Lung Cancer Incidence in the Province of Avila, Spain, in 2002 and Decade-Long Trends

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OBJECTIVES: To determine lung cancer incidence in the province of Avila, Spain, in the year 2002 and compare it with incidences reported in 2 previous studies (for 1992-1993 and 1997).

PATIENTS AND METHODS: Patients diagnosed in 2002 were evaluated prospectively by the method used in the previous studies. The reference population was obtained from the municipal records for 2001.

RESULTS: In 2002, 87 patients (74 men and 13 women) were diagnosed with lung cancer. The crude incidence rate was 53.09 cases per 100 000 population (men: 89.92/100 000; women: 15.93/100 000). Of these, 87.3% had been smokers. Squamous cell carcinomas were the most frequent type overall (38.1%) and in men (42.4%). Adenocarcinomas were the most frequent type in women (60%). The most frequent treatment was chemotherapy (35.6%).

Between the 1992-1993 study and our 2002 study, significant increases were found in crude incidence rates of lung cancer and the use of chemotherapy, as well as significant decreases both in squamous cell carcinomas and the use of radiotherapy alone.

CONCLUSIONS: Between 1992 and 2002 the lung cancer incidence in men and women in the province of Avila increased significantly.

Key words: *Lung cancer. Epidemiology. Incidence. Smoking. Diagnosis. Treatment.*

Incidencia del cáncer de pulmón en la provincia de Ávila. Año 2002 y tendencias en una década

OBJETIVOS: Determinar la incidencia del cáncer de pulmón en la provincia de Ávila en el año 2002 y comparar estos datos con los obtenidos en 2 estudios previos (1992-1993 y 1997).

PACIENTES Y MÉTODOS: Se ha evaluado prospectivamente a los enfermos de 2002, con el método seguido en los estudios anteriormente realizados. La población española de referencia fue la del padrón de 2001.

RESULTADOS: En 2002 se diagnosticó cáncer de pulmón en 87 pacientes (74 varones y 13 mujeres). La tasa bruta de incidencia fue de 53,09 casos/100.000 habitantes (varones: 89,92/100.000; mujeres: 15,93/100.000). El 87,3% eran fumadores. Los carcinomas escamosos predominaron en el conjunto (38,1%) y el colectivo masculino (42,4%) y en las mujeres, los adenocarcinomas (60%). El tratamiento más frecuente fue la quimioterapia (35,6%).

Entre el estudio de 1992-1993 y el de 2002 se han encontrado aumentos estadísticamente significativos en las tasas brutas de incidencia e indicación de tratamientos quimioterápicos, así como descensos significativos tanto de los carcinomas escamosos como de las indicaciones de radioterapia aislada.

CONCLUSIONES: Se ha comprobado, entre 1992 y 2002, un incremento significativo de la incidencia de cáncer de pulmón en varones y mujeres de la provincia de Ávila.

Palabras clave: *Cáncer de pulmón. Epidemiología. Incidencia. Tabaco. Diagnóstico. Tratamiento.*

Introduction

In 1995, with an estimated incidence of 377 000 new cases, lung cancer was still the most common tumor among the European population. In the same year the disease was responsible for 330 000 deaths in Europe (approximately 20% of all cancer deaths), more than any other type of cancer.[1] In Spain, according to data from the National Institute of Statistics, 17 340 people died of lung cancer in 2000,[2] and in 1998 this type of cancer was responsible for the highest percentage (26.5%) of all deaths attributable to smoking.[3]

Throughout the second half of the last century there was a progressive increase in lung cancer incidence and mortality among Spanish men,[4] although some authors have observed a more favorable trend for the disease in recent years.[5-7] In Spanish women rates remained nearly stable until the first years of the 1990s.[4]

