council of Ministers (DPCM) 308/2

After setting up the Regional Operative Centre (COR) the search for incident cases was started using the following sources:

- periodical data flow (using the regional information network) on the relevant codes for discharge and disease (and SNOMED)
- death certification
- reports of histology/cytology/autopsy supplied by the Pathological Anatomy Departments, reporting by the departments (Chest Surgery, Oncology, Pneumology, etc.)
- periodical data from the Tumour Register of the Friuli Venezia Giulia Region

• reports from other Regional Operative Centres (COR)

The definition of the degree of certainty of the diagnosis of pleural or peritoneal mesothelioma or that in other locations occurs through the recovery of histology data reports *in vivo* and/or from autopsy, cytology, immunohistochemistry and from medical records.

The definition of past exposure to asbestos is made:
• where possible, by interviewing the person concerned. The interviews are carried out by the relevant UOPSAL staff, which have taken part in training courses.
• acquiring data from the UOPSALs, INAILs, INPSs, etc..
• planning interviews with relatives, for subjects in serious health conditions or deceased. This choice is a priority when all the other sources of data on past exposure to asbestos are found to be insufficient.

The data collected, regarding both the disease and past exposure to asbestos, are coded according to the National Mesothelioma Register (ReNaM) Guidelines.

Cases of mesothelioma in the Province of Trieste: period 1995-1999

The periodical data flow on the discharge and disease codes, through the regional information network, began at the end of 2003, and therefore incidence data are not yet available for cases of MM diagnosed in the Region, starting from 1 January, 2000, as prescribed by Decree of the President of the Council of Ministers (DPCM) 308/02. Provisional data, only on the disease, have recently been documented for the Province of Trieste, for the period 1995 to 2003 [D. Calligaro 2004].
The Regional Operative Centre (COR) of Friuli Venezia Giulia began, nevertheless, the retrospective assessment of cases of pleural and peritoneal MM for the Province of Trieste, for the period 95-99, using as a source of data the cases marked as incident, for that period, by the Regional Tumour Register.

Definition of the Disease

In the period 1995-99, for the Province of Trieste, 108 cases were reported by the Tumour Register, of which 98 are from the Mesothelioma Register with MM diagnosis that is certain or probable [R. De Zotti *et al.*, 2005]. Of the 98 incident cases (90 men and 8 women) 90 are pleural and 8 peritoneal. 96% of cases have a histological diagnosis; only in 4% was the diagnosis based on cytological and clinical/radiological data. In 19% of cases the diagnosis was post-mortem records.
The distribution by age groups (Tab. 1) and by year of incidence (Tab. 2) is shown in the following tables.

Tabella 1

Età	**Peritoneo(N.)**		**Pleura(N.)**		**Totali (N.)**	
(classi)	**Donne**	**Uomini**	**Donne**	**Uomini**	**Donne**	**Uomini**
<50			1	2	1	2
50-59		1		23	0	24
60-69	1	1	3	19	4	20
70-79		4	1	22	1	26
>80	1		1	18	2	18
Totali	2	6	6	84	8	90

Table 1

Key:

Età	Age
(classi)	(classes)
Peritoneo (N.)	Peritoneum (N.)
Pleura (N.)	Pleura (N.)
Totali (N.)	Total (N.)
Donne	Women
Uomini	Men
Totali	Total

Tabella 2

Anno	Sesso(N.)		Sede(N.)		Totali (N.)
Incidenza	Donne	Uomini	Pleura	Peritoneo	
1995	1	15	14	2	16
1996	2	24	25	1	26
1997	2	12	12	2	14
1998	0	19	18	1	19
1999	3	20	21	2	23
Totali	8	90	90	8	98

Table 2

Key:

Anno	Year
Incidenza	Incidence
Sesso (N.)	Gender (N.)
Sede (N.)	Site (N.)
Totali (N.)	Total (N.)
Donne	Women
Uomini	Men
Pleura	Pleura
Peritoneo	Peritoneum
Totali	Total

Definition of exposure

For the definition of the occupational exposure to asbestos the National Mesothelioma Register (ReNaM) Guidelines were used. In this analysis the assessment of non-occupational exposure to asbestos could not be taken into consideration, since only in very few cases was an interview possible with the subjects concerned or the relatives. For the assessment of the occupational exposure employment record cards, the documentation held by UOPSAL, INAIL, INPS and clinical records were sought. It was possible to attribute a past occupational exposure to 68 cases (69%): for 39 of such cases a certain exposure was found, for 17 cases the exposure was considered to be probable, while for 12 cases it was deemed to be possible. With reference to 11 cases, there were no data available on the working activity, while 19 cases were classified as “unknown” (exposure class 8 according to ReNaM) since no adequate elements were found in order to classify the past exposure. The more frequently represented sectors characterized by a certain/probable/possible exposure were the following: shipyards and the port sector.

Acknowledgments

The collection of data hereby presented was developed through the cooperation of the Tumour Registers of Friuli Venezia Giulia Region as well as the INAIL branch of Trieste together with the contribution of several territorial service operators. We also wish to thank Dr. A. Muran (UOPSAL ASS1), Dr. D. Calligaro and Dr. L. Finotto.

References

Calligaro D. I primi dati del Registro Mesoteliomi del Friuli Venezia Giulia, per la provincia di Trieste. Thesis on Occupational Medicine - University of Trieste. Academic Year 2004-2005.

R. De Zotti, D. Calligaro, L. Finotto, A. Muran, C. Negro. L'esposizione professionale ad asbesto come causa di mesotelioma pleurico e peritoneale in provincia di Trieste. Proceedings of the 68° Convegno Nazionale SIMLII, Parma October 2005; 451-453.

R. De Zotti, D. Calligaro, L. Finotto, A. Muran, C. Negro. Mesoteliomi Maligni in provincia di Trieste. Proceedingsof the Convegno Le patologie correlate all'amianto e la sorveglianza sanitaria degli ex esposti. Pisa aprile 2005; 139-140.

EMILIA-ROMAGNA REGION

THE MESOTHELIOMA REGISTER OF EMILIA-ROMAGNA REGION

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Introduction

The Mesothelioma Register (REM) of Emilia-Romagna Region is a register of malignant tumours specialised in the study of the incidence and etiology of mesothelioma of the pleura, peritoneum, pericardium and vaginal tunic of the testicle. The Mesothelioma Register (REM) is kept at the Public Health Department of the Local Health Unit (AUSL) of Reggio Emilia, where a Tumour Register specialised in the surveying of incident mesothelioma cases in the Province was already set up. The register was set up following a mortality study conducted on a cohort of workers employed in the ten companies belonging to the asbestos cement sector of Emilia-Romagna region. The Results highlighted an excess of mortality due to malignant tumours of the respiratory system and especially of the pleura. In effect, eight of these companies had been actively operating in the Province of Reggio Emilia where a large group of engineering companies, which concentrated after the Second World War, were especially devoted to the construction, repair and demolition of railway locomotives and carriages and therefore used to practice insulation with friable matrix asbestos. The Mesothelioma Register (REM), set up by Regional Council Resolution on 01/01/96, also functions as a Regional Operative Centre (COR) of the National Mesothelioma Register (ReNaM) of ISPESL, the Italian National Institute for Occupational Safety and Prevention (Articles 36, Legislative Decree 277/91 and 2, Decree of the President of the Council of Ministers 308/02). The Objectives of the Emilia-Romagna Mesothelioma Register (REM) are represented by the gathering of all incident cases of malignant mesothelioma in the Region and the acquisition, for each one of them, of data which allow a correct definition of diagnosis and a standardised attribution of occupational and/or environmental exposure to asbestos.
Below, the account of the register’s experience for the period 1993-2005 follows. The Incidence data for the three-year period 1993-95 are incomplete, mostly referring to the Province of Reggio, whilst starting from 1996 the incidence is reported for the whole region. The incidence can be considered almost complete for the years 1996-2003, whilst for the subsequent period an active research of cases for the completion of the survey is currently underway.
The Emilia-Romagna Region extends over a surface area of 22,124 km^2; the territory is divided into nine Provinces and the resident population in 2001 was 4,037,095 (2,077,516 women and 1,959,579 men).

Materials and methods

The Mesothelioma Register (REM) records all cases of malignant mesothelioma of the pleura, pericardium, peritoneum and vaginal tunic of the testicle arising since January 1, 1996 in subjects

resident in the Region at time of diagnosis. Suspected mesotheliomas, benign mesotheliomas and those found not to be resident in the Region are also recorded, but are in fact excluded from the incidence calculation.
For each recorded case, besides the reports of the anatomopathological investigations carried out, the acquisition of the medical records relating to significant hospital admissions, undertaken at public and private, regional or non-regional health Units. The examination of said health documentation, by the Mesothelioma Register (REM) medical staff, determines the diagnostic classification of the case and the gathering of most of the recorded data.
The classification of the exposure adopted is that proposed by the National Mesothelioma Register (ReNaM). The personal and occupational etiology data and those on the living environment are gathered by an analytical questionnaire, proposed by the National Mesothelioma Register (ReNaM), given out to the patient or their closest relatives, organised by the occupational medical staff of the Public Health Departments, making up the Regional Survey Network.
The involvement of the Local Prevention Services medical staff tends to develop the historical body of knowledge on the local production industry of the SPSAL. This is all the more significant if one considers that the network of these services in Emilia-Romagna is widespread and has been operating, generally, since the 1970s.
The Regional information network includes all the institutes and Pathological Anatomy Departments, public and private, operating in the region, the various hospital wards where the local patients affected by mesothelioma electively converge and all the local Public Health Departments. The surveying of the cases partly takes place actively, through the periodical request for data and partly through prearranged reporting by the contact persons of the Regional Survey Network. The Survey Network tends to acquire the reports of newly diagnosed cases in real time, so as to gather the necessary data directly from the patient.
For the examination of the completeness of the survey of incident cases, cross referencing is planned with the data acquired periodically from the computerised regional archives (mortality and Hospital Discharge Forms (SDO)) and from the regional and extra-regional Population-based Tumour Registers.

Results

As at 31 October, 2005, 1,145 cases were recorded: 84 cases suspected, found upon subsequent surveys to be non-mesotheliomas and 88 MMs diagnosed in people not resident in our Region. Therefore, the data analysis was carried out on the 973 cases of malignant mesothelioma, 697 men and 276 women, incident in citizens effectively resident in Emilia-Romagna at the date of diagnosis and starting from 01/01/93.
As regards the definition of diagnosis, the distribution is as follows: 779 certain MMs, 97 probable MMs and 97 possible MMs. The definition of diagnosis was based on histological examination in 812 cases, on cytological examination in 66 cases and on image diagnosis and clinical documentation in the remaining 97 cases.
The location in the body mainly affected is the pleural one with 874 cases (89.8%), but the 82 cases in the peritoneum (8.4%) are not few, nor are the (1.8%) pericardiac (6) and testicular ones (12) exceptional.
The gender ratio, for all cases, is 2.5:1 in favour of men. These data are essentially repeated for the pleural localisation (2.8:1) and undergo a slight inversion for the peritoneal (0.9:1)
64.9% of cases have been diagnosed after 64 years, 3.0% before 45 years and the remaining 32.2% in the age group 45-64.
The services and institutes that have contributed to the notification of cases over the last few years are: Pathological Anatomy (54.5%), SPSAL (14.4%), Public Hygiene (9.8%) and the Departments of

Pneumology (3.2%); the other data bodies involved (other hospital departments, Tumour Registers, other Regional Operative Centres (COR)) constitute 6.0%, whilst the linkage with the regional computerised mortality and Hospital Discharge Form (SDO) archives allowed the acquisition of 12.1% of cases.
The average regional incidence rate, calculated for the period 1996-2003 and standardised for the Italian population in the 1991 census, is equal to 2.5 in men and 0.9 in women. The highest rate, in both men and women, was recorded in Reggio Emilia: 4.1 for men and 1.7 for women; even the rate for men in Piacenza is significant. The Province of Modena, on the other hand, registers the lowest rates in both genders (1.5 and 0.7) (see Tab. 1)

Tab. 1 Tasso di incidenza per 100.000, standardizzato su pop. Italia '91, per provincia di residenza (anni 1996-2003)

Residenza	Uomini			Donne		
	N. Casi	Tasso	I.C. 95%	N. Casi	Tasso	I.C. 95%
Piacenza	48	3,30	2,25-4,53	15	0,93	0,34-1,52
Parma	44	2,11	1,42-2,81	25	1,18	0,67-1,69
Reggio Emilia	71	4,08	3,10-5,06	29	1,75	1,08-2,42
Modena	45	1,53	1,04-2,03	23	0,72	0,35-1,09
Bologna	135	2,74	2,21-3,27	40	0,76	0,48-1,05
Ferrara	59	3,07	2,17-3,97	25	1,19	0,61-1,77
Ravenna	45	2,26	1,49-3,03	17	0,90	0,43-1,37
Forlì	35	2,38	1,57-3,18	17	1,05	0,52-1,57
Rimini	25	2,02	1,14-2,90	8	0,62	0,13-1,10
Emilia-Romagna	507	2,48	2,24-2,72	199	0,91	0,77-1,07

Table 1 Rate of incidence per 100,000 persons, standardised on the Italian population, reference year 1991, by province of residence (years 1996-2003)

Key:

Residenza	Residence
Uomini	Men
Donne	Women
N. Casi	N. of cases
Tasso	Rate
I.C. 95%	C.I. 95%
Piacenza	Piacenza
Parma	Parma
Reggio Emilia	Reggio Emilia
Modena	Modena
Bologna	Bologna

Ferrara	Ferrara
Ravenna	Ravenna
Forlì	Forlì
Rimini	Rimini
Emilia-Romagna	Emilia-Romagna

In order to assess the exposure to asbestos, data have been gathered so far on 632 cases: 24 were found to be *non-classifiable* due to a refusal or impossibility of contacting the patient or relatives, while, for the remaining 608 the exposure history was collected, in 47.4% of cases directly from the patient.
These data are deemed to be particularly significant and subject to improvement, since the survey network, based on the widespread presence of the Workplace Prevention and Safety Departments (SPSAL), was effectively designed to gather medical history data directly from the patient's account in order to reconstruct the working history with a high level of accuracy. Currently the gathering of this data is quite different in the various Provinces. Romagna has the two opposite ends of the spectrum: almost complete in the Province of Ravenna, to be implemented in that of Rimini.
In 376 cases, the exposure was classified as *occupational* (245 certain, 68 probable and 63 possible), in 55 cases non-occupational (31 domestic, 17 environmental and 7 linked to non-work related activities) and in 177 cases the exposure was *improbable-unknown*.

The 55 subjects with non-occupational exposure are represented by 33 women and 22 men. For women, the exposure was domestic in 27 cases, since they were relatives of people occupationally exposed, environmental in 6 cases, due to having lived near companies using significant amounts of asbestos. In men, 4 subjects suffered domestic exposure, 11 environmental and 7 due to activities involving the handling of materials containing asbestos in non-occupational activities.
An exposure to asbestos is, therefore, present in 431 cases out of 603 (70.9%); in men the proportion rises to 78.8%, whilst in women it was found in 44.0%. As regards the distribution of occupational exposure by sector of production, the construction/repair of railway rolling stock was the sector most involved (64 cases), followed by construction (60 cases), sugar-refineries and other industries in the food sector (40 cases) and the production of asbestos cement products (35 cases). There is also a significant presence of glass, rubber and ceramics manufacture (22 cases), engineering industry (22 cases), chemical industry and plastics (19 cases) and metal products (18 cases), whilst the other 96 cases relate to several other economic sectors confirming the fact that asbestos used to be an almost ubiquitously widespread substance due to its insulating characteristics.

Conclusions

MM is a rare tumour almost always associated with even quite moderate exposure to asbestos. Therefore, each new case must be considered to be a "sentry" event pointing to past exposure and must be carefully assessed. On the basis of these considerations, a priority objective of this specialised Register must be the completeness of the data and the accuracy of the information gathered.
The first objective seems to have been reached thanks to the widespread network of reports constructed at the regional level, which has guaranteed an effective coverage of the whole territory. The reports consolidated with extra-regional centres and with the other national Regional Operative Centres (COR) have even enabled the recovery of the proportion of cases, rather modest in truth, which are treated outside of the Region. Even the accuracy of the data can be considered to be at a good level: 90.2% of cases, in fact, have cytohistological confirmation; cases without anatomopathological confirmation, are

only entered if they are equipped with significant clinical-instrumental documentation.
An important aspect of the MMs recorded in Emilia-Romagna is the high percentage of cases with peritoneal location in the body: in fact the pleura/peritoneum ratio recorded by the Mesothelioma Register (REM) was equal to 10.7 compared to 14.6 registered by all the Regional Operative Centres (COR), in this report, for the period 1993-2001.

As regards the age at diagnosis, the average was 68.5 ± 11.5 years; it is worth noting that 64.9% of subjects was ≥ 65 years of age at the time of diagnosis compared to 62.2% registered by all the Regional Operative Centres (COR). The data could be correlated with a greater tendency, in our Region, to take bioptic samples even in more elderly subjects, thanks to the wide spread of the video-thorascopic technique compared to more invasive traditional methods.

The regional rates of incidence, calculated for the period 1996-2003, show data that are not easily construable for Piacenza and Modena, whilst for Reggio Emilia, they can mainly be correlated to the significant diffusion in the past of companies producing asbestos cement products and constructing/repairing railway stock. In particular, the higher value of the Region for women, is certainly to be linked to the employment, characteristic in this Province, of female labour in the manual production of “special pieces” in cement/asbestos.

An exposure to asbestos was documented in 78.8% of men and 44.0% of women: if we consider only exposure due to occupational reasons, the percent changes little in men (74.0%) but is considerably reduced in women (25.2%), more than likely due to the greater difficulty in reconstructing a correct occupational and non-occupational exposure history in women.

The sectors of production most involved in occupational exposure to asbestos were found to be: building/repair of railway stock (cases mostly resident in the Provinces of Bologna and Reggio Emilia); construction work (subjects distributed uniformly throughout the region); food industries (20 out of the 40 cases working in sugar-refineries in BO, FE, RA, PR, FC); manufacture of asbestos cement products (30 out of 35 cases, resident in Reggio Emilia); production of glass, ceramics and rubber (22 cases in the Provinces of PR, RE, MO, BO and RA); engineering industry (22 cases uniformly distributed throughout the region); production of fertilisers, plastics and artificial fibres (19 cases in the petrochemical industries of RA, FE and FC).

Acknowledgments

The collection, archiving and definition of incident cases of malignant mesothelioma throughout the region were only possible through the effective cooperation of the Survey Network Contact Persons. Many specialists, especially anatomopathologists, pneumologists, surgeons, and oncologists, made a fundamental contribution to the acquisition of the new cases in real time. This is key for the collection of the occupational and personal medical history data directly from the patient’s own account, an essential element when one is trying to reconstruct exposure occurring even 30-50 years before the manifestation of the disease.
Thus the contribution of the occupational physicians of the Occupational Prevention and Safety Departments of the Local Health Unit (AUSL) has been important. Even the occupational hygienists of the Public Hygiene Departments as well as the operators of the regional Hospital Discharge Form (SDO) and Mortality computer archives have played a precious role in the thoroughness of the case histories, an essential guarantee of the quality of work when interventions are made on rare diseases. We would like to extend an informal thanks to everyone for the results achieved, certain that the good

standard of collaboration established may ensure a better understanding of this dreadful disease.

Contact persons of the Regional Survey Network

Pathological Anatomy

Dott. Nicola Orsi - Piacenza
Dott. Marzio Gabrielli -Parma
Dott.ssa Carolina Gelli - Reggio Emilia
Prof. Antonio Maiorana - Modena
Dott.ssa Carrnelita Di Gregorio -Carpi (MO)
Dott. Guido Collina – Bologna - Bellaria Hospital
Dott.ssa Alessandra Cancellieri –Bologna - Maggiore Hospital
Dott.ssa Barbara Corti -Bologna - Sant'Orsola-Malpighi Hospital – Medical Director: Prof. Grigioni
Dott. Nunzio Salfi -Bologna - Sant'Orsola - Malpighi Hospital - Medical Director: Prof. Martinelli
Dott.ssa Licia Caparra -lmola Bologna
Dott. Stefano Ferretti -Ferrara
Dott.ssa Laura Guerrini - Ravenna
Dott.ssa Nadia Grilli -Faenza - Ravenna
Dott. Maurizio Puccetti - Lugo Ravenna
Dott.ssa Laura Medri - Forli
Dott.ssa Daniela Bartolini -Cesena
Dott. Paolo Rinaldi -Rimini

Workplace Prevention, Hygiene and Safety Department (SPSAL)

Dott. Giuseppe Sergi - Piacenza
Dott.ssa Marta Ferrari -Parma
Dott. Renato Di Rim -Modena
Dott. Loris Costellati -Bologna
Dott.ssa Renata Salvarani -Bologna
Dott.ssa Patrizia Cichella -Bologna
Dott.ssa Venere Pavone -Bologna
Dott.ssa lliana Pornpei -lmola Bologna
Dott.ssa Maria Rosa Spagnolo - Ferrara
Dott.ssa Mirella Solaroli -Ravenna
Dott.ssa Maria Giuseppina Valentini -Forli
Dott. Claudio Bissi -Cesena
Dott. Loris Fabbri -Rirnini

Mortality Registers

Dott. Carlo Alberto Goldoni – Regional Register of Emilia-Romagna
Dott. Giuliano Rigoni -Piacenza
Dott.ssa Franca Maria Deriu -Parma

Dott.ssa Maria Teresa Cassinadri -Reggio Emilia
Dott. Daniele Agostini -Bologna
Dott.ssa Daniela Zoni -Bologna
Dott.ssa Giovanna Domeniconi -Bologna
Dott. Andrea Pizzoli -lmola - Bologna
Dott. Carlo Turatti -Ferrara
Dott.ssa Giannalberta Savelli -Ravenna
Dott.ssa Morena Cantarelli -Forli
Dott.ssa Barbara Bondi -Cesena
Dott. Pierluigi Cesari -Rimini

TUSCANY REGION

REGIONAL ARCHIVE FOR MALIGNANT MESOTHELIOMAS (ARTMM)

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The activity of surveying cases of malignant pleural mesothelioma was launched in Tuscany in the 1980s, following the observation of a cluster of cases arisen among rag sorters of the Prato area. The search for cases was retrospectively extended until 1970 in the Provinces of Florence, Pisa and Siena. Since 1988 recording has been systematically carried out throughout the region, and since 1996 the Tuscany Regional Archive for Malignant Mesotheliomas (ARTMM) has been part of the National Mesothelioma Register.

