ORIGINAL PAPERS

Lung Cancer Mortality in Andalusia, 1975-2000

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OBJECTIVE: To describe trends in lung cancer mortality in Andalusia, Spain, during the period from 1975 through 2000.

SUBJECTS AND METHOD: Records of lung cancer deaths for the period from 1975 through 2000 were obtained from the Statistical Institute of Andalusia. The following indicators were calculated: crude rates, age-adjusted rates, truncated rates, and cumulative rates.

RESULTS: Mortality rates for men dropped in all subject groups aged over 50 years during the period from 1994 through 2000. In women mortality rates were much lower, although we observed an increase in the 35-39 and 45-49 age groups, which is reflected in the 6.1% rise in the truncated rates (35-64 years) during the period from 1994 through 2000. In older women mortality rates fluctuated more in the different age groups, although on the whole the truncated rate for all those over 65 years old fell by 9.7% in the period between 1995 and 2000.

CONCLUSION: Lung cancer mortality rates among men in Andalusia began to decrease after 1994. In contrast, mortality increased among young women, although their rates are still very low.

Key words: *Lung cancer. Mortality. Epidemiology. Andalucia.*

Mortalidad por cáncer de pulmón en Andalucía (1975-2000)

OBJETIVO: Describir la evolución de la mortalidad por cáncer de pulmón en Andalucía durante el período 1975-2000.

SUJETOS Y MÉTODO: Las defunciones por cáncer de pulmón durante el período 1975-2000 se obtuvieron del Instituto Andaluz de Estadística. Se han calculado los siguientes indicadores: tasas brutas, tasas ajustadas por edad, tasas truncadas y tasas acumuladas.

RESULTADOS: En los varones las tasas descienden en todos los grupos de edad por encima de los 50 años durante el período 1994-2000. En las mujeres las tasas son muy inferiores, aunque se aprecia un incremento en los grupos de 35-39 años y de 45-49 años, lo que queda reflejado en un incremento de las tasas truncadas (35-64 años) del 6,1% en el período 1994-2000. En las mujeres de mayor edad las tasas fluctúan más en los diferentes grupos de edad, aunque en conjunto la tasa truncada (> 65 años) desciende un 9,7% en el período 1995-2000.

CONCLUSIÓN: En Andalucía las tasas de mortalidad por cáncer de pulmón en varones han comenzado a descender desde 1994. Por el contrario, se registra un incremento en las mujeres jóvenes, pero con tasas muy inferiores.

Palabras clave: *Cáncer de pulmón. Mortalidad. Epidemiología. Andalucía.*

Introduction

In Europe lung cancer is the leading cause of cancer deaths in men and the third in women.[1] Smoking, the main risk factor for lung cancer, is responsible for 85% to 90% of deaths from this disease.[2] In the year 2000 the estimated number of deaths worldwide attributable to smoking was 4.9 million, surpassing 1990 estimates by 1 million. It is industrialized countries, however, that have the largest proportion of smoking related diseases.[3]

In 1998 smoking was responsible for some 56 000 deaths among adults in Spain. In men, lung cancer is still the main cause of death attributable to smoking. In women, lung cancer is already the second smoking-related cause of death, just after chronic obstructive pulmonary disease, and before cerebrovascular diseases. The change in rank for lung cancer among women is due to the increased prevalence of smoking and the increased number of deaths from the disease.[4]

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At the end of the 20th century a decrease in the mortality rate from lung cancer was observed in men living in Mediterranean countries. This decrease was attributed to changes in smoking patterns beginning in the 1970's.[5,6] The pattern in Mediterranean countries is similar to that observed in Northern European countries where, however, this change was observed almost a decade earlier.[7,8]

In previous publications we analyzed the trend in lung cancer mortality in Andalusia in the period from 1975 through 1992, for which we observed a marked increase in mortality rates for men (62%) and a decrease for women (–24%).[9] In the present study we propose to contribute updated information on lung cancer mortality in Andalusia and to determine the trends for the period from 1975 through 2000.

Subjects and Method

We performed a descriptive study of mortality from tracheal, bronchial, and lung cancer, using secondary data sources. The study population consisted of the residents of the autonomous community of Andalusia, Spain, during the period from 1975 through 2000.

Information on deaths from the aforementioned causes and on the populations needed to calculate the various indicators was supplied in magnetic format by the Statistical Institute of Andalusia.