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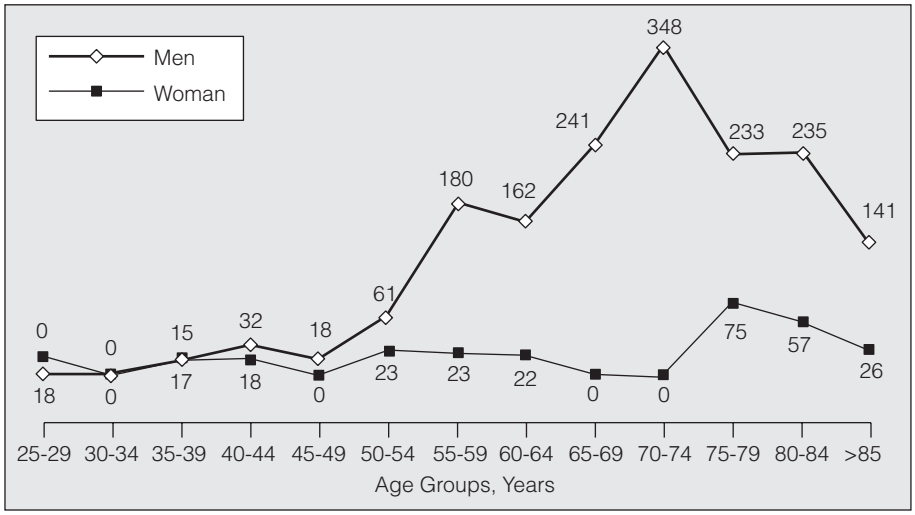

Figure 1. Incidence rates for bronchopulmonary carcinoma, by age group, in men and women in Avila in 2002 (cases/100 000 population).

In such a context, a close examination of the epidemiological characteristics of lung cancer can give us a better idea of the prevalence of the disease. While cancer registers annually provide extremely interesting data, their limitations with respect to population and clinical aspects make studies in well-defined geographic areas advisable. In order to discern trends in basic health status indicators, we present data concerning the incidence and other epidemiological aspects of lung cancer in the province of Avila, Spain, gathered during the year 2002 and compare them with those obtained in previous studies, carried out in 1992 and 1993 (evaluated together) [8] and in 1997.[9]

Patients and Methods

All patients residing in the province of Avila for at least 1 year who had received a clinical or cytologically/histologically confirmed diagnosis of primary lung cancer in 2002 were enrolled prospectively. In the case of clinical diagnoses, as diagnostic procedures could not be completed, clinical picture and radiologic findings consistent with the disease evaluated by at least 2 pneumologists were required. Patients with benign, pleural tumors and preneoplastic lesions were excluded. Enrollment decisions were based on information from the department of health records and from the internal medicine, pathology, and respiratory medicine departments of the Hospital Nuestra Señora de Sonsoles, the referral hospital for the province. There were 2 other hospitals in the province that, due to their particular characteristics, contributed to the study only a small number of patients, on whom information was gathered periodically. The same system had been used in the 2 previous epidemiological studies, the first covering the years 1992 and 1993[8] and the second, the year 1997, part of the study carried out in the autonomous community of Castile and Leon.[9] We also used the same patient data sheet containing the following sections (although not all were analyzed in the present study): personal data (name, address, and age), risk factors (smoking, occupational risks, diseases, and tumor history), diagnosis (method, anatomical site, and pathological type), and treatment. People who had smoked at least 1 cigarette a day for a year, or more than 365 cigarettes in their lives were considered smokers, and those who had given up smoking at least 6 months before the onset of lung-cancer symptoms were considered ex-smokers. For some patients referred for treatment outside our province we requested precise information by telephone to confirm the type of treatment initiated.

To calculate the crude incidence rates, age- and sex-adjusted rates, and rates standardized to the Spanish population, we used the inhabitants of Avila (163 885), Castile and Leon (2 479 425), and Spain (41 116 842) appearing in the 2001 census.[2] We used the direct method to adjust rates for age and sex to the European and world standard populations[10] with the help of Epidat software, version 1.0. Statistical analysis was done using EpiInfo software, version 6.04. The χ^2 test was used to compare qualitative data and a P value less than .05 was considered significant.

Results

Between January 1 and December 31, 2002, 87 patients (74 men [85%] and 13 women [15%]) with a mean (SD) age of 68.04 (12.32) years were diagnosed with lung cancer in the province of Avila. The youngest was 25 years old; the 25th, 50th, and 75th percentiles were at 61, 71, and 76 years respectively; and the oldest patient was 91 years old. There was no significant difference between the mean ages of the men

TABLE 1
Lung Cancer in the Province of Avila, 2002. Crude and Adjusted Incidence Rates per 100 000 Population

	Crude Rates	Rates Adjusted to the Population of			
		Castile and Leon	Spain	Europe	World
Total	53.09	48.49	41.85	38.89	23.44
Men	89.92	80.54	65.63	64.8	39.76
Women	15.93	14.86	13.16	11.46	14.96