With Regional Council Resolution 102/1997 the Tuscan Regional Council approved “a plan for the protection of the environment, of decontamination, of disposal and reclamation with a view to eliminating the dangers arising from asbestos”, in the transposition of Article 10 of Law 257/1992. The text of this resolution outlined the aims of the ARTMM. Following the publication of Decree of the President of the Council of Ministers (DPCM) 308/2002, regulations for the setting out of the National Mesothelioma Register, the Tuscany Region with Resolution 1521/2003, identified in the Oncological Study and Prevention Centre (CSPO) the Tuscan Regional Operative Centre, and Dr. Seniori Costantini as the manager and Dr. Gorini of the Occupational Environmental Epidemiology Operative Unit (UO) of the CSPO as deputy manager.

The network of the services reporting cases of mesothelioma involves in the first instance the Pathological Anatomy Departments of the Local Health Units (USL) and of the Tuscany Hospitals (Pisa, Florence, Siena), the Tuscany

Thoracic Surgery Departments, and other hospital wards (Pneumology, General Surgery). Although the network responsible for notification has been active for almost 20 years, the notification is in fact strongly dependent on the “degree of sensitivity” of the staff working in the departments of the centres whose task is to report the cases to the COR of Tuscany. Even though the notification centres have also been urged to undertake this task on the basis of the compulsory nature of the notification after the entry into force of Decree of the President of the Council of Ministers (DPCM) 308/2002, it has been found that some of them are late in reporting cases. Late reporting makes it impossible to interview cases, a guarantee of good quality for collecting data on working activities.

The surveying of the occupational etiology, the life habits and the residential history of each case is carried out through an interview using the National Mesothelioma Register (ReNaM) questionnaire. The interview is carried out by staff of the Oncological Study and Prevention Centre (CSPO), in particular by the health operators Valentina Cacciarini and Anna Maria Badiali, in the areas of Florence and Prato and in the other areas of Tuscany where it has not been possible to identify an interviewer among the staff of the Functional Units (UF) - Workplace Prevention, Hygiene, and Safety Department (PISLL).

In the areas of Livorno and Viareggio interviews on the other hand were carried out by medical staff of

the Functional Units (UF) - Workplace Prevention, Hygiene, and Safety Department (PISLL).
The assessment of exposure to asbestos is carried out by Stefano Silvestri of the CSPO which establishes whether the working activity, the personal life history or any environmental conditions, have led to exposure to asbestos, classifying the exposure according to the procedures adopted by the ReNaM. Any occupational exposure to asbestos is assessed for each period of the working activity carried out by the subject. When exposure is ascertained for several working periods, the exposure with higher degree of probability is assigned as "predominant" (certain, probable, possible), or, if the level of probability of exposure is the same in the various working periods, the first one in chronological order is assigned as the predominant exposure.
In the period 1988-2003 694 cases (141 women and 553 men) of MP were diagnosed with histological or cytological examination or Computerised Axial Tomography (CAT) were recorded. The main sources of the reporting are the Pathological Anatomy Departments (40.2%), the PISLL (16.4%), and the regional Thoracic Surgery Operative Units (U.O.) (13.6%). In 54.3% of cases the diagnosis was formulated through histological examination with immunohistochemical examinations (IIC); in 24.2% of cases with histological examination without immunohistochemical examinations; in 7.9% of cases with cytological examination, 13.6% with Computed Axial Tomography (CAT) or radiographic examinations.
In the period 1988-2003, 614 interviews were carried out (88.5% of cases of identified MP). In 68.1% of cases the interview was carried out by staff of the CSPO, in 28.8% of cases by staff of the PISLL. An occupational exposure to asbestos (certain, probable and possible) was attributed to 83.6% of men and 20.9% of women. In 11 cases exposure to asbestos occurred in a domestic environment, in 2 cases the exposure was considered to be environmental; in 7 cases it was due to non-occupational activities. The sectors of production in which the highest number of cases with occupational exposure is recorded are shipbuilding, railway stock building, repair and use, rag sorting and the construction industry. In the last few years there has been a drop in the number of cases employed in sectors such as shipbuilding, the production of electricity and the iron and steel industry.

ARTMM Publications

Buiatti E, Chellini E, Merler E, Paoletti L, Seniori Costantini A, Zappa M. Results of an epidemiological study on mesothelioma in Tuscany. Acta Oncologica 1989, 10(3): 259-261;

Carnevale F., Chellini E. (eds): Amianto. Miracoli, virtù, vizi. Editoriale Tosca, Firenze, 1992;

Chellini E, Merler Bruno C, Comba P, Crosignani P, Magnani C, Nesti M, Scarselli R, Marconi M, Fattorini E, Toti G. Registro Nazionale dei casi accertati di mesotelioma asbesto-correlati (art.36 D.Lgs 277/91). Linee guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'lSPESL da parte dei Centri Operativi Regionali. Fogli Inform ISPESL 1996, 1: 19.107

Chellini E, Merler E, Seniori Costantini A. L'Archivio Regionale Toscano dei Mesoteliomi maligni: un contributo all'identificazione di esposizioni lavorative ad amianto Silvestri S. & Merler E. C'era una volta... I'amianto. Tuscany Region, TCE n.1, 1995, pg.42-51;

Chellini E, Merler E, Seniori Costantini A, Buiatti E. La prevenzione dei rischi da amianto passa anche attraverso il futuro Registro nazionale dei mesoteliomi maligni. Toscana Medica 1993, 3:18-20;

Chellini E, Fornaciai G, Merler E, Paci E, Seniori Costantini A, Silvestri S, Zappa M, Buiatti E. Pleural Malignant Mesothelioma in Tuscany, ltaly (1970-1988).II.ldentification of Occupational Exposure to Asbestos. Am J Ind Med 1992, 21: 577-585;

Crosignani P, Forastiere F, Petrelli G, Merler E, Chellini E, Pupp N, Donelli S, Magarotto G, Rotondo E, Perucci C, Berrino F. Malignant mesothelioma in thermoelectric power plant workers in Italy. Am J Ind Med 1995, 27: 573-576;

Gorini G, De Gregorio G, Silvestri S, Chellini E, Cupelli V, Seniori Costantini A. Survival of malignant pleural mesothelioma cases in the Tuscan Mesothelioma Register, 1988-2000: a population-based study. Eur J Cancer Prev2005, 14(3): 195-99.

Gorini G, Pinelli M, Sforza V, Simi U, Rinnovati A, Zocchi G. Mesothelioma of the tunica vaginalis testis: report of two cases with asbestos occupational exposure. Inf J Surg Pathol 2005, 13(2):211-14.

Gorini G, Chellini E, Merler E, Cacciarini V, Silvestri S, Seniori Costantini A. Malignant pleural mesothelioma incidence and mortality in Tuscany in 1988-1999. Epidemiol Prev 2003, 27(1):13-17.

Gorini G. Malignant mesothelioma in Tuscany. Epidemiol Prev. 2003, 27(1):59.

Gorini G, Merler E, Silvestri S, Cacciarini V, Chellini E, Seniori Costantini A. Archivio Regionale Toscano dei mesoteliomi maligni. Rapporto sulla casistica 1988-2000. Ti Con Erre, Sicurezza Sociale. Edizioni Regione Toscana, 2002

Gorini G, Merler E, Chellini E, Crocetti E, Seniori Costantini A. Is the ratio of pleural mesothelioma mortality to pleural cancer mortality approximately unity for Italy? Considerations from the oldest regional mesothelioma register in Italy. British J Cancer2002, 86(12):1970-71.

Gorini G, Silvestri S, Merler E, Chellini E, Cacciarini V, Seniori Costantini A. Tuscany mesothelioma registry (1988-2000): evaluation of asbestos exposure. Med Lav 2002, 93 (6): 507-518.

Magnani C, Agudo A, Gonzales CA, Andrion A, Calleja A, Chellini E, Dalmasso P, Escobar A, Hernandez S, Ivaldi C, Mirabelli D, Ramirez J, Tuguret D, Usel M, Terracini B. Multicentric study on malignant pleural mesothelioma and non-occupational exposure to asbestos. Br J Cancer2000,83: 104-11

Merler E, Silvestri S, Mauro L, Campinoti G. Re. Mortality among workers in the geothermal power plants at Larderello, Italy. AJlM 35: 356- (Pira)Am J Ind Med2001, 38: 1-2

Merler E, Silvestri S, Mauro L, Campitoti G. Re. Mortality among workers in the geothermal power plants at Larderello, Italy. Am J Ind Med 35: 536-539,2000. Am J Ind Med 2001, 39: 436-7

Merler E, Silvestri S, Chellini E, et al. Aggiornamento dei casi di mesotelioma dovuti all'esposizione all'amianto usato nel settore dei trasporti ferroviari. RMdL 1991, 20: 3-14;

Merler E, Chellini E, Ciani Passeri A. A proposito del Registro Nazionale dei mesoteliomi e delle asbestosi: fattibilità, precondizioni, obiettivi. Epidem.Prev. 1991, 48-49: 146

Merler E, Silvestri S, Chellini E., et al. ldentificazione dei casi di mesotelioma insorti in ltalia per I'esposizione all'amianto usato nella coibentazione di mezzi ferroviari RMdL, 1990, 16(1): 1-25

Paci E, Zappa M, Paoletti L, Buiatti E, Chellini E, Merler E, Seniori Costantini A. Further evidence of an excess of risk for malignant mesothelioma in textile workers in Prato area. Br J Ind Med 1991, 64: 377- 378;

Paoletti L, Falchi M, Batisti D, Zappa M, Chellini E, Biancalani M. Characterization of asbestos fibers in pleural tissue from 21 cases of mesothelioma. Med Lav 1993, 84 (5): 373-378

Seniori Costantini A, Chellini E. The experience of the Mesothelioma Registry in Tuscany in assessing health hazard associated with asbestos exposure. Med Lav 1997, 88: 310-15

Seniori Costantini A, Calistri S, Zappa M., Nisi S, Chellini E, Gasparini M, Paci E. Comparto tessile pratese. Silvestri S. & Merler E. C'era una volta... I'amianto. Tuscany Region, TCE n.1, 1995, p.157-64

THE MARCHES REGION

REGIONAL OPERATIVE CENTRE (COR)
OF THE REGIONAL MESOTHELIOMA REGISTER

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Starting up of the Mesothelioma Register and setting up of the Regional Operative Centre (COR)

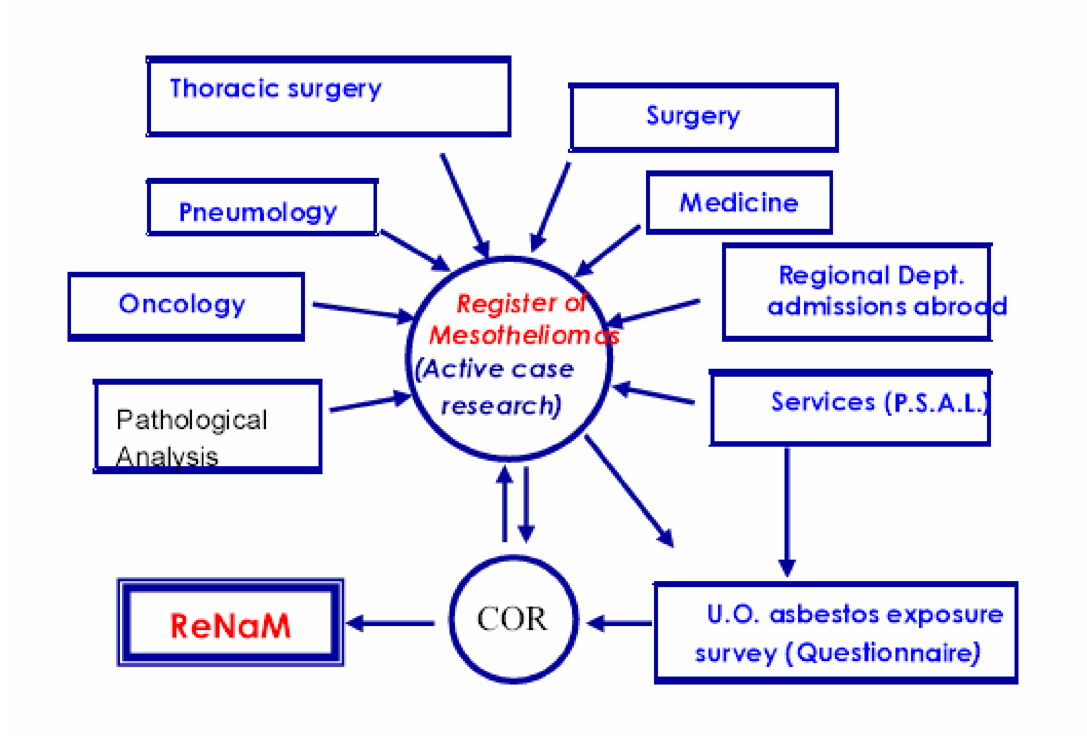
The Mesothelioma Register of The Marches was formed in September 1999 under the initiative of the Cancer Register of the Province of Macerata (managed by the University of Camerino), authorised by the Councillor responsible for Health of The Marches Region who asked the Directors General of the Local Health Units (USL) and Hospitals, to make available to the above-mentioned register the necessary documentation to:
a) identify subjects with a diagnosis of malignant mesothelioma (MM);
b) ascertain, with the criteria prescribed by the guidelines of the Italian National Institute for Occupational Safety and Prevention (ISPESL), the level of certainty of the diagnoses of MM;
c) establish, with a suitable medical history survey through a questionnaire, past exposure to asbestos at work, in the domestic sphere and at environmental level.
In April 2001, on the basis of the historical reconstruction of the diagnoses verified by the register in the three-year period 2006-2008, the Councillor continued the activity of identification and recording of cases of MM and asked the Health Authorities to continue their efforts and ordered that the Pathological Anatomy, Pneumology, General Surgery, Thoracic Surgery, and Medical Oncology Departments, as well as the Workplace Prevention, Hygiene and Safety Department (SPISAL) and Hygiene and Public Health Services, notify the Regional Mesothelioma Register (University of Camerino), within a month of diagnosis, of every certain or suspected form of MM.

With Regional Council Resolution No. 166 dated 11/02/03, the Marches Region, approved the setting up of the "Regional Register of cases of asbestos-related Mesothelioma or that occurring in The Marches Region identifying the institutional point of reference and linkage in the "Regional Mesotheliomas Centre of The Marches Region" (COR) based at the Hygiene and Environmental Sciences Department of the University of Camerino, "granting Prof. Franco Pannelli, responsibility for the Regional Mesotheliomas Register" and the job of "data processing controller of the Regional Mesothelioma Register of The Marches". At present, the Mesothelioma Register of The Marches (that coincides with the Regional Operative Centre (COR) of The Marches), which is based at the Department of Experimental Medicine and Public Health, Hygiene and Environmental Sciences Department of the University of Camerino, (Public Health Service) can benefit from regional funding to cover the costs of assistant staff.

Procedures for surveying and assessing cases following Decree of the President of the Council of

Ministers (DPCM) 308/2002

Data gathering flow



The activity of the Register (and of the Regional Operative Centre (COR)) is guaranteed by a University lecturer (manager) and an assistant biologist who controls the diagnosis sector (acquisition of Hospital Discharge Forms (SDO), reports by the public and private hospital operative units of the Region, consultation of medical records, coding of cases, programme management and sending data to the National Mesothelioma Register (ReNaM)).
Since 2000 the register has started a close collaboration with the Operating Units (U.O.) of the 13 Workplace Prevention, Hygiene and Safety Department of the former Local Health Units (ASL) (P.S.A.L.- Workplace Prevention and Safety services) proceeding to a suitable training of their staff to undertake, in the respective areas, the activity of surveying past exposure to asbestos through a questionnaire. The Regional Operative Centre (COR) promptly notifies the P.S.A.L. service staff of the admission of cases of MM falling within their competence, monitors and coordinates the surveying activities of past exposure to asbestos, receives and analyses the questionnaires, carries out the assignment of the levels of exposure to asbestos in cooperation with an occupational physician, following the National Mesothelioma Register (ReNaM) Guidelines, and sends the data to the National Mesothelioma Register (ReNaM). The register periodically organises vocational refreshing courses for the staff of the regional network for the surveying of cases of MM.

Cases of Malignant Mesothelioma in The Marches: 1996-2001

The Marches Region consists of 4 provinces (Pesaro Urbino, Ancona, Macerata and Ascoli Piceno; in

2004 the Province of Fermo was set up, though not yet active) and has, according to the 2001 census, a resident population of 1,463,868 inhabitants (711,484 men and 752,384 women).
The Authorities of the Regional Health Service are the Regional Health Unit (ASUR), subdivided into 13 local areas, which have replaced the corresponding Local Health Authorities (USL), and into 2 Hospitals (Hospital *Ospedali Riuniti* Umberto I - G.M. Lancisi – G. Salesi of Ancona and Hospital "*San Salvatore*" of Pesaro). In the Region there are 4 public Pathological Anatomy Departments in operation, 1 Thoracic Surgery Ward, 8 Pneumology Units and 14 Medical Oncology Operative Units (U.O.).
The areas with the highest exposure to asbestos are those distributed along the Adriatic coast (Pesaro, Fano, Senigallia, Falconara, Ancona and Civitanova M).
In the period 1996-2001, in the whole area, altogether 141 cases of MM (72% men and 28% women) were identified by the register. 95% of these cases were classified as pleural MM (certain, probable and possible) (78% of which were certain), 12% as peritoneal MM (certain, probable and possible) (88% of which were certain). The percentage of total cases confirmed by histological diagnosis reached 88%.
In the classification of the 12 participating areas, The Marches, by incidence of total cases of pleural MM (certain, probable and possible) rank 8th in males and 6th in females (1.706 and 0.572 x 100,000 residents, respectively). By incidence of peritoneal MM The Marches rank 3rd in both males and in females (0.232 and 0.125, respectively).

References

Calisti R., Mosciatti P. Analysis and assessment of esposures from the collected working histories – in Vocational refreshing course for the Mesothelioma case surveying network operators of the Marches, Civitanova Marche 22-23 September 2004

Vocational refreshing course for the Mesothelioma case surveying network operators of the Marches, Civitanova Marche 22-23 September 2004

Mesotheliomas in the Marches. Case surveying, occupational and environmental exposure, epidemiological surveillance. Study and vocational training workshop, Ancona 9-10 January 2001.

Mosciatti P. Mesothelial neoplastic pathology in the Marches: data in the Marches regional mesothelioma register in Vocational refreshing course for the Mesothelioma case surveying network operators of the Marches Region, Civitanova Marche 22-23 September 2004

Nesti M, Marinaccio A, Gennaro V, Gorini G, Mirabelli D, Mensi C, Merler E, Montanaro F, Musti M, Pannelli F, Romanelli A, Tumino R; ReNaM Working Group, Epidemiologic surveillance for primary prevention of malignant mesothelioma: the Italian experience. Med. Lav. Jul-Aug 2005, 96(4): 338-346,

Nesti M., Adamoli S., Mosciatti P., Pannelli F. Pascucci C. Linee Guida per la rilevazione e la definizione dei casi di mesotelioma maligno e la trasmissione delle informazioni all'ISPESL da parte dei Centri Operativi Regionali, 2[a] edizione, 2003.

Pannelli F. Tasks of the hospital and territorial Services of the Marches ASUR and COR in the Mesothelioma case surveying (Marches D.R.G. n. 166 11/02/2003), in Vocational refreshing course for the Mesothelioma case surveying network operators of the Marches Region, Civitanova Marche 22-23 September 2004

Pannelli F. Operative Protocol for the case reporting to the COR and for the exposure surveying in Vocational refreshing course for the Mesothelioma case surveying network operators of the Marches Region, Civitanova Marche 22-23 September 2004

Pannelli F., Montanaro F., Gennaro V., Pascucci C. L'incidenza dei Mesoteliomi nei Cinque continenti. VIII Meeting of the Associazione Italiana Registri Tumori. Salerno 1-2 April 2004.

Pannelli F., Mosciatti P., Pascucci C. I mesoteliomi nelle Marche: i dati del Registro regionale, Information day on the Census of materials containing asbestos, Camerino 07/05/2002

Pannelli F., Mosciatti P., Pascucci C. II mesotelioma maligno nelle Marche: i dati del Registro regionale, Proceedings of the VI Meeting of the Associazione Italiana Registri Tumori, Trento 21-22 March 2002

Pannelli F., Mosciatti P., Pascucci C., Antonini S., Vitarelli S. Esperienza della rilevazione dei mesoteliomi nella Regione Marche e prospettive di sorveglianza epidemiologica nella Regione in Study and vocational training workshop on Mesotheliomas in the Marches. Case surveying, occupational and

environmental exposure, epidemiological surveillance, Ancona 9-10 January 2001

UMBRIA REGION

FIRST REPORT ON THE STATE OF THE ART OF THE UMBRIA ASBESTOS RELATED MESOTHELIOMAS REGISTER

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Introduction

In Umbria, the Regional Operative Centre of the Register of cases of asbestos related mesothelioma was set up by Regional Council Resolution No. 1149 since July 2003 in the context of the activities of the Regional Epidemiological Monitoring Unit of Umbria. In the start-up phase the Umbria Regional Operative Centre (COR) took over from the regional population Cancer Register all cases of mesothelioma recorded in the period of operation (the register was set up in 1991 (Regional Council Resolution (DGR) 10158/91) and has complete incidence data for the period 1994-2002). Below are some aspects concerning the mortality and regional incidence of the pathology.