In order to facilitate interpretation of the data, we calculated, in addition to the absolute number of deaths, the crude, age-specific, standardized (by the direct method, using Segi's[10] European standard population as a reference), and truncated (35-64 years, 0-64 years and ≥65 years) rates. We also calculated the cumulative rate,[11] as it has the advantage of requiring simpler calculations and circumventing the arbitrary selection of a standard population. Its main usefulness, however, lies in the fact that it provides a good approximation of the cumulative risk, the indicator presented in Table 1. Cumulative risk is the risk of a person dying from a disease during a given period of time if no other causes of death existed. Normally the time period considered is between 0 and 74 years.

Results

Lung cancer is the most frequent tumor in men in Andalusia. In the year 2000 it was the cause of 2 622 deaths in men and 265 in women, which represents 30% and 5% of deaths, respectively, from malignant tumors in Andalusia. Table 1 shows the number of deaths, the crude, standardized, truncated (35-64 years) and cumulative rates for lung cancer deaths in

TABLE 1
Lung Cancer Mortality Rates. Andalusia, 1975-2000*

Year	Men					Women				
	Deaths	CrR	ESR	TR	CuR	Deaths	CrR	ESR	TR	CuR
1975	1075	35.8	50.1	47.4	4.3	187	6.0	6.6	6.2	0.53
1976	1077	35.6	49.3	47.9	4.2	174	5.6	5.9	5.5	0.50
1977	1186	38.9	53.5	52.7	4.6	161	5.1	5.5	6.0	0.40
1978	1306	42.5	57.8	61.0	4.9	186	5.8	6.2	6.4	0.52
1979	1337	43.1	57.7	58.4	4.9	168	5.2	5.4	4.6	0.41
1980	1358	43.4	58.0	55.7	4.8	189	5.8	6.0	6.1	0.47
1981	1548	48.9	64.3	59.0	5.3	166	5.1	5.3	6.3	0.39
1982	1598	49.9	64.8	61.0	5.4	184	5.6	5.7	6.2	0.39
1983	1733	53.4	69.2	68.3	5.6	212	6.4	6.2	5.2	0.44
1984	1795	54.6	69.0	70.6	5.6	186	5.5	5.3	4.9	0.39
1985	1797	54.0	68.7	68.6	5.7	200	5.9	5.6	5.4	0.43
1986	1920	57.2	70.8	71.0	6.1	223	6.5	6.1	5.9	0.43
1987	1961	58.1	70.9	66.1	5.9	185	5.3	5.0	5.2	0.38
1988	2092	61.8	74.6	77.5	6.0	188	5.4	5.1	5.1	0.38
1989	2179	64.2	76.1	76.8	6.2	194	5.6	5.2	5.5	0.37
1990	2226	65.4	76.5	77.7	6.2	201	5.7	5.0	3.7	0.36
1991	2251	65.9	75.9	74.7	6.4	203	5.8	5.2	4.9	0.43
1992	2447	71.1	81.1	81.2	6.6	198	5.6	5.0	5.0	0.35
1993	2554	73.5	83.2	85.3	6.7	230	6.4	5.7	5.3	0.41
1994	2637	75.1	84.0	83.3	6.6	196	5.4	4.8	5.1	0.36
1995	2683	75.8	82.5	77.1	6.7	235	6.4	5.6	5.4	0.44
1996	2625	73.8	80.1	76.1	6.3	235	6.4	5.5	5.7	0.42
1997	2642	74.2	79.1	75.5	6.3	228	6.2	5.4	6.1	0.39
1998	2758	77.5	80.9	74.1	6.4	225	6.1	5.1	6.0	0.38
1999	2634	73.8	76.4	74.7	6.0	231	6.3	5.2	5.8	0.41
2000	2622	73.2	74.2	71.9	6.0	265	7.2	5.9	7.1	0.46
ψ1975 compared to 2000	143.9%	104.7%	48.0%	51.5%	38.4%	41.7%	19.4%	–10.0%	13.6%	–12.6%
Φ1975-2000	3.7%	3.0%	1.7%	1.9%	1.4%	2.0%	1.3%	0.1%	1.7%	0.4%
Φ1975-1994	4.9%	4.0%	2.8%	3.2%	2.3%	0.8%	0.04%	–1.1%	0.3%	–1.1%
Φ1994-2000	–0.1%	–0.4%	–2.0%	–2.4%	–1.5%	5.5%	5.1%	3.7%	6.1%	4.9%

*ψ indicates total percentage change for the period; Φ, mean annual percentage change for the period; CrR, crude rate per 100 000 persons; ESR, European standardized rate per 100 000 persons; TR, truncated rate (35-64 years) adjusted per 100 000 persons; CuR, cumulative risk (0-74 years, expressed as a percentage).