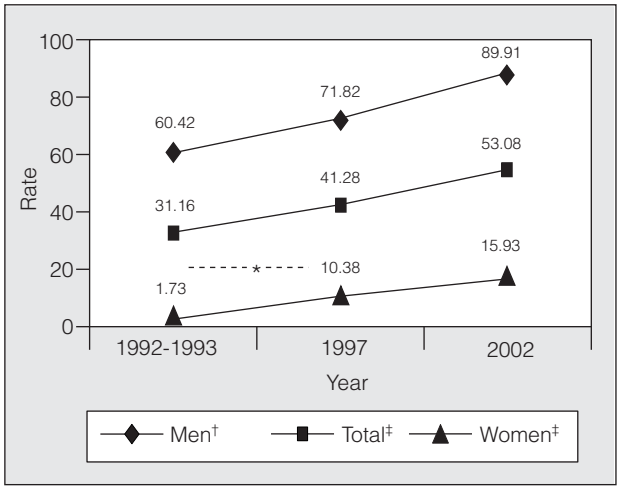

Figure 2. Changes in crude incidence rates per 100 000 population in the province of Avila.[8,9]
***P*=.0038; †statistically significant increase between 1992-1993 and 2002 rates (*P*<.05); ‡statistically significant increase between 1992-1993 and 2002 rates (*P*<.001).**

TABLE 2
Percentages of Smokers and Ex-Smokers in the 1992-1993, 1997, and 2002 Studies

	1992-1993	1997	2002
Smokers			
Total	97.24	88.88*	87.35
Men	100	98.41	98.65
Women	0	11.11	23.08
Ex-smokers			
Total	45.28	45.31	53.94
Men	45.28	46.03	54.79
Women	–	0	33.33

*Statistically significant difference between 1992-1993 and 1997 (*P*=.02).

(68.67[10.43] years) and the women (64.46 [(20.21] years). The ratio of men to women was 5.69:1, 77.01% of the patients were 60 years old or more, and 52.87% were 70 years old or more.

In Figure 1 we show crude incidence rates per 100 000 population, by age and sex, for 2002, and in Table 1, crude incidence rates and rates adjusted to the population of Castile and Leon, and the Spanish, European, and world populations. The crude rates, together with those obtained in the 1992-1993 study (109 patients: 106 men and 3 women) and those of the 1997 study (71 patients: 62 men and 9 women), are presented in Figure 2. Significant differences were found in the overall rates for 2002 and those for 1997 and 1992-1993, both for the total (*P*=.0008) and for the groups of men (*P*=.030) and women (*P*=.0002). Comparing paired rates from correlative studies significant differences (*P*=.0038) were found only between the rates for women in 1992-1993 and in 1997.

Of the 87 patients diagnosed in 2002, 76 (87.35%) were smokers—98.65% of the men and 23.08% of the women (Table 2). Mean tobacco consumption was 1.58 (0.76) packs a day (1.61 [0.74] packs a day for men and 1[1] pack a day for women). Six men were also occasional cigar smokers. Of the 76 smokers, 41 (53.94%) had quit smoking before diagnosis (6.4 [8.7] years before). Only the decrease in smoking between 1992-1993 and 1997 was significant (*P*=.02).

In 2002, 11 (12.64%) patients were diagnosed solely by clinical and radiologic criteria. In the remaining 76 (87.36%), diagnosis was confirmed by cytology (15 patients, 17.2% of the total) and histology (61 patients,

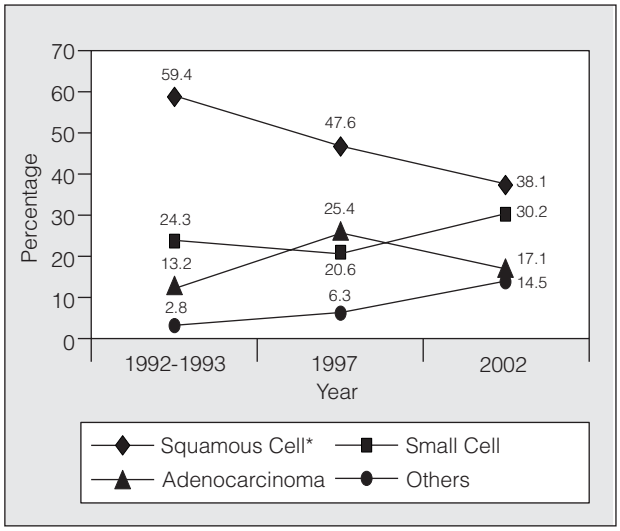

Figure 3. Histologic types. Others: 7 undifferentiated, 2 carcinoid, and 2 large cell carcinomas in 2002; 3 undifferentiated and 2 carcinoid tumors in 1997; 2 undifferentiated and 1 large cell carcinoma in 1992-1993; *statistically significant decrease between the 1992-1993 and 2002 studies (*P*=.019).