Mesothelioma in Umbria

Considering the whole period of activity of the register (1994-2002) there are overall 52 cases in men and 23 in women (Figure 1, Table 1). Mortality due to mesothelioma is lower than incidence, probably due to a failure in the classification system of cases on the mortality sheets (Figure 2, Table 2). The distribution by age of cases is shown in Figures 3 and 4. In men the rates are more stable and appear to increase with age. In women few cases in premature age are undergoing re-evaluation.

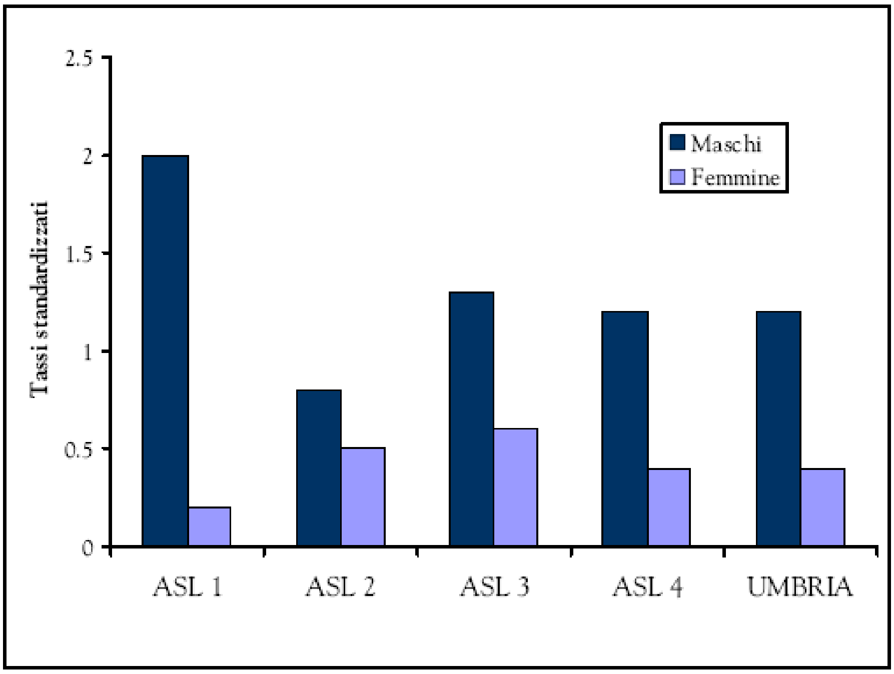

Figura 1: Tassi standardizzati di incidenza per ASL 1994-2002

Figure 1. Incidence standardised rates by ASL (Local Health Unit) 1994-2002.

Key:

Maschi	Men
Femmine	Women
ASL 1	ASL (Local Health Unit) 1
ASL 2	ASL (Local Health Unit) 2
ASL 3	ASL (Local Health Unit) 3
ASL 4	ASL (Local Health Unit) 4
UMBRIA	UMBRIA
Tassi standardizzati	Standardised rates

Incidenza 1994-2002				
	Numero di Casi		Tasso standardizzato (Italia 1991)	
	Uomini	Donne	Uomini	Donne
ASL 1	12	2	2,0	0,2
ASL 2	14	10	0,8	0,5
ASL 3	11	6	1,0	0,6
ASL 4	15	5	1,2	0,4
Umbria	52	23	1,2	0,4

Tabella 1. Numero di casi e tassi di incidenza di mesotelioma in Umbria per sesso ed ASL; periodo 1994-2002.

Table 1. Number of cases and incidence rates of mesothelioma in Umbria by gender and ASL (Local Health Unit) 1994-2002.

Key:

Incidenza 1994-2002	Incidence 1994-2002
Numero di Casi	Number of Cases
Tasso standardizzato (Italia 1991)	Standardised rate (Italy 1991)
Uomini	Men
Donne	Women
ASL 1	ASL (Local Health Unit) 1
ASL 2	ASL (Local Health Unit) 2
ASL 3	ASL (Local Health Unit) 3
ASL 4	ASL (Local Health Unit) 4
Umbria	Umbria

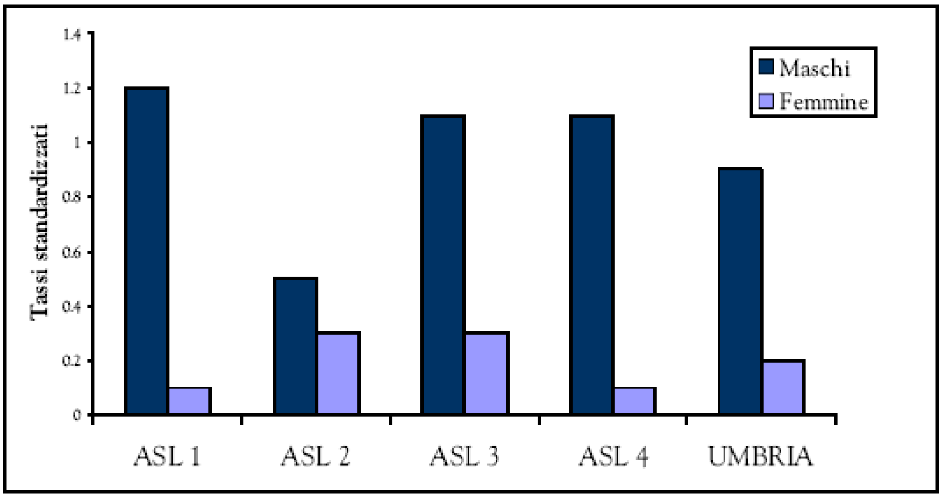

Figura 2: Tassi standardizzati di mortalità per ASL 1994-2002

Figure 2: Mortality standardised rates by ASL (Local Health Unit) 1994-2002.

Key:

Maschi	Men
Femmine	Women
ASL 1	ASL (Local Health Unit) 1
ASL 2	ASL (Local Health Unit) 2
ASL 3	ASL (Local Health Unit) 3
ASL 4	ASL (Local Health Unit) 4
UMBRIA	UMBRIA
Tassi standardizzati	Standardised rates

Mortalità 1994-2002				
	Numeri di Casi		Tasso standardizzato (Italia 1991)	
	Uomini	Donne	Uomini	Donne
ASL 1	7	1	1,2	0,1
ASL 2	8	6	0,5	0,3
ASL 3	9	3	1,1	0,3
ASL 4	14	1	1,1	0,1
Umbria	38	11	0,9	0,2

Tabella 2. Numero di decessi e tassi di mortalità per mesotelioma in Umbria per sesso ed ASL; periodo 1994-2002.

Table 2: Number of deaths and mortality rates due to mesothelioma in Umbria by gender and ASL (Local health Unit); 1994-2002.

Key:

Mortalità 1994-2002	Mortality 1994-2002
Numero di Casi	Number of Cases
Tasso standardizzato (Italia 1991)	Standardised rate (Italy 1991)
Uomini	Men
Donne	Women
ASL 1	ASL (Local Health Unit) 1
ASL 2	ASL (Local Health Unit) 2
ASL 3	ASL (Local Health Unit) 3
ASL 4	ASL (Local Health Unit) 4
Umbria	Umbria

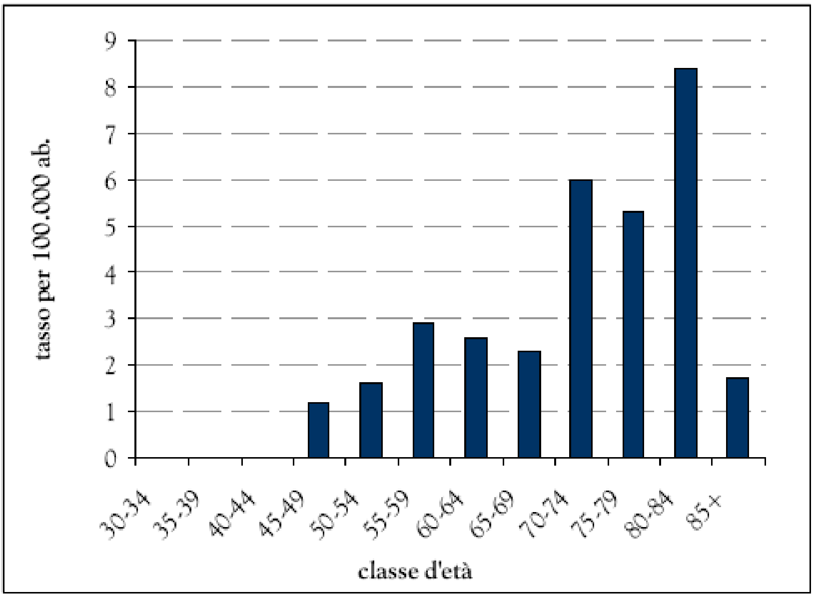

Figura 3: Tassi di incidenza per classi di età 1994-2002, uomini

Figure 3: Incidence rates by age groups 1994-2002; men.

Key:

tasso per 100.000 ab.	rate per 100,000 inhabitants
classe d'età	age groups

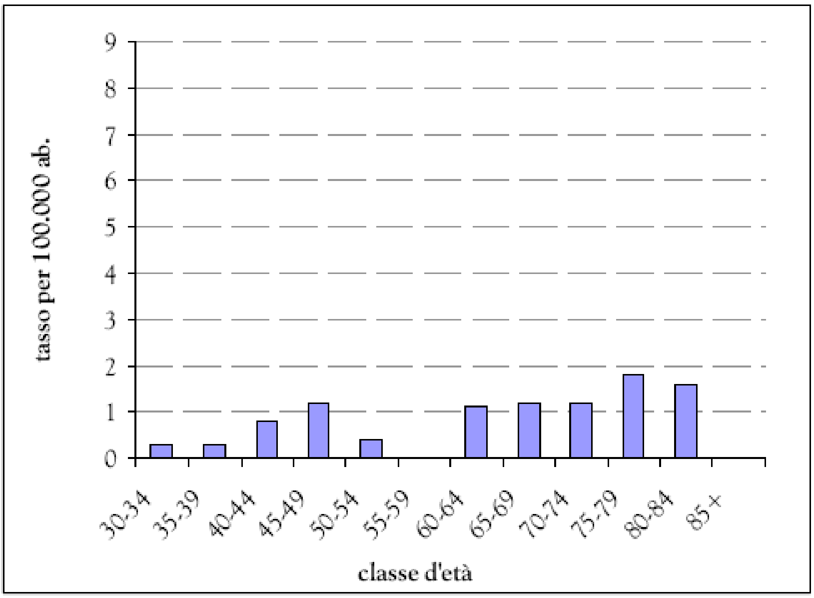

Figura 4: Tassi di incidenza per classi di età 1994-2002, donne

Figure 4: Incidence rates by age groups 1994-2002, women

Key:

tasso per 100.000 ab.	rate per 100,000 inhabitants
classe d'età	age groups

Taking into consideration the strength of the incidence of mesothelioma in the various Local Health Units (ASL), one can see that the highest incidence rate is in men in the Local Health Unit (ASL) No. 1 (2.5 cases per 100,000 inhabitants in the period 1999-2002, 2.0 in the whole period 1994-2002; Figure 1). On the basis of the knowledge of the local area, one can see that in the more industrialised Local Health Units (ASL) (upper Umbrian Tiber and Terni area), there is a more accentuated imbalance between men and women in the distribution of cases.

Activity of the Regional Operative Centres (COR)

The cases identified by the Regional Tumour Register were sent to the Workplace Prevention, Hygiene and Safety Department (SPISAL) of the 4 Regional Local Health Units (ASL) for the reconstruction of the exposure history.

Furthermore preliminary agreements have been made with the Regional Pathological Anatomy Departments for the notification of cases and for the definition of diagnostic assessments. Similarly preliminary agreements aimed at prompt reporting were drawn up with the departments where the diagnosis of new cases of pleural and extrapleural mesothelioma is possible (Occupational Medicine, Internal Medicine, Pathological Anatomy Department, Pneumology, diagnostic imaging and others and also trade union funds).

At the end of a phase of reduced activity by the Regional Operative Centre (COR), conditioned by a lack of available resources, the foundations have been laid for reactivation in the near future. Staff dedicated to the activities of the Regional Operative Centre (COR) has been found and is undergoing training. An agreement is being drafted with the Regional Directorate of the Institute for Insurance against Occupational Accidents (on a voluntary basis and upon the proposal of INAIL) for the prompt reporting of relevant cases with the relative documentation. A working meeting is planned at the Regional Health and Social Services Department for the rapid reactivation of the active reporting of cases. Measures will be taken to solicit participation in the registration system by all people concerned and for an organisation-wide planning of the work of reconstructing the history of exposure to asbestos by the Workplace Prevention, Hygiene and Safety Department (SPISAL).

ABRUZZO REGION

REGIONAL OPERATIVE CENTRE OF THE NATIONAL MESOTHELIOMA REGISTER.

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The Register of Asbestos-related Mesotheliomas of the Abruzzo Region, implementing Article 2 of Decree of the President of the Council of Ministers (DPCM) 308/02, was set up, without targeted funding, by Regional Council Resolution 1213 dated 19/12/2003, which identified the location as the Hospital Operative Unit of Occupational Medicine - Health Centre of Tocco da Casauria - AUSL of Pescara, with functions as a Regional Operative Centre for the National Mesothelioma Register (ReNaM).
The activity of the register is guaranteed by the manager of the Regional Operative Centre (COR), Dr. Luana Trafficante and by the deputy manager of the Regional Operative Centre (COR), Dr. Silverio Gatta, as well as by the occasional cooperation of another two Occupational Physicians for the assessment and definition of exposure to asbestos of these cases. Furthermore in each SPSAL staff qualified as points of reference of the Regional Operative Centre (COR) for the collection of the data necessary for the definition of each case were identified.
According to the registry office data updated as of 31/12/2004, in the Region there are 1,299,272 resident persons of which 631,709 men and 667,563 women, thus distributed in the four regional Provinces: Chieti (391,167 residents), L'Aquila (304,068 residents), Pescara (307,974 residents) and Teramo (296,063 residents).
There are six Health Units present throughout the Region: Avezzano-Sulmona, L'Aquila, Chieti, Pescara, Lanciano-Vasto, Teramo. In addition to the Hospital Operative Unit of Occupational Medicine (U.O.) at the Local Health Unit (AUSL) of Pescara there are therefore six S.P.S.A.L. – Workplace Prevention and Safety Services (one for each Local Health Unit).
The diagnosis and treatment health structures relevant to the Regional Operative Centre (COR) present in the Region are: three Thoracic Surgery Departments, seven Pneumology Departments, eight Pathological Anatomy Departments, five Oncolomnets and five Oncologic wards.
In the region, up to now no industrial centres of particular significance have been highlighted for the specific risk.

Procedures for surveying and assessing cases based on Decree of the President of the Council of Ministers (DPCM) 308/02.

The surveying of cases of MM in our Region has provided for the organisation of an information network including all sources considered necessary for supplying the Regional Operative Centre (COR) the data of interest, especially based on the cooperation of the SPSAL. For the staff involved in the process of surveying and acquiring the data an adequate and specific training course has been organised in advance. The cases of incident MM in the Region are therefore researched through the use of:

- Hospital Discharge forms
- death certificates
- notification by the hospital wards (Thoracic Surgery, Pneumology, Oncology)
- histology-cytology-autopsy data provided by the Pathological Anatomy Departments

Furthermore there is an agreement protocol underway for a specific cooperation with the Regional base of the Institute for Insurance against Occupational Accidents (INAIL) mainly aimed at an exchange of data on the cases of MM reported to the institute and/or reaching the Regional Operative Centre (COR).

The definition of the degree of diagnostic certainty of pleural, peritoneal or other site of mesothelioma takes place through the recovery of reports of histology data *in vivo* and/or from autopsy, cytology, immunohistochemistry and from medical records.

The definition of past exposure to asbestos takes place:

- by interviewing the person concerned (when possible) or the relatives for the deceased
- by acquiring data from the SPSAL and from INAIL

The data collected, regarding both the disease and past exposure to asbestos, were coded according to the National Mesothelioma Register (ReNaM) Guidelines.

An examination of the mesothelioma case history: period 2000-2005

The periodical data flow through the Survey Network began not long ago and therefore the incidence data for the cases of MM diagnosed in the Region starting from 1 January 2000, as prescribed by Decree of the President of the Council of Ministers (DPCM) 308/02, are clearly underestimated.
The case history currently available from the Regional Operative Centre (COR), originating in the retrospective assessment of the cases of diagnosed MM at a single Thoracic Surgery and a few Pathological AnatomyDepartments, is of 35 cases, of which only 30 pertain to the Regional Operative Centre (COR) with a diagnosis of mesothelioma.
The available cases mainly refer to the period 2000-2005 (one single case in 1998).
All the cases under examination (23 men and 7 women) are pleural. In 23 cases there is a histological diagnosis, in the remaining 7 cases there are only cytological and Clinical/Radiological data.

The distribution by age groups and by year of incidence is shown in the following tables.

Classi di ETA'	F	M
< 50		1
50-59	1	2
60-69	3	4
70-79	2	13
> 80	1	3
TOTALI	7	23

Anno incidenza	F	M
1998		1
2000	3	1
2001	1	7
2002	1	3
2003	2	2
2004		6
2005		3
TOTALI	7	23

Key:

Classi di ETA'	AGE Groups
F	F
M	M
TOTALI	TOTAL
Anno incidenza	Incidence year
F	F
M	M
TOTALI	TOTAL

Definition of exposure

For the evaluation of the occupational exposure, in accordance with the National Mesothelioma Register (ReNaM) Guidelines, besides the data from the interviews, data were also used obtained from the employment cards and the documentation present at the SPSAL Services and the Offices of INAIL.
Only four cases have been assessed and defined at the moment for which it has been possible to attribute a past occupational exposure that is certain.
The relevant sectors of exposure here are: metalworking (oven building and insulation; building and insulation of iron and steel plants), chemical industry (plant maintenance) and glass industry (oven manufacturing).

Acknowledgments

A special thank to the thoracic Surgery Clinic of the University "G. D'Annunzio" of Chieti for the availability and cooperation offered for the collection of cases in question".

CAMPANIA REGION

REGIONAL OPERATIVE CENTRE (COR) OF THE NATIONAL MESOTHELIOMA REGISTER

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[1] *Regional Operative Centre of Campania c/o Department of Experimental Medicine, Second University of Naples*

The Campania Regional Mesotheliomas Register (Regional Operative Centre (COR) Campania) was set up by Regional Council Resolution No. 3901 dated 2 August, 2002, at the Experimental Medicine Department of the University of Naples, and benefits from targeted funding.
The manager of the Regional Operative Centre (COR) of Campania is Prof. Massimo Menegozzo with the cooperation of Dr. Simona Menegozzo, research grant holder, and Mr. Francesco Izzo, data archiving expert.
The Regional Operative Centre (COR) of Campania has build up a network of relationships with the 13 Hygiene and Occupational Medicine Departments working in the correspondent Campania Local Health units (ASL), appointing a representative of the Regional Operative Centre (COR) in each of the services. The representatives are assigned the task of carrying out the interviews concerning the patients affected by mesothelioma, under the scientific coordination of the Regional Register.
Furthermore the Register has set up an information network made up of the main health facilities of the Campania Region. These bodies supply the Regional Operative Centre (COR) of Campania with the notification sheets of past and emerging cases of mesothelioma.
The register, in cooperation with the Experimental Medicine Department of the University of Naples and IGB-CNR of Naples, coordinates a research project aimed at the identification of early biomarkers in the diagnosis of mesothelioma through the study of gene expression in the transformation of the mesothelial cell into mesothelioma.
A study is underway, furthermore on the presence of serum mesothelin on one cohort of 800 workers formerly exposed to asbestos, in cooperation with the ASL NA2.
In the Region, according to the registry office data updated as of 21.10.2001, there are 5,701,931 resident persons 2,778,532 of which are men and 2,923,399 are women. The Region is made up of 5 Provinces: Naples (3,059,196 inhabitants), Salerno (1,073,643 inhabitants), Caserta (852,872 inhabitants), Avellino (429,178 inhabitants), Benevento (287,042 inhabitants).
There are 13 Local Health Units (AA.SS.LL.) which cover the whole Region in which as many Hygiene and Occupational Medicine Services operate (one for each Local Health Unit (ASL)).
The Regional Operative Centre (COR) of Campania built up a network of active surveying of incident cases of mesothelioma, the main core of reference being made up of: 7 Thoracic Surgery Departments, 11 Pneumology Departments, 33 Pathological Anatomy Departments and 19 Oncology Departments.
Industrial centres of particular significance, for the specific risk of exposure to asbestos, can be identified in:

- Shipbuilding (building, repair and maintenance)
- Port facilities and sea transport
- Asbestos cement

- Railway stock
- Petrochemicals complex

At the same time there is a specific interest in investigating a cluster of mesotheliomas emerging in the Area of the Provinces of Salerno, Benevento and Avellino which apparently is not correlated with the occupational exposure to asbestos.

Procedures for surveying and assessing cases, based on Decree of the President of the Council of Ministers (DPCM) 308/02

After the setting up of the Regional Operative Centre (COR) the incident cases were investigated by the use of the following sources:

- Hospital Discharge Forms (SDO) available between 1996 and 2002 and supplied by ARSAN
- Certification of cause of death (Italian National Institute of Statistics (ISTAT) forms)
- Histology/cytology/autopsy data collected by the Pathological Anatomy Departments.
- Clinical diagnosis from the wards (thoracic Surgery, Oncology, Pneumology etc.)