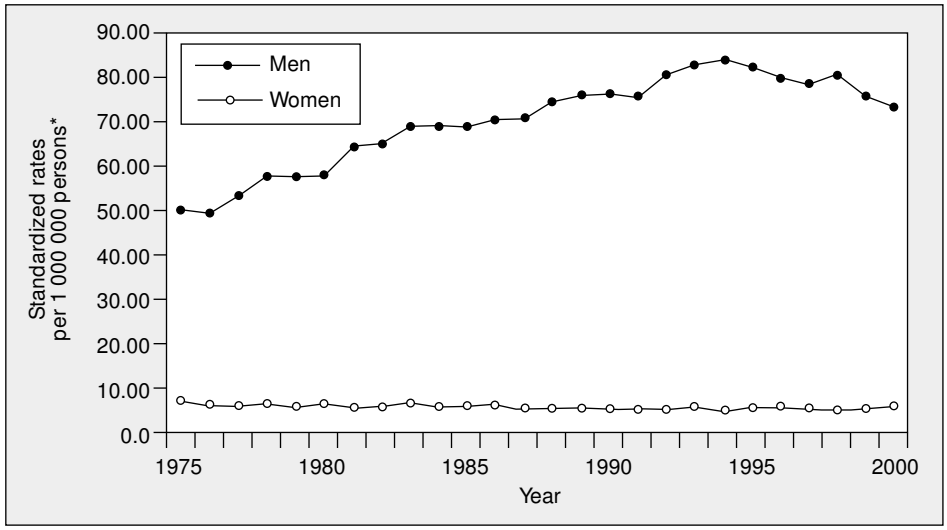

Figure 1. Lung cancer mortality trend (Andalusia, 1975-2000). *European standard population.

Andalusia (1975-2000) for men and women. The age-adjusted lung cancer mortality rate for the time period studied rose from 50.1 per 100 000 men in 1975 to 74.2 in the year 2000, with a mean annual increase of 1.7%. These rates reached their highest point in 1994, with 84 deaths per 100 000 persons/year and fell in later years (Table 1 and Figure 1). For women, mortality rates were 8- to 13-fold lower than for men and showed a slight annual decrease of 0.5%.

For women, the risk of dying of lung cancer before the age of 75 years, calculated from the cumulative rate, fell from 0.53% in 1975 to 0.46% in 2000. This means that at the beginning of the period studied 1 out of every 188 women died of this disease; by the end of the period this ratio had decreased to 1 out of every 215. The trend for men was somewhat different, with risk rising from 4.3% to 6.0% in the same period; 1 out of every 23 men died of this disease at the beginning of the period, and 1 out of every 17 at the end.

Table 2 shows the cumulative 5-year rates by age group and sex, as well as the mean percent changes for the periods from 1975 through 2000, 1975 through

TABLE 2
Age-Group Specific Rates and Mean Annual Percent Change. Lung Cancer Mortality Rates in Andalusia, 1975-2000*