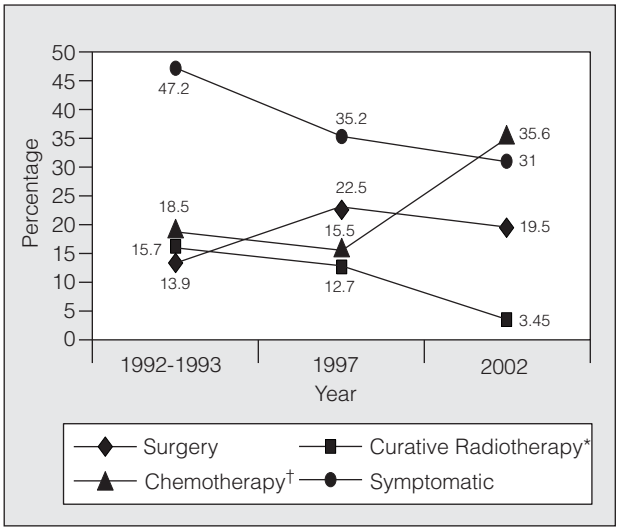

Figure. 4. Treatments received by patients. *Statistically significant decrease between the 1991-1993 and 2002 studies (*P*=.02); †statistically significant increase between the 1992-1993 and 2002 studies (*P*=.006).

TABLE 3
Histologic Types Found in Patients Diagnosed in 2002

	Total [n (%)]	Men [n (%)]	Women [n (%)]
Histologic type			
Squamous cell	29 (38.16)	28 (42.42)	1 (10)
Small cell	23 (30.26)	22 (33.33)	1 (10)
Adenocarcinoma	13 (17.11)	7 (10.61)	6 (60)
Undifferentiated*	7 (9.21)	7 (10.61)	–
Large cell	2 (2.63)	1 (1.515)	1 (10)
Carcinoid	2 (2.63)	1 (1.515)	1 (10)
Total	76 (100)	66 (100)	10 (100)

*Non-small cell undifferentiated carcinoma.

70.1% of the total). Those findings are summarized in Table 3. Figure 3 shows the histologic types found during the periods studied. A significant decrease was noted between 1992-1993 and 2002 in the percentage of squamous cell carcinomas diagnosed (*P*=.019).

Table 4 presents treatment given to patients in 2002 according to histologic type and summarizes treatment given in 1997 and 1992-1993. In Figure 4 we show changes in the main treatments given to patients. The increase in the use of chemotherapy (*P*=.006) and the decrease in treatment with radiotherapy alone (*P*=.02) were significant.

TABLE 4
Treatments Given to Patients With Lung Cancer in the Present Study and Previous Studies (1992-1993 and 1997)*

Treatment	For 2002, According to Cytologic/Histologic and Clinical/Radiologic Diagnosis				
	Non-Small Cell Cancer	Carcinoid	Small Cell Cancer	Clinical/Radiologic	Total
Surgery	15	2	–	–	17
Surgery+RT	1	–	–	–	1
Curative RT	3	–	–	–	3
Palliative RT	1	–	–	–	1
Chemotherapy	11	–	20	–	31
Chemotherapy+RT	5	–	2	–	7
Symptomatic	15	–	1	11	27
Total	51	2	23	11	87

Summary				
	1992-1993 [n (%)]	1997 [n (%)]	2002 [n (%)]	Total [n (%)]
Surgery	15 (13.88)	16 (22.53)	17 (19.54)	48 (18.04)
Surgery+RT	2 (1.85)	–	1 (1.15)	3 (1.13)
Curative RT†	17 (15.74)	9 (12.68)	3 (4.35)	29 (10.90)
Palliative RT	3 (2.77)	2 (2.82)	1 (1.15)	6 (2.26)
Chemotherapy‡	20 (18.51)	11 (15.49)	31 (35.63)	62 (23.31)
Chemotherapy + RT	–	5 (7.04)	7 (8.05)	12 (4.51)
Symptomatic	51 (47.22)	25 (35.21)	27 (31.03)	103 (38.72)
Unconfirmed	–	3 (4.23)	–	3 (1.13)
Total	108 (100)	71 (100)	87 (100)	266 (100)

*RT indicates radiotherapy.
†Statistically significant decrease between 1992-1993 and 2002 (*P*=.02); ‡statistically significant increase between 1992-1993 and 2002 (*P*=.006).