The Campania Region has a Cancer Register for the territory of the ASL NA 4.
The definition of the degree of certainty of diagnosis of pleural, peritoneal mesothelioma or of other sites is made through the recovery of the medical records with particular emphasis on the data of the histology *in vivo* and/or from autopsy, of the cytology, of the immunohistochemistry. The definition of past exposure to asbestos is made where possible, by interviewing the person concerned or planning interviews with relatives, if the subjects are seriously ill or have died. From the date of inception of the Mesothelioma Register of Campania (02.08.2002) the interviews for the definition of exposure have been carried out by the staff of the Register (Occupational Physicians) initially favouring interviews with living patients. Since July 2005 interviews have also been carried out by the 13 responsible persons identified for each single Hygiene and Occupational Medicine Department; these responsible persons have taken part in a specific training course lasting four days.
The data collected, regarding both the disease and past exposure to asbestos, are coded according to the National Mesothelioma Register (ReNaM) Guidelines.

Cases of mesothelioma in the Campania Region

In order to evaluate the incidence of cases of mesothelioma in the Region the Regional Operative Centre (COR) of Campania must take into consideration two different sources of data:
- the ISTAT mortality data for malignant pleural tumour in the Campania Region in the period 1988-1997
- the Hospital Discharge Forms (SDO) concerning the period 1996-2002, provided in May 2004 by the Regional Health Agency (A.R.S.A.N).

As regards the ISTAT data, they have highlighted for the Campania Region an average incidence of 52.9 cases a year of malignant pleural tumours in the period 1988-1997. The data of the Hospital Discharge Forms (SDO) were processed by the Regional Operative Centre (COR) of Campania for the three-year period 2000-2002. This processing provided an idea of the trend of the range of cases incident in Campania, classified according to ICD IX with the codes 163 (malignant pleural tumour) and 158 (malignant peritoneal tumour), which is respectively of 104 and 147 cases a year. A critical assessment of the Hospital Discharge Form (SDO) data is underway, through a check by medical records.

From the starting date of the activities (01.07.2003) the Regional Operative Centre (COR) of Campania, through the recognition network set up, received the notification of 315 cases of malignant mesotheliomas (in the pleura, peritoneum, pericardium and vaginal tunic of the testicle), 5 of which were found to be non-mesotheliomas. For 268 cases, with complete private and clinical data, it was possible to set out the distribution by age groups (Tab. 1) and by year of incidence (Tab. 2).

Tabella. 1

Classi d'età	Sede							Totale	
	Peritoneo		Pleura		Pericardio		Vaginale del testicolo		
	F	M	F	M	F	M	M	F	M
<50	1	1	7	12	0	1	1	8	15
50-59	0	3	18	50	0	0	0	18	53
60-69	1	1	19	71	0	0	0	20	72
70-79	1	0	14	48	0	0	0	15	48
>80	0	0	4	14	0	0	1	4	15
Totali	3	5	62	195	0	1	2	65	203

Table 1

Key:

Classi d'età	Age groups
Sede	Site
Peritoneo	Peritoneum
Pleura	Pleura
Pericardio	Pericardium
Vaginale del testicolo	Testicle vaginal
Totale	Total
F	F
M	M
Totali	Total

Tabella. 2

Anno di incidenza	Sesso		Sede				Totale
	Donne	Uomini	Pleura	Peritoneo	Pericardio	Vaginale del testicolo	
2000	4	19	21	1	0	1	23
2001	11	44	51	3	1	0	55
2002	16	39	54	1	0	0	55
2003	17	50	63	3	0	1	67
2004	13	42	55	0	0	0	55
2005[1]	4	9	13	0	0	0	13
Totale	65	203	257	8	1	2	268

[1] Le informazioni del 2005 sono aggiornate al mese di settembre

Table 2

Key:

Anno di incidenza	Year of incidence
Sesso	Gender
Donne	Women
Uomini	Men
Sede	Site
Pleura	Pleura
Peritoneo	Peritoneum
Pericardio	Pericardium
Vaginale del testicolo	Testicle vaginal
Totale	Total
Totale	Total

[1] Data concerning the year 2005 refer to the period until the month of September

Definition of exposure

To define exposure to asbestos in patients affected by mesothelioma the questionnaire on the working history and the life habits were used as well as the criteria for the definition of exposure, both contained in the 2003 National Mesothelioma Register (ReNaM) Guidelines.
The questionnaire was given out to 33 cases (29 patients and 4 proxies); the exposure was defined as

occupational in 26 cases (16 occupational certain, 4 occupational probable, 6 occupational possible), 1 case was defined as “domestic”, 1 as “environmental”, 1 as “improbable” and 4 as “unknown”.
The sectors with certain/probable/possible occupational exposure most frequently represented were: 15% in shipbuilding, 15% in railway stock construction and repair, 15% in construction.
We would like to point out that when giving out the questionnaire priority was given to living cases, and therefore most interviews were carried out for the cases incident in 2003 – 2004 – 2005.

APULIA REGION

NATIONAL MESOTHELIOMA REGISTER APULIA REGION OPERATIVE CENTRE

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The Apulia Regional Operative Centre of the National Mesothelioma Register

The Mesothelioma Register has been set up since 1988, at the Occupational Medicine Institute of the University of Bari, Workers' Prevention Medicine and Psychotechnics Department. With the entry into force of Legislative Decree 277/91 and then Law 257/92 the register increased its information network; in 1996 the Region identified in this
structure the Regional Operative Centre (COR) of the National Mesothelioma Register (Apulia Region Resolution No. 366 dated 26/02/1996 Ref. SAN-DEL 196/00104) and finally in 2003 Regional Council Resolution (DGR) 983/2003 "Decree of the President of the Council of Ministers (DPCM) 10/12/02 No. 308 Rules for the definition of the model and of the procedures for keeping the register of cases of asbestos-related mesothelioma - identification of the Regional Operative Centre (COR) of Apulia and of the managers– operating procedures".
The Regional Operative Centre (COR) of Apulia cooperate with the Ministry of the Environment - Ministry of Health as to the coordination operations for polluted sites of national interest in operation since September 2003.
Since 2001, in the context of the special agreement with the Basilicata Region, the COR of Apulia begun cooperation with the COR of Basilicata for activities in support of its setting up and its functioning. The residents people of Apulia in the 2001 census were:

Provincia	Uomini	Donne	Totale
Foggia	338.516	352.476	690.992
Bari	762.930	796.732	1.559.662
Taranto	281.700	298.106	579.806
Brindisi	193.285	209.137	402.422
Lecce	374.847	412.978	787.825
Puglia	**1.951.278**	**2.069.429**	**4.020.707**

Key:

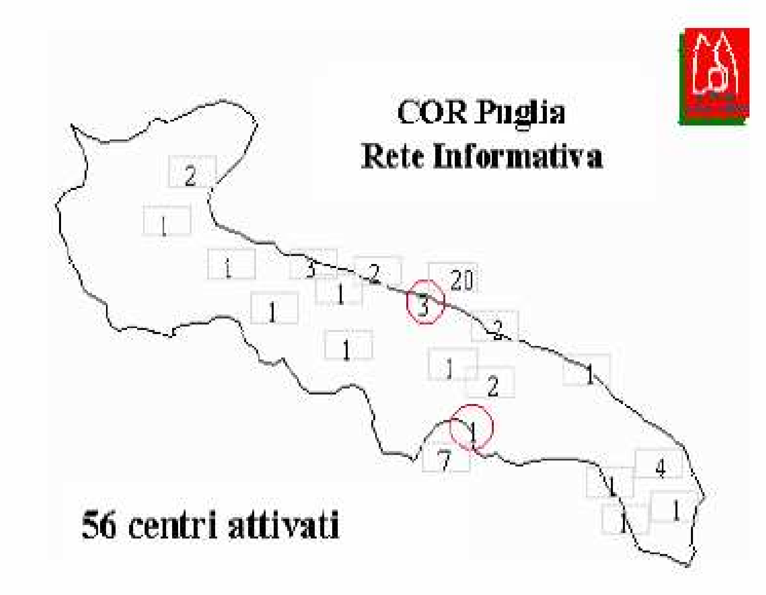
Provincia	Province
Foggia	Foggia

Bari	Bari
Taranto	Taranto
Brindisi	Brindisi
Lecce	Lecce
Puglia	Apulia
Uomini	Men
Donne	Women
Totale	Total

The region is subdivided into 12 Local Health Units (ASL), 5 of which are in the Province of Bari, 3 in the Province of Foggia, 2 in the Province of Lecce, 1 in the Province of Taranto, 1 in the Province of Brindisi.
In the 12 Local Health Units (ASL) there are 6 Thoracic Surgery Departments, 9 Pathological Anatomy Departments, 27 Pneumology and Respiratory System Disease Departments, 13 Oncology Departments

In the Apulia Region, seat of one of the main national centres of the shipbuilding industry (Taranto) as well as the production of cement asbestos products (Bari), exposure to asbestos, especially in the 1940s-80s, was intense and prolonged.
Due to the existence of these regional production activities, already since 1988, a feasibility study was promoted, in cooperation with the Italian National Institute of Health in the project "Surveillance of pleural mesothelioma in Italy" for a regional register of Mesotheliomas. This Register was set up in 1989 in cooperation, at the regional level, with the Pathological Anatomy Institute and the Thoracic Surgery Division of the University of Bari, with the I
Thoracic Surgery Division of the "Cotugno" Hospital in Bari and with the Pathological Anatomy Department of the Hospital "SS. Annunziata" of Taranto. The staff included a Professor of the University of Bari, with the role of coordinator, a permanent technician and a postgraduate student in Occupational Medicine. The resources were supplied by the University research funds (fund share 60%).
With the entry into force of Legislative Decree 277/91 prescribing the setting up of a National Mesothelioma Register (ReNaM) in Article 36, already existing regional registers became Regional Operative Centres (COR). In 1996 and 2003 the Apulia Region, identified the Workers' Prevention Medicine Division of the Occupational Medicine Division, Department of Internal Medicine and Public Medicine, of the University of Bari, seat of the Regional Mesothelioma Register as Regional Operative Centre of the National Mesothelioma Register.
This identification did not involve any costs by the Regional Health Department, in fact neither funding was allocated nor personnel was supplied for the Regional Operative Centre (COR) of Apulia
Currently the staff of the Regional Operative Centre (COR) includes University Professor, a permanent technician and three postgraduate students of Occupational Medicine from the University of Bari.
The Regional Information Network comprises the doctors and health staff of the Departments of Occupational Medicine, Pathological Anatomy and Histology, Thoracic Surgery, Pneumology, Respiratory Physiopathology, Oncology.
The Regional Information Network allows the coverage of the whole regional territory.
To this end, in the months of November and December 1997, the Regional Operative Centre (COR) of Apulia organised an Advanced Employed Health Staff Training Course (FAPSO). This course was financed by the Apulia Region within the framework of the Vocational Training Plan and co-financed by the European Social Fund.
83 people attended the course, mainly doctors with several specialisations from all five Apulia

Province and they automatically became managers of the Regional Operative Centre (COR) of Apulia at their respective work places thanks to the skills acquired during the course and official recognition as "Managers of the Regional Operative Centre (COR) of Apulia" was requested to the Regional Health Department: therefore at present the COR of Apulia can count on an information network of 56 centres.



Key:

COR Puglia Rete Informativa	COR Apulia Information Network
56 centri attivati	56 activated centres

The coverage of the whole region by local points of reference who report cases that they happen to be aware of is a necessary condition to obtain a complete picture of the incidence of this pathology in our Region and to identify possible sources of exposure still present in order to carry out the relevant reclamation operations.

The cooperation with the Regional Operative Centre (COR) involves for the local points of reference the possibility of accessing the statistics of the regional case histories, the bibliographic updating, the use of the data for scientific publications, the availability of anatomopathological consultancy in support of diagnosis and the availability of data on the more advanced therapy centres, as well as the possibility of acquiring documentation valid for medical and legal and insurance purposes.

<u>Objectives of the Regional Operative Centre (COR) of Apulia</u>:

- Recording of all the cases of mesothelioma diagnosed among resident people in Apulia to evaluate the spreading of the pathology (incidence, prevalence);
- Retrospective reconstruction for each case of the asbestos exposure history (military, occupational, domestic, environmental, leisure);
- Implementation of current regulations (Legislative Decree 277/91, Decree of the President of The Republic 336 13-04-94);
- Epidemiological Research and Surveillance:

to recognize unexpected sources of exposure,
to plan preventive and health surveillance interventions,

to study the relationship between environmental exposure to asbestos and the onset of mesotelioma.

Tasks of the Regional Operative Centre (COR) of Apulia:

- Acquisition, implementation and archiving of the data on each individual case; through active and passive research of cases;
- Diagnosis of each individual case (best evidence); with the acquisition of health documentation;
- Definition of exposure through a standardised questionnaire to the subject, where possible, or to the relatives;
- Enrolment in the register, setting up of a paper or computerised archive which allows access to the data by all the components of the Regional Information Network;
- Operative support as to medical and legal issues aimed at the recognition for insurance purposes of cases of mesothelioma as an occupational disease where the terms apply;
- Notification of cases to the competent Judicial Authority;
- Transmission to the National Mesothelioma Register of the notification sheets of the individual cases;
- Setting up of a specific database for subjects formerly exposed to asbestos and scientific, training and operative support for the implementation of health surveillance interventions for the subjects themselves;
- scientific, training and operative coordination of the "Regional Reference Centre for the Prevention, Diagnosis and Treatment of Occupational and Environmental Asbestos-Related Pathologies".

Procedures for surveying and assessing cases, in compliance with the Decree of the President of the Council of Ministers (DPCM) 308/2

The methodology: the regional data flow for the surveying of cases applies is based on the National Mesothelioma Register (ReNaM).

Passive surveying:

The case surveying system provides for a preliminary passive surveying phase with a reporting of cases by the information network managers. This phase consists of reporting to the Regional Operative Centre (COR) of case of mesothelioma supplying all personal data for identifying the subject affected and the clinical data concerning the diagnosis according to the special case surveying sheet.

After acquiring the notification from the local reference parties, the Regional Operative Centre (COR) arranges for active surveying consisting of the acquisition of all diagnostic elements capable of increasing the certainty of the diagnosis. This also entails a further review of the histological diagnosis by anatomopathological experts should any doubt arise. Having defined the clinical diagnosis the Regional Operative Centre (COR) reconstructs the exposure through an interview with the subject, if alive, or with the relatives, using the nationally standardised questionnaire.

After being reported by the bodies of the information network which collaborate with the Regional Operative Centre (COR), the new cases are directly contacted and the subject is interviewed during admission in order to obtain as accurate a reconstruction of the exposure as possible.

The interviews are carried out by direct meeting whenever possible, and by telephone where subjects (cases or relatives) are unavailable for a meeting. The latter case often occurs for cases reported with a lot of delay and relating to diagnoses made more than two/three years before the reporting. Just as frequent is the case in which the relatives, after the first telephone interview, interested in the medical/legal/insurance aspects, make themselves available for the collection of documentation on the case in question and for direct interview.

Active Surveying:

The working methodology adopted consists of researching back in time for cases of mesothelioma using the regional archives of the Pathological Anatomy Institutes, of the Thoracic Surgery,

Pneumology and Oncology Departments of the Hospitals involved in the active research. For these cases there is a review of the histological specimens for the confirmation of diagnosis. In this phase cases of suspected mesothelioma and benign pleuropathies due to asbestos are obviously also taken into consideration.
Therefore contact is made with the relatives of the subject if deceased, that are given a semi-structured questionnaire suited to the demands of standardisation of the National Register. This questionnaire is aimed at reconstruction of the working and residential history, leisure habits (spare time or activities at risk), any exposure in a domestic environment (working activity of the parents, siblings and spouse).
If necessary data are also provided to the person concerned or to the survivors aimed at obtaining, if the conditions apply, the recognition of the occupational disease even providing medical, legal and bibliographic support.
Cases outside the Region, once reconstructed, are forwarded to the National Register and, if present, to the relevant Regional Operative Centre (COR).
Completeness and exhaustivity of surveying:
starting from November 1997 the Regional Operative Centre (COR) of Apulia activated the procedures for the completion of the Regional Information Network and the systematic collection of certain or suspected cases of mesothelioma throughout the Region. For a few sources of data which were not previously available steps are being taken towards the acquisition of data for the integration and the verification of completeness of the case histories collected. And in particular both the Hospital Discharge Forms (SDO) and the ISTAT mortality sheets have been available in our Region since the activation in 1998 of the Regional Epidemiological Observatory and the Jonico-Salentino Cancer Register (for the Provinces of Brindisi, Taranto and Lecce) with coverage of the Hospital Discharge Forms (SDO) (active and passive mobility) and of the ISTAT mortality sheets since 1998.

Linkage with the Apulia Region Hospital Discharge Forms (SDO) (Svim Service – Apulia Epidemiological Observatory

The activity is still underway, the Hospital Discharge Forms (SDO) for the years 1998-2003 have been processed, assigning the ICD IX codes: 163 (pleura), 158 (peritoneum) and 164 (pericardium), as regards the active and passive mobility for the resident people of Apulia.

Anno	Cartelle cliniche SDO° Richieste		Cartelle Ricevute	Non pertinenti	Pertinenti da valutare
	Mobilità Attiva	Mobilità Passiva			
1998	101	9	54 (100%)	34 (63%)	20 (37%)
1999	128	10	49 (100%)	37 (75%)	12 (25%)
2000	127	10	47 (100%)	17 (36%)	30 (64%)
2001	119	9	52 (100%)	42 (81%)	10 (19%)
2002	124	5	46 (100%)	35 (76%)	11 (24%)
2003	124	11	54 (100%)	30 (55%)	24 (45%)
Totale	**723**	**54**	**302** (100%)	**195 (65%)**	**107 (35%)**

°ICD IX: 158.8; 158.9; 163.0; 163.1; 163.8; 163

Key:

Anno	Year
Cartelle cliniche SDO° Richieste	Clinical records Hospital Discharge Forms requested
Mobilità Attiva	Active Mobility
Mobilità Passiva	Passive Mobility
Cartelle ricevute	Received clinical records
Non pertinenti	Non relevant
Pertinenti da valutare	Relevant to be evaluated
Totale	Total

° ICD IX; 158.8; 158.9; 163.0; 163.1; 163.8; 163

The same data collection procedure was set up for the cooperation at the regional level between the COR and the Italian National Institute for Insurance against Occupational Accidents (INAIL) and the acquisition of the regional database of subjects exposed/formerly exposed to asbestos (Art. 13 of Legislative Decree 257/92).

The acquisition of data on cases of mesothelioma among the resident people of Apulia diagnosed outside of the Region has been duly set up for cases diagnosed in the Regions hosting the other 4 historical CORs (Piedmont, Liguria, Tuscany, Emilia-Romagna), with the Brescia/Bergamo Register of Mesotheliomas and with the CORs of Sicily, Basilicata, Campania, Veneto, etc. due to be set up.

On the basis of what has been stated, would like to emphasise that the recording, as with all cancer recordings, is an on-going survey with the retrospective monitoring of cases, which becomes consolidated, for the production of incidence data, on an average timescale longer than 36 months.

The data of the Apulia Operative Centre - Regional Mesotheliomas Register

The cases of mesothelioma currently recorded by the COR of Apulia for the years 1980-2005 (1st semester), total 502, 86% of which have a histological diagnosis and among the latter 57% have immunohistochemical diagnosis, the predominant anatomical site is the pleura.
The distribution by gender of the 502 cases is 79% male and 21% female.

SEDE	SESSO		TOT	%
	M	F		
PLEURA	375	102	477	95
PERITONEO	19	5	24	4,8
PERICARDIO	0	1	1	0.2
TOTALE	**394**	**108**	**502**	**100**

Key:

SEDE	SITE
SESSO	GENDER
M	M
F	F
TOT	TOT
%	%
PLEURA	PLEURA
PERITONEO	PERITONEUM
PERICARDIO	PERICARDIUM
TOTALE	TOTAL

The distribution by age group of the cases:

Classi d'età	Totale							
	PLEURA		PERITONEO		PERICARDIO		TOTALI	
	M	F	M	F	M	F	M	F
<50	23	13	5	0	0	0	28	13
50-59	92	22	4	0	0	0	96	22
60-69	122	36	8	3	0	1	130	40
70-79	109	24	2	2	0	0	111	26
>=80	29	7	0	0	0	0	29	7
TOTALI	375	102	19	5	0	1	394	108

Key:

Classi d'età	Age groups
Totale	Total
PLEURA	PLEURA
PERITONEO	PERITONEUM
PERICARDIO	PERICARDIUM
M	M
F	F
TOTALI	TOTAL

The distribution of the cases by exposure groups and gender:
467 out of the 502 cases (93%) were defined (reconstructed)
As regards the distribution by gender of reconstructed/defined cases 75% are men and 25% are women.

ADM ESPOSIZIONE	SESSO		TOT	%
	M	F		
Esposizione professionale certa	128	4	132	26.3
Esposizione professionale probabile	83	3	86	17.1
Esposizione professionale possibile	76	5	81	16.1
Esposizione domestica	-	8	8	1.6
Esposizione ambientale	19	27	46	9.2
Esposizione extraprofessionale	7	2	9	1.8
Esposizione improbabile	31	32	63	12.5
Esposizione ignota	27	15	42	8.4
Esposizione in corso di definizione o non classificata	24	11	35	7
TOTALE	**395**	**107**	**502**	**100**

Key:

ADM ESPOSIZIONE	ADM EXPOSURE
SESSO	GENDER
M	M
F	F
TOT	TOT
%	%
Esposizione professionale certa	Certain occupational exposure
Esposizione professionale probabile	Probable occupational exposure
Esposizione professionale possibile	Possible occupational exposure
Esposizione domestica	Domestic exposure
Esposizione ambientale	Environmental exposure
Esposizione extraprofessionale	Extraprofessional exposure
Esposizione improbabile	Improbable exposure
Esposizione ignota	Unknown exposure
Esposizione in corso di classificazione o non classificata	To be defined or unclassified exposure
TOTALE	TOTAL

The data of the National Mesothelioma Register (ReNaM) of Apulia comply with those shown by the National Mesothelioma Register (ReNaM) at the national level. For the cases defined/reconstructed, in 36% of cases it was possible to gather the data directly from the patient, in 54% from the spouse or children and in the remaining 9% of cases the data were supplied by other relatives or colleagues (mother/father, sister/brother, son-in-law/daughter in law, brother-in-law/sister-in-law, colleagues).