	1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	Φ 1975-2000	Φ 1975-1994	Φ 1994-2000
Age men, years								
30-34	1.8	2.6	2.4	1.8	1.8	22.5	21.1	27.2
35-39	4.9	5.6	6.9	8.0	4.6	10.8	9.4	15.3
40-44	14.1	16.1	19.0	20.7	16.8	7.3	11.0	–4.2
45-49	18.0	36.5	40.3	45.2	43.8	4.7	5.3	2.9
50-54	60.3	72.5	83.3	86.8	88.7	2.6	3.9	–1.3
55-59	111.4	129.1	141.1	160.4	150.7	2.9	4.8	–3.1
60-64	170.0	200.3	227.4	242.8	217.5	1.4	2.6	–2.3
65-69	243.8	290.8	318.8	350.3	327.8	1.1	1.9	–1.3
70-74	323.8	383.8	411.8	447.2	430.7	1.6	2.1	–0.1
75-79	348.2	435.2	470.1	532.0	531.9	2.5	3.8	–1.9
80-84	322.7	445.7	505.4	522.0	575.5	2.4	3.7	–1.6
>85	263.5	367.3	364.3	486.0	482.6	5.5	8.3	–3.3
Age women, years								
30-34	0.9	0.5	0.2	0.9	0.8	7.7	9.0	3.7
35-39	1.4	1.4	1.2	1.3	1.9	24.4	16.3	50.1
40-44	1.4	2.3	1.6	2.5	3.4	24.3	26.5	17.3
45-49	4.5	4.0	4.2	3.3	5.8	13.0	9.9	22.7
50-54	6.7	6.0	5.1	6.5	7.1	9.3	9.3	9.3
55-59	10.8	9.6	9.7	8.9	8.6	5.4	7.1	0.0
60-64	14.3	14.7	13.0	11.8	13.4	3.8	2.3	8.7
65-69	19.7	18.7	18.3	18.6	16.5	5.2	4.2	8.3
70-74	31.9	23.3	23.4	25.0	15.2	3.1	0.9	10.3
75-79	42.5	36.4	38.4	35.0	31.7	0.9	1.5	–1.3
80-84	42.5	54.7	45.2	37.9	38.8	4.7	0.3	18.6
>85	28.6	51.0	51.3	52.4	44.5	9.9	11.3	5.3

Φ indicates mean annual percentage change for the period.

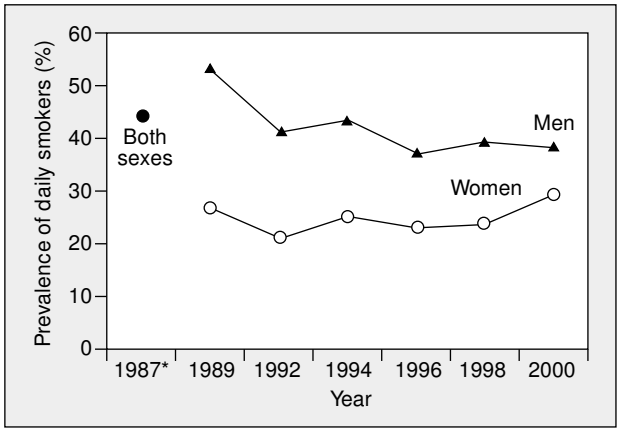

Figure 2. Prevalence of daily smokers by sex (Andalusia, 1987-2000). *For 1987 the variable of tobacco consumption was not analyzed by sex.

1994, and 1994 through 2000. In men, the rates decreased in all age groups over 50 years during the period from 1994 through 2000. The rates were much lower in women, although increases were observed for the 35 to 39- and 45 to 49-year age groups and are reflected in the 6.1% increase in truncated rates (34-65 years) in the 1994 to 2000 period (Table 1). In older women, rates fluctuated more in the different age groups, although overall the truncated rate (≥65 years) fell by 9.7% in the 1995 to 2000 period (Table 3).

Table 3 shows the overall age-adjusted and truncated (0-64 and ≥65 years) mortality rates from lung cancer by sex for Andalusia, Spain, and for the European Union.[12] Most striking is the difference between the changes in lung cancer mortality in Andalusia and in the European Union as a whole during the period studied.

Discussion

Before considering the results, we must comment on the quality of the data and the methodology used. Due to the lack of morbidity data available, we used mortality data, as they constitute the only available source of data on the national and local levels and they also satisfy the criteria of continuity and comprehensiveness.[13]

In our case we can consider mortality figures a reliable indicator of the frequency of lung cancer, both because of the low patient survival rates (despite diagnostic and therapeutic advances, lung cancer still remains highly lethal, with fewer than 15% of patients surviving 5 years after diagnosis)[14] and because of the accuracy of the information on death certificates mentioning lung cancer as cause of death in our context.[15] Furthermore, we also analyzed truncated rates (<65 years), for which the quality of information as to cause of death is greater.