TABLE 5
Comparison of Lung Cancer Incidence Rates in Avila in 2000 With Estimates for Spain in 2000 (GLOBOCAN) and for Spain and Europe in 1998 (EUCAN)[15]*

	1998 Spain			2000 Spain			2002 Avila		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
RAEP	39.57	79.13	7.16	–	–	–	38.89	68.4	11.46
RAWP	27.69	54.62	5.03	–	53.22	3.97	23.44	39.76	14.96

	Europe		
	Total	Men	Women
RAEP	42.16	73.95	17.31
RAWP	29.12	50.29	11.97

*RAEP indicates incidence rates adjusted to the European population (cases/100 000 population); RAWP, incidence rates adusted to the world population (cases/100 000 population).

Discussion

Lung cancer is still an important health problem in the province of Avila. In 2002, 87 patients were diagnosed, with a mean age of 68 years, very similar to that reported in previous studies for Castile-Leon and other provinces of Spain.[9,11-14] However, the ratio of men to women diagnosed (5.69:1) was low[8,11,12] and only comparable to the 5.5:1 ratio found between 1993 and 1997 in the north of Castellon.[14]

As shown in Table 5, lung cancer incidence rates among men in Avila in 2002 were lower than mean rates for Spain and Europe, as they had been in 1997.[9] In women, the situation was similar to that of 1997: rates were higher than in the rest of Spain, but still lower than mean rates adjusted to the standard European population. When our findings are expressed in terms of world population, the actual rate is 14.96 women per 100 000 population, but this should be interpreted cautiously, as 1 woman was diagnosed when she was only 25, and the standard world population has a proportion of young people far higher than other reference populations, such as those of Europe or Spain. The International Agency for Research on Cancer (IARC) has published the 1998 lung cancer incidence rates for Spain and Europe in their EUCAN database, and estimated rates for Spain for the year 2000 adjusted to the world population in their GLOBOCAN database.[15] We decided to use these data as a comparative reference because of their reliability and chronological proximity to the present study.

Lung cancer incidence rates within the well-defined public health area of the province of Avila tended to increase significantly among all groups over the time period covered by the 3 studies, all of which were carried out prospectively using the same method (Figure 2). Cancer registers for the provinces of Tarragona and Navarre show progressive increases in rates among men, at least until 1996 (for Tarragona) and 1997 (for Navarre).[16,17] Recent studies, however, have indicated a decline in mortality rates for men in the city of Barcelona (for the period 1994-1998 compared to previous 5-year periods),[7] in Catalonia (starting in 1990),[6,18] in Andalusia (starting in 1994),[19] and for younger age groups (30-34 years) throughout Spain (starting in 1988).[5] Absolute mortality figures for lung cancer in Spanish men gathered by the National Institute of Statistics also stabilized at around 15 500 deaths between 1998 and 2000.[2] Estimates provided by IARC[15] showed a progressive rise in incidence rates in men until 1998, when incidence was 54.62 cases/100 000 when adjusted to the world population, and a slight decrease (53.22 cases/100 000) in estimated rates for the year 2000.

It is difficult to say whether we are finally seeing the beginning of the long-awaited change in lung cancer trends in Spanish men or simply a temporary dip in the curve that may give way to a new rise in incidence rates. On one hand, given the poor prognosis of lung cancer,[17] mortality data seem to point to the possibility of a decrease in incidence rates. However, because of the close causal link between this type of cancer and smoking,[3] we analyzed lung cancer incidence data in combination with the curve of tobacco consumption among Spanish men, and here our conclusions seem less optimistic. We know that in Spain lung cancer is diagnosed in smokers only 30 to 50 years after initiation of smoking[4,11] and we are now seeing the consequences of tobacco consumed in the 1960s and 1970s. Furthermore, tobacco consumption among Spanish men increased progressively until the first third of the 1970s,[20,21] remaining stable at its highest levels until the first third of the 1980s. We also know that the risk of lung cancer remains high during the first years after smoking cessation.[4] Thus, although tobacco consumption began to decline in men in the United States of America and some European countries (Denmark, Finland, the Netherlands, Switzerland, and the United Kingdom) in the first years of the 1960s,[17,22] it was only 30 years later, at the beginning of the 1990s, that lung cancer incidence began to decline.[17,23] We cannot predict, however, that the incidence rate for Spanish men will continue to rise until around 2015, as the quantity of nicotine and carcinogenic substances inhaled by smokers in the United States of America and northern and central Europe was probably greater than for Spanish smokers who began smoking several decades later.[21]