In the distribution of the 502 cases by exposure group and by gender there is a clear predominance of occupational exposure among the 287 male subjects (96%) against 12 (4%) of female cases up to a total of 299 cases with occupational exposure.

39% of the production sector of the occupational exposure are associated with the activities in the military or merchant Navy, and with shipbuilding; 9% with the activity carried out in the iron and steel sector. In total 48% of occupational exposure concerns the two industrial centres of our Region and especially the Province of Taranto (shipbuilding and iron and steel industry).
Exposure to asbestos for the cases registered in the Regional Operative Centre (COR) of Apulia was documented in 72% of subjects: 59% of which with occupational exposure, 12% with non-occupational exposure and 27.9% with exposure that could not be attributed to any factor.
Among the data of the Regional Operative Centre (COR) of Apulia for the years 1980/2005 (1^{st} semester) there are 46 cases with environmental exposure which make up 9.2% of the total of referred cases (502) and 9.8% of the total of cases defined-reconstructed (467). Out of the 46 cases considered, 27 women and 19 men, 32 (69%) are resident in Bari and 10 (22%) in Taranto.
The distribution by municipality of residence confirms the role of the asbestos cement industry in the environmental pollution of surrounding areas, as recently reported in the literature. The residence of the referred cases was within 1 km from the asbestos cement production plant of Bari.
The average age when diagnosis was made was 57.6 years (interval 38/75 years), 65.2 years for men (interval 58/74 years) and 51.6 years for women (interval 38/75 years). The histotype distribution among the 46 cases is as follows: Epithelioid 64.4%, Biphasic 24.4%, Fibrous 11.1%.
The average duration of the exposure reconstructed is equivalent to 21.5 years (interval 4/49), with the start of exposure for all cases occurring between 1947-1972. The average latency is 37.3 years (interval 22/49 years), whilst the average age at start of exposure is 20.3 years, with the age between zero (from birth) and 48 years. It is interesting to note that for the 4 cases with age at diagnosis of between 38 and 55 years, all women and all resident in Bari, the age at the start of exposure is between zero (from birth) and 23 years. It must be emphasised that as regards the case occurring in a 38 year old woman, with start of exposure at zero years (birth), it is a subject whose family lived between 1958 and 1964 inside the plant for the production of asbestos cement products of Bari, and therefore the subject was exposed from birth to the age of 6 with an "occupational" exposure type in quantitative terms (Musti 2002, Bilancia, 2003).

Conclusions

The increase in terms of morbidity and asbestos mortality in Apulia requires adequate interdisciplinary answers; it is by now deemed necessary to go from the network dimension (current working methodology) to the regional polycentric excellence "system" dimension, that can univocally manage the complex environmental and health problems linked to asbestos.

COR- APULIA Publications

M. Musti, D. Cavone, P. Comba, T. Vetrugno. "LA CASISTICA PUGLIESE SUL MESOTELIOMA PLEURICO NEGLl ANN1 1977-1989. PRIMI RISULTATI" - Proceedings of the 53° Congresso Naz. Soc. Ital. Med. Lav. ed lg. Ind., 1079/1082, Monduzzi, 1990.

M. Musti, D. Cavone. "CONSIDERAZIONI SULLA CASISTICA Dl MESOTELIOMI OSSERVATI IN PUGLIA", Proceedings of the Convegno Nazionale Mesoteliomi maligni ed Esposizioni Professionali ed Extraprofessionali ad amianto", 13-14/11/ 1990 PISA, Edigrafica Sarzana, 134-141, 1992.

M. Musti, D. Cavone, L. Palamà. "CASISTICA DEI MESOTELIOMI IN PUGLIA", Proceedings of the Meeting "L 'Amianto: dall'ambiente di lavoro all'ambiente di vita. Nuovi indicatori per futuri effetti", Turin, 23-25 September1996, series FMS-I Documenti 12, 1997, 295-306.

M. Musti, L. Palamà, D. Cavone. "IL REGISTRO MESOTELIOMI. IN RASSEGNA Dl PATOLOGIA DELL'APPARATO RESPIRATORIO" -II mesotelioma Pleurico, Edi AIPO Scientifica, 1998, 13/18.

M. Musti, L. Palamà, D. Cavone, V. Bufano. "IL MESOTELIOMA PLEURICO IN PUGLIA. I DATl DEL REGISTRO NAZIONALE MESOTELIOMI CENTRO OPERATIVO REGIONALE PUGLIA, Proceedings of the 7° Congresso Nazionale FONICAP Suppl. 711, 1998, Quaderni di patologia toracica D. Cotugno 2/3.

M. Musti, D. Cavone, A. M. Frasca, L. Palamà, V. Bufano, P. Di Mauro "L'ANALISI DELL'ETÀ ALLA DlAGNOSl NEI CASl Dl MESOTELIOMA MALIGNO DELLA PLEURA IN PUGLIA. I DATl DEL CENTRO OPERATIVO REGIONALE (C.O.R.) DEL REGISTRO NAZIONALE MESOTELIOMI (ReNaM)". Proceedings of the 61° Congresso Nazionale Società ltaliana di Medicina del Lavoro e lgiene lndustriale, Chianciano, Folia Medica, 69/2, 479/485, 1998.

M. Musti, L. Palamà, D. Cavone, V. Bufano, P. Di Mauro "MESOTELIOMA MALIGN0 IN PUGLIA- I DATl DEL CENTRO OPERATIVO REGIONALE DEL REGISTRO NAZIONALE MESOTELIOMI". Proceedings of the Ill Congresso Nazionale Associazione Universitaria ltaliana di Medicina del Lavoro B. Ramazzini, Modena, 1998.

M. Musti, D. Cavone, L. Convertini, "CENNI SULLE PATOLOGIE DA ESPOSlZlONE AD AMIANTO - SlGNlFlCATO E VALIDITÀ DELLA SORVEGLIANZA SANITARIA PER GLI EX ESPOSTI AD AMIANTO - IL REGISTRO MESOTELIOMI", Proceedings of the Refreshing Course

for the SSR (Regional Health Service) operators, Basilicata Region, Department of Social Security and Solidarity–Environment and Territory, February-June 1999, 9/60, 1999

M. Musti, L. Palamà, D. Cavone, V. Bufano, P. Di Mauro. "IL CENTRO OPERATIVO PUGLIESE DEL REGISTRO NAZIONALE MESOTELIOMI", Proceedings of the 5° Convegno Multidisciplinare di Oncologia I Tumori di Origine lndustriale i Mesoteliomi, Bari, 1998, in Eur J Onc, 1999, 4, 387-390.

M. Musti, D. Cavone, L. Convertini, F. Ammirabile, C. Tartarelli. "I DATl DEL RE.NA.M.- C.O.R. PUGLIA - LA REGISTRAZIONE DEI MESOTELIOMI IN PUGLIA: LE ESPOSlZlONl AMBIENTALI", Proceedings of the 62° Congresso Nazionale Società ltaliana di Medicina del Lavoro ed lgiene lndustriale, Genova 29/9-2/10, 1999, Lavoro e Medicina 2, ECIG, 1999, 575-580.

M. Musti, D. Cavone, V. Bufano, P.Di Mauro, L. Convertini "I DATl DEL RE.NA.M.- C.O.R. PUGLIA- (DL 277/91 art. 36). LA REGISTRAZIONE DEI MESOTELIOMI IN PUGLIA". Summaries of reports and posters of the Conferenza Nazionale sull'Amianto, Rome 1- 5/03/1999, 196.

M. Musti, G. Serio, A. Pennella, A. Marzullo, M. Lo Mele, D. Cavone, F. Ammirabile, L. Pollice. "MALIGNANT PLEURAL MESOTHELIOMA: EPIDEMIOLOGY, DIFFERENTIAL DIAGNOSIS AND PROGNOSIS" Virchows Archiv vol 435 (3): 366, p-696, 1999.

M. Musti, D. Cavone, V. Bufano, L. Convertini, P. Di Mauro, G. Serio. "MESOTHELIOMA NATIONAL REGISTER PUGLIA OPERATIONS CENTRE: MALIGNANT MESOTHELIOMA CORRELATION BETWEEN ASBESTO'S EXPOSURE AND HISTOLOGICAL TYPE". In Proceedings of the Malignant Mesothelioma International Conference, Lignano Sabbiadoro, Udine 18-19/03/99

G. Assennato, M. Carbonara, D. Cavone, C. Di Pierri, G.M. Ferri, A. Lo Izzo, M. Musti, L. Palamà, A. Porro, D. Sivo. "MORTALITY AMONG EMPLOYERS OF AN ASBESTOS-CEMENT FACTORY IN APULIA, Eur. J. Onc. 4 (4): 391-394. 1999

M. Musti, D. Cavone. "LETTERA APERTA DAL CENTRO OPERATIVO REGIONALE PUGLIESE DEL REGISTRO NAZIONALE MESOTELIOMI" Quarterly Osservatorio Epidemiologico Regionale, Anno II numero 1, Marzo 1999.

M. Musti, G. Serio, F. Ammirabile, A. Pennella, D. Cavone, A. Scattone, J. Valerio, L. Pollice. "MESOTELIOMA MALIGNO DELLA PLEURA: VALUTAZIONE DEL FOLLOW-UP, in SIAPEC-IAP Poster, Bolzano 24-27/05/2000, p-38,44-45.

M. Musti, G. Serio, A. Pennella, A. Marzullo, A. Scattone, F. Ammirabile, M. Lo Mele, L. Pollice.

"IL MESOTELIOMA PLEURICO. CONTRIBUTO IMMUNOISTOCHIMICO" in SIAPEC-IAP Poster Meeting, Bolzano 24-27/05/2000, p-38,44-45.

L. Pollice, G. Serio, A. Scattone, A. Pennella, F. Ammirabile, Lo Mele, J. Valerio, D. Cavone, M. Musti, "MESOTELIOMA MALIGN0 DELLA PLEURA: VALUTAZIONE DEL FOLLOW-UP E CORRELAZIONE CON L'INDICE Dl PROLIFERAZIONE MIB-1", in Proceedings of the 17° Convegno sulla Patologia da Tossici Ambientali ed Occupazionali, Torino Moncalieri le Vallere, 11 September 2000,43-48.

M. Musti, F. Ammirabile, D. Cavone, G. Floridia, D. Caccavo, G. Serio, L. Viggiano, D. Taruscio. "ALTERAZIONI CROMOSOMICHE E SV40 IN SOGGETTI CON MESOTELIOMA PLEURICO E CON SCLEROIALINOSI: PRIMI RISULTATI". AIE 2000 annual meeting of the Società ltaliana di Epidemiologia, Rome, 18-21 October 2000.

G. Cauzillo, D. Cavone, L, Convertini, C. Annona, M. Musti, "LETTERA APERTA DEL CENTRO OPERATIVO REGIONALE LUCANO DEL REGISTRO NAZIONALE MESOTELIOMI", Magazine Osservatorio Epidemiologico Basilicata region, July 2001.

M. Musti, M. Bilancia, A. Pollice, D. Cavone. "VALUTAZIONE DEL RlSCHlO Dl MESOTELIOMA: IN CASO Dl UN INSEDIAMENTO PER LA PRODUZIONE Dl CEMENTO-AMIANTO NELLA CITTÀ Dl BARI". Sismec 2001 Proceedings, Tris Napoli, 168/171, 2001.

M. Musti, F. Ammirabile, G. Serio, L. Viggiano, A. Pennella, A. Scattone, D. Cavone, L. Pollice. "ESPRESSIONE Dl SV40 IN PAZlENTl CON MESOTELIOMA E/O CON PLACCHE PLEURICHE ESPOSTI AD ASBESTO". Pathologica, 93, 4,407, 2001.

L. Pollice, G. Serio, A. Scattone, A. Pennella, F. Ammirabile, M. Lo Mele, J. Valerio, D. Cavone, M. Musti, "MESOTELIOMA MALIGNO DELLA PLEURA: VALUTAZIONE DEL FOLLOW-UP E CORRELAZIONE CON L'INDICE Dl PROLIFERAZIONE MIB-1". Pathologica, 93, 4,437, 2001.

M. Musti, D. Cavone, M. Bilancia, A. Pollice. "STUDIO DELLA DlSTRlBUZlONE SPAZIALE DELLA MORTALITÀ DA MESOTELIOMA MALIGNO NELLE PROVINCE Dl BARI E TARANTO", AIE 2001, Venezia 3/6 October 2001.

M. Musti, D. Cavone, V. Bufano, F. Ammirabile. "ANALISI DELLA RESIDENZA DEI CASl Dl MESOTELIOMA NELLA CITTÀ Dl BARI", AIE 2001, Venezia 3/6 October 2001.

M. Musti, F. Ammirabile D. Cavone, L. Viggiano, D. Caccavo, G. Serio "RICERCA Dl SV40 IN SOGGETTI AFFETTI DA MESOTELIOMA MALIGNO" Med Lav Erg, 23/3, 378-379, 2001.

M. Musti, F. Ammirabile D. Cavone, G. Floridia, D. Taruscio, "ANALISI DELL'ASSETTO GENOMICO Dl SOGGETTI AFFETTI DA MESOTELIOMA MALIGNO, Med Lav Erg, 23/3, 380-

381, 2001.

M. Musti, D. Cavone, F. Ammirabile "IL CENTRO OPERATIVO REGIONALE PUGLIESE DEL REGISTRO NAZIONALE MESOTELIOMI" in Registro Nazionale dei Mesoteliomi. Monografie Fogli di informazione ISPESL, 2001, 95-103.

M. Musti, G. Serio, A. Pennella, A. Scattone, F. Ammirabile, A. Marzullo, C. Giardina, L. Pollice "PLEURAL MALIGNANT MESOTHELIOMA: EVALUATION OF THE PROLIFERATIVE INDEX MIB-1 AND ITS CORRELATION WlTH SURVIVAL. CANCER: FROM BASIC RESEARCH TO CLINICAL APPLICATION. ABSTRACTS". II Carso International Conference on Oncology Research. Tricase, Lecce, pp.39, 20-21 July 2001.

G. Serio, A. Scattone, A. Pennella, C. Giardina, M. Musti T. Valente, L. Pollice "MALIGNANT DEClDUOlD MESOTHELIOMA OF THE PLEURA: REPORT OF TWO CASES WlTH LONG SURVIVAL". Histopathology, 40, 348-352, 2002.

M. Musti, D. Cavone, Y Aalto, A. Scattone, G. Serio, L. Pollice, S. Knuutila. "A CLUSTER OF FAMILIAL MALIGNANT MESOTHELIOMA WITH DELETION OF 9P AS THE ONLY CHROMOSOMAL ALTERATION" Cancer Genetics and Cytogenetics, 138/1, 31-31, 2002.

M. Bilancia, D. Cavone, A. Pollice, M. Musti, 'VALUTAZIONE DEL RlSCHlO Dl MESOTELIOMA: IL CASO Dl UNA FABBRICA PER LA PRODUZIONE Dl CEMENTO AMIANTO NELLA CITTÀ Dl BARI", Epidemiologia e Prevenzione, 27, 5, 277/284, 2003

E. Merler, R. Bizzotto, R.Calisti, D. Cavone, N. De Marzo, F. Gioffrè, T. Mabilia, D. Marcolina, M. Musti, MG. Munafò, S. Roberti, P. Zambon, "MESOTHELIOMAS AMONG ITALIANS, RETURNED TO THE HOME COUNTRY, WHO WORKED WHEN MIGRANT AT A CEMENT-ASBESTOS FACTORY IN SWITZERLAND, Soz. Praventivmed, 48, 65/69, 2003

M. Nesti, A.Marinaccio, E. Chellini e i Centri Operativi Regionali.....M. Musti, "LA SORVEGLIANZA DEI CASl Dl MESOTELIOMA MALIGNO E LA DEFlNlZlONE DELLE ESPOSlZlONl AD AMIANTO: I DATl RENAM 1997, Epidemiologia e Prevenzione, 27, 3, 147/153, 2003

M. Nesti, A.Marinaccio, E. Chellini & Regional Operational Centers.....M.Musti, "MALIGNANT MESOTHELIOMA IN ITALY, 1997, Am J Ind Med, 22, 172/179, 2003

M. Nesti, A. Marinaccio, & Regional Operational Centers, M. Musti, " SURVIVAL ANALYSIS FOR MESOTHELIOMA CASES IN THE ITALIAN REGISTER (RENAM)", European J of Cancer, 39, 1290/1295, 2003

M. Musti, "IL REGISTRO MESOTELIOMI" G. Ital. Med Lav Erg, 25, 3, 393/395, 2003

L. Convertini, D. Cavone, G. Cauzillo, G. Montagano, L. Panarace, G. Serio, M. Musti, "SORVEGLIANZA SANITARIA (INTERVENTO SANITARIO) IN EX ESPOSTI AD AMIANTO (LAVORATORI EX MATERIT FERRANDINA)", G. Ital. Med Lav Erg, 25, 3, SUPPL, 245/246, 2003

G. Serio, A. Scattone, E. Mattioli, A. Pennella, C. Giardina, P. Nazzaro, D. Cavone, L. Pollice, M. Musti, "P27KIP AND MIB-1 IMMUNOREACTIVITY IN PLEURAL MALIGNANT MESOTHELIOMA, Virchows Archiv, 443, 3, 340/341, 2003

A. Scattone, G. Serio, M. Gentile, L.Pollice, L. Bonadonna, D. Cavone, P. Nazzaro, M. Bisconti, M. Musti, "FAMILIAL CLUSTERING OF MALIGNANT MESOTHELIOMA WITHOUT DIRECT CONTACT TO ASBESTOS. A GENETIC STUDY", Virchows Archiv, 443, 3, 340/341, 2003

M. Nesti, et al....M. Musti, "ISPESL. Linee guida per la rilevazione e la definizione dei casi di mesoteloma maligno e la trasmissione delle informazioni all'lSPESL da parte dei Centri Operativi Regionali.", ISPESL, Roma,2003

Pasetto R, Bruni B, Bruno C, Cauzillo G, Cavone D, Convertini L, De Mei B, Marconi A, Montagano G, Musti M, Paoletti L, Comba P., Pleural mesothelioma and environmental exposure to mineral fibres: the case of a rural area in the Basilicata region, Italy Ann Ist Super Sanità 40(2):251-65, 2004

Serio G, Scattone A, Gentile M, Nazzaro P, Pennella A, Buonadonna AL, Pollice L, Musti M. Familial pleural mesothelioma with environmental asbestos exposure: losses of DNA sequences by comparative genomic hybridization (CGH). Histopathology. Dec;45(6):643-5, 2004

G. Serio, A. Pennella, M. Gentile, A. Marzullo, A.L. Buonadonna, M. Musti, L. Pollice, A. Scattone, Mesotelioma deciduoide della pleura: analisi molecolare con CGH (comparative genomic hybridization) in 6 casi, Pathologica, 96,4,366, 2004

M. Musti, G. Cauzillo, D. Cavone, L. Convertini, B. De Mei, G. Montagano, A. Zona, P. Comba, Metodologia per la sorveglianza sanitaria e la comunicazione del rischio in popolazioni con esposizione ambientale a fibre di tremolite: I'esperienza nel territorio della Basilicata, Proceedings of the 68° Congresso SIMLII, Parma 5-8 October 2005, Mattioli editore, 191-93, 2005

L. Convertini, G. Cauzillo, D. Cavone, G. Montagano, T. Massaro, A. Maccuro, e M. Musti, Esperienza di sorveglianza sanitaria per ex esposti ad amianto: lavoratori ex Materit Ferrandina. Proceedings of the Convegno Nazionale "Le Patologie correlate all'amianto e la sorveglianza sanitaria degli ex esposti", Grafiche Caroti,163-165, 2005

A. Pennella, M. Musti, A. Scattone, D. Cavone, P. Nazzaro, E. Mattioli, R. Renna, L. Vurro, Pollice, G. Serio, Significato prognostico della proteina p27Kip1 e del fattore di crescita Ki- 67 in 122 mesoteliomi pleurici, Pathologica, 97,4,236-237,2005

M. Nesti, A. Marinaccio, V. Gennaro, G. Gorini, D. Mirabelli, C. Mensi, E. Merler, F.Montanaro, M. Musti, F. Pannelli, A. Romanelli, R. Tumino, ReNaM Working Group, Epidemiological Surveillance for primar prevention of malignant mesothelioma: the Italian Experience, Med Lav, 96,4,338-346, 2005

A. Scattone, A. Pennella, M. Gentile, M. Musti, P. Nazzaro, A.L. Buonadonna, A. Marzullo, D. Cavone, L.Pollice and G. Serio, Comparative Genomic Hybridization (CGH) in malignant deciduoid mesothelioma, Journal of Clinical Pathology Online, 2005

BASILICATA REGION

REGIONAL OPERATIVE CENTRE (COR) OF THE NATIONAL MESOTHELIOMA REGISTER

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Introduction

The Mesothelioma Register of the Basilicata Region (Re.Na.M. C.O.R. Basilicata) was set up with Regional Council Resolution No. 2775 dated 20/12/2000 and subsequent amendments and integrations, the latter to be referred to the transposition of Decree of the President of the Council of Ministers (DPCM) 308/2002.
Following the activities provided for by Article 10 of Law 257/92, from which the Regional Asbestos Plan originates, which shows the results of the census of contaminated sites, the actions to be undertaken for the updating of data and the guidelines for monitoring conditions of environmental integrity and safety at work, waste reclamation and disposal, having thus defined situations, current and past, of exposure risk, already in 2000, there was an opportunity to evaluate the asbestos-health impact in the population and to this end to establish the proper relationships with Re.Na.M. in accordance with the current national directives.
The Regional Operative Centre (COR) of Basilicata, active since March 2001, is based at the Regional Epidemiological Observatory of the Department of Health, Security and Social Solidarity, Services to the Person and to the Community.
The activity of the Regional Operative Centre (COR) of Basilicata, supported by regional funds, is guaranteed by the head of the Centre, Dr. Gabriella Cauzillo, Director of the Regional Epidemiological Observatory, by Dr. Luca Convertini, Occupational Physician, deputy manager, and by the technical-scientific support of the Regional Operative Centre (COR) of Apulia. The Regional Operative Centre (COR) of Basilicata started a close collaboration with all the regional health facilities (local information network), to which, at the start of works, it dedicated accredited training days in order to qualify its data flows.