Various studies have quantified the relative risk of lung cancer from exposure to tobacco smoke (about 10, with a strong dose-response relationship).[16] Moreover, if the prevalence of exposure to tobacco smoke in the general population is about 36%, the population attributable fraction is probably close to 80%, which

TABLE 3
Age-Adjusted Lung Cancer Mortality Rates (European Standard Population) and Percent Change in Andalusia, Spain, and the European Union*

	1975	1980	1985	1990	1995	1995 Compared to 1985 (% Change)	1995 Compared to 2000 (% Change)
Men							
All ages							
Andalusia	50.1	58.0	68.7	76.5	82.5	20.1	–10.1
Spain	43.6	48.8	58.8	67.6	72.4	23.0	–3.6
European Union	70.3	76.2	78.5	75.8	72.4	–7.7	
0-64 years							
Andalusia	21.9	26.0	32.0	36.1	35.5	0.9	–5.9
Spain	20.4	22.7	27.2	31.9	33.7	21.6	
European Union	32.4	34.4	34.8	32.7	30.2	–13.2	
≥65 years							
Andalusia	278.5	316.8	365.8	403.2	462.5	26.4	–12.7
Spain	231.1	260.3	310.8	356.3	385.6	24.0	
European Union	376.8	414.8	432.2	424.5	414.2	–4.2	
Women							
All ages							
Andalusia	6.6	6.0	5.6	5.0	5.6	0	5.9
Spain	6.0	5.7	5.4	5.2	5.8	6.4	16.5
European Union	9.5	10.8	12.3	13.6	14.9	21.6	
0-64 years							
Andalusia	2.9	2.9	2.5	1.7	2.5	0	29.4
Spain	2.9	2.6	2.3	2.3	2.8	20.7	
European Union	5.1	5.6	6.1	6.5	7.0	14.6	
≥65 years							
Andalusia	36.6	31.0	30.8	31.8	30.6	–0.6	–9.7
Spain	31.0	30.9	30.5	28.7	29.7	–2.5	
European Union	45.3	52.7	62.3	70.7	79.5	27.5	

*Adapted from López-Abente.[12]

shows the impact that eliminating exposure would have on the incidence of and mortality from lung cancer. For this reason we feel that primary prevention, that is smoking avoidance or cessation, is an effective measure at our disposal that would have a significant effect not only on lung cancer, but also on tumors at other sites (oropharynx, larynx, esophagus, bladder, etc) and on other diseases (ischemic heart disease, chronic bronchial disease). Nevertheless, the latest report of the Preventive and Health Promotion Activities Program (PAPPS) of the Spanish Society of Family and Community Medicine indicates that only 33% of smokers were advised to stop smoking and 39% of them were followed up.

Although much emphasis has been placed on the limitations of epidemiological findings based on mortality studies, they nonetheless still provide a basic tool for understanding the disease and its determinants.[17] Thus, for example, the time-series analysis of mortality has shown that variation in smoking prevalence over time is responsible for the trends in lung cancer mortality in Mediterranean men, and that the observed downward trend occurred almost a decade behind the one observed in Northern and Eastern European men.[18]

Our results indicate that in Andalusia lung cancer mortality in men reached its highest level in 1994 and began to fall thereafter (Figure 1). This is similar to the trend observed in Barcelona, where the fall in lung cancer mortality rates was preceded by a decline in the prevalence of smoking among men.[19] Considering the changes in smoking prevalence by sex in our part of Spain[20] (Figure 2), we can expect this favorable trend to continue in the coming years, as there is no other factor that can explain it.

In 1995 the standardized ratio (men to women) was 15 in Andalusia, 12 in Spain, and 5 in the European Union (Table 3), which probably reflects delayed initiation of regular smoking and lower professional risk in Andalusian women. However, the increase observed in truncated rates (35-64 years) may reflect the increase in smoking among women in recent decades[21] and we can expect the trend to extend to older age groups in the coming years. We may see the situation of women, years ago a privileged one, begin to worsen rapidly in the near future. The social cost of this trend will be seen when the cohorts of young women, who have taken up smoking on a large scale, reach the ages at which the symptoms of smoking-related diseases begin to appear.

In Andalusia a progressive increase in smoking among young people between 1987 and 1999 was observed, especially in the 12 to 15-year age group.[22] In the report published in 2000 for that period, it was observed that smoking initiation was highest in the 16 to 24-year age group, which accounted for nearly half the total, and that the mean age was 16 years.[20]

Although smoking prevalence has decreased, lung cancer still constitutes an important public health problem in Andalusia. For this reason, the courageous lawsuit that the autonomous government of Andalusia has filed against the tobacco companies for the harm they cause but do not bear the cost of is worthy of note.[23] Also, the availability of and increased access to effective new smoking cessation interventions may contribute to a decrease in morbidity and mortality from lung cancer and associated heath care costs in Andalusia.

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