Between 1992-1993 and 2002 we observed an increase in the incidence of lung cancer among women in the province of Avila. As the number of women diagnosed in our study was low, we will have to watch for changes in the coming years. Even so, the increase was significant and concurred with findings in the registers of Navarre[17] and Tarragona,[16] in which an increase in incidence among young women was seen starting in the early 1990s. The same tendency has been observed in mortality studies in Catalonia,[6,7] Andalusia,[19] and throughout Spain[2,5] beginning in the 1960s.[20] We did observe how the percentage of women smokers diagnosed with lung cancer grew beginning with the 1997 study, although it is still far from the 98% of cases diagnosed in male smokers in recent years (Table 2). These figures are similar to those found in other recent Spanish studies.[11,12,14] The significant decrease in the percentage of smokers among patients of both sexes diagnosed with lung cancer between 1992-1993 and 1997 was chiefly a consequence of the increase in cases reported in women, among whom the proportion of smokers was still low.

The percentage of patients diagnosed in our province using clinical and radiologic criteria alone was 12.64% in 2002 and 11.26% in 1997. These figures are in the 8% to 14% range reported in similar studies done in Spain and abroad.[9,11-13,24] In patients diagnosed by cytology or histology (Table 3 and Figure 3), a significant decrease was found in squamous cell

carcinomas during the study period. Squamous cell carcinomas, which accounted for 38.16% in 2002, are still the most common type in our area, as in other parts of Spain.[11,12,14] Adenocarcinomas predominated in women, and it is probable that with the greater increase in lung cancer expected in women compared to men and recent changes in the characteristics of the tobacco consumed by both sexes (filter cigarettes, lower tar content, probable increase in nitrogenous material, etc)[17] the decrease in squamous cell carcinomas will continue and may lead to a substantial increase in adenocarcinomas, as has occurred in countries with a more extended history of tobacco consumption (central and northern Europe, the United States of America, Japan, etc).[17,25]

As can be seen in Table 4, the most frequently used type of therapy in our area in 2002 was symptomatic treatment, which with palliative radiotherapy accounted for 40.91% of treatments initiated in the 266 patients evaluated in the 3 studies. This percentage was higher than those reported in La Coruña (26%)[12] and Castellon (30%)[14] in the mid 1990s, and is similar to the 43.4% found in Asturias in 1992.[26] In our 1992-1993 study, 47.2% of the patients only received medication for symptom relief. This percentage decreased in the 1997 and 2002 studies (Table 4 and Figure 4). In Avila 18% of the patients received surgery, as did 15.7% of those in Asturias[26] and 17% of those in La Coruña, with occasional adjuvant radiotherapy or chemotherapy.[12] There were no significant variations in percentages of surgical treatment in the 3 periods evaluated in Avila. We gave chemotherapy to 23% of our patients (compared to 16% in La Coruña,[12] 23.33% in Castellon,[14] and 32.4% in Asturias[26]), and a significant increase in its use since 1997 was observed. The number of patients treated with curative radiotherapy was small and had decreased significantly since 1997, coinciding with an increase in the indication of combined chemotherapy and radiotherapy (Figure 4 and Table 4). The changes in treatment observed were in line with those found in other European longitudinal studies[17] and are a consequence of the advances produced throughout the 1990s.[27-29]

In conclusion, the incidence of lung cancer in the province of Avila has maintained its upward trend in men and has clearly increased in women, all consistent with smoking patterns described throughout Spain. There has been a significant decrease in the percentage of squamous cell carcinomas, and since 1997 there has been a clear increase in the use of chemotherapy. Unfortunately, the available data indicate that the increase in incidence of lung cancer in women has already started in Spain, and it is difficult to hazard a guess as to future trends in men, although we hope that optimistic predictions in this regard will be confirmed. It is therefore still vital to promote whatever measures are necessary to achieve a significant decrease in tobacco consumption in the Spanish population.

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