Notes on demography and the Regional Health System

In Basilicata, as of 1 January 2003, there are 596,821[1] resident people, 293,250 of which are men and 303,571 are women. The Region is made up of 2 Provinces: Potenza (392,713 inhabitants) and Matera (204,108 inhabitants) and 131 municipalities (100 in the Province of Potenza and 31 in the Province of Matera). There are five Local Health Units (ASL) covering the whole Area of the Region, 3 of which are in the Province of Potenza and 2 in the Province of Matera: Local Health Unit (ASL) No. 1 of Venosa (19 municipalities - 96,859 inhabitants), Local Health Unit (ASL) No. 2 of Potenza (53 municipalities - 218,198 inhabitants) and Local Health Unit (ASL) No. 3 of Lagonegro (28

municipalities - 77,656 inhabitants) in the Province of Potenza; Local Health Unit(ASL) No. 4 of Matera (14 municipalities - 122,628 inhabitants) and Local Health Unit (ASL) No. 5 of Montalbano Jonico (17 municipalities - 81,480 inhabitants) in the Province of Matera. In each Local Health Unit (ASL) various departments have been set up, including that of Prevention, where the Occupational Medicine Departments also operate (one for each Local Health Unit (ASL)).
There is a single Hospital, the Hospital San Carlo of Potenza and a Regional Oncological Hospital, C.R.O.B., based in Rionero in Vulture (PZ), located in the territory of the Local Health Unit (ASL) No. 1 of Venosa, where the Basilicata Cancer Register is based.
And, in terms of Local Health Units (ASL), there are the following hospital centres: Local Health Unit (ASL) 1 of Venosa: hospitals of Melfi, Pescopagano and Venosa; Local Health Unit (ASL) 2 of Potenza: hospital of Villa d'Agri-Marsicovetere; Local Health Unit (ASL) 3 of Lagonegro: Hospital of Chiaromonte and Hospital "Ospedali Riuniti of Lagonegro-Lauria and Maratea"; Local Health Unit (ASL) 4 of Matera: Hospitals of Matera and Tricarico; Local Health Unit(ASL) 5 of Montalbano Jonico: Hospitals of Policoro, Stigliano and Tinchi-Pisticci. There is a single Private Nursing Home, the Luccioni Clinic, based in Potenza.
In the Region there are a Thoracic Surgery Operative Unit, three OU of Pneumology, three OU of Pathological Anatomy and two units with beds for oncology patients.

Situations at risk of exposure to asbestos

Centres of industry of particular significance, for the specific risk, can be identified, currently, in a former asbestos-cement production unit, former sugar-refineries and glassworks, in the chemical and engineering industry as well as in the rolling stock building and repair workshops.
Of apparent significance is also the construction sector together with the environmental situation observed in the Southern area of Basilicata due to the discovery of green rocks containing asbestos minerals (in particular tremolite) to which at least 8 cases of pleural MM are thought to be related.
Neither can one ignore the fact that, following the 1980 earthquake, prefabricated emergency buildings were installed in Basilicata using building materials containing asbestos, and that most of these remained in use for many years after the emergency phase and were subject to structural changes by the same inhabitants.
Similarly one must verify the risk of exposure arising from the intensive wine industry activity which especially characterises the Vulture-Melfi area (Local Health Unit (ASL) No. 1 of Venosa) due to the use of filters made of asbestos materials.

Procedures for surveying and assessing cases based on Decree of the President of the Council of Ministers (DPCM) 308/2002

After the setting up of the Regional Operative Centre (COR) the incident cases were investigated by the use of the following sources:
- death certificates
- hospital discharge forms (using the Regional Information Network and the specific discharge codes);
- reports from hospital wards (pneumology, oncology, thoracic surgery etc.);
- medical records supplied by the Health Management of regional and extra-regional hospitals;
- histology/cytology/autopsy data supplied by the Pathological Anatomy Departments;
- periodical data from the Basilicata Cancer Register.

[1] Source: ISTAT

The definition of the degree of certainty of the diagnosis of pleural, peritoneal mesothelioma as well as the diagnosis of mesothelioma of other anatomical sites takes place through the recovery of *in vivo* histology data reports and/or from autopsy, cytology data, immunohistochemistry data and from medical records.

The definition of past exposure to asbestos is made by interviewing the person concerned, where possible, or planning interviews with relatives, for seriously ill subjects or deceased. The interviews are carried out by Dr. Luca Convertini, deputy manager for the Regional Operative Centre (COR) of Basilicata. The data collected, regarding both the disease and past exposure to asbestos, are coded according to the National Mesothelioma Register (ReNaM) Guidelines.

Cases of malignant mesothelioma (MM) in Basilicata

When the activities of the Regional Operative Centre (COR) of Basilicata began (March 2001), the search for the cases started from the findings on the death certificates acquired by the managers of ReNCaM (Nominative Register of the Causes of Death) and on the Hospital Discharge Forms available from the Regional Health Information System (SISR) as well as from the first reports made by the regional health facilities through a specific data sheet sent by the Regional Operative Centre (COR).

Definition of the Disease

The Regional Operative Centre (COR) of Basilicata therefore gathered data on 152 possible cases of malignant mesothelioma (MM) during 1989-2004.
Out of the possible cases of MM mentioned above, 49 were certain, 43 were excluded because they were not MM, 8 were excluded because they had arisen in subjects who were not resident in the Basilicata Region and 52 are still undergoing diagnostic definition. Out of the 49 incident cases (M: 31; W: 18), occurring in the period 1989-2004, 45 (M: 30; W: 15) are pleural and 4 (M: 1; F: 3) peritoneal. About 70% of cases have a histological diagnosis; in 42% of the same cases the diagnosis is histological-immunohistochemical.
Their distribution by age groups, gender and year of incidence is shown in the following tables (Tab. 1 and 2).

Tabella 1-Casi incidenti di MM per classi età e sesso. Periodo 1989-2004.

Età	MM pleura (N.)		MM peritoneo (N.)		Totali (N.)	
	Uomini	Donne	Uomini	Donne	Uomini	Donne
<50	1	3	0	0	1	3
50-59	10	1	0	0	10	1
60-69	9	2	0	1	9	3
70-79	6	7	1	2	7	9
80+	4	2	0	0	4	2
Totali (N.)	30	15	1	3	31	18

Table 1 – Cases of malignant mesothelioma by age groups and gender. Period 1989-2004.

Key:

Età	Age
MM pleura (N.)	Pleural MM (N.)
MM peritoneo (N.)	Peritoneal MM (N.)
Totali (N.)	Total (N.)
Uomini	Men
Donne	Women
Totali (N.)	Total (N.)

Tabella 2-Casi incidenti di MM per anno di incidenza. Periodo 1989-2004.

Anno Incidenza	Sesso (N.)		Sede MM (N.)		Totali (N.)
	Uomini	Donne	Pleura	Peritoneo	
1989	1	0	1	0	1
1990	0	0	0	0	0
1991	1	3	3	1	4
1992	0	1	0	1	2
1993	0	0	0	0	0
1994	0	1	0	0	1
1995	2	1	3	0	3
1996	1	0	1	0	1
1997	0	2	2	0	2
1998	6	1	7	0	7
1999	1	0	1	0	1
2000	6	4	9	1	10
2001	5	3	8	1	7
2002	3	1	4	0	4
2003	1	0	1	0	1
2004	4	1	5	0	5
Totali (N.)	31	18	45	4	49

Table 2 - Cases of malignant mesothelioma by year of incidence. Period 1989-2004.

Key:

Anno Incidenza	Year of Incidence
Sesso (N.)	Gender (N.)
Uomini	Men
Donne	Women
Sede MM (N.)	Site of MM (N.)
Pleura	Pleura
Peritoneo	Peritoneum
Totali (N.)	Total (N.)
Totali (N.)	Total (N.)

Definition of exposure

For the definition of the occupational and non-occupational exposure to asbestos the Re.Na.M. Guidelines were used and the data necessary were acquired through interview with the people concerned or the relatives, from medical records and employment cards.

For the 49 incident cases - period 1989-2004, it has been possible to attribute a past occupational exposure to 21 cases (42.8%): for 2 of these the occupational exposure was certain, for 8 probable and for 11 possible. For 9 cases there was no data on working activity, 2 cases were classified as “unknown” (exposure group 8 according to Re.Na.M), as there were insufficient elements to classify past exposure, and 17 cases are yet to be defined. The more frequently represented sectors with certain/probable/possible working exposure were industry as regards the maintenance of production plant-equipment and construction. The subjects for whom certain exposure can be defined worked as steam boiler conductors in ships, in systems on the land and industries in which the presence of asbestos insulation is certain. There follow bricklayers and other construction workers in general. Furthermore there is a considerable number of workers in agriculture where in some way it was possible that they handled asbestos during their activity (asbestos cement coverings of poultry pens, wine filters, etc.). Furthermore there are some cases probably linked to the environmental conditions in which these subjects lived: there is a well known presence of ophiolitic outcrops of tremolite in the Southern area of the region, on which extra in-depth surveys are taking place. Finally Table 3 shows the classification of incident cases (49 in the period 1989-2004) by type of exposure.

Table 3 - Incident cases of malignant mesothelioma by type of exposure. Period 1989-2004.

ADM Exposure	Number of cases	%
ADM WORKING 1,2,3	21	42.86
ADM NON-WORKING 4,5,6	4	8.16
ADM NON-ATTRIBUTABLE 7,8	7	14.28
ADM TO BE DEFINED 9	17	34.69
TOTAL CASES	49	100

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The collection of the data presented was possible thanks to the cooperation of all the regional health facilities.
Therefore we would like to thank the staff of all the hospitals and local services of Basilicata and the Health departments of the extra-regional hospitals which, when requested by the Regional Operative Centre (COR) of Basilicata, immediately sent the relevant health documentation (medical records).
A special thanks to the Regional Operative Centre (COR) of Apulia for the precious methodological and training support.

CALABRIA REGION

REGIONAL OPERATIVE CENTRE (COR) OF THE NATIONAL MESOTHELIOMA REGISTER

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The Regional Mesotheliomas Register of the Calabria Region (Regional Operative Centre (COR) of Calabria) was set up, without targeted funding, with Resolution No. 227 dated 13 April 2004 by the Regional Council which identified, in accordance with Article 2 of Decree of the President of the Council of Ministers (DPCM) 308/02, in the SC of Pathological Anatomy and Cytodiagnostics of Health Unit No. 6 of Lamezia Terme and in the Epidemiology and Health Statistics Department of the Calabria Region Health Department, the facilities of the Regional Operative Centre, granting, in addition, Dr. Attilio LEOTTA, Director of the SC of Pathological Anatomy of the Hospital of Lamezia Terme with the task of Scientific Director, Manager in charge of the surveying of cases of mesothelioma, and identifying as a deputy manager Dr. Santo Giovanni LIO, 1st level Director of the same SC of Pathological Anatomy.
In the Calabria Region, according to the registry office data updated to 1 January 2003, the resident population is 2,007,392 inhabitants of which 1,025,887 are women and 981,505 are men.
After the activation of the Regional Operative Centre (COR) the health facilities for diagnosis and treatment of the Region were contacted, and more specifically the Operative Units (U.O.) of Thoracic Surgery (3), of Pneumology (10), of Pathological Anatomy (9) and of Oncology (11) present in the 11 Health uand in Units and in the 4 Hospitals (one of which is a University hospital) and the Provincial Directorates of the National Social Security Institute (INPS) and of the Italian National Institute for Insurance against Occupational Accidents (INAIL).
Cooperation with the Workplace Prevention, Hygiene and Safety Department (SPSAL) was also set up.
The cases of Mesothelioma in the Calabria Region will be researched through the reports of the Hospital Wards outlined above, the Hospital Discharge Forms (SDO), the death certificates and the histological, cytological and post-mortem record reports supplied by the Pathological Anatomy Departments; these reports will also be used for the definition of certainty of the diagnosis of pleural, peritoneal mesothelioma as well as for mesothelioma of other anatomical sites

The Re.Na.M. Guidelines will be used for the definition of the occupational and non-occupational exposure to asbestos.

Since the start of the activity the Regional Operative Centre (COR) of Calabria received the reports of 4 cases of pleural mesothelioma concerning patients admitted in 2004 at non-regional health facilities.
Another 2 cases of pleuroperitoneal mesothelioma were diagnosed in 2005 by the SC of Pathological Anatomy in Lamezia.

SICILY REGION

REGIONAL OPERATIVE CENTRE OF SICILY

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In Sicily the Regional Operative Centre (COR) of the National Mesothelioma Register was set up by Decree of the Regional Health Minister No. 25861 dated 24.6.1998 and the subsequent Decree of the Councillor for Health dated 24.11.2003 which, in accordance with Decree of the President of the Council of Ministers (DPCM) 308/02, sets out that "*Article 2, the Manager for the Regional Operative Centre (COR) with functions of management and coordination of the activities of the register in the region, is the general manager or the deputy of the Epidemiological Observatory Department*" and "*Article 3, the official responsible for the surveying of cases of mesothelioma and for the assessment of past exposure to asbestos in accordance with Paragraph 1 of Article 2 of Decree of the President of the Council of Ministers (DPCM) No. 308/02 is the Director or the deputy responsible for the Tumour Register of Ragusa in the cases prescribed by law*". The registration activity is also regulated by the memorandum of the Health Councillor No. 1025 dated 23.5.2000 subsequently "*amended as regards the set of forms in use as per Decree of the President of the Council of Ministers (DPCM) no. 308/02*" by Council Decree 24.11.2003, Article 4.
No funding was allocated and no staff was assigned to the Regional Operative Centre (COR) of Sicily; the activity is carried out by the staff in the context of their work in the respective Health Units and the Regional Health Department.
According to the 2001 census Sicily has 4,968,991 inhabitants (2,401,542 men and 2,567,449 women). The Health System is based on 9 Local Health Units and 21 Hospitals, three of which are represented by the University hospitals. In the Region there are 6 Thoracic Surgery Operative Units, 13 OU of Pneumology, 23 OU of Pathological Anatomy, 4 Oncology Divisions and 20 facilities with beds for oncology patients. In the 9 Provinces there are as many Occupational Medicine Services (Workplace Prevention, Hygiene and Safety Department (SPRESAL)).
In 1996 the Environment and Health Report of the World Health Organisation (WHO) identified in Sicily three areas of environmental crisis risk [World Health Organisation, 1997]: Biancavilla (Catania), Priolo (Syracuse) and Gela (Caltanissetta); in the latter two areas there are petrochemical plants and sea ports with a partial shipbuilding activity. All three sites have been included in the national plan for the reclamation of the target 1 Regions [Fazzo L., 2005]. Other areas at risk were identified in Milazzo (Messina) [Fano V. et al., 2005], Syracuse where in the period 1955-90 there was an Eternit plant and in Palermo, site of an important shipyard.
The organisation of the Regional Operative Centre (COR) of Sicily is centrally based on the cooperation between the Regional Epidemiological Observatory (OER), at which the register is based, and the Cancer Register of the Province of Ragusa (RTR); the latter has the task of checking the quality and the completeness of the data; peripherally in each of the 9 Provinces of the Region the managers responsible for surveying and for carrying out the interviews for evaluating exposure to asbestos have

been identified amongst the epidemiology service staff; the asbestos exposure is carried out in cooperation with the occupational physicians of the respective Local Health Units. In short the data flow of the Regional Mesothelioma Register of Sicily takes place through active surveying at the Pathological Anatomy Departments, hospital wards for diagnosis and treatment, system of public hospital archives, private clinics, university departments, the hospital discharge system, mortality records of the Local Health Units (ASL) and occupational medicine services; the surveying sheets and a copy of the clinical documentation of individual cases (even suspect ones) are sent to the RTR where a pathologist and a biologist check the quality and completeness of the data collected and make the final recording attributing the level of diagnostic certainty in accordance with the ISPESL guidelines. After the assessment the RTR communicates to the Provincial contact person the names of the patients to be subjected to medical history surveys. All the paper material of the registration including surveying sheets, medical history questionnaire, copies of the clinical documentation typically equipped with the histological or cytological report if applicable and the death certificate if applicable is archived and kept at the head offices of RTR. The latter is responsible for the inputting of data into the database of the National Mesothelioma Register (ReNaM) and the transmission of the registration file to OER which in turn sends it to the ISPESL of Rome, national headquarters of the National Mesothelioma Register (ReNaM). The RTR also carries out the follow-up of cases recorded through the local registry offices: the last updating of whether a person is still alive is on 31.12.2004. The OER, which organised a specific training course for the managers of the Regional Operative Centre (COR) of Sicily and drew up the memorandum with the executive procedures, is in charge of the monitoring of the registration, collaborates in the data analysis and organises periodical workshops between the various managers and colleagues of the Regional Operative Centre (COR) of Sicily for problem solving or the improvement of recording procedures.
In the period 1998-2001 the average number of cases of mesothelioma in all the anatomical sites recorded in Sicily is 71 patients/year. The ratio of certain MM/all mesotheliomas matches the national one in women (69.8% and 72.6% respectively in Sicily and Italy), whilst it is slightly lower than the national value in men (70.6% and 76.5% respectively in Sicily and Italy). In this calculation it is necessary to mention that the number of cases recorded only on the basis of the death certificate with mention of mesothelioma (DCO [Death Certificate Only]) is slightly higher: 12.7%. The geographical comparisons of the rates of incidence put Sicily in an intermediate position of risk of people falling ill due to pleural mesothelioma both in men and women; compared to the other Italian Regions the rate of peritoneal mesotheliomas is among the lowest in men (0.134 x 100,000) and the lowest in women (0.058 x 100,000). Preliminary analyses on the intraregional distribution of cases highlight a high incidence compared to the Regional population of Sicily in men in Gela, Priolo, Augusta, Biancavilla and Palermo (Standardised Incidence Ratio (SIR) higher than 100 statistically significant, data not presented in this report). Even though the data is invalidated by the fact that the percentage of cases with a medical history definition in the Regional Operative Centre (COR) of Sicily is among the lowest (45.8% against the national value of 69.8%) it should be taken into account that economic-working activities more frequently referred to in the interviews are construction and agriculture among men, and housewife for women. The Regional Operative Centre (COR) of Sicily takes part in the ISPESL project B37/MDL/02 project “Survey and in-depth medical history study of cases of mesothelioma defined as having unknown exposure by Epidemiological Surveillance systems which use the standards of the National Mesothelioma Register”, and in the ISPESL B/45/DML/03 research project: “malignant mesotheliomas with non-pleural location”.
A description of trends in the recording activities was published in the *Notiziario OE* [Tumino R., et al., 2002]. Oral communications were presented to the 5th and 8th meeting of the Italian Cancer RegistryAssociation (AIRT). The Ragusa Cancer Register is co-author of an article on mesothelioma incidence trends in Europe [Montanaro F. *et al.*, 2003].
The activity of the Regional Operative Centre (COR) of Sicily is based on the cooperation of the

following epidemiology representants and occupational physicians: Alecci N. (Public Hygiene Service –Local Health (USL) Unit 2 Caltanissetta), Annino M. (Occupational Medicine Department of the Local Health Unit (AUSL) 8, Syracuse), Candura R. (Public Hygiene Service of the Local Health Unit (AUSL) 9, Trapani), Caracausi R. (Occupational Medicine Service, Local Health Unit (AUSL) 6 Palermo), Diaco T. (Occupational Medicine Department of the Local Health Unit (AUSL) 5, Messina), Gafà R. (Biostatistics Office, Local Health Unit (ASL) 7, Ragusa), Di Benedetto G. (Occupational Medicine Department of the Local Health Unit (AUSL) 1 Agrigento), Icona A. (Occupational Medicine Department, Local Health Unit (AUSL) 2 Caltanissetta), L'Episcopo G. (Service Medicine, Local Health Unit (USL) 4, Enna), Miceli G. (Local Health (USL) Unit 4, Enna), Miceli G. (Occupational Medicine Department of the Local Health Unit (USL) 7, Ragusa), Morsello G. (Occupational Medicine Service, Local Health Unit (USL) 9 Trapani), Parrinello L. (Occupational Medicine Service, Local Health Unit (USL) 1 Agrigento), Pisana P. (Epidemiology Operating Unit and Health Demographics, Catania), Randazzo M. (Hygiene, Public Health and Epidemiology Department (S.I.S.P.E.) Local Health (USL) Unit 6, Palermo), Scaglione L. (Occupational Medicine Department, Local Health Unit (AUSL) 8, Syracuse), Trupia B. (Occupational Medicine Service, Local Health Unit (AUSL) 3 Catania).

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References

Fano V, Cernigliaro A, Scondotto S, Pollina Addario S, Caruso S, Mira A, Forestiere F, Perucci C A Stato di salute della popolazione residente nelle aree ad elevato rischio ambientale e nei siti di interesse nazionale della Sicilia. Analisi della mortalità (aa 1995-2000) e dei ricoveri ospedalieri (aa 2001-2003). Regione Sicilia Assessorato Sanità, 2005

Fazzo L. I 17 siti del piano nazionale nazionale delle bonifiche delle regioni obiettivo 1: le indagini epidemiologiche ad oggi disponibili. Rapporti ISTISAN 05/1, 2005: 38-50

Montanaro F, Bray F, Gennaro V, Merler E, Tyczynski JE, Parkin DM, Strnad M, Jechov'a M, Storm HH, Aareleid T, Hakulinen T, Velten M, Lef'evre H, Danzon A, Buemi A, Daur'es JP, Menegoz F, Raverdy N, Sauvage M, Ziegler H, Comber H, Paci E, Vercelli M, De Lisi V, Tumino R, Zanetti R, Berrino F, Stanta G, Langmark F, Rachtan J, Mezyk R, Blaszczyk J, Ivan P, Primic-Zakelj M, Martinez AC, lzarzugaza I, Borras J, Garcia CM, Garau I, Sanchez NC, Aicua A, Barlow L, Torhorst J, Bouchardy C, Levi F, Fisch T, Probst N, Visser O, Quinn M, Gavin A, Brewster D, Mikov M; ENCR Working Group. Pleural mesothelioma incidence in Europe: evidence of some deceleration in the increasing trends. Cancer Causes Control. 2003, 14:791-803

Organizzazione Mondiale della Sanità. Ambiente e salute in Italia. Roma: Il Pensiero Scientifico ed.; 1997: 443-50.

Tumino R., Scondotto S., Nicita C., Di Giorgi M. Relazione sullo stato di avanzamento della registrazione dei casi accertati di mesotelioma in Sicilia: 1998-2000. Assessorato Sanità Regione Sicilia - Notiziario dell'Osservatorio Epidemiologico della Regione Sicilia 2002: 37-41

APPENDICES

APPENDIX 1

Quality Indicators

Table I1 – Mortality/incidence ratio.

The deaths due to pleural tumour are reported (coded 163.0) from the archives of the mortality sheets of the ISTAT, as are incident cases of pleural mesothelioma reported to the National Mesothelioma Register (ReNaM) by gender and region. The reference periods for the Regions are different and are reported in the first column of the table. The indicator must be assessed taking into consideration a good approximation between pleural tumour and mesothelioma and the short survival (generally less than one year).

Periodo di riferimento	Regione	Mortalità per tumore maligno della pleura. Numero di casi		Incidenza del mesotelioma. Numero di casi		Rapporto M/I	
		Uomini	Donne	Uomini	Donne	Uomini	Donne
1997-2000	PIEMONTE	358	229	370	227	1,0	1,0
2000	LOMBARDIA	172	77	164	92	1,0	0,8
1997-2000	VENETO	203	104	188	80	1,1	1,3
1997-2000	FRIULI VENEZIA GIULIA	119	39	47	4	2,5	9,8
1997-2000	LIGURIA	356	105	426	100	0,8	1,1
1997-2000	EMILIA ROMAGNA	190	93	207	82	0,9	1,1
1997-2000	TOSCANA	205	63	197	34	1,0	1,9
1996-2000	MARCHE	65	21	59	21	1,1	1,0
2000	CAMPANIA	42	23	3	1	14,0	23,0
1997-2000	PUGLIA	150	51	113	30	1,3	1,7
2000	BASILICATA	7	6	5	2	1,4	3,0
1998-2000	SICILIA	169	78	152	28	1,1	2,8
	TOTALE	2.169	956	1.931	701	1,1	1,4

Key:

Periodo di riferimento	Reference period
Regione	Region
Mortalità per tumore maligno della pleura. Numero di casi	Mortality by malignant tumour of the pleura. Number of cases
Incidenza del mesotelioma. Numero di casi	Incidence of the mesothelioma. Number of cases
Rapporto M/I	M/I ratio
Uomini	Men
Donne	Women

PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL

Table I2 - Distribution of cases of malignant mesothelioma by code of diagnostic certainty by Region.

The table shows the proportion of cases of MM that is certain (according to the national guidelines) compared to the total number of cases of MM reported to the National Mesothelioma Register (ReNaM). Cases reported with diagnosis in the period 1993-2001 and for all anatomical sites are considered.

Regione	MM certo Numero di casi		MM certo, probabile, possibile. Numero di casi		Rapporto (MM certo / MM certo, probabile, possibile)	
	Uomini	Donne	Uomini	Donne	Uomini	Donne
PIEMONTE	618	338	783	464	0,79	0,73
LOMBARDIA	225	115	296	161	0,76	0,71
VENETO	387	145	422	165	0,92	0,88
FRIULI VENEZIA GIULIA	85	7	90	8	0,94	0,88
LIGURIA	452	95	761	200	0,59	0,48
EMILIA ROMAGNA	315	131	416	174	0,76	0,75
TOSCANA	300	69	349	81	0,86	0,85
MARCHE	92	28	103	38	0,89	0,74
CAMPANIA	63	13	63	13	1,00	1,00
PUGLIA	208	61	240	69	0,87	0,88
BASILICATA	4	5	8	7	0,50	0,71
SICILIA	155	34	215	47	0,72	0,72
TOTALE	2.904	1.041	3.746	1.427	0,78	0,73

Key:

Regione	Region
MM certo. Numero di casi	Certain MM. Number of cases
MM certo, probabile, possibile. Numero di casi	Certain, probable possible MM. Number of cases
Rapporto (MM certo / MM certo, probabile, possibile)	Ratio (certain MM / certain, probable, possible MM)
Uomini	Men
Donne	Women
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES

CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL

Table I3. - Distribution of cases of malignant mesothelioma by type of medical history definition by Region.

The table shows the proportion of cases of MM that is certain, probable or possible for which exposure has been defined (i.e. the medical history questionnaire was given out and the exposure coded according to the National Guidelines). Cases reported with diagnosis in the period 1993-2001 and for all anatomical sites are considered.

Regione	MM certo+probabile+possibile	Numero di casi con esposizione "da definire"	Numero di casi con definizione anamnestica.	Quota % casi con definizione anamnestica
PIEMONTE	1.247	803	444	35,6
LOMBARDIA	457	62	395	86,4
VENETO	587	60	527	89,8
FRIULI VENEZIA GIULIA	98	11	87	88,8
LIGURIA	961	185	776	80,7
EMILIA ROMAGNA	590	174	416	70,5
TOSCANA	430	47	383	89,1
MARCHE	141	49	92	65,2
CAMPANIA	76	72	4	5,3
PUGLIA	309	14	295	95,5
BASILICATA	15	1	14	93,3
SICILIA	262	143	119	45,4
TOTALE	5.173	1.621	3.552	68,7

Key:

Regione	Region
MM certo + probabile + possibile	Certain + probable + possible MM
Numero di casi con esposizione "da definire"	Number of cases with exposure "to be defined"
Numero di casi con definizione anamnestica	Number of cases with medical history definition
Quota % casi con definizione anamnestica	% of cases with medical history definition
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY

MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL

Table I4 - Distribution of cases of malignant mesothelioma with defined exposure by interview procedure (direct interview, indirect interview, no interview) by Region;

the table shows the proportion of cases of MM that is certain, probable or possible for which the exposure has been defined through an interview with the patient or the relatives compared to the total number of cases looked at in-depth (i.e. for which a direct interview, an interview with the relatives or through the collection of data by another means* is available). The total number of interviews can exceed the number of cases with a medical history definition because it is possible that the exposure is still being defined. Cases reported with diagnosis in the period 1993-2001 and for all anatomical sites are considered.

Regione	Numero di casi per i quali è stata definita l'esposizione	Numero di casi per i quali è disponibile l'Intervista al soggetto	Numero di casi per i quali è disponibile l'intervista ai familiari	Numero di casi per i quali l'esposizione è stata definita senza intervista	Percentuale di casi con esposizione definita tramite intervista al soggetto o ai familiari
PIEMONTE	444	387	99	0	100,0
LOMBARDIA	395	270	162	0	100,0
VENETO	527	160	306	61	88,4
FRIULI VENEZIA GIULIA	87	3	0	84	3,4
LIGURIA	776	338	371	67	91,4
EMILIA ROMAGNA	416	157	246	13	96,9
TOSCANA	383	195	180	8	97,9
MARCHE	92	17	73	2	97,8
CAMPANIA	4	2	2	0	100,0
PUGLIA	295	132	155	8	97,3
BASILICATA	14	3	12	0	100,0
SICILIA	119	51	57	11	90,8
TOTALE	3.552	1.715	1.663	254	93,0

* Le informazioni sono recuperate attraverso la documentazione dell'Inail, dei servizi territoriali di prevenzione e sicurezza nei luoghi di lavoro, dell'Inps e dalle cartelle cliniche. Su questo argomento si vedano anche le relazioni dei COR regionali.

Key:

Regione	Region
Numero di casi per i quali è stata definita l'esposizione	Number of cases for which exposure was defined
Numero di casi per i quali è disponibile l'intervista al soggetto	Number of cases for which interview with the patient is available
Numero di casi per i quali è disponibile l'intervista ai familiari	Number of cases for which interview with the relatives is available
Numero di casi per i quali	Number of cases for which exposure

l’esposizione è stata definita senza intervista	was defined without interview
Percentuale di casi con esposizione definita tramite intervista al soggetto o ai familiari	Percentage of cases with exposure defined through interview with patient or relatives
PIEMONTE	PIEDMONT
LOMBARDIA	LOMBARDY
VENETO	VENETO
FRIULI-VENEZIA GIULIA	FRIULI-VENEZIA GIULIA
LIGURIA	LIGURIA
EMILIA-ROMAGNA	EMILIA-ROMAGNA
TOSCANA	TUSCANY
MARCHE	THE MARCHES
CAMPANIA	CAMPANIA
PUGLIA	APULIA
BASILICATA	BASILICATA
SICILIA	SICILY
TOTALE	TOTAL

* The data are recovered through the documentation of the Italian National Institute for Insurance against Occupational Accidents (INAIL), of the Local Prevention and Safety at Work Departments, of the National Social Security Institute (INPS) and from the clinical records. See also the reports of the Regional Operative Centres (COR).

APPENDIX 2

The criteria for diagnostic definition

Source: Nesti M. *et al*. (ed). Guidelines for surveying and defining the cases of malignant mesothelioma and transmission of the data to the Italian National Institute for Occupational Safety and Prevention (ISPESL) by the Regional Operative Centres. ISPESL monograph, Rome 2003. Available at http://www.ispesl.it/ispesl/sitorenam/index.htm. Chapter II.

2.1 Criteria for the definition of cases of interest to the National Mesothelioma Register (ReNaM).
All cases of malignant mesothelioma, even suspected are included and therefore recorded in the National Mesothelioma Register. The case classification provides for 5 groups and several subgroups of decreasing levels of diagnostic certainty, in relation to the procedure and diagnostic certainty achieved:
1. malignant mesothelioma that is CERTAIN (with 3 subgroups)
2. PROBABLE malignant mesothelioma (with 2 subgroups)
3. POSSIBLE malignant mesothelioma (with 2 subgroups)
4. malignant mesothelioma TO BE DEFINED (with 3 subgroups)
5. NOT malignant mesothelioma
Table 1 briefly shows the diagnostic examinations required and their certainty for including the cases in the various groups and subgroups.

1 CERTAIN MALIGNANT MESOTHELIOMA
1.1 The case must be characterised by **all** the following conditions:
- Microscopic examination on material (histological or cytological with centrifugation of the sediment) enclosed in paraffin, with characteristic morphological pattern. Tissues removed during a post-mortem examination are also included;
- Immunohistochemistry with characteristic immunophenotypical pattern;
- Diagnostic imaging (confirmation of primary pleural or peritoneal neoplastic lesion and exclusion of alternative pathology) or else diagnosis of discharge of mesothelioma or similar assessment made by a clinician.

1.2 The case must be characterised by all the following conditions:
- Microscopic examination on histological material enclosed in paraffin, with characteristic morphological pattern. Tissues removed during a post-mortem examination are also included;
- Immunohistochemistry not carried out or pattern not defined;
- diagnostic imaging (confirmation of primary pleural or peritoneal neoplastic lesion and exclusion of alternative pathology) or else diagnosis of discharge of mesothelioma or similar assessment made by a clinician.

1.3 The case must be characterised by all the following conditions:
- Microscopic examination on histological material enclosed in paraffin, with characteristic morphological pattern. Tissues removed during a post-mortem examination are also included;
- Immunohistochemistry not carried out or pattern not defined;
- Absence of clinical and radiological data available to the Regional Operative Centre (COR) to assess the legitimacy of clinical diagnosis.

2 PROBABLE MALIGNANT MESOTHELIOMA

2.1 The case must be characterised by **all** the following conditions:
- Histological or cytological examination with enclosure in paraffin carried out, even during an post-mortem examination, but which did not give a result indicating mesothelioma in a clear and reliable way (doubtful case);
- diagnostic imaging (confirmation of primary pleural or peritoneal neoplastic lesion and exclusion of alternative pathology) or else diagnosis of discharge of mesothelioma or similar assessment made by a clinician.
2.2 The case must be characterised by **all** the following conditions:
- Cytological examination not enclosed in paraffin, carried out even during a post-mortem examination, with characteristic pattern and report expressed in terms clearly indicative of mesothelioma (and not of simple malignant neoplasia);
- Diagnostic imaging (confirmation of primary pleural or peritoneal neoplastic lesion and exclusion of alternative pathology) or else diagnosis of discharge of mesothelioma or similar assessment made by a clinician.

3 POSSIBLE MALIGNANT MESOTHELIOMA
3.1 The case must be characterised by:
- Indicative clinical and radiological data;
- Diagnosis of discharge of mesothelioma (the discharge code alone is insufficient, it is necessary to assess the medical record to check that it is not a neoplasia from another site in the body affecting the pleura). Cases in which the records have not been examined are not included in this category;
- Absence of histological examination;
- Absence of cytological examination.
3.2 The case must be characterised by:
- Death Certificate Only (DCO) with presence on the death certificate of the ISTAT of the wording "mesothelioma".
Cases in which the death certificate has not been examined are not included in this category;
- Absence of histological examination;
- Absence of cytological examination.
- Absence of clinical and radiological data.

4 CASES TO BE DEFINED
This category must be only used as a "temporary container" in which to classify the cases undergoing verification. Cases occurring in resident persons in another Region must be reported to the relevant COR which will then report them to the ISPESL.
4.1 The case must be characterised by:
- Histological or cytological examination enclosed in paraffin, in the absence of a characteristic morphological pattern (doubtful case), in the absence of positive diagnosting imaging for mesothelioma or mesothelioma discharge diagnosis or similar assessment made by a clinician.
or
- Immunohistochemistry not carried out, with doubtful immunophenotypical pattern, in the absence of positive diagnostic imaging for mesothelioma or mesothelioma discharge diagnosis or similar assessment made by a clinician.
4.2 The case must be characterised by:
- Hospital Discharge Forms (SDO) diagnosis only, without reading of the medical record and without further diagnostic data.
4.3 The case must be characterised by:
- Only DCO defined on the basis of the ICD IX death code, without reading of the death certificate.

5 NON MESOTHELIOMA

This is the level for cases which from level 4.0 are not able to reach a higher level (1.0; 2.0; 3.0) after having ascertained death and having waited at least two months from death (understood as the time limit for the execution of post-mortem examinations which could better define the diagnosis).

Table 1 - Summary of the classification criteria for cases relevant to ReNaM.

	1. Malignant mesothelioma that is CERTAIN			**2. PROBABLE malignant mesothelioma**		**3. POSSIBLE malignant mesothelioma**		**4. Malignant mesothelioma SUSPECTED and TO BE DEFINED**		
Type of diagnosis	**1.1**	**1.2**	**1.3**	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**	**4.3**
Histological material enclosed in paraffin	QMC Yes	QMC Yes	QMC Yes	QMD Yes	-	-	-	QMD	-	-
Cytological material enclosed in paraffin	QMC (Yes if the previous one is not available)	QMC (Yes if the previous one is not available)	-	QMD (Yes if the previous one is not available)	-	-	-	QMD	-	-
Cytological material not enclosed in paraffin	-	-	-	-	QMC Yes	-	-	-	-	-
Immunohistochemistry with immunophenotypical pattern	C Yes	-	-	-	-	-	-	Not undertaken or doubtful outcome	-	-
Diagnostic imaging	C Yes	C Yes	-	C Yes	C Yes	Indicative Yes	-	-	-	-
Clinical or Hospital DischargeForms (SDO) diagnosis	C (Yes if the previous one is not available)	C (Yes if the previous one is not available)	-	C (Yes if the previous one is not available)	C (Yes if the previous one is not available)	Indicative (Yes if the previous one is not available)	-	-	Hospital Discharge Form (SDO) only	-
Autopsy diagnosis	C (Yes if	C (Yes if	-	C (Yes if	C (Yes if	-	-	-	-	-

	the previous one is not available)	the previous one is not available)		the previous one is not available)	the previous one is not available)					
Death certificate	-	-	-	-	-	-	Mesothelioma condition Yes	-	-	ICD IX Code only

QMC: Characteristic Morphological Pattern
QMD: Doubtful Morphological Pattern
C: Certain
YES: Necessary

APPENDIX 3

The new codification table for coding the economic exposure sectors (Ateco 91 ISTAT codes - ReNaM classification)

ReNaM CODE	Economic sector (ReNaM classification)	ISTAT ATECO 91 Codes
01	Engineering industry	29*, 30*, 31*, 32*, 33*
02	Metallurgical industry	27.0*, 27.1*, 27.4*, 27.5*
03	Petroleum extraction and refining	23.20*, 11.11*
04	Mineral extraction	10*, 11* and not 11.11*, 12*, 13*, 14*
05	Metal product manufacture	27.2*, 27.3*, 28*
06	Textiles industry	17*, 24.7*
07	Non-metalliferous mineral industry except asbestos cement	26.23*, 26.26*, 26.3*, 26.4*, 26.5*, 26.6* and not 26.65*
08	Asbestos cement industry	26.65*
09	Railway rolling stock	35.20*
10	Shipyards	35.11*
11	Maintenance and production of transport vehicles; car and motor-vehicle workshops (excluding shipyards and railway rolling stock yards)	34*, 35* and not (35.20* or 35.11*), 50.2*, 50.40.3
12	Food and drinks industry (except sugar-refineries)	15* and not 15.83*
13	Sugar-refineries	15.83*
14	Chemical industry and plastics	25.2*, 23* and not 23.20*, 24*, and not 24.7*
15	Rubber industry	25.0*, 25.1*
16	Wood industry and wood products	20*
17	Tobacco industry	16*
18	Tanning industry, manufacture of leather and fur items	18.10*, 18.30*, 19*

ReNaM COD.	Economic sector (ReNaM classification)	ATECO 91 ISTAT Codes
19	Clothes manufacturing (clothing industry)	18* and not (18.10* or 18.30*)
20	Glass and ceramics industry	26.1*, 26.20*, 26.21*, 26.22*, 26.24*, 26.25*
21	Paper industry and paper products (including publishing sector)	21*, 22*
22	Other manufacturing industries (furniture, jewellery, musical instruments, sports goods, etc.)	36*
23	Construction	45*
24	Electricity and gas production	40*
25	Recovery and recycling	37*
26	Agriculture and rearing	01*, 02*
27	Fishing	05*
28	Hotels, restaurants, bars	55*
29	Trade (wholesale and retail)	50.0*, 50.1*, 50.3*, 50.4*, 50.5*, 51*, 52*, 70*, 71*, 72*
30	Sea transport	61*
31	Land and air transport	60*, 62*, 63*and not 63.11*
32	Maritime transport cargo handling	63.11*
33	Public Administration	75*, 99*, and not 75.22*
34	Education	80*
35	Military defence	75.22*
36	Banks, insurance, postal services	64*, 65*, 66*, 67*
37	Health and social services	85*, 90*, 91*, 92*, 93*
38	Other	26.7*, 26.8*, 41*, 63*, 73*, 74*, 95*

APPENDIX 4

Statistical methods

The standard reference population for the rates is the Italian one from the 1991 census and the method for standardisation is the direct one.
For the Regional Operative Centre (COR) of Liguria the surveying starts from 1994 for the Municipality of Genoa only, for 1995 it concerns the Province of Genoa and is extended to the whole Liguria Region from 1996. For the period 1994-1996 Liguria collected only the cases of pleural mesothelioma. The data of the COR of Emilia-Romagna for the period 1993-1995 almost exclusively refer to the Province of Reggio Emilia whilst since 1996 the incidence has been considered to be complete and referring to the whole area. The specific rates by gender and age (Table 6a) are also obtained with reference to the resident population.

In symbols

Crude rate = $= T_{gr} = \frac{\sum_i n_i}{\sum_i p_i} \bullet 100.000$

Where n_1 = number of cases in the period by age group;
p_1 = resident population by age group
i = age group index

Crude rates = $= T_i = \frac{n_i}{p_i} \bullet 100.000$

Standardised rates = $= T_{st} = \frac{\sum_i (T_i \bullet \text{pop stand}_i)}{\sum_i \text{popstand}_i}$

Where pop stand_1 = standard population (Italy 1991 census) by age group

The standard errors of the standardised rates are calculated according to the guidelines contained in *Cancer incidence in Five Continents*:

APPENDIX 5

DECREE OF THE PRESIDENT OF THE COUNCIL OF MINISTERS
n. 308 DATED 10 DECEMBER, 2002.

“RULES FOR THE DEFINITION OF THE MODEL AND THE PROCEDURES FOR KEEPING THE REGISTER OF CASES OF ASBESTOS-RELATED MESOTHELIOMAS IN ACCORDANCE WITH ARTICLE 36 OF LEGISLATIVE DECREE 277 DATED 1991”

PUBLISHED IN THE OFFICIAL JOURNAL DATED 7 FEBRUARY, 2003

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Year no. 144 – No. 31
Rome, Friday 7 February 2003

THE PRESIDENT
OF THE COUNCIL OF MINISTERS
UPON THE PROPOSAL OF
THE MINISTER OF LABOUR
AND SOCIAL POLICIES
AND OF
THE MINISTER OF HEALTH

Having regard to Article 36, Paragraph 3 of Legislative Decree No. 277 dated 15 August 1991, which prescribes, for the protection of workers against risks connected to exposure to asbestos at work, the definition of the model and the procedures for keeping the register of cases of asbestos-related mesotheliomas, as well as the procedures for the transmission of the clinical documentation to the Italian National Institute for Occupational Safety and Prevention by the bodies of the National Health Service and the public and private social security and insurance institutes;

Having regard to Article 17, paragraphs 3 and 4 of Law No. 400 dated 23 August 1988;

Having obtained the opinion of the Permanent Conference for relations between the State, the Regions and the Autonomous Provinces of Trento and Bolzano in the session dated 21 May 1998;

Having heard the opinion of the Controller for the protection of personal data;

Having heard the Opinion of the Public Administration Authority for Information Technology;

Having heard the opinion of the Council of State, expressed by the Consultation Department for legislative instruments in the assembly dated 29 May, 2000;

Upon the proposal of the Ministers of Labour and Social Policies and the Minister of Health;

HEREBY ADOPTS
the following rules:

Article 1.
National Register of cases of asbestos-related mesothelioma

1. The national register of cases of asbestos-related mesothelioma is set up at the Italian National Institute for Occupational Safety and Prevention (ISPESL). ISPESL is authorised to collect and process the data as per Art. 22 of Law No. 675 dated 31 December 1996, as amended by Article 5 of Legislative Decree No. 135 dated 11 May 1999.

2. The register collects data on cases of malignant mesothelioma of the pleura, peritoneum, pericardium and vaginal tunic of the testicle, diagnosed in Italy, with the purpose of:

a) estimating the incidence of cases of mesothelioma in Italy;
b) gathering data on the past exposure to asbestos of recorded cases;
c) contributing to the assessment of effects, of past industrial use of asbestos and the acknowledgment of sources of contamination;
d) promoting research projects to assess the association between cases of mesothelioma and exposure to asbestos.

Article 2.

Regional Operative Centres

1. In each Region, the health departments identify the regional operative centres, hereinafter referred to as COR, and appoint the official responsible for the surveying of cases of mesothelioma and to examine past exposure to asbestos, as well as, upon the proposal of the latter, the deputy in the case of holidays, absence or impediment of the former.

2. For the purposes of identifying the CORs, the health departments take account, where applicable, of the facilities already operating in the Region and in the Autonomous Provinces such as: regional epidemiological observatories or other epidemiological services, local mesothelioma archives, population cancer registers.

3. Within a hundred and eighty days from the date of issue of this decree, the Regions and the Autonomous Provinces of Trento and Bolzano shall communicate to ISPESL the identification data and the operating procedures of the CORs.

4. The surveying as per Paragraph 1 includes the cases as per Article 1 above, diagnosed since 1 January 2000.

Article 3.
Tasks of the Regional Operative Centres

1. The CORs shall:

a) collect and archive the data on all cases of mesothelioma of the pleura, peritoneum, and vaginal tunic of the testicle, on the basis of the data as per Paragraph 4;
b) define the cases from the point of view of diagnosis;
c) assess the quality of the diagnoses received;
d) research and integrate the data of the cases identified on past exposure to asbestos;
e) periodically monitor the data flow of cases of mesothelioma, also in order to assess their completeness;
f) send to the ISPESL, through the notification sheet as per Annex 1, the data on the diagnoses and assessments of exposure safeguarding the legislative prescriptions pursuant to Law No. 675 dated 1996 and Legislative Decree No. 135 dated 1999.

2. The CORs shall undertake the tasks pursuant to Paragraph 1 above, in accordance with standards defined and periodically updated by ISPESL, also with the cooperation of the CORs, by drawing up suitable guidelines.

3. The staff of the CORs must respect professional and official secrecy when undertaking the tasks pursuant to Paragraph 1.

4. Public and private health facilities shall supply COR with the data pursuant to Paragraph 1, Letter a).

Article 4.
Cooperation with other institutes

1. ISPESL, the National Social Security Institute (INPS), the Italian National Institute for Insurance against Occupational Accidents (INAIL) and the other Public and Private Social Security and Insurance Institutes, shall work together in order to complete or reciprocally supplement the data in their possession.

Article 5.
Procedures for and maintenance of the register

1. The register as per Article 1, may be computerised in accordance with Article 6 below, and shall in any case be held in accordance with the regulations pursuant to Law No. 675 dated 1996, in accordance with the Decree of the President of the Republic No. 318 dated 28 July 1999, concerning the protection of the person and other parties regarding the processing of personal data.

2. The CORs and ISPESL must issue, through the data processing managers, as identified in Art. 5 of Law No. 675 dated 1996 and Article 2, Paragraph 1, above, specific authorisations to the data maintenance or processing controllers.

3. The register as per Article 1, if kept in paper format, must comply with the form shown in Annex 1.

4. ISPESL shall send to the Regions on an annual basis the summary data for the results of the register outlined in this decree. This sending shall be carried out anonymously, as per Art. 23, Paragraph 4, of Law No. 675 dated 1996.

Article 6.
Automatic data processing systems

1. The procedures for the creation, sending, storing, duplication, reproduction and validation, even temporal, of the data regarding the register as per Article 1, must comply with the prescriptions of Decree of the President of the Republic No. 513 dated 10 November 1997, and of Decree of Implementation of the President of the Council of Ministers dated 8 February 1999, of the Resolution of the Public Administration Authority for Information Technology (AIPA) No. 24 dated 30 July 1998, and subsequent amendments and by the regulations implementing Decree of the President of the Republic No. 428 dated 20 October 1998. The above without prejudice to any reference standards collected in a consolidated act.

2. Access to the functions of the system is permitted only for subjects expressly qualified for data input and, from a separate list, for subjects authorised only for reading.

3. The validation of the data, even temporal, must be able to be traced back to the subject responsible for the COR, with a digital signature and time stamp added to the document as per Decree of the President of the Republic No. 513 dated 1997.

4. Any data changes must never replace the original data already stored, but only supplement it.

5. The communications carried out in accordance with Article 36, Paragraph 3, of Legislative Decree No. 277 dated 1991, may also be made by computerised systems, with the procedures set by the addressees of these communications.

6. The data present in databases, lists or registers, must be processed with ciphering techniques or identification codes, or any new systems becoming available based on technological progress, that allow the identification of people concerned only if required, in accordance with Art. 3, Paragraphs 4 and 5 of Legislative Decree No. 135 dated 1999.

This decree, along with the Government seal, will be entered into the Official Collection of legislative instruments of the Italian Republic. It is the obligation of whoever is responsible to observe it and make sure others observe it.

Rome, 10 December, 2002

p. *The President of the Council of Ministers*

LETTA

The Minister of Labour and Social Policies
MARONI

The Health Minister
SIRCHIA

Endorsed, *the Keeper of the Seals*: CASTELLI
Registered in the Court of Auditors on 17 January, 2003
Institutional Ministries, register No. 1, sheet No. 114

REGISTER OF CASES OF ASBESTOS-RELATED MESOTHELIOMAS

Notification sheets to be sent to ISPESL

Date of compilation dd/mm/yy

Regional Operative Centre (C.O.R) Code

Manager

Address Via

municipality Zip code Province

Tel. N. Fax n.

Personal data of the subject

Case Identification Code (C.I.C)
Taxpayers' number
Surname
Name
Gender: M F Date of birth: dd/mm/yy

Place of birth
Commune ISTAT code ZIP Code Prov.

Place of residence
Via
Commune ISTAT code ZIP Code Prov.

Survival status: Alive Dead (date of death)

Form MESO AI

Case Identification Code (C.I.C.)

Anatomical Site: Pleura Peritoneum Pericardium Vaginal Tunic of the Testicle

Death Certificate	Date: dd/mm/yy
Clinical diagnosis:	Date: dd/mm/yy
Radiological examinations:	Date: dd/mm/yy
Computerised Axial Tomography	Date: dd/mm/yy
Cytological Examination:	Date: dd/mm/yy
Histological Examination:	Date: dd/mm/yy
Immunohistochemical examinations:	Date: dd/mm/yy
Post-mortem examination:	Date: dd/mm/yy
Morphology: CIM –m	Date: dd/mm/yy
Morphology: CIM-m	Date: dd/mm/yy

MAXIMUM "DIAGNOSTIC ASSESMENT" REACHED

LEVEL DATE: DD/MM/YY

Form MESO AIY

Case Identification Code (C.I.C)

Definition of Exposure

Interview: yes no

In case of interview state:

Interview to the subject: Date: dd/mm/yy
Interview to the relatives: Date: dd/mm/yy

Occupational exposure: Yes No

In case of occupational exposure state

ISTAT Code Ateco 91 (Economic activity)	Description economic activity	ISTAT code (Job)	Job Description	Start of the activity (year)	End of the activity (year)	Notes	Assessment level

Form MESO – AIH

C.I.C.

Domestic exposure: YES NO

In case of domestic exposure state

Cohabitant exposed:	Parent	Economic Activity (ISTAT Ateco91)
	Spouse	Economic Activity (ISTAT Ateco91)
	Children	Economic Activity (ISTAT Ateco91)
	Other	Economic Activity (ISTAT Ateco91)

Environmental exposure: YES NO

In case of environmental exposure state

Used to live near: Chemical works
Iron and steel plant
Thermo-electric power plant
Port
Shipyard
Cement factory
Eternit production plant
Incinerator
Quarry or mine
Other

Distance of the source of exposure from the dwelling

Definition of exposure resulting from leisure activities: YES NO

In case of exposure resulting from leisure activities state:

D.I.Y
Masonry work
Plumbing or electricity repairs
Thermal insulation work
Car or mechanical vehicle repairs
Other

MAXIMUM “MEDICAL HISTORY ASSESSMENT” REACHED

LEVEL

Form MESO-A1

SPECIFICATIONS FOR FILLING IN THE FORM

Communication of cases of mesothelioma to ISPESL.

The CORs shall send ISPESL, Department of Occupational Medicine, Occupational Epidemiology Laboratory, Via Alessandria No. 220/E - 00139 Rome, a communication of cases of malignant mesothelioma of the pleura, pericardium, peritoneum and vaginal tunic of the testicle reported in their area of jurisdiction on a yearly basis.

A code for each COR is assigned by ISPESL.

The COR, after checking the completeness and consistency of the data, shall give each case a C.I.C. (case identification code) in progressive numeral form which will be communicated to ISPESL and must be used for every subsequent update of the same.

The data may be sent in paper format (Form MESO-A1) or electronically; in the latter case the technical features of the electronic format will be agreed with ISPESL.

Where necessary, ISPESL may ask COR for a copy of the complete documentation concerning a case of interest or a group of cases.

At pre-set periods the CORs shall send to ISPESL the archive together with the case histories updated as of 31 December of the year of reference. Included in the archive are also those cases that at the date of sending are not fully defined (for instance only the personal and diagnostic data have been obtained).

With reference to reports of cases relating to a COR other than that which sent the case, ISPESL will send the data to the relevant COR for each area.

All the data inherent to Epidemiological Surveillance will be kept so that the personal data remains separate from the clinical and medical history data.

The Form MESO-A1 for notifying ISPESL of cases. Specifications for filling in.

The Form MESO-A1 is made up of four parts:

the data inherent to the CORs and the personal data of the subjects;

the characteristics of the diagnostic definition;

the characteristics of the medical history definition (working history);

any domestic, environmental and/or hobby-related exposure.

Part I

COR.

"Date of compilation" = format: dd/mm/yyyy. Each time data is sent through the MESO A1, the CORs will record the date of compilation which therefore becomes the guiding element for updates and the construction of the "historical".

"COR code" The COR codes are pre-set by ISPESL and will be communicated when they are set up.

Private data of the subject.

"Case identification code" = 6 numerical characters. This code will be assigned by the COR in sequential form (progressive unique general). The code, after assigning, must be used by each COR for the subsequent reports (updates).

Part II

Diagnostic definition.

The summary of the diagnostic data obtained by the CORs and recorded on the special sheet prescribed by the ISPESL Guidelines, is shown in the second part of the form.

"Morphology": CIM-M" = show the code specified by the International Disease Classification reserved for oncology - sector II".

"Maximum assessment level reached" = show the code corresponding to the definition criteria supplied by the ISPESL Guidelines. On the basis of the guidelines supplied by the ISPESL Technical Committee the definition criteria may be modified; any changes shall be promptly communicated to the CORs.

"Date maximum assessment level reached" = show the date of definition of the diagnosis. This date will be used by ISPESL to assign the year of incidence and the age at diagnosis of the subject.

Part III

Definition of medical history.

The third part shows the data for the reconstruction of occupational etiology surveyed through the medical history questionnaire prescribed by the ISPESL Guidelines.

It is worth highlighting that, for the same subject, there may be different sectors of production and different jobs reported, all significant for examining exposure to asbestos. In this case the assessment level assigned must be shown for each exposure.

Part IV

Domestic exposure, environmental exposure, hobbies.

Show the data collected through the medical history questionnaire provided by the ISPESL Guidelines.

Should exposure of a different nature be found (occupational, domestic, environmental, hobby-related) all the relevant boxes must be filled in:

"maximum medical history assessment level reached" = show the code corresponding to the definition criteria prescribed by the ISPESL Guidelines. This code will be assigned by the COR with reference to the entire medical history surveyed. If there is exposure of a different nature, the COR will show the code of the greatest exposure.

The reference guidelines are published in the ISPESL journal "Information sheets" No. 1, year 1996, pages 19-106. The subsequent changes will be made in the special ISPESL publications and promptly communicated to the CORs.

NOTES

Introduction:

The text of the notes published here was edited by the authorised administration, in accordance with Article 10, Paragraph 3, of the consolidation act of the arrangements on the promulgation of the laws, on the issuing of the decrees of the President of the Republic and on the official publications of the Italian Republic, approved with Presidential Decree (D.P.R.) No. 1092 dated 28 December 1985, only for the purposes of facilitating the interpretation of the legal provisions to which reference is made. The value and the effectiveness of the Legislative acts transcribed here remain unchanged.

Notes to the preambles:

- Paragraph 3 of Article 36 of Legislative Decree No. 277 dated 15 August 1991, concerning: "implementation of Directives No. 80/1107/EEC, No. 82/605/EEC, No. 83/477/EEC, No. 86/188/EEC and No. 88/642/EEC, regarding the protection of workers against risks arising from exposure to chemical, physical and biological agents at work, in accordance with Article 7 of Law No. 212 dated 30 July 1990" (published in Official Journal No. 200 dated 27 August 1991, ordinary supplement), states:

"Article 36 (*Register of tumours*). - 1. - 2. *Omissis*.

3. With Decree of the President of the Council of Ministers, upon the proposal of the Ministers of Labour, Social Security and Health, the model and the procedures for keeping the register are determined, as are the procedures for sending the documentation pursuant to Paragraph 2".

- Paragraphs 3 and 4 of Article 17 of Law No. 400 dated 23 August 1988, concerning: "Regulations of the activity of government and regulations of the Presidency of the Council of Ministers" (published in *Official Journal* No. 214 dated 12 September 1988, ordinary supplement), state:

"Articles 17 (*Regulations*)". - 1. - 2. *Omissis*.

3. By Ministerial Decree regulations may be adopted, in the issues under the jurisdiction of the Minister or authorities subordinate to the Minister, when the law expressly grants said power. These regulations, for matters under the jurisdiction of several Ministers, may be adopted by interdepartmental decrees, without prejudice to the need for suitable authorisation by the law. The Ministerial and interdepartmental regulations cannot dictate regulations contrary to those of the regulations enacted by the Government. They must be communicated to the President of the Council of Ministers before their issuing.

4. The regulations pursuant to Paragraph 1 and the ministerial and interdepartmental regulations, which must include the name of "regulations", are adopted subject to the approval of the Council of State, subject to the endorsement and registration with the Court of Auditors and published in the *Official Journal*".

Note to Article 1, Paragraph 1:

- The text of Article 22 of Law No. 675 dated 31 December 1996, (protection of the persons and other subjects with respect to the processing of personal data), as amended by Article 5 of Legislative Decree No. 135 dated 11 May 1999, (supplementary provisions of Law No. 675 dated 31 December 1996, on the processing of sensitive data by public authorities) and by Legislative Decree No. 467 dated 28 December, 2001 (provisions correcting and supplementing the regulations on the protection of personal data, in accordance with Article 1 of Law No. 127 dated 24 March, 2001), is as follows:

"Art. 22 (*sensitive data*). - 1. Personal data required for revealing racial and ethnic origin, religious, philosophical or other kinds of beliefs, political opinions, membership of Parties, trade unions, associations or religious, philosophical, political or trade union organisations, as well as personal data required to reveal the health status and sexual habits, may only be subject to processing with the written consent of the person concerned and subject to the prior authorisation of the Controller

1-bis. Paragraph 1 does not apply to data relating to supporters of religious creeds whose relationships with the state are governed by agreements in accordance with Arts. 7 and 8 of the constitution, as well as those relating to subjects that with reference to exclusively religious aims have regular contact with the same creeds, that are processed by the relevant civilly recognised bodies or organisations, provided that the data are not communicated or spread outside the same creeds. The latter involve suitable guarantees as regards the processing carried out.

1-ter. Paragraph 1 does not apply, also, to data regarding membership of trade union or professional associations or organisations to other trade union or professional associations, organisations or confederations.

2. The Controller shall communicate the decision adopted on the request for authorisation within thirty days, after which the lack of an answer is equivalent to refusal. With the authorisation provision, or subsequently, also on the basis of possible verification, the Controller may prescribe measures and precautions as a security for the person concerned, which the processing controller is obliged to adopt.

3. The processing of the data indicated in Paragraph 1 by public subjects, excluding public economic bodies, is only permitted if authorised by express legal provision, specifying the types of data which can be processed, the operations that can be executed and the significant public interest aims to be pursued. In the absence of an express legal provision, and excepting the cases prescribed by the Legislative Decrees amending and integrating this law, issued as implementing Law No. 676 dated 31 December 1996, the public authorities may ask the Controller, in the course of the legislative specification, the identification of the activities, among those assigned to the same subjects by the law, which pursue significant aims of public interest and for which the data processing indicated in Paragraph 1 is consequently authorised, in accordance with Paragraph 2.

3-bis. Where the aim of significant public interest is specified in accordance with Paragraph 3 but the operations that can be executed and the types of data are not specified, the public authorities, in application of this Law and of the Legislative Decrees implementing Law No. 676 dated 31 December 1996 regarding sensitive data, shall identify and publicise, in accordance with the respective regulations, the types of data and operations strictly relevant and necessary in relation to the aims pursued in the individual cases, bringing this identification periodically up to date.

4. The personal data outlined in Paragraph 1 may be processed subject to authorisation by the Controller:

a) should the processing be carried out by non-profit making associations, agencies or facilities, including non-recognised ones, political, philosophical, religious or trade-union in character, including parties and political movements, religious creeds and communities, for the pursuit of lawful ends, relating to the personal data of their supporters or subjects that have regular contact with the association, agency or body in relation to these aims, provided that the data are not communicated or disseminated outside of the relevant circles and the agency, association or body set up suitable guarantees relating to the processing carried out;

b) should the processing be necessary for the safeguarding of the life or of the physical safety of the person concerned or of a third party, should the person concerned not be able to give his/her consent due to physical impossibility, inability to act or inability to understand or express a will;

c) should the processing be necessary for the purposes of carrying out defensive investigations in accordance with Law No. 397 dated 7 December 2000, or in any case, to enforce or defend a right during a judicial hearing, of equal rank to that of the person concerned when the data are suitable for revealing the health status and sex life, provided that the data are exclusively processed for these aims and for the period strictly necessary for their pursuit. The Controller shall prescribe the measures and the precautions pursuant to Paragraph 2 and shall promote the execution of a suitable code of ethics and good practice in accordance with the procedures as per Article 31, Paragraph 1, Letter h. The provisions of Article 43, Paragraph 2 shall remain unaffected”.

Note to Article 5, Paragraph 1:

- The text of Decree of the President of the Republic No. 318 dated 28 July 1999 (Regulations for the identification of minimum security measures for personal data processing, in accordance with Article 15, Paragraph 2, of Law No. 675 dated 31 December 1996), is published in Official Journal no. 216 dated 14 September 1999.

Note to Article 5, Paragraph 2:

- The text of Article 5 of Law No. 675 dated 31 December 1996, is as follows:

“Article 5 (*data processing carried out without the aid of electronic means*). – 1. The processing of personal data carried out without the aid of electronic or automated means is subject to the same regulations provided for the processing with the aid of this means”.

Note to Article 5, Paragraph 4:

- The text of Article 23, Paragraph 4, of Law No. 675 dated 31 December 1996, is as follows:

“Article 23 (health data). - from 1. to 3. *Omissis*.

4. The dissemination of data required to reveal health status is forbidden, except if necessary for the aim of preventing, ascertaining or stopping crimes, in observance of the regulations governing the matter”.

Notes to Article 6, Paragraph 1:

- The text of Decree of the President of the Republic No. 513 dated 10 November 1997 (Regulations containing criteria and procedures for the creation, archiving and sending of documents with information technology and telecommunications instruments, in accordance with Article 15, Paragraph 2, of Law No. 59 dated 15 March 1997), is published in *Official Journal* No. 60 dated 13 March 1998.
- The text of Decree of the President of the Council of Ministers dated 8 February 1999 (Technical standards for the creation, sending, storing, duplication, reproduction and validation, even temporal, of computerised documents in accordance with Article 3, Paragraph 1, of Decree of the President of the Republic No. 513 dated 10 November 1997 is published in the *Official Journal* No. 87 dated 15 April 1999.
- The text of Decree of the President of the Republic No. 428 dated 20 October 1998 (Regulations for the management of computer records by the public authorities), is published in *Official Journal* No. 291 dated 14 December 1998.

Note to Article 6, Paragraph 5:

- For the text of Article 36, Paragraph 3, of Legislative Decree No. 277 dated 1991, see the notes to the preambles.

Note to Article 6, Paragraph 6:

- The text of Article 3, Paragraphs 4 and 5, of Legislative Decree No. 135 dated 11 May 1999, is as follows:

“Art. 3 (processed data). - from 1. to 3. *Omissis*.

4. The data contained in lists, registers or databases, kept with the aid of electronic or automated means, are processed with ciphering techniques or by the use of identification codes or others systems that, considering the number and nature of the processed data, allow only the people concerned to be identified if necessary.

5. Data which can reveal health status and sex life are kept separate from any other personal data processed for aims which do not require their use. When processing these data one must carry out the procedures outlined in Paragraph 4 even when said data are not contained in lists, registers or databases or are not held with the aid of electronic or automated means”.